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MESSAGES

Dr. S. Abbas Raza
Corresponding Author

Pakistan is facing a crisis in terms of malnutrition that is among the worst in the world, witnessing both aspects of malnutrition at critical levels. Under-nutrition is leading to low birth weight, stunting, wasting and increasing risks to diseases and lowering life expectancy. Whereas over-nutrition coupled with high caloric and tempting food, choice of food, imbalance in physical movements is a major reason of obesity in Pakistan.

Malnutrition is known to compromise an individual's productivity, endanger the economy and impede national development. High morbidity and mortality rates of malnourished presents an immense challenge and exert additional pressure on resources, in all sectors of society. In developing countries, an estimated 2-3% of gross domestic product (GDP) is known to be lost to malnutrition.

Nutritional management has many implications and impact; extending from individuals to families, communities and to the national wellness. As a corresponding author of these guidelines, I am very much thankful to all the medical societies and their task force members for extending their support in the development of these nutritional guidelines. These guidelines would not have been possible without the continuous support of the Medical Affair department of Getz Pharma.

I strongly believe that these first-ever nutrition management guidelines of Pakistan will surely help to further educate health care professionals and would be a right step towards standardizing treatment. This guideline will also support in enhancing the knowledge and understanding of the health care professionals with the principal benefit of improving the quality of care of the people.

I am thankful to all the contributors and supporters who played their part in the publication of Pakistan 1st Nutritional guidelines.

MESSAGES

Fayza Khan
Co - Author

Nutrition plays an essential role in both health and chronic disease management. A healthy diet and wise food selection are critical components not only for promoting health and reducing the risk of chronic diseases but also in the management of certain conditions and diseases. In addition, this process helps reduce a substantial amount of healthcare resources by expanding the knowledge of healthy diets and reducing the outcome of chronic disease and multi-morbidities

Consuming the right food and Nutrition can improve well-being and physical strength, versus poor Nutrition, which leads to reduced immunity, impaired physical and mental development, and reduced productivity. Moreover, certain foods will be more appropriate for some patients depending on the patient's condition, predisposing factors, lifestyle, ability, age and environment. In these cases, Nutrition should also be adapted and modified in accordance with the patient's needs and condition.

Currently, there are no standard clinical nutrition practice guidelines in Pakistan related to various health conditions and diseases. Considering the current scenario of malnutrition and the non-availability of local guideline data, this initiative was taken by the Pakistan Nutrition and Dietetic Society(PNDS)in collaboration with local healthcare professional societies, namely the Pakistan Society of Obstetric and Gynaecology(SOGP), Pakistan Endocrine Society(P.E.S.), Pakistan Cardiac Society(P.C.S.), Pakistan Society of Internal Medicine(PSIM), Society of Surgeons of Pakistan(S.S.P.), Pakistan Society of Otorhinolaryngology(PSO), Pakistan Society of Nephrology(P.S.N.) Pakistan Association of Urological Surgeons (PAUS) and Pakistan Society of Oncology(PSO) and a task force was established. The Working group was formed by the Internal core committee of PNDS members and assigned members from the collaborating societies.

The main objective of the task force of each speciality was to collect comprehensive and recognized clinical nutrition guidelines and evidence-based knowledge for informed practice, keeping in mind the local demographics, dietary habits and lifestyle of the Pakistani population. It is hoped these guidelines will help the healthcare professionals to use it as a reference guide for providing timely nutrition support with the help of qualified and trained dietitians/nutritionists for better patient's management leading to improved health outcomes.

PNDS gratefully acknowledges the invaluable assistance and significant support provided by the relevant Nutritional experts; Senior Clinical Dietitians, Public Health Nutritionists & Medical specialists. They contributed to preparing nutrition guidelines for health and diseases based on evidence-based research. Their expertise, critical review and cooperation were essential to developing these guidelines/fact sheets with a holistic approach. Every attempt has been made to recognize all who have contributed to this publication

Lastly, I would like to express my sincere and utmost gratitude to Getz Pharma and its entire team for efficient administrative support from the beginning to the end.

MESSAGES

Prof. Dr. Atta U Rehman

President, Pakistan Association of Urological Surgeons

Nutrition can play a crucial role in the prevention, treatment, and management of urological conditions such as urinary tract infections, kidney stones, and prostate cancer. Maintaining a healthy and balanced diet can help support the overall health of the urinary system, including the kidneys and bladder.

When it comes to nutrition in urological patients HCPs should encourage patients to have proper hydration, maintain a good protein and fiber intake, limit the use of salt, and support their immune system with an adequate intake of vitamins and minerals. Additionally, certain foods and nutrients have been shown to have specific benefits for urological health.

As you work with urological patients, it is important to assess each patient's unique nutritional needs and provide individualized recommendations based on their specific condition and medical history. By prioritizing nutrition in the care of urological patients, we can help improve their overall health and recovery.

Dr. Ibrar Ahmed

President, Pakistan Endocrine Society

Universally , it is evident that malnourished people often have a poorer immune status, delayed wound healing, a greater risk of developing decubitus, a lower quality of life, and raised mortality. These factors contribute to a longer duration of admission, a poorer response to the medical treatment (chemotherapy, radiotherapy), and greater use of medicines, which is associated with increased healthcare costs.

Malnutrition is often unrecognized and untreated in hospitals (both in-patients and outpatients), nursing homes, and in the community, causing concern among a wide range of health professionals, national organizations, and patients. Despite this, there are no national guidelines for planners of healthcare.

I want to congratulate Dr. Abbas Raza, Pakistan Endocrine Society (PES) and authors affiliated with various contributing societies for their valuable sustenance in preparation of these guidelines. I truly believe that these guidelines will surely provide assistance to Health care professionals' in timely, optimal and uniform recognition and treatment of malnutrition related to disease and age.

MESSAGES

Prof. Dr. Javed Akram
President, Pakistan Society of Internal Medicine

As healthcare providers working with medicine patients, we must recognize the importance of nutrition in supporting treatment and managing chronic conditions. Proper nutrition can improve medication effectiveness, reduce the risk of adverse effects, and enhance overall well-being.

HCPs should discuss nutrient intake with patients as certain medications can affect nutrient absorption, leading to deficiencies. Some medications can interact with certain foods and supplements, affecting drug absorption, efficacy, or toxicity. Some medications require specific dietary restrictions, such as low-sodium, low-fat, or low-protein diets.

Along with nutrition, lifestyle is also an important factor and HCPs should encourage healthy eating habits and physical activity to support overall health and well-being. Discuss strategies to manage stress, sleep, and other lifestyle factors that can affect medication efficacy and overall health. Incorporating nutrition education and counseling into your practice can support your patients in achieving optimal health outcomes.

Prof. Dr. Kareem Zarkhoon,
President, Pakistan Nephrology Society

As a nephrologist, I have witnessed firsthand the critical role that nutrition plays in maintaining kidney health. As healthcare providers working with nephrology patients, we must recognize the crucial role that nutrition plays in maintaining kidney health. A balanced and individualized diet is essential in managing chronic kidney disease, delaying the progression of kidney failure, and improving overall well-being.

The kidneys play a vital role in removing waste and excess fluids from the body, and a balanced diet is key to supporting this process. Some important considerations for kidney health include proper hydration, individualized protein intake, and controlled levels of potassium, phosphorus, and sodium. High levels of potassium and phosphorus are very dangerous in patients with chronic kidney disease.

By following a balanced and individualized diet, you can support kidney health and improve overall well-being. Remember to always consult with your healthcare provider before making any significant dietary changes.

MESSAGES

Prof. Dr. Razia Korejo

President, Society of Obstetricians & Gynecologists of Pakistan

Nutrition can have a powerful impact on women's health, both during pregnancy and throughout their lives. Proper nutrition is essential to support a healthy pregnancy, as well as to reduce the risk of chronic diseases such as heart disease, diabetes, and cancer and prevent complications such as gestational diabetes and preeclampsia.

It is never too early to start prioritizing nutrition in females. Even before pregnancy, consuming a well-balanced diet can help ensure the female body is prepared for pregnancy and reduce the risk of complications. During pregnancy, proper nutrition is essential to support the growth and development of the baby, as well as to support female health and well-being.

Incorporating nutrition education and counseling into your practice can support your patients in achieving optimal health outcomes. Thank you for your dedication to providing comprehensive care to your patients.

Prof. Dr. Sohail Aziz

President, Pakistan Cardiac Society

It gives me great pleasure as the President of the prestigious Pakistan Cardiac Society, to convey my happiest sentiments and proud feeling, on the completion of the National nutritional guideline by Prof Feroz MEMON and his team. Diet has a major role to play in dealing with diabetes and cardiovascular disease. We are going through an epidemic of heart disease, now, and there is no sign of its abatement. Hence, thankfully these guidelines could not have been more timely. These guidelines are indeed a Herculean task, which has been undertaken with utmost care and thorough evaluation. Kudos to the great effort by a great team.

Diet varies in each part of the world, and neither the diet nor the mode of cooking is similar. Most of the data we suggest to the people is from the western literature and we all know how different it is from our dietary habits, taste and method of cooking. Lack of education and dispensing of information is another hurdle in the spread of useful messages in a third-world country like Pakistan.

These guidelines will go a long way in meeting our deficiencies and fulfilling our requirements and allow our population and health care providers to relate to them and hence be able to educate people accordingly. PCS looks forward to the propagation of these guidelines on the National level. PCS will inshallah be at the forefront in spread these guidelines through various meetings seminar booklets and media, in collaboration with our health partners.

I once again congratulate all the members of the team, who have worked tirelessly in completing these guidelines in such thoroughness and short time.

I wish Prof Feroz Memon sb and his team-best wishes and glad riding in this great endeavor.

MESSAGES

Prof. Dr. Syed Asghar Naqi
President, Pakistan Society of Surgeons

As a surgeon, I understand that surgery is a major event that can have a significant impact on a patient's physical and emotional health. Proper nutrition is essential in promoting successful surgical outcomes and optimal recovery. Adequate nutrition can improve wound healing, reduce infection risk, and enhance overall well-being.

It has been well established and documented that malnutrition is an independent negative factor associated with post-surgical complications, mortality, prolonged hospital stay, and, therefore, higher healthcare costs. Furthermore, malnutrition is frequently associated with pathologic conditions such as cancer, chronic inflammation, or organ dysfunction, which not only increase the risks of surgery but can also be easily avoided.

The surgical team should be proactive in identifying malnutrition and in the rational use of nutritional therapy. Surgeons should work with patients to ensure that they are meeting their individualized nutritional needs before and after surgery, to promote optimal healing and overall well-being.

Prof. Dr. Zakir Ullah
President, Pakistan Society of Otorhinolaryngology

As an otolaryngologist, I have seen the impact that nutrition can have on the health and well-being of patients. Whether you are experiencing chronic ear infections, allergies, or a deviated septum, proper nutrition is essential to support your recovery and improve your quality of life.

While it may be tempting to focus solely on medications and procedures to treat your otolaryngology condition, nutrition plays a crucial role in overall health. In fact, a diet high in anti-inflammatory foods and nutrients can reduce inflammation and promote healing, potentially decreasing the severity of patient symptoms.

As an otolaryngologist, I encourage HCPs to prioritize nutrition as part of their overall treatment plan. By working with a registered dietitian or nutritionist, you can develop an individualized nutrition plan that meets the patient's unique needs and supports quick recovery.

MESSAGES

Prof. Dr. Zeba Aziz
President, Society of Medical Oncology of Pakistan

A well-balanced diet, which provides adequate nutrition, is important for cancer patients. Appropriate nutrition ensures better tolerance and can help in combatting common side effects that may arise from cancer treatment. The society for Medical Oncology Pakistan (SMOP) as part of its mission encourages providing contextually adapted solutions. As SMOP President, I am honored that my team has been part of this important initiative of developing Nutrition guidelines for cancer patients and this simplified document will be able to provide basic information for the practitioners.

CHAPTER NO.1

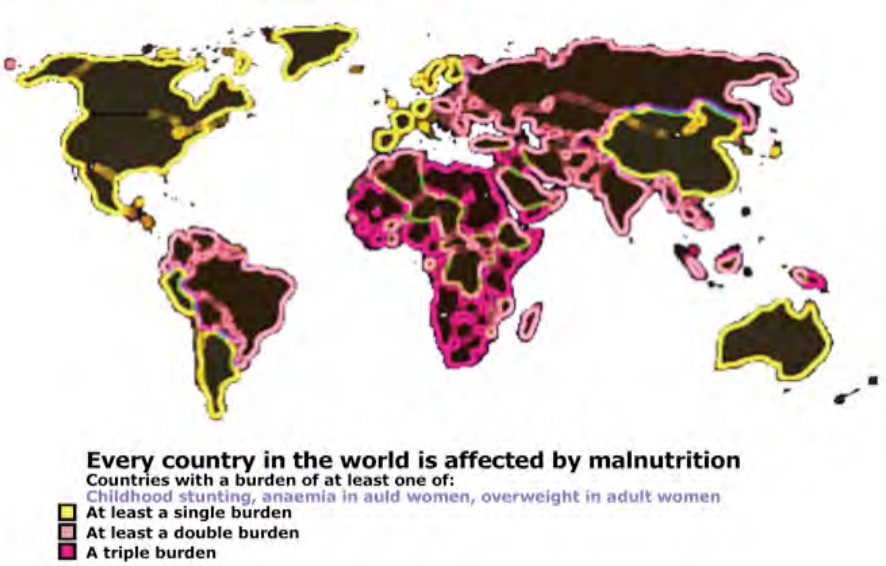
Clinical Nutrition Guidelines in Health and Diseases

Abbas Raza,[1] Fayza Khan[2]

Introduction

Nutrition is a fundamental human need and is imperative for a healthy life. A proper diet is essential for every stage of life for proper growth and development and to remain active. Food provides us energy to not only promote and maintain tissue growth but also to regulate body processes. Nutritious food is the cornerstone of health. Food consumption largely depends on its production and distribution and determines the health and nutrition of the population. Recommended allowances for nutrients are amounts intended to be consumed as part of a normal diet. Therefore, it is necessary to consider any factor that influences the absorption of food nutrients or the efficiency with which they are utilized. The recommended dietary allowances (RDA) are nutrient-centred and technical in nature.[1-3]

With the current increase in lifestyle disorders worldwide, promoting nutrition in all age groups is important. Remodelling eating habits is not just for an individual but for the whole population. Nutrition is a double-edged sword as both over and undernutrition harm health. Undernutrition particularly affects early age groups, i.e., childhood, and overnutrition affects adulthood and after-years.[4]



Source: WHO Global Nutrition Report 2018[5]

The major concern is the imbalanced intake of food and nutrients. The common nutritional problems of public health in Pakistan are low birth weight, malnutrition and stunting in children, adult energy deficiencies, micronutrient malnutrition, and diet-related non-communicable diseases. Recent evidence implies that undernutrition may lead to chronic diseases in later life. Demographic changes, Population explosion, rapid urbanization, and modifications in traditional habits add up to the development of certain unhealthy dietary practices and physical inactivity, which results in diet-related chronic diseases.[6]

This document provides a concise summary of the recommendations for energy and nutrients for all age groups. These recommendations are based on eating habits and the country's current nutritional profile and emphasize that they can maximize the current health status through the use of varieties of food in tune with traditional habits. These dietary guidelines emphasize the promotion of health and prevention of disease of all age groups with a special focus on vulnerable segments of the population, such as infants, children and adolescents, pregnant and lactating women, and the elderly. Other related factors that need consideration are physical activity, health care, safe water supply, and socio-economic development, all of which strongly influences nutrition and health.[4,6]

A complex, multi-sectoral issue of malnutrition in Pakistan that presents across a continuum of poor nutrition, from under-nutrition due to deficiencies in energy, protein,

Affiliation: [1]Pakistan Endocrine Society , [2]Pakistan Nutrition and Dietetic Society

and micronutrients to problems of overweight, obesity, and non-communicable diseases, resulting from poor quality, energy-dense and micronutrient-poor diets and low physical activity practices at the other end of the spectrum.[1] According to Barker's Hypothesis, there is convincing evidence that the effects of malnutrition start from the womb and persist into adult life[4] hence, prevention of NCDs must also start from the womb.

Diet and nutrition are thus considered the cornerstone in maintaining good health throughout the life cycle; their role as the determining factor of chronic non-communicable diseases is well recognized and therefore occupies an important role in preventive medicine.[2]

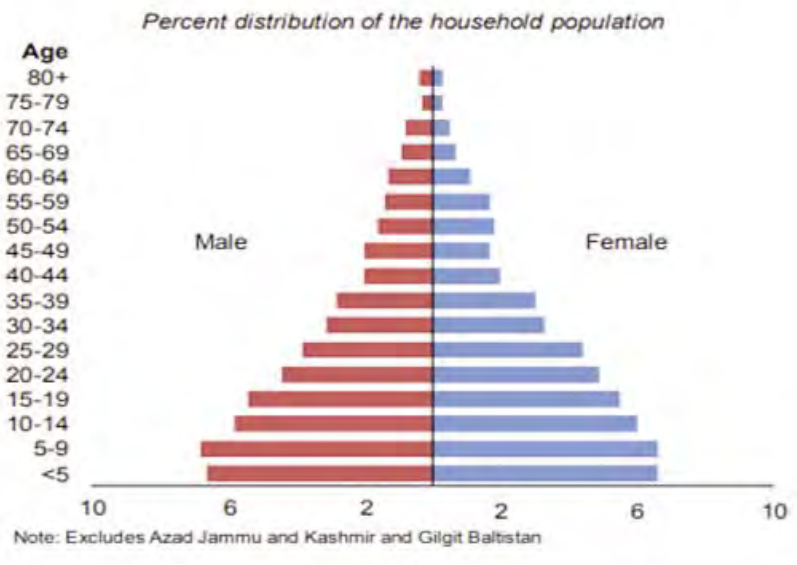
Hypothetically, treatment and management of non-communicable diseases seem like an easy task i.e. through dietary modification but the literature review reveals that it is not as easy as it seems due to diverse dietary patterns and other demographic variables.[3]

In order to handle nutritional challenges during disease, trauma, rehabilitation, and elderly care, the dietary guidelines need to be practical, dynamic, and flexible based on the prevailing situation. Their utility is influenced by the extent to which they reflect the social, economic, agricultural, and other environmental factors.

Dietary guidelines adapt scientific knowledge on nutrients into specific dietary advice. They represent the recommended dietary allowances of nutrients in terms of diets that the population should consume. The guidelines promote the concept of nutritionally adequate diets and healthy lifestyles from conception to old age. Formulating such dietary goals and specific guidelines would ensure populations' nutritional sufficiency. The dietary guidelines could directly apply to the general population or high-risk groups to derive health benefits. Medical and health personnel, nutritionists, and dietitians may also use them.

Epidemiology

According to the Population Census of 2017, the total population of Pakistan is 207 million, with a growth rate of 2.4% (Government of Pakistan 2017).[7] The size of the population and the growth rate present serious challenges to governmental efforts to prevent food insecurity, water scarcity, rapid urbanization, inadequate housing, and loss of economic opportunities. Such challenges necessitate a regular assessment of their demographic impact through collecting reliable data in surveys such as the PDHS.[8]



There has not been a substantial change in Pakistan's household population distribution since 2012-13. The proportion of the population under age 15 has declined slightly, from 39% in 2012-13 to 38% in 2017-18. There has also been a decline in the share of children under age 5 (14% to 13%) in the past five years. However, their proportion in the rural population has increased. The proportion of the population aged 0-17 is 47% in rural areas compared with 41% in urban areas. There is a slight difference between rural (41%) and urban (35%) proportions of the household population under age 14.[8]

Malnutrition in Pakistan is a complex, multi-sectoral problem that presents across a continuum of poor nutrition, from under-nutrition due to deficiencies in energy, protein, and micronutrients to problems of overweight, obesity, and non-communicable diseases, resulting from poor quality, energy-dense, and micronutrient-poor diets and low physical activity. Over the last decade, Pakistan's progress in child malnutrition has not been encouraging.

Statistics from the National Nutrition Survey 2018, Pakistan states that four out of ten children under five years of age are stunted, while 17.7% suffer from wasting. The double burden of malnutrition is becoming increasingly apparent, with almost one in three children underweight (28.9%) alongside a high prevalence of overweight (9.5%) in the same age group. The prevalence of overweight among children under five has almost doubled over seven years, increasing from 5% in 2011 to 9.5% in 2018.[6]

Non-communicable diseases (NCDs) encompass all diseases that are not transmitted from person to person.

These include diabetes, hypertension, cancers, mental disorders, arthritis, injuries, and accidents. These diseases have emerged as a major public health challenge with devastating impacts on premature morbidity, mortality, and economic losses. NCDs were responsible for 63% of the 57 million deaths in 2008. The highest proportion of premature deaths (under 60 years) was reported from low and lower-middle-income countries, i.e., 41% and 28%[5], respectively, followed by 25% in middle-income and 13% in high-income countries. According to WHO, by 2030, only NCD deaths are projected to increase to 52 million, and most of these shall be occurring in developing countries.[8]

The aims of the compilation of guideline are the following:

- Provide an overview of existing nutrition guidelines during lifecycle and in specific conditions and diseases in local perspective.
- Emphasize the importance of information related to nutrition diagnosis, nutritional needs, and dietary recommendations in context of the Pakistani population.
- Formulate an easy reference for the primary to tertiary level healthcare professionals/providers.
- Emphasize promotion of health and prevention of disease, for all age groups with special focus on vulnerable segments of the population such as infants, children and adolescents, pregnant and lactating women and the elderly.

Since nutrition forms the corner stone of health promotion and disease prevention in addition to the management of many diseases it was considered necessary to provide the health care providers in all spheres with a handy tool to recognize the importance of nutrition in their respective practices. Understandably, qualified and skilled nutritionists/clinical dietitians are required for the finer details of nutritional and dietary control.

Methodology

The clinical Practice Guideline for the Nutritional requirements in the country was formed based on literary evidence and an overview of the existing guidelines. An extensive literature search on the epidemiology of obesity and metabolic conditions was gathered, including worldwide data and data specific to the Pakistani population so that guidelines specific to the population could be created. After careful assessment and analysis, relevant sources were gathered from PubMed, Journal of Pakistan Medical Association (JPMA), Elsevier, and Cochrane. In addition to the literature search, standard guidelines such as the American Association of Clinical Endocrinologists (AACE) and American College of Endocrinology (ACE) clinical practice guidelines for obesity and metabolic disorders were searched along with the World Health Organization (WHO) framework. A standard global resource for nutrition and dietetics was the Practice Based Evidence Nutrition (PEN system), which provides nutrition guidelines. To make it simple for medical professionals to reference, each guideline format was maintained concisely.

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CHAPTER NO.2

Nutrition in pre-pregnancy

Shahlla Kanwal,[1] Rubina Sohail,[2] Mozamila Saeed[3]

Purpose:
This guideline aims to create awareness among healthcare professionals regarding the importance of nutrition before pregnancy and provide evidence-based recommendations.

Need for preconception advice:
Preconception care should be an essential part of primary and preventive care for all women of childbearing age, including adolescence.[1-3] Healthy diet and regular physical activity reduce the risk of chronic ailments in women and foetuses, such as diabetes, hypertension, and obesity. Healthy eating patterns and nutrient-dense food before and during pregnancy reduces the risk of foetal complication like neural tube defects.[3]

Preconception counselling:
Women in their reproductive years should receive advice and counselling to promote good health. Normal BMI before conception reduces adverse foetomaternal outcomes.

Women should be aware of the following:
1. Being underweight is also linked to an increased risk for adverse pregnancy outcomes such as preterm birth (20%), low birth weight (40%), and gastroschisis.

2. Maternal obesity results in impaired maternal glucose tolerance, gestational diabetes, high blood pressure, miscarriage, preterm birth, pre-eclampsia, induced or longer labour, instrumental delivery, caesarean section or postpartum haemorrhage, congenital abnormalities, shoulder dystocia, spina bifida, heart defects, multiple dysplasias, macrosomia, subsequent obesity, and associated complications and a higher risk of stillbirth or foetal death.[4,5]

Eating healthy before pregnancy:
Key recommendations providing further guidance:[4]

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1. Follow a healthy eating pattern across the life span: Choose a healthy eating pattern at an appropriate caloric level to help achieve and maintain a healthy body weight and support nutrient adequacy, which reduces the risk of chronic diseases.

2. Focus on variety, nutrient density, and amount: To meet nutrient needs within the caloric limit, choose a variety of nutrient-dense foods across and within all food groups in the recommended amount.

3. Limit calories from added sugar and saturated fat and reduce sodium intake: Do not use items with high components of such foods.

4. Shift to healthier food and beverage choices: Choose nutrient-dense foods and beverages across and within all food groups in place of less healthy choices. Consider cultural and personal preferences to make these shifts easier to accomplish and maintain good health.

5. Support healthy eating patterns for all: Everyone has a role in helping to create and support a healthy eating pattern in multiple settings nationwide. From home to school to work to communicate.

Consume A Healthy Eating Pattern That Accounts For All Foods And Beverages Within An Appropriate Calorie Level:

1. A healthy eating pattern includes:
- A variety of vegetables from all of the subgroups--dark green, red, and orange, legumes (beans and peas), starchy, and others.
- Fruits, especially whole fruits.
- Grains, at least half of which are whole grains.
- Fat-free or low-fat dairy products, including milk, yogurt, cheese, and/or fortified soy beverages.
- A variety of protein foods, including seafood, lean meats and poultry, eggs, legumes (beans and peas), nuts and seeds, and soy products.
- Oil.

Recommendations amount at 2000 calorie level and micronutrients: [4- 6]

Food & nutrients	Per day	Examples	Forms
Vegetables	Two & a half cups from each vegetable group	Dark green, red, orange, legumes, starchy, and others	Fresh, Frozen, Canned, Cooked, and Dried, vegetable juice and soups
Grains	8 Ounces (170g)	Whole & refined	Half should be whole grains
Dairy products (based on age)	3-Cups for adolescent & reproductive-age women	Milk, Yogurt and cheese	Fresh, Frozen, Condensed, Formulated milk,
Proteins	Five and a half cups	Lean meat and fish	Fresh meat or Frozen
Oil	5 tsp	Saturated or Unsaturated	Olive oil, Sunflower oil, Desi ghee
Folic Acid	400ug, 4mg (history of NTD)	Green leafy vegetables,	Spinach, Lettuce
Iron	30mg	Green leafy vegetables, Dried fruits	Spinach, Lettuce, Raisins, Dates
Iodine	150ug	Sea food, Table salt	Cod, Canned tuna, Oyster, Shrimps, Iodized salt

2. A healthy eating pattern limits:

- Saturated fats and trans fats, added sugars, and sodium.

3. Quantitative key Recommendations are provided for several dietary components and should be limited to:

- Consume less than 10% of calories per day from added sugars.
- Consume less than 10% of calories per day from saturated fats.
- Consume less than 2,300 mg per day of sodium.

Terms to Know

1. Nutrient-dense food

Food that is high in nutrients but relatively low in calories. Nutrient-dense foods contain vitamins, minerals, complex carbohydrates, lean protein, and healthy fats.

Examples of nutrient-dense foods include fruits and vegetables,

whole grains, low-fat or fat-free milk products, seafood, lean meats, eggs, peas, beans, and nuts.

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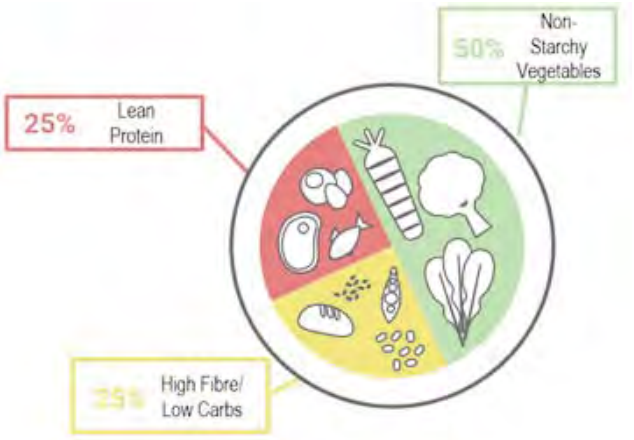

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2. Variety of food

Food variety refers to the consumption of a mixture of foods from the entire range of food groups (that is, vegetables, fruit, cereals, meat, fish, and dairy products).

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CHAPTER NO.3

Nutrition in pregnancy

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Background

Ensuring good nutrition in pregnant women influences not only the growth and development of the foetus but also builds the foundations for her child's later health.[1] Nutrition impacts the short and long-term health of pregnant women and their offspring. Although the myth of "eating for two" is still commonplace in some cultures, evidence has shown that: "Think for two, but don't eat for two" is the best motto during pregnancy. [2,3]

Purpose

This guideline aims to create awareness among healthcare professionals regarding the importance of nutrition during pregnancy and provide evidence-based recommendations for healthy eating patterns and the requirement of micronutrients during the first, second, and third trimesters of pregnancy.

Nutritional Assessment Of The Pregnant Woman

1. Health Care Providers to access nutritional status and offer dietary modifications.
2. Comprehensive history to uncover nutritional behaviours and medical conditions such as diabetes could pose risks for the pregnancy or the foetus.
3. History of previous pregnancies, birth spacing, and Non-Transmissible Diseases, such as anaemia.
4. It is recommended that pregnant women should fill out a self-administrated questionnaire about their current diet and intake. [4,5]

General Advice

Women should be encouraged to continue three daily meals, not skip meals, and balanced meals with all food groups. They should be advised against cold drinks, boxed juices, snacks, binge eating, and restaurant eating.[5] Highlight the consumption of a variety of primarily whole, unprocessed, nutrient-dense foods in appropriate amounts. [4, 5]

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First prenatal visit:

1. Nutritional assessment.
2. Advice on the recommended diet for pregnancy and safe food handling.
3. Discuss weight management and weight gain pattern recommendations.
4. Nutritional supplementation when necessary (e.g., iron supplementation for anaemia).
5. Discuss and counsel about appropriate physical activity during pregnancy.
6. Counsel to avoid substance abuse, smoking, and alcohol during pregnancy.
7. Discuss and promote breastfeeding practices. Ideally, the first prenatal visit should follow a preconception visit. Many times, the first visit is the first encounter.[5, 6]

Energy requirement:

During pregnancy, an extra 85 kcal/day, 285 kcal/day, and 475 kcal/day during the first, second, and third trimesters, respectively, is recommended. Royal College of Obstetricians and Gynaecologists recommends a modest increase of 200 kcal/day only in the third trimester. Caloric requirements may be increased in adolescent pregnancy, with hard physical labour, multiple gestations, and short inter pregnancy interval.

When advising women about caloric intake increase during pregnancy, it may be more helpful to translate calorie intake into food intake, for example [6, 7]

- A slice of whole grain bread with low-fat cheese and a tomato slice (around 260 kcal).
- A cup of low-fat yogurt, a handful of berries, and three tablespoons of whole grain cereal (around 210 kcal).
- A plate of vegetable soup with noodles - around 40g dry weight (around 250 kcal).

Recommendations For Calories From Macronutrients For Single And Multiple Pregnancies

	Singleton pregnancy	Multiple pregnancies
Fat	20-35 %	40 %
Carbohydrate	45-65 %	40 %
Protein	10-35 %	20 %

Recommendations of macronutrients & fluids in pregnancy of a 70 kg (150 pound) woman

	Per day	Additional
Protein	1.1g/kg	DHA (200mg) 1-2 portion of fish / week
Carbohydrate	175mg	
Fat & Lipids	No special recommendation	Linoleic acid and alpha -linoleic acid 5:1
Fluids	10 cups (2.3L)	

Based on WHO guidelines, FIGO recommends[8]

1. Plenty of varied fruits, vegetables, and legumes (e.g., lentils, beans).
2. Nuts and whole grains (e.g., unprocessed maize, millet, oats, wheat, brown rice).
3. At least 400g (5 portions) of fruit and vegetables per day (potatoes, sweet potatoes, cassava, and other starchy roots are NOT classified as fruits or vegetables).
4. Less than 10% of total energy from free sugars, equivalent to 50g (or around 12 level teaspoons), but possibly less than 5% of total energy for additional health benefits.
5. Less than 30% of total energy is from fat, with a preference for unsaturated fats: Saturated fats are less than 10% of total energy. Polyunsaturated fats are 6% – 10% of total energy.
6. Less than 5g of salt (equivalent to approximately one teaspoon, which contains 2g sodium) per day and use iodized salt. [9,10]

Experts agree that fish can contribute to a healthy diet during pregnancy. Fish also contains high-quality protein and essential nutrients.[13,14]

Diet In Pregnancy

The following are recommendation.

1. During the second and third trimesters, 2-3 additional Food servings daily.
- An apple and cheese
- Yogurt and fresh fruit
- Hummus with vegetable sticks
2. Avoid foods high in fat, salt, or sugar, like chips, coca cola, cakes, and cookies.

Recommended Daily Allowance Of Micronutrients During Pregnancy

1	Folic acid	600ug
2	Vitamin B12	2.5ug
3	Iodine	220ug
4	Calcium	1000-1300mg
5	Vitamin D	600IU
6	Iron	27mg

3. To meet the folic acid needs, especially in the 1st trimester:
- Take the prescribed folic acid
- High folate items like chickpeas, black beans, sunflower seeds, peanuts, broccoli, okra, spinach and papayas
1. To meet iron needs, foods rich in iron should be selected, such as cooked beef, lamb, organ meats, chicken, fish, pumpkin seeds, cashew and hazel nuts, dried beans, peas and lentils, fortified whole grain cereals, dark leafy greens like spinach.

* Iron-rich foods containing Vitamin C helps iron absorption (kiwi fruit, citrus and bell peppers).

- Daily multivitamins containing a minimum of 16-20 mg iron is recommended.

2. To meet the calcium needs, two servings of milk or

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50 g of lower-fat cheese, or 175 g (3/4 cup) of yogurt help teeth, bones, the heart, nerves, and muscles develop.

3. Omega-3 fatty acids are critical building blocks the foetal brain and retina, and they may play a role in determining the gestation length and preventing perinatal depression. The RDI for total omega-3 is 1,100mg. Most people get it from flax seeds, soybean oil, and walnuts.

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CHAPTER NO.4

Nutrition in anaemias during pregnancy

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Introduction

Anaemia is the commonest medical and haematological disorder encountered during pregnancy. The condition is more prevalent in underdeveloped countries of the world, including Pakistan.[1]

Prevalence

Anaemia among women of reproductive age (15-49) in Pakistan was 52% as of 2016. World Health Organization defined anaemia as a haemoglobin concentration of less than 11g/dl and haematocrit of less than 33%.[2] High prevalence of anaemia in women of reproductive age is of great concern due to its association with increased maternal and infant mortality and morbidity.[3] Frequent repetitive pregnancies are a very important cause of iron deficiency anaemia.

Aetiology and Risk factors

Repeated and multiple pregnancies, poverty, unhealthy dietary habits, iron and micronutrient deficiencies, folate and vitamin B12 deficiencies, and chronic ailments are common causes. Haemoglobinopathies, malaria, and hookworm infestation may also be responsible. Evidence has highlighted the association of maternal anaemia with poor maternal and foetal outcomes, including miscarriages, prematurity, low birth weight (LBW), intrauterine foetal demise, increased perinatal mortality, poor outcome from postpartum haemorrhage, and puerperal sepsis. [4,5]

Iron need during pregnancy

Iron needs to increase during pregnancy to support foetoplacental development and for maternal adaptation to pregnancy. To support and meet this demand, dietary iron absorption and mobilization of iron from stores increase. Approximately 1040mg is the total iron needed during pregnancy with foetal iron (270mg), placental iron (90mg), baseline maternal body iron loss (230mg), and expansion of maternal RBC mass (450mg). With the RBC mass contraction after delivery (450mg) minus the blood lost at delivery (150mg), the net iron would be 1040-300 = 740mg. [6,7]

Absorption of dietary iron is 5-15%. Although iron absorption increases during pregnancy, this alone is insufficient to cope with the iron requirement. This need is fulfilled by mobilizing the iron stores of the maternal body. Pregnant women who get anaemic usually enter pregnancy with depleted iron stores, as normally, about 750-1000mg of iron can be mobilized from body iron stores.[8,9] Iron requirement increases during pregnancy. Therefore, it is necessary to modify the diet during pregnancy to iron-rich foods. In a patient, who is already, anaemic and iron deficient, dietary changes and supplementations are even more needed not only for the normal increase in demand of pregnancy but also to replenish the iron in the body.[10]

Diet

Pregnant women should be advised to choose iron-rich foods, including meat like mutton, beef, fish, eggs, goat liver, green and leafy vegetables, and beans. Intake of Vitamin C rich foods, along with the meals, enhances iron absorption (guava, berries, melon, mango, pineapple, citrus fruits and lime juice)

Oral iron preparations

Oral iron is an effective, cheap, and safe way to replace iron. A total of 100-200mg of elemental iron is recommended daily for the management of iron deficiency anaemia. Daily doses higher than this are not associated with any added benefit due to absorption saturation and higher side effects profile. The rise in haemoglobin concentration starts after 2-3 weeks of commencement of therapy and does not usually exceed 0.8g/dl/week. Oral iron can also be given to pregnant women having minor thalassemia.[11]

Parenteral Iron Therapy

Parenteral iron therapy is available in intramuscular and intravenous forms. The doses of each can be calculated according to the haemoglobin level, thus individualizing the treatment for every patient.

Total body iron deficit/cumulative iron dose (mg) = body weight (kg) x (target Hb – actual Hb in g/L) x 0.24 + iron

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depot (500)
Parenteral therapy is indicated when there are issues with compliance and iron absorption from the gastrointestinal tract. Contraindications to parenteral iron are; a history of anaphylaxis to the parenteral iron therapy, the first trimester of pregnancy, active acute or chronic infection, and chronic liver disease. Parenteral iron should be administered in a facility capable of managing the anaphylactic reaction. The availability for erythropoiesis and safety profile is better for iron sucrose than iron dextran.[12,13]

Fast-acting intravenous iron preparations:
An iron preparation containing ferric hydroxide carbohydrate complex (Iron III carboxymaltose) allows for controlled delivery of iron within the cells of the reticuloendothelial system, predominantly bone marrow, and subsequent delivery to the iron-binding proteins ferritin and transferrin. This preparation is also available in Pakistan. It is administered intravenously, as a single dose of 1000mg over 15 minutes (maximum 15mg/kg by injection or 20 mg/kg by infusion). Its superiority has been proven by randomized controlled trials in treating postpartum iron deficiency anaemia with a quick and sustained rise in haemoglobin.[14,15] Moreover, it is rapidly eliminated from the plasma, thus minimizing the risk of a large quantity of ionic iron in the plasma.[16,17]

Intramuscular preparations:
Iron sorbitol (100mg) injections are available in Pakistan. In addition, a test dose of 50mg IM is advised initially. Side effects may include pain, skin discoloration, abscess formation, nausea, vomiting, fever, and rarely anaphylaxis. The total dose of elemental iron depends upon the patient's haemoglobin level. A Z- track injection technique should be used to minimize leakage under the skin.

Blood transfusion:
Blood transfusion should strictly be reserved in cases of severe anaemia, life-threatening haemorrhages, and maternal conditions susceptible to obstetric haemorrhage. An optimum level of haemoglobin should be maintained throughout the pregnancy, such as placenta Previa.[18]

Folic acid:
Folic acid tablets are available for the treatment of folate deficiency anaemia. They are given in a dose of 5mg/day and continued until puerperium. The rise in haemoglobin follows the same path after iron replacement; however, the appetite and other symptoms improve immediately. Parenteral folate therapy is occasionally indicated in case of gastric tolerance issues.[19]

Vitamin b12 preparations:
Pregnant women on a strict vegetarian diet may need parenteral, intramuscular cyanocobalamin (250 micrograms) injections every month.

Antimalarial drugs:
Anaemia is common in women where malaria is endemic. Chloroquine tablets can treat P. Vivax, P. Ovale, and P. Malaria during pregnancy. Intravenous artesunate is the treatment of choice for severe falciparum malaria. Quinine can be used intravenously if artesunate is not available.[20,21]

Antihelminthic drugs:
WHO recommends prophylactic oral anthelminthic drugs for pregnant women where the prevalence of hookworm is 20% or higher.[19]

Possible drug and nutrition interaction:
The key dietary enhancers of iron absorption include vitamin C (ascorbic acid), meat, poultry, fish, and inhibitors include tannins (found in tea and coffee), calcium and dairy products, polyphenols, phytate, animal proteins (milk and eggs), and other micronutrients, e.g., zinc and copper.[19]

Iron, Folic Acid, And Vitamin B12 - Recommended Daily Allowance In Pregnancy:
To prevent anaemia, 30-60 mg of elemental iron, 400 micrograms of folic acid, and 2.6 micrograms of vitamin B12 are required during pregnancy. The equivalent of 60mg of elemental iron is 300mg of ferrous sulphate, 180mg of ferrous fumarate, and 500mg of ferrous gluconate. [22-24]

Nutritional Interventions Required For The Pakistani Population
The majority of diet in Pakistan lacks good quality iron and predominantly consists of plant origin and non-haem iron sources with low bioavailability. In addition, strong inhibitors of iron like tea and cereal grains are also part and parcel of a routine diet. Serious consideration should be given to the better nutrition of pregnant women; however, it is difficult to apply this rule due to low socio-economic status. Fortification of food, including flour with iron and folic acid, can be an appropriate step toward reducing the burden of anaemia. [25,26]
Women should be guided to avoid tea or coffee with meals and avoid combining an iron-rich meal with too

many calcium-rich foods like milk, cheese, paneer, etc. The excessive fibre in the diet also affects iron absorption. Also, avoid refined and processed foods – Limit intake of pasta, noodles, polished rice, and ready-to-eat foods. Dietary sources of folic acid include green leafy vegetables like spinach, mint, oil seeds like sesame seeds, soya bean, orange juice, chickpeas, green gram, and red gram. Dietary sources of vitamin B12 are shellfish, liver, fish, lamb, egg, and low-fat dairy products.[19,23,24]

Debunking the myths:

Many myths are prevalent regarding pregnant women's nutrition, which affects overall health and can lead to nutrient deficiency and anaemia. In underdeveloped and rural areas, pregnant women are advised not to eat dates, frequent meat meals, mangoes, fish, and eggs.[27] People believe these foods can cause early pregnancy bleeds, miscarriage, antepartum haemorrhage, preterm labour, and foetal loss. Contrary to their beliefs, it has been proven that these foods are rich sources of nutrients required to prevent anaemia and poor pregnancy outcomes. Counselling sessions should be arranged for women and their "significant others" regarding these myths.

Summary Of Recommendations:

1. Anaemia is defined as haemoglobin less than 11.0 g/dL during pregnancy and postpartum.
2. To confirm pregnancy, women should receive routine antenatal care, including daily iron and folic acid supplementation.
3. All pregnant women should be screened for anaemia at each prenatal visit. At the initial prenatal care visit and 28 weeks, haemoglobin should be measured. Clinical signs of anaemia, such as conjunctival or palmar pallor, should be assessed on all subsequent visits. Women diagnosed with anaemia should be treated appropriately with iron and folic acid supplements.
4. Pregnant women should be advised to eat a greater amount and variety of foods, particularly those rich in iron, such as meat and fish. Discussing food taboos during pregnancy that could be nutritionally harmful, as well as including family members in discussions related to the pregnant woman's diet, is advisable. All women should be given dietary information to maximize iron intake and absorption.
5. Women with iron deficiency anaemia should be given 100–200 mg of elemental iron daily, and they should be advised on the correct administration to optimize absorption.
6. Referral to secondary care should be considered if there are significant symptoms and/or severe anaemia (haemoglobin <7.0 g/dL), late gestation (>34 weeks), or if there is failure to respond to a trial of oral iron.
7. Once haemoglobin is in the normal range, iron supplementation should continue for three months and at least until six weeks postpartum to replenish iron stores.
8. Pregnant women with anaemia may require additional precautions, including delivery in a hospital setting, intravenous access, active management of the third stage of labour, and preparation for excess bleeding. Suggested haemoglobin cut-offs are less than 10.0 g/dL. Women with haemoglobin less than 10.0 g/dL in the postpartum period should be given 100–200 mg of elemental iron for three months.
9. Parenteral iron should be considered from the second trimester onward and during the postpartum period for women with confirmed iron deficiency who fail to respond or are intolerant to oral iron.
10. Blood transfusion should be reserved for those with a risk of further bleeding, imminent cardiac compromise, or symptoms requiring immediate attention.
11. Preventive chemotherapy (deworming) is recommended as a public health intervention for all pregnant women after the first trimester, living in areas where both the baseline prevalence of hookworm and/or T. trichiura infection is 20% or higher among pregnant women and anaemia is a severe public health problem, with a prevalence of 40% or higher among pregnant women, to reduce the worm burden of hookworm and T. trichiura infection.
12. Women in their second and third trimesters should receive prophylaxis/treatment appropriate, as well as receive and utilize long-lasting insecticidal nets as early in pregnancy as possible.
13. Delayed cord clamping is consistent with recommended practices to prevent postpartum haemorrhage and reduce neonatal anaemia.
14. Women with anaemia during pregnancy are at increased risk of greater blood loss at delivery and in the immediate postpartum period. The use of uterotonic drugs to prevent postpartum haemorrhage in all births is recommended, and oxytocin is the recommended uterotonic drug. Controlled cord traction is recommended for vaginal births in settings where skilled birth

attendants are available. Surveillance of uterine tonus through abdominal palpation is recommended in all women for early identification of postpartum uterine atony.

15. WHO recommends that after live birth, an interval of at least 24 months should pass before attempting the next pregnancy to reduce the risk of adverse maternal, perinatal, and infant outcomes.

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CHAPTER NO.5

Nutrition in post caesarean section

Naheed Fatima,[1] Rubina Sohail,[2] Mozamila Saeed[3]

Background:

Diet is one of the strongest determinants of health and nutritional status. Optimal nutrition is essential for the physical and cognitive development of the body, improved quality of life, and socio-economic development of the country. While assessing the nutrition in a woman after a caesarean section, two aspects must be covered adequately. The postoperative state and the fact that the woman will be lactating, to increase the demand for lactation to support both the woman and her newborn child.[1]

Pakistan Dietary Guidelines for Better Nutrition (PDGN) are dietary recommendations based on scientific knowledge related to nutritional requirements, food consumption patterns, and nutrient intake of the population.1 Poor nutrition supply to women in puerperium will affect their health and the quality and quantity of breast milk.

Purpose:

This guideline aims to develop awareness among health professionals regarding the importance of nutrition in women delivered by caesarean section and to provide evidence-based dietary instructions during puerperium.

Counselling:

1. Counselling of a pregnant woman is required, as she needs to address her additional energy and micronutrient requirements and adopt a healthy lifestyle.
2. There is a consensus that healthy lactating women from developing countries produce more or less the same amount of breast milk comparable to lactating women of developed countries, but maternal nutritional status has varying effects on the nutrient composition of breast milk.[2,3]

Recommendations:

Keeping in view the additional demands of a lactating mother, the following is recommended:

1. She should take an additional 525 kcal/day in the first six months and 420 kcal/day calories in the next six months to produce 750 ml milk/day in the first six months and 600 ml milk/day in the second six months of the postnatal period.[4]
2. Additional 19 g and 13 g proteins during the first and second six months of lactation should be taken.
3. An optimal amount of micronutrients (vitamin A, vitamin C, vitamin B1, vitamin B2, niacin, vitamin B6, vitamin B12, calcium, vitamin D, phosphorus, zinc, iodine, and selenium) per day are required.[5]
4. Myths and taboos in society need to be addressed.
5. High fat and sugary diets should be avoided.

Food to be consumed in the first three days post caesarean section:

1. Once she starts the oral diet after gut sounds are audible, she should take as much food as her body can tolerate; if she feels nauseated, she should rest on her stomach for one to two hours, then try drinking a clear liquid.[6]
2. Diet in the first 48-72 hours should be a soft surgical diet. It includes soft, easy-to-eat, and digest foods while giving required nutrition, i.e., soups, fresh fruits, cooked vegetables, pulses, and baked, roasted, and steamed meat. After this surgical transition diet, routine nutritious food should be commenced until puerperium.[7]
3. Calculation of total energy requirement is to be made by considering the following:

- The total energy requirement is Basal Energy Expenditure * Activity factor * injury factor. In a 70 kg woman, it comes to be around 2300-2400 kcal/day in the first 48-72 hours and around 2700 hkcals/day late in the puerperium. A woman's weight and built may range from 2000-3000 kcals/day.[8]

Affiliation: [1,2]Society of Obstetricians and Gynecologists of Pakistan, [3]Pakistan Nutrition and Dietetic Society

Table 1: Sample diet chart for C-Section followed by a plan for Lactating Mothers

Surgical transition diet.	**Day Zero**			
	NPO for 8 hours	Water, tea, soups, and juices (fresh)		
	Day 1			
	Semisolids	Cereals, Khichri, fruits like banana, Egg white, sandwich, minced meat		
	Day 2 (Normal Diet)	**Portion Size**	**Calories**	**Proteins**
Breakfast	Chappati small 6" across / Bread slice	1	80	2gms
	Porridge / oatmeal	½ cup	75	7gms
	Egg / Kebab	1 medium (60gms) / 1 (1oz)	75 / 160	7gms / 8gms
	Milk/yogurt (whole)	1 cup	160	8gms
	Milk 1% fat-free or low fat	1 cup	100	8gms
	Milk 2% reduced fat	1 cup	120	8gms
Mid-Morning Snack				
Fruit	Apple	1 small (4oz)	60	-
	Peach	1 medium (6oz)	60	-
	Banana	Extra small (4oz)	60	-
	Orange	1 small (61/2oz)	60	-
	Strawberries	1 ¼ cup	60	-
	Figs	Dried 1 ½	60	-
	Mango	1 small	60	-
	Dates	3	60	-
Fruit Juice	Apple	½ cup	60	-
	Orange	½ cup	60	-
Nuts	Almonds	6 nuts	45	Traces
	Cashews	6 nuts	45	Traces
	Peanuts	10 nuts	45	Traces
	Pistachios	16 nuts	45	Traces
	Walnuts	4 halves	45	Traces
Meat	Chicken/Mutton kebab	2oz	135 / 195	14 / 14gms
Egg	Egg Nog (without sugar)	½ cup	170	7.5gms
Lunch	Chappati	2	160	4gms
	Fish/chicken	3oz	225	21gms
	Vegetable curry	½ cup	65	2gms
	Salad fresh	1 cup	20	2gms
	Yogurt	½ cup	80	4gms
Snack	Carrot Halwa	½ cup	160	6gms
	Punjabi	½ cup	285	6gms
Dinner	Rice / Khichri Or chappati	1 cup with 1 tsp oil	285	6gms
	Pulses / Lentils	½ cup	125	9gms
	Meat	3oz	225	21gms
Snack	Carrot / pumpkin / kheer	1 cup	160	7gms
	Milk	1 cup	150	6gms

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1 roti or 2 toast or ½ paratha or 1 cup fortified cereals providing a similar amount of calories and proteins; ‡ egg fried or meat, chicken, fish or lentil or chickpea or red beans or any other pulses providing a similar amount of calories and proteins; † 1 cup milk or 1 cup yogurt or 1 cup kheer or 1 ice cream or any other milk-based product providing a similar amount of calories and proteins; ¶Apple or banana or any other seasonal fruit providing a similar amount of calories; ‡‡ Chicken sandwich or shami sandwich or egg sandwich or boiled chickpea or red beans or slice of pizza or peanut butter sandwich providing a similar amount of calories and proteins; # Shami kabab or red beans or boiled gram or meat based snack providing a similar amount of calories and proteins; ‡ Aloo qeema or mater qeema or beef curry or any other meat-based curry or beans or any other pulses providing a similar amount of calories and proteins; **Vegetable rice or bread with salad providing a similar amount of calories and protein; *** Carrot-halwa or pumpkin halwa or any other milk-based dessert providing a similar amount of calories and proteins; §Salad or mix vegetable or any other vegetable providing a similar amount of calories; §§Peanuts or any other nuts providing a similar amount of calories and proteins; 8-10 glasses of water/liquid should be ensured for successful lactation.

Note: 1 Cup =250 ml; 1 plate pulao or dal or vegetables (100 g cooked food); 1 bowl fresh salad= (100 g); 1 serving peanuts=1 ounce peanuts.

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CHAPTER NO.6

Nutrition in lactation

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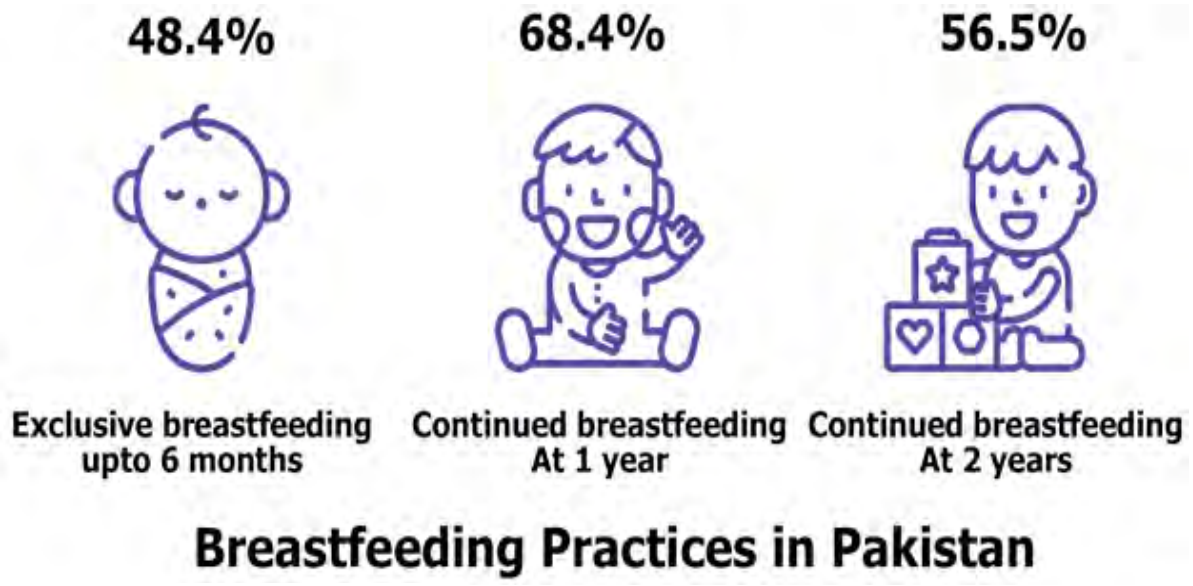
Background

The World Health Organization states that breastfeeding is "an unequalled way of providing ideal food for the healthy growth and development of infants." Breastfeeding is recommended as the exclusive source of nutrition for infants up to 6 months of life. After six months, iron-fortified complementary foods should be added to the basic diet of breast milk.[1]

The situation in Pakistan:

While there has been a steady increase in the proportion of children receiving breastmilk during the first hour after birth between 2011 and 2018, the trend for exclusive breastfeeding is not linear. From 50% in 2001, it decreased to 37.7% in 2011 and increased again to 48% in 2018, bringing Pakistan close to the World Health Assembly target of 50%[2].



Artist; Ujala Shahid

Nutritional Care during Lactation:

1. Include a variety of foods, focussing on nutrient-dense food choices.
2. Energy intake to maintain health and wellbeing: calorie level no less than 1800 kcals/day. Intentional weight loss is not advised before breastfeeding is well established (approximately two months).
3. Protein intake to meet nutritional needs, approximately an additional 25 g/day from base-level pregnancy. This often requires 20% of energy intake from protein.
4. Fatty fish because of DHA twice a week.
5. Mineral and vitamins can be met from a variety of foods from the diet. Supplements as directed by health care professionals.
6. Drink to thirst, and have beverages readily available during nursing and when expressing milk.

In the hospital:

1. Let doctors and nurses know that you plan to breastfeed.
2. Do not use any bottles or pacifiers
3. Breastfeed during the first hour after birth.
4. Keep the baby in the room with you 24 hours a day.

Affiliation: [1,2,3]Society of Obstetricians and Gynecologists of Pakistan
[4]Pakistan Nutrition and Dietetic Society

5. Breastfeed every 2-3 hours.
6. Hold baby skin-skin to bond with baby and increase milk supply.
7. If you and your baby are separated due to some illness, ask for a breast pump.

During the first 2-3 weeks at home:
1. Do not give a bottle or pacifier.
2. Breastfeed every 2-3 hours.
3. Make sure the baby latches onto the breast correctly.
4. Continue skin-skin contact whenever possible.
5. See the baby's doctor at five days of age for a weight check.

Benefits of breastfeeding compared with formula feeding:
1. Optimal nutrition for infants,
2. Strong bonding with mother,
3. Safe, fresh milk,
4. The enhanced immune system,
5. Protection from gastroenteritis, severe lower respiratory tract infections, asthma,
6. Protection against allergies and intolerances,
7. Promotion of the correct development of the jaw and teeth,
8. Association with higher intelligence quotient and school performance through adolescence,
9. Reduced risk for chronic diseases such as obesity, type 1 and 2 diabetes, heart disease, hypertension, hypercholesterolaemia, and childhood leukaemia,
10. Reduced risk for sudden infant death syndrome,
11. Reduced risk for infant morbidity and mortality.

Benefits for mothers:
1. Strong bonding with infant,
2. Increased energy expenditure, which may lead to a faster return to pre-pregnancy weight,
3. Faster shrinking of the uterus,
4. Reduced postpartum bleeding,
5. Delayed return of the menstrual cycle,
6. Decreased risk for chronic diseases such as type 2 diabetes and breast and ovarian cancer,
7. Improved bone density and decreased risk for hip fracture,
8. Decreased risk for postpartum depression; enhances self-esteem in the maternal role,
9. Time saved by not having to prepare and mix formula,
10. Money saved by not buying formula and not having to pay the increased medical expenses associated with formula feeding.

Benefits for society:
1. Reduces health care costs.
2. Prevents excess lost wages resulting from employee absenteeism for sick children.
3. Supports greener environment.[3]

Galactagogues:

Low milk supply is a common concern among breastfeeding mothers. Whether real or perceived, mothers throughout the ages have turned to herbal remedies and medications to assist them in increasing their milk supply. Because milk supply is mainly determined by emptying the breast regularly and effectively, this should be the first action to promote milk production. However, sometimes because of maternal or infant illness and hospitalization or separation because of work or school, a mother may find that her milk supply is faltering despite her efforts. Galactagogues, or milk production stimulants, can be classified as medications, herbals, or foods, each with its result.

Common galactogogues:
- Fenugreek (methi dana/maithray): strong reputation as an effective galactagogue, but undocumented. It may cause diarrhoea and hypoglycaemia. Not to be taken during pregnancy. Recommended dose 2-3 capsules daily.
- Milk Thistle (oont katara).
- Cooking herbs: Anise (tukhum-e-badiyan), black seeds (kalonji), coriander (dhania), Fennel (saunf): historical and cultural uses as Galactagogues, but effectiveness is undocumented. Assumed to be safe with the recommended dose. Some companies make special blends for breastfeeding mothers.[4]

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CHAPTER NO.7

Nutrition in cancer patients

Farooq Afzal,[1] Faiza Kamal Khan[2]

Background

Cancers are among the leading causes of morbidity and mortality not only in Pakistan but worldwide, and the number of new cases is expected to rise significantly. At the same time, all types of cancer treatment, such as surgery, radiation therapy, and pharmacological therapies are improving in sophistication, precision and having the capacity to target specific characteristics of individual cancers.[1]

Malnutrition in cancer

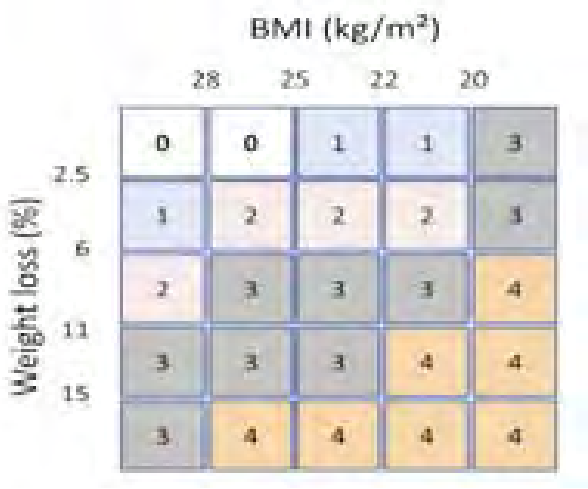
Malnutrition and a loss of muscle mass are frequent in cancer patients and have a negative effect on clinical outcome. Common causes include inadequate food intake, decreased physical activity and catabolic metabolic derangements. All cancer patients should be screened regularly for the risk or presence of malnutrition. In all patients -with the exception of end of life care - energy and substrate requirements should be met by offering nutritional interventions in steps, from counselling to parenteral nutrition. Cancer survivors should engage in regular physical activity and adopt a practical diet.[2]

Assessment for malnutrition and catabolic alterations:

1. **Inadequate nutritional intake associated with severe weight loss:**

Grading scheme (grades 0-4) to predict In patients with advanced cancer. The grading scheme is based on groupings of BMI and weight loss showing distinct median survival (0: best, 4: worst prognosis).

For practical reasons, inadequacy of food intake has been considered to be present if a patient cannot eat for more than a week or if the estimated energy intake is <60% of requirement for more than 1-2 weeks. Reduced food intake is caused by primary anorexia and may be compounded by secondary impairments to oral intake such as intestinal obstruction, malabsorption, constipation, diarrhoea, nausea, vomiting, reduced intestinal motility, chemosensory alteration, uncontrolled pain, and side effects of drugs.



Artist; Ujala Shahid

Grading scheme (grades 0-4) to predict In patients with advanced cancer. The grading scheme is based on groupings of BMI and weight loss showing distinct median survival (0: best, 4: worst prognosis).

BMI and the amount of weight loss are independent predictors of overall survival.

2. **Cancer cachexia** is specifically the loss of skeletal muscles with or without loss of fat which is the main aspect of cancer-associated malnutrition that predicts risk of physical impairment, post-operative complications, chemotherapy toxicity, and mortality.

A generally accepted value for severe depletion of muscle mass is an absolute muscularity below the 5th percentile. This can be assessed as follows:

- mid upper-arm muscle area by anthropometry (men <32 cm, women <18 cm)
- appendicular skeletal muscle index determined by dual energy x-ray absorptiometry (men <7.26 kg/m^2; women <5.45 kg/m^2)
- lumbar skeletal muscle index determined from oncological CT imaging (men <55 cm2/m2; women <39 cm^2/m^2)
- whole body fat-free mass index without bone determined by bioelectrical impedance (men <14.6 kg/m^2; women <11.4 kg/m^2)

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Muscle mass below these values is strongly associated with mortality and complications in cancer patients. Therefore, combined nutrition and physical therapy to regain muscle mass are recommended.[3]

3. An activated systemic inflammation syndrome impacts all relevant metabolic pathways in the following ways:

- **Protein metabolism:** altered protein turnover, a loss of fat and muscle mass and an increase in the production of acute phase proteins.
- **Carbohydrate metabolism:** insulin resistance and impaired glucose tolerance.
- **Lipid metabolism:** increased lipid oxidation, especially in the presence of weight loss.[4]

Nutrition therapy- Higher incidence of nutritional deficits and metabolic derangements demand thorough monitoring of relevant parameters regularly to initiating intervention early to prevent excessive deficits.

Therapies for cancer-associated malnutrition include the following:

1. **Nutrition counselling** - It is considered as 1st line of nutrition therapy. Professional counselling is a professional communication process that aims to provide patients with a thorough understanding of nutritional topics that can lead to lasting changes in eating habits.
2. **Oral nutritional supplements-** These are commercially available homogeneous and usually nutritionally complete nutrient mixtures for oral consumption and are most often recommended to supplement food intake.
3. **Artificial nutrition-**If nutrient intake remains inadequate, supplemental or complete nutrition by the oral, enteral or parenteral route may be indicated, depending on the level of function of the gastrointestinal tract. Parenteral nutrition may be indicated in a complete bowel obstruction or in failure.[3]
4. **Physical therapy** includes physical activities of daily life, resistance and aerobic exercises, and techniques to increase muscle mass and strength. In this context, physical therapy is intended to promote anabolism and therefore promote the retention and utilization of nutrients. Inactivity causes muscle wasting, potentiates catabolic signals, and desensitizes muscle to anabolic factors.[4]
5. **Drug therapy** - In severely malnourished patients with advanced disease, pharmacologic agents are the main treatments used to:

- Stimulate appetite
- Gut motility
- Decrease systemic inflammation
- Hyper-catabolism
- Increase muscle mass
- Improve anabolism

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CHAPTER NO.8

Nutrition in cancer patients (enteral)

Yasmin Rashid,[1] Rashidah Javed[2]

Background:
Undernutrition and cachexia frequently occurs in cancer patients and are indicators of poor prognosis. By definition, enteral implies using the gastrointestinal tract, usually via a feeding tube with the tip in the stomach or small bowel, to compensate for the inability of voluntarily ingest food. Enteral access selection depends on the

a) Anticipated length of time enteral feeding will be required
b) Degree of risk for aspiration or tube displacement
c) Patient's clinical status and disease status
d) Adequacy of digestion and absorption

Enteral Nutrition (EN) should be started if undernutrition already exists or the patient is having markedly decreased oral intake for more than 7-10 days. The location of nutrient administration and type of enteral access device is selected after the patient is determined to be a candidate for EN.[1,2]

Nasogastric tubes (NGTs) are most commonly used for feeding patients who require short-term EN. Patients who do not tolerate gastric feedings benefit from a nasoduodenal tube (NDT) or a nasojejunal tube (NJT). When EN is required for more than 3 to 4 weeks, then percutaneous endoscopic gastrostomy (PEG) or percutaneous endoscopic jejunostomy (PEJ) should be considered.[3,4]

Nutritional needs: In these patients, the energy and protein requirements are estimated to be 25–30 kcal/kg/day and 1.2–1.5 g of protein/kg/day, respectively. While in severe protein depletion, up to 2.0 g/kg/day is given to restore lean body mass. In patients who are at risk of refeeding syndrome, feeding is established gradually, starting with 25% of the estimated requirements and slowly building over 4–7 days.[2-4]

Affiliation: [1]Society of Medical Oncology Pakistan, [2]Pakistan Nutrition and Dietetic Society

Classification of Enteral formulas: Enteral nutrition formulas available are classified as Standard polymeric formulas containing all macro and micronutrients, Elemental and semi-elemental formulas, Modular formulas, and Specialized for specific clinical conditions or diseases. Selection of an enteral formula for a specific patient involves consideration of the patient's:[2,3]

a) Nutrient needs (meet the patient's nutrient requirements, Caloric and protein density of the formula (i.e., kcal/ml, g protein/ml, ml fluid/L)
b) GIT function (Form and amount of protein, fat, carbohydrate, and fibre in the formula relative to the patient's digestive and absorptive capacity)
c) Clinical status (Sodium, potassium, magnesium, and phosphorus content of the formula, especially for patients with cardiopulmonary, renal, or hepatic failure)
d) Cost-to-benefit ratio
e) Disease-specific formula (e.g., diabetic, pre-dialysis, post-dialysis, liver failure, lactose-free, gluten-free, etc.)

Formula Selection and benefits: Most patients with a variety of clinical conditions tolerate standard enteral formula (Livity®) containing intact macronutrients, 1 to 2 kcal/ml, and are lactose and gluten-free.[4]

Macronutrient content of enteral formulae: Carbohydrate content in enteral formulae varies from 30% to 85%, proteins vary from 6% to 25%, and lipid content varies from 1.5% to 55% of the total kilocalories. Maintaining the dietary reference intakes (DRIs) for vitamins and minerals might be easier. The Osmolality of the formula is also known, and isotonic formulas are available. The higher nutrient density (1.5 to 2 kcal/ml) formulas are useful when fluid restriction is required (cardiopulmonary, renal, and/or hepatic dysfunction like Nova Source Renal) and for patients with intolerance to typical feeding volume.[2]

Blenderised (Homemade) Tube Feedings (BTF): If the patient has a feeding tube for the long term, then blenderised diets are a better option. Being able to blend fresh ingredients at home (porridge, soups, cereals,

shakes) goes a long way towards re-establishing control and fighting cancer. An individualized plan based on nutritional needs is necessary. BTF is contraindicated in patients who are sick and immunocompromised, for infusion through smaller tubes, for continuous feeding (unless the formula hangs for < 2 hours), if fluid restriction of less than 900 ml/day is required, and patients with multiple food allergies.[4,5]

Home Care: Home enteral nutrition (HEN) support usually entails the provision of nutrients or formulas, supplies, equipment, and professional clinical services.

Fluid: Adult fluid needs are often estimated at 30 to 35 ml/kg of usual body weight. Patients fed exclusively by EN may receive insufficient fluid (water) to meet their needs, especially when concentrated formulae are used.[5]

Administration: Selection of the optimal method of administration should be based on the patient's clinical status, living situation, and quality-of-life considerations.[2,6]

a) **Bolus:** Syringe bolus enteral feedings are given in patients with adequate gastric emptying and are clinically stable. Administered over 5 to 20 minutes, these feedings are more convenient and less expensive than pump or gravity bolus feedings.

b) **Intermittent and Cyclic:** These regimens allow mobile patients to enjoy an improved quality of life by offering time "off the pump" to allow time for treatment, therapies, and activities. Cyclic feeding may also be called nocturnal feeding when the tube feeding is done overnight.

c) **Continuous:** Continuous infusion of EN requires a pump. Patients with compromised gastrointestinal function because of disease, surgery, cancer therapy, or other physiologic issues are given continuous feedings.

Complications of tube feed: Tube feeds do have some complications, which are mentioned below:[1,2,6]

a) **Access:** Leakage from ostomy/stoma site, Pressure necrosis/ulceration/stenosis, Tissue erosion, Tube displacement/migration, Tube obstruction/occlusion.

b) **Administration:** Microbial contamination, misplacement of the tube, causing infection, aspiration pneumonia, peritonitis, pulmonary or venous infusion, Regurgitation, Inadequate delivery for one or more reasons.

c) **Gastrointestinal:** Constipation, Delayed gastric emptying/elevated gastric residual volume, Diarrhoea, distension/bloating/cramping, rate of administration, Intolerance of nutrient components, Mal-digestion /malabsorption, Nausea/vomiting.

d) **Metabolic:** Drug-nutrient interactions: when medicines are given through a tube in crushed and diluted form may have their properties altered, including bioavailability of the drug, Glucose intolerance, Dehydration/over hydration, Hypernatraemia/hyponatraemia, Hyperkaliemia / hypokalemia, hyperphosphatasemia / hypophosphataemia, Micronutrient deficiencies (notable thiamine), Refeeding syndrome.[2,3,5]

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CHAPTER NO.9

Nutrition in breast cancer

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Prevalence

Among all cancers, breast cancer is a pronounced issue in females all over the world, including Pakistan. It is listed for both genders. It is the second leading cause of death among women. An estimated 29,528 cases were reported in our country in 2020, and 13725 deaths were due to this deadly disease.[1] One in every 9 Pakistani women develops breast cancer at some stage of her life.[2] In Asia, Pakistan has the largest rate of breast cancer.[3]

Effects on nutritional needs: Cancer patients experience weight loss and anorexia, and some patients suffer from cancer cachexia. Nutrients of the host are utilized by cancer cells which causes weakness and deficiencies in the patient.[4,5]

Drugs used: Modes of treatment include chemotherapy, radiotherapy, hormone therapy, and surgery. The most common side effects of chemotherapy drugs are myelosuppression, anorexia, nausea, vomiting, fatigue, diarrhoea, mucositis, renal toxicity, hot flashes, thromboembolic events, fever, joint aches, and bone pains. Increased appetite, weight gain, and fluid retention are also caused by some medications.[5]

Drug and nutrient interaction: Foods, juices, and dietary supplements can modulate the bioavailability of chemotherapy drugs. Fruit juices, especially grapefruit juice, can significantly modulate the metabolism and bioavailability of the cancer chemotherapy drug docetaxel. Similarly, the main catechin in green tea, epigallocatechin-3-gallate, and green tea polyphenols are proteasome inhibitors that block the antitumor activity of other proteasome inhibitors through competitive interference when being treated with Velcade (chemical name: bortezomib). Garlic may also change docetaxel clearance in breast cancer patients, though this finding is preliminary[5].

Nutrition Care Plan: Nutritional care plan helps to prevent or correct nutritional deficiencies, minimize weight loss and maximize oral intake.

Energy: To ensure that adequate energy is being provided, the individual's diagnosis, presence of other diseases (Diabetes, hypertension, dyslipidaemias), the intent of treatment (e.g., curative, control, or palliation), anticancer therapies (e.g., surgery, chemotherapy, biotherapy, or radiation therapy), presence of fever or infection, and other metabolic complications such as refeeding syndrome must be considered. BMI should also be taken into account while counting calories. The caloric requirement may vary from 25-35kcal/kg/d in adult cancer patients.[5]

Proteins: There is an increased requirement for proteins during times of sickness and stress. Also, additional protein is required to repair and rebuild tissues affected by cancer treatments and to maintain a healthy immune system. Patients undergoing treatment may need double the requirement of protein as compared to normal individuals. Daily protein requirements generally are calculated using actual body weight rather than ideal body weight.[5,6]

Carbohydrates: Carbohydrates are the main source of energy, providing 50% of daily caloric intake. Patients should be asked to choose a variety of colourful fruits and vegetables, potatoes, peas, squashes, and gourds. Grains, including whole wheat, oats, barley, brown rice, corn, whole grain bread, pasta, cereal, and crackers, should be offered.[4-7]

Fats: Fat intake should be less than 30% of caloric intake, and saturated fat intake should be decreased. It is important eating more omega-3 fatty acids (foods such as fatty fish, flaxseed oil, and walnuts) rather than omega-6 fatty acids (polyunsaturated fats such as safflower oil and sunflower oil)[5]

Fluid: Altered fluid balance may occur with fever, ascites, oedema, fistulas, profuse vomiting or diarrhoea, multiple concurrent intravenous (IV) therapies, impaired renal function, or medications such as diuretics. Individuals need close monitoring to ensure adequate hydration and

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electrolyte balance and prevent dehydration and hypovolaemia.[5,6]

Vitamins and Minerals: According to the recommendations from leading national scientific groups, whether, for primary or secondary prevention, individuals should attempt to meet vitamin and mineral needs through the foods they eat rather than use dietary supplements. According to the literature, high-dose dietary supplementation can have cancer-promoting effects.[5,7,8]

Healthy weight: Weight loss should be avoided by consuming enough calories and nutrients every day in underweight patients. In the case of obese patients, it may be better to wait until after treatment so that they have all the nutrition needed to stay strong. If weight loss is recommended during treatment, it should be moderate, meaning only about a pound a week.

Activity: A daily walk should be maintained. Sitting or sleeping too much may cause loss of muscle mass and increase body fat, even if the patient is not gaining weight.[5,6]

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CHAPTER NO.10

Nutrition in head and neck cancers

Muhammad Shuja Farrukh[1] Faiza Bushra[2]

Introduction:
Most head and neck cancers are squamous cells in origin and develop in the mucosa of the upper digestive tract. Head and neck cancer sites include the oral cavity, nasopharynx, oropharynx, hypopharynx, larynx, nasal cavity and paranasal sinuses, and salivary gland. The disease and treatment, especially surgery, chemo- and radiation therapy, have a significant impact on upper digestive tract function, and oral intake is often insufficient during and after therapy.[1-3]

Epidemiology:
Head and neck (HN) cancers are the most commonly diagnosed cancers around the world and makeup 8-10% of all cancers in Southeast Asia. Social and cultural habits play a significant role in the cause of HN cancers. Some of the most imperative risk factors associated with head and neck cancers include cigarette or other recreational drug smoking, the use of alcohol, and tobacco chewing such as paan, naswar, gutka, etc. Out of all the concerns in Pakistan, head and neck cancers have been growing at about 18.74% since 2004-2014.[4]

Nutritional Intervention:
1- Patients will benefit from the placement of an enteral feeding tube, either nasogastric or Catheter Jejunostomy (NJC). NJC is safe, cost-effective, and can be provided for a longer period after oesophagectomy. A gastrostomy tube prophylactically to continue with the treatment plan[5]. Tube feeding also helps meet nutritional requirements and minimize signs and symptoms of intolerance, such as nausea and fullness.
2- Anaemia is a well-known side effect of chemo-radiation. A proper diet will help correct anaemia as well as wound healing and fatigue associated with treatment.
3- Efforts should be made to deal with problems with dysphasia as a result of mucositis, dry mouth, and dental caries after treatment.
4- Abstaining from the intake of alcoholic beverages and the use of tobacco.
5- Refeeding syndrome should be avoided, which can be potentially fatal. Efforts should be made to ensure slow progress for patients who are severely malnourished for a week or longer. Begin with 10kcal and slowly increase the intake as progress is noted that is 25 to 35 kcal/kg/day calories and 1.0 to 1.5gm protein /kg/ day.[2,3,6,7]
6- Use Thiamin and other B complex vitamins in a supplement. Finally, provide a high-energy diet with protein and bland or pureed food if oral intake is possible.

Antioxidants
Adequate Vit D3, A, C, Zinc, and Magnesium should be provided either from food sources or in the form of a multivitamin-mineral supplement.

Omit Irritants and use protective foods
Black pepper, chili powder, and some acidic fruits or juices such as orange juice and grapefruit should be avoided. Protective foods like beans, vegetables, fish, whole grains, and food rich in zinc and vitamin C should be encouraged.[2,6]

Common drugs used and potential side effects:

Aspirin can reduce oesophageal cancer risk by 90% and also recurrence by reducing prostaglandins.[2]

Cisplatin-A metal-based chemotherapeutic agent is often used. It can cause altered taste, nausea, and vomiting. It can also affect the kidneys by reducing their function. Emphasis should be given on adequate hydration; they should be advised to drink at least 2 litres of fluids /per day in the form of water and juices at regular intervals.[2]

Bleomycin and methotrexate- used frequently, may result in anorexia, nausea, vomiting, and Stomatitis and may need special nutritional advice, including the use of folic acid.[2]

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Steroids are widely used to reduce inflammation and may cause hyperglycaemia, sodium retention, and potassium depletion, which should be managed accordingly.[2,6]

Pilocarpine tabs are sometimes used to treat dryness of mouth and throat, which can result from chemo-radiation.[2,6]

Botanics and Supplements

These should not be used without discussing them with the doctor, as their role is not fully understood. Echinacea should not be used with cyclosporine and methotrexate, which may result in hepatotoxicity. Curcumin should also be used with caution, for it is a powerful COX 2 inhibitor and can result in bleeding problems. L-carnitine is sometimes used with bleomycin to reduce toxicity. Zinc supplements are helpful in the management of mucositis due to radiation and help improve healing.[2,3,6]

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CHAPTER NO.11

Nutrition in type 2 diabetes mellitus

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Epidemiology:
Non-communicable diseases (NCDs) encompass all diseases that are not transmitted from person to person. These include diabetes, hypertension, cancers, mental disorders, arthritis, injuries, and accidents. These diseases have emerged as a major public health challenge, devastatingly impacting premature morbidity, mortality and economic losses. Talking about Pakistan, NCDs were responsible for 63% of the 57 million deaths that occurred in 2008.[1] The prevalence of overweight among children under five has almost doubled over seven years, increasing from 5% in 2011 to 9.5% in 2018.[1] The prevalence figures of diabetes in the Pakistani population has been determined as 26%, according to the National Survey 2016-17 on diabetes[2]. Type 2 diabetes was found to be the most common form of diabetes.

Diagnostic Criteria according to Pakistani PROMPT guidelines:-[3]
The diagnostic criteria for Type-2 diabetes are,
Fasting plasma glucose: ≥126 mg/dl (≥ 7.0 mmol/dl),
Random plasma glucose: ≥ 200mg/dl (11.1mmol/l)
After 2 hours of ingesting a 75 gm glucose load, plasma glucose is≥ 200mg/dl (11.1mmol/l).1
International bodies are now recommending HbA1c as diagnostic criteria.

PROMPT guidelines highlight the importance of lifestyle management (LSM) of diabetes and discusses the goals of nutrition therapy, weight management, physical activity and self-monitoring of blood glucose (SMBG). The continuing management of diabetes requires the person living with it to self-manage and be able to make simple decisions regarding meals, exercise and medications.[3]

ABC of nutritional management:
The nutrition prescription for patients with type 2 diabetes should optimally manage the "ABCs" of diabetes control: glycated haemoglobin (A1C), blood pressure, and low-density lipoprotein (LDL) cholesterol[4]

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Medical Nutrition Therapy (MNT) for type 2 diabetes should consider five key aspects:
- Weight management and increased physical activity
- Caloric intake (balanced with caloric expenditure)
- Consistency in day-to-day carbohydrate intake at meals and snacks
- Nutritional content
- Timing of meals and snacks

Things to remember by persons with type 2 Diabetes Mellitus:
- Various eating patterns (Mediterranean, low fat, l ow carbohydrate, vegetarian) are acceptable.
- Fat quality and quantity, both are important.
- Protein intake goals should be individualized but not lower than 0.8 g/kg body weight per day from both plant and animal sources.
- Fibre intake should be at least 14 grams per 1000 calories daily; higher fibre intake may improve glycaemic control.
- A reduced sodium intake of less than or equal to 2300 mg per day with a diet high in fruits, vegetables, and low-fat dairy products is prudent and has demonstrated beneficial effects on blood pressure.
- Sugar-sweetened beverages should be avoided to control glycaemia, weight, and reduce the risk for CVD and fatty liver.
- Sugar, Alcohols, and non-nutritive sweeteners are safe when consumed within daily levels (5mg/kg B.W.), as established by the U.S. FDA.[3]

Carbohydrate Consistency:
This is a Universal meal-planning tool to avoid erratic blood glucose levels and hypoglycaemia, is most important when patients with type 2 diabetes are treated with insulin regimens, sulfonylureas, or other secretagogues.[4]

Although patients with type 2 diabetes are more resistant to hypoglycaemia than those with type 1 diabetes, those treated with hypoglycaemic medications or insulin may

benefit from meal planning to achieve carbohydrate consistency. Management of carbohydrate consumption and appropriate insulin adjustments for identified quantities of carbohydrates can improve glycaemic control since carbohydrate intake directly determines postprandial blood glucose. Older "conventional" insulin regimens, with fixed doses of short- and intermediate-acting insulin, require more consistency in timing and amounts of carbohydrate intake to avoid fluctuations in glucose values. However, flexible insulin dosing regimens, incorporating long-acting insulin to provide basal levels and rapid-acting insulin for pre-meal bolus doses, allow for insulin dose adjustments for variations in carbohydrate intake.[4]

There are several meal planning approaches to achieve carbohydrate consistency. The selection of meal planning and whether to use carbohydrate counting (basic or advanced) is tailored to the individual.

- **Basic Carbohydrate Counting** – The goal of carbohydrate counting for patients with type 2 diabetes is to promote glycaemic control by implementing a consistent carbohydrate consumption pattern with meals and snacks. Patients who have been instructed in basic carbohydrate counting consume a predetermined amount of carbohydrates proportioned throughout the day, calculated in grams per food portion. The target amount of carbohydrates is usually based on nutrition goals and usual eating patterns. Patients need to be comfortable with simple arithmetic computations. Most patients will require specific training in carbohydrate counting, usually by a registered dietitian, to set an appropriate target and learn to measure or estimate portion size.[4]

- **Advanced Carbohydrate Counting** – At a more advanced level, carbohydrate counting focuses on the adjustment of food, insulin, and activity based on patterns from detailed logs. Patients treated with flexible insulin dosing can determine how much rapid-acting insulin is needed to cover a certain amount of carbohydrates. Pre- and post-meal blood glucose monitoring data can help to determine if the insulin dose is correct.

Patients vary considerably in the amount of insulin required to cover a set amount of carbohydrates; some patients need a different insulin-to-carbohydrate ratio at different meals. Once the ratio is established, patients have the freedom to vary the amount of carbohydrates ingested at particular meals.[4]

Glycaemic control can minimize risks for retinopathy, nephropathy, and neuropathy in type 1 and type 2 diabetes and has been shown to decrease the risk for cardiovascular disease (CVD) for type 1 diabetes.[5]

Type 2 Diabetes Mellitus

Calculations for consistent Carbohydrate intake

Step1 Find Ideal Body Weight IBW and Body Mass Index (BMI)

Step 2 Estimated Energy Requirement (EER)

Step 3 Finding the recommended Kcal from Carbohydrates
(Dietary guidelines for Americans suggest that between 45 and 65 % of the day's total calories should come from carbohydrates based on your Height & Body weight, Nutritional goals/ Required Calories and activity level[5])

Step 4 Conversion of kcal to grams and dividing into 3 consistent meals (In T2DM, 1-3 less than 15 gm carbohydrate each snack or no carbohydrate snack can be consumed if needed)[6]

Glycaemic index and glycaemic load

Foods containing the same amount of carbohydrates can have significantly different glycaemic effects. In general, foods with high fibre content have a lower glycaemic index. These differences lead to the development of the concepts of glycaemic index and glycaemic load. American Diabetes Association (ADA) nutritional guidelines encourage a diet that includes carbohydrates from fruits, vegetables, whole grains, legumes, and low-fat milk.[7]

Treating Hypoglycaemia

Patients taking insulin or oral hypoglycaemic medications that increase insulin secretion should be well trained in methods to treat hypoglycaemia, advise patients to carry a snack with 10 to 15 grams of carbohydrates to prevent hypoglycaemia or to treat hypoglycaemia.

- For blood glucose of 51 to 70 mg/dL, treat with 10 to 15 g of fast-acting carbohydrate.
- For blood glucose ≤50 mg/dL, treat with 20 to 30 g of fast-acting carbohydrate.
- Retest 15 minutes after ingestion and repeat treatment as needed based on Bood Glucose. levels.
- Once Blood Glucose is >70 mg/dL, the patient should use the appropriate insulin dose to cover carbohydrate intake at the meal. If the meal

following the hypoglycaemic episode is going to be delayed, a snack containing another 15g carbohydrate rate should be consumed.[6]

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CHAPTER NO.12

Nutrition in hypertension

Feroz Memon,[1] Shabnum Razi[2]

Introduction:
Hypertension is one of the most prevalent and powerful contributors to cardiovascular diseases. There is, on average, a 20 mm Hg systolic and 10 mm Hg diastolic increment in blood pressure from age 30 to 65 years.[1] Hypertension contributes to all of the major atherosclerotic cardiovascular disease outcomes increasing risk, on average, 2- to 3-fold.[1]
Prevalence in Pakistan: The National Health Survey of Pakistan estimated that hypertension affects 18% of adults and 33% of adults above 45. Another report showed that 18% of people in Pakistan suffer from hypertension with every third person over the age of 40 becoming increasingly vulnerable to a wide range of diseases.[1,2]

Types of Hypertensions:
Primary Hypertension: The cause of primary hypertension is not related to a pre-existing condition. Between 85% and 95% of individuals with high blood have primary hypertension.[2]

Secondary Hypertension: High blood pressure results from a pre-existing condition, such as a hormonal or kidney disorder.[2]

Isolated Systolic Hypertension: normal diastolic pressure (<90 mmHg) and high systolic pressure (≥140 mmHg).[2]
Co-Morbidities/ Associated Diseases: High blood pressure causes thickening of arteries, making them vulnerable to atherosclerosis, resulting in increased risk of stroke, heart disease and kidney failure.

Medical Treatment: There is no cure for hypertension, only management. As described in clinical practice guidelines, various antihypertensive drugs are used for the treatment of hypertension.3 The goal of treatment is to reduce blood pressure to below 140/90 mmHg, but for those with diabetes or renal disease, the goal is 130/80 mmHg.[4] Most individuals with hypertension require at least two antihypertensive medications to reach their blood pressure goal.[3]

Affiliation: [1]Pakistan Cardiac Society , [2]Pakistan Nutrition and Dietetic Society

Nutritional Management
The goal of hypertensive management is to reduce morbidity and mortality from stroke and hypertension associated heart disease and renal diseases.[4]

Energy Intake: For each kilogram, weight reduction of approximately 1mmHg is expected. Energy intake should be approximately 30-35kcal\kg\day. Hypocaloric diets that include a low sodium DASH dietary pattern have reduced blood pressure significantly.[3,4]

Proteins: Evidence from observational studies suggests that replacement of protein for fat results in lowering blood pressure. Protein intake of 50-60g/day is recommended.[3]

Fats: Intake of saturated fatty acids should be reduced to less than 10% of total energy consumption, and Trans fatty acids to less than 1%. Intake of Trans fatty acids can be reduced by replacing them with polyunsaturated fatty acids.[2]

Sodium: Evidence from various studies supports lowering blood pressure and CVD risk by reducing dietary sodium. Currently based on evidence WHO recommends the restriction of daily sodium intake to 2000 mg (5gms=1tsp levelled salt) per day while AHA recommends 1500mg sodium (3.7gms=2\3 tsp of salt.)[1]

Potassium: Higher intake of potassium is associated with lower risk of stroke. AHA recommends approximately 4.7gms\ day of rich potassium fruits and vegetables. The large number of fruits and vegetables recommended in the DASH diet meets the requirement.[2]

Magnesium: It is a potent inhibitor of vascular smooth muscle contraction and plays a role in blood pressure regulation as a vasodilator. The DASH dietary pattern emphasizes magnesium-rich food, including green leafy vegetables, nuts, cereals and wholegrain breads.[2]

Drug Nutrient Reaction: Diuretics can produce adverse effects while significantly treating cardiovascular disease, especially congestive heart disease. As a general rule, diuretics may cause some degree of glucose intolerance, especially when taken in high doses and in the face of poor dietary intake of potassium.[3]

The use of diuretics by the elderly has been considered the most common cause of mineral imbalances and a major factor in the development of thiamine deficiency. Thiamine deficiency in hypertension and congestive heart failure patients can greatly exacerbate the clinical picture. Poor thiamine status produces a loss of appetite that, in turn, decreases food intake and may induce wet beriberi, which is a form of deficiency characterized by peripheral vasodilation. This outcome further overloads the strained cardiovascular system.[3]

In general, four basic precautions are commonly appropriate with many of these drugs:
(1) restriction of fluid, (2) restriction of electrolytes, (3) weight loss recommendations, and (4) avoidance of alcohol.

Drugs

Diuretics, Loop diuretics e.g.:
Furosemide-Rich potassium diet including, thiamine sources should be included. Fluid intake should be monitored to prevent dehydration and its potential side effects such as increased thiamine, calcium, sodium chloride, and potassium loss.[2]

Potassium-sparing diuretics e.g.:
Spiromide-Foods's rich in salts, such as processed foods or ready meals should be avoided. Hyperglycaemia and hyperkalaemia need monitoring.[2]

Thiazides- are taken on an empty stomach or after meals. Rich sources of potassium should be included and serum potassium should be monitored to prevent hypokalaemia.[2]

Digoxin – This is taken with meals to avoid gastric distress. Levels of magnesium and potassium should be monitored. High-fibre foods and juices should be withheld for 2 hours after taking Digoxin as they can interfere with drug absorption.[2]

Calcium channel blockers.
Amlodipine, Nifedipine- Potential interaction with grapefruit juice[3].

ACE inhibitors E.g., Fosinopril Sodium- Potential interaction with natural liquorice (herbal tea) and dietary supplements should be avoided. A high-fat meal (50 g) may lower drug absorption by 25–30%.[2]

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CHAPTER NO.13

Nutrition in dyslipidaemia

Feroz Memon,[1] Shabnum Razi,[2] Fayza Khan[3]

Introduction

Cardiovascular diseases (CVDs) are the leading cause of death globally, taking an estimated 17.9 million lives each year.1 CVDs are a group of disorders of the heart and blood vessels and include coronary heart disease, cerebrovascular disease, rheumatic heart disease, and other conditions. Four out of 5 CVD deaths are due to heart attacks and strokes, and one-third of these deaths occur prematurely in people under 70.[1]

Prevalence

According to Global Health Observatory Data, NCD deaths accounted for 58% of all deaths, of which 29% are due to cardiovascular diseases. Many studies have shown an increased prevalence of CHD in the South Asian population directly caused due to increased dyslipidemia.[2]

Principles of nutrition management:

The primary goals of nutrition therapy are to maintain and achieve healthy body weight, improve the lipid profile, and reduce the risk of CV events.[1]

Guidelines for reducing Cholesterol /Triglyceride levels:

Weight maintenance: Excess body weight is positively related to LDL cholesterol levels. Recommendations to improve dyslipidaemias are to decrease body weight to achieve or maintain a healthy weight.

Exercise: Moderate to vigorous exercise (30-60 min/day) or 150 minutes (2 ½ hours) of aerobic physical activity each week is recommended as it can increase HDL-C by 5-10 %.3 Examples of aerobic activities include brisk walking, swimming, or biking.[3]

Recommended Food Groups: The selection of foods should be based on lower content of saturated fat, cholesterol, and sugar and is rich in dietary fibre.

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Meat/Fish poultry:

Lean cuts of meat, beef, lean ground beef, lamb, goat, and skinless poultry are recommended. A portion is about a ¼ of a plate or a small chicken drumstick. Vegetable proteins include legumes, peas, beans, and lentils.[4] Fatty fish such as salmon, mackerel, trout, or sardines are recommended twice a week. Fish contains EPA and DHA omega-3 fats that can help lower triglyceride levels.[4] Consumption of oily fish may reduce serum T.G. levels in subjects with elevated levels. Taking fish oil supplements (2-4 g/day) is an excellent source of DHA and EPA omega-3 fats.[2,3] The recommendation for fish consumption does not apply to pregnant or breastfeeding women.

Milk/dairy products:

Low-fat milk, yogurt, and milk alternatives like cheese are recommended.[4]

Dietary Fibre:

High intakes of total dietary fibre (at least 25-29 g/day) are recommended for CVD's primary and secondary prevention. Dietary patterns high in viscous, soluble fibre (7-27 g/day from oats, barley, psyllium, pectin, or konjac) can reduce LDL-C levels by about 3 to 10%.3 At least 10g of soluble fibre and 25-29g of total fibre per day is recommended. Food sources include legumes (such as black, lima, navy, pinto. kidney beans, and chickpeas), psyllium, whole grains such as oats, oat bran, quinoa, barley, and some vegetables and fruits. Add one table spoonful of whole or ground flaxseed to cereal and soup.[4]

Fats/oil:

Small amounts of unsaturated oils such as canola, corn, olive, peanut, soybean, or sunflower for cooking and in salad dressings, unsalted nuts and their butter, as almond, almonds butter, unsalted peanuts, and peanut butter and soft, non-hydrogenated margarine can be used.4 Use unsalted seeds like flax seeds, pumpkin, sesame, and sunflower seeds are usually recommended. Walnuts and flaxseeds contain a different type of omega-3 fat called ALA. It does not lower triglycerides. While walnuts and flax seeds are healthy food, they do not replace fish or fish oil supplements.4 Two tbsp. Plain, unsalted nuts, at least five times a week, can be included in the diet.[5]

Food sources to Limit/ avoid

Trans fats and fried food: Current dietary recommendations to improve blood lipid profiles are to eliminate trans fatty acids or to limit them to less than 1% of total energy intake.[3] Fried foods, such as deep-fried chicken nuggets, French fries and donuts, hard margarine, and vegetable shortening made with hydrogenated oils, butter, coconut, palm, or palm kernel oil, should be avoided.[4]

Dietary Cholesterol: Dietary cholesterol intake should be limited to 200 mg or less per day.[3] The source of Dietary cholesterol is animal products like meat, poultry, shellfish, butter, egg yolks, and milk products. Intake of egg yolk less than two per week is recommended.[6]
If the diet is meat and milk-based, intake of more plant-based foods, including legumes (beans, peas, and lentils) is recommended. Food choices should be low in saturated fats.[4]

Processed and baked food:
Intake of processed foods and stored baked goods should be limited. Processed meat like sausage, nuggets, etc., Ready-to-eat and processed frozen foods such as creamy salad dressings, chicken and meat products, and snack foods such as chips and crackers should be restricted.[4]

Desserts/Sweets and Sugars:
Limited regular intake of Ice cream and frozen desserts, sugar, and sweet foods such as candies, chocolate bars, cookies, ice cream, and frozen desserts are permitted.[1,4] Reduced intake of added sugars such as white and brown. Icing or coconut sugar, honey, and syrups.[4]

Fluid /beverages:
Maintaining good hydration is important. Water, low-fat milk, tea, or coffee without added sugar instead of sugary drinks (such as sodas, specialty coffees and teas, fruit juices, and beverages labelled as drinks or cocktails) should be encouraged.[4]

Drug Nutrient Interactions

Drug	Potential side effects	Potential Drug-Nutrient Interaction
Statins, e.g., simvastatin, rosuvastatin calcium	Avoid grapefruit and juice, orange, and tomatoes.	Slows down the ability to metabolize cholesterol-lowering effect
Beta Blocker, e.g.:Metoprolol tartrate, propranolol hydrochloride	Cold hands or feet, Fatigue, weight gain, Depression ,Shortness of breath	Avoid consuming caffeine-rich foods.
ACE Inhibitors, e.g.:Captopril, Enalapril Maleate, lisinopril, fosinopril sodium, and others)	Increased levels of potassium cause irregular heartbeat and heart palpitations.	Avoid Banana Richpotassium-containing foods include oranges, tomatoes, leafy greens, and some salt substitutes.

Cardiovascular Agents[5-7]

Drug	Guidelines	Potential side effects	Potential drug-nutrient interactions
Diuretics,Loop diuretics e.g.: Lasix	Rich K Diet, including thiamine sources.Monitor fluid intake to prevent dehydration	Increased losses of thiamine, calcium, sodium chloride, and potassium.	N/A
K sparing diuretics e.g.:Spiromide	Do not eat foods with a lot of salts, such as processed foods or ready meals.	Hyperglycaemia, hyperkalaemia	N/A
Thiazides	Take on an empty stomach or after meals. Include rich sources of K.	Loss of potassium leading to hypokalaemia	N/A
Digoxin	Take with meals to avoid gastric distress	Low levels of magnesium and potassium	High-fibre foods and juices are to be held for two hrs. as they might interfere with drug absorption.
Anticoagulants, e.g., Warfarin	Intake of vit K sources through Green Leafy vegetables and cranberry juice to be avoided.	Vit K directly antagonized the anticoagulant effect.	Cranberries or cranberry juice, Grapefruit, Alcohol, Garlic, and Black licorice
Antihyperlipidaemic e.g.: colestipol	Vitamin supplementation of the fat-soluble vitamins in water-miscible form may be needed in long-term use and recommend that it be taken 1 h before or 4 h after any bile acid sequestrants.	impair absorption of fat-soluble vitamins A, D, E, and K	N/A

Method of cooking:

Meals and snacks should be prepared as much as possible by using healthy cooking methods like baking, poaching, steaming, broiling, roasting, and stir-frying in small amounts of unsaturated oil or fat.[4]

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CHAPTER NO.14

Nutrition in congestive heart failure

Feroz Memon,[1] Shabnum Razi[2]

Introduction

Congestive heart failure (CHF) is the heart's inability to provide adequate cardiac output to meet the body's perfusion and oxygen requirements.[1] It develops when ventricles cannot pump enough blood volume to the body.[1,2] Eventually, blood and other fluids can back up inside the lungs, abdomen, liver and lower body. Signs and symptoms of CHF include shortness of breath, rapid pulse rate, nocturia, loss of appetite, fatigue, peripheral oedema and fluid weight gain, abdominal discomfort, and cool extremities.[1,2] CHF can be life-threatening

Prevalence

Congestive Heart failure (CHF) is a global pandemic affecting at least 26 million people worldwide. Approximately 550,000 new cases are diagnosed in the U.S. each year. Congestive heart failure affects people of all ages, from children and young adults to the middle-aged and the elderly. Almost 1.4 million persons with CHF are under 60 years of age. CHF is present in 2 percent of persons aged 0 to 59.[3]

Nutritional Management

Nutritional management in CHF treatment may include oral dietary supplements, nasogastric or gastrostomy tube feeding, and parenteral nutrition. Nutrition intervention is used as an adjunct to pharmacological therapy in treating CHF and cardiac cachexia management.

Sodium

Sodium restriction is the primary diet therapy in treating CHF. A daily sodium restriction of 3000 mg (130 mmol) is often recommended in mild to moderate heart failure cases. People with severe CHF are more likely to benefit from a 2000 mg/day (87 mmol per day) restriction. Using herbs and spices to replace salt can help increase the palatability of the sodium-restricted diet.[4]

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Fluids

Fluid restriction of 1000-2000 mL may be indicated in individuals with severe heart failure, especially if hyponatraemia is present.[4]

Energy

Energy requirements in persons with severe CHF are often 20-30% above basal needs due to increased cardiac and pulmonary workload and metabolic rate.[4]

Protein

Guidelines for a high-protein, high-calorie diet include oral nutritional supplements, which may be suggested for underweight individuals with poor nutritional status or cardiac cachexia.[4]

Other Dietary Considerations

- Caffeine should be limited due to its potential to increase the heart rate.[1,2]
- Small, frequent meals may decrease the cardiac workload and assist in improving dietary intake.[2]
- A multivitamin/mineral is recommended.[5]
- Calcium supplementation should be considered due to reduced physical activity and risk of bone loss. [2,5]
- Thiamine supplementation (200 mg/day) is also beneficial in improving left ventricular function.[4]
- A high-potassium diet and/or supplements may be indicated with the use of potassium-wasting diuretics.[1,2]
- Individuals with H.F. should abstain or limit alcohol consumption to ≤2 standard drinks/day for men and ≤1 standard drink/day for women.[2]
- The DASH (Dietary Approach to Stop Hypertension) diet encourages the consumption of fruit, vegetables, low-fat dairy products, whole grains, poultry, fish and nuts and the reduced consumption of fats, red meat, sweets and sugar-containing beverages.[2,4]

Cardiac Cachexia

Cardiac Cachexia is characterized by negative energy balance, profound loss of lean body mass, anorexia and subsequent weight loss. Between 58-60% of patients with

CHF are malnourished. Cardiac cachexia is accompanied by many biochemical changes of malnutrition[5] (anaemia, hypoalbuminaemia, leukopenia, and hyper cholesterolaemia) and inflammation.[5] The mechanism of cachexia is mainly unknown. High resting metabolic rate in patients with CHF probably contributes to weight loss and musculoskeletal wasting.5 The ideal diet to reverse malnutrition in persons with cardiac cachexia is presently unknown. Many clinicians suggest using a high-calorie, high-protein diet with 2-3 g sodium per day.[5]

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CHAPTER NO.15

Nutrition in irritable bowel syndrome

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Irritable Bowel Syndrome (IBS) is the most common chronic gastrointestinal disorder of brain-gut interaction with no identified structural pathology and a symptom-based diagnosis characterized by abdominal pain or discomfort with altered bowel habits without any other disease.[1]

Prevalence:
IBS is more common in people younger than age 50 years than people older than age 50[2]. It affects around 11% of the total population globally[3]. In general, the prevalence of IBS in Asia varies from 4.4% to 10.4% in various communities.[4] The exact prevalence of IBS in the Pakistani population is still unknown. However, the prevalence of IBS was found 34% in a small study conducted on younger adults of Karachi, Pakistan.[5]

Factors that can increase the likelihood of having IBS include:
- having someone in the family with IBS
- a history of stressful or traumatic life events, such as abuse in childhood
- having a severe infection in the digestive tract

Symptoms: A diagnosis of IBS should be considered only if abdominal pain or discomfort is either relieved by defecation or associated with a change in bowel habit.

This should be accompanied by at least two of the following symptoms:

- Altered stool passage (straining, urgency, incomplete evacuation)
- Abdominal bloating (more common in women than men), distension, tension or hardness
- Symptoms made worse by eating
- Passage of mucus.
- Unintentional and unexplained weight loss
- Rectal bleeding
- A family history of bowel or ovarian cancer
- A change in bowel habit to looser and/or more frequent stools persisting for more than six weeks in a person aged over 60 years.

For individuals meeting the diagnostic criteria following tests should be completed:

Full Blood Count (FBC), erythrocyte sedimentation rate (ESR) or plasma viscosity, C-Reactive Protein (CRP), Antibody testing for Coeliac disease (Endomysial antibodies (EMA)or Tissue transglutaminase (TTG).[6]

Nutritional Management: Nutritional management involves

- Taking three regular meals without skipping any meal, sitting down to eat chewing foods thoroughly and not eating late at night.
- Reduced intake of caffeine-containing drinks, e.g., no more than three cups a day, reduced intake of fizzy drinks and intake of at least eight cups of fluid (preferably water) per day is recommended.
- Decrease in fat intake may be beneficial in relieving meal related abdominal pain and IBS symptoms, cutting down on rich or fatty foods, reducing intake of processed foods and cook from fresh ingredients where possible.
- Limit intake of gas producing foods e.g. beans and pulses, Brussels sprouts, cauliflower.

If symptoms include constipation: Fibre intake needs to be gradually increased –any sudden increase may worsen symptoms. Rich sources include whole grains, oats, vegetables, fruits, nuts, seeds and pulses. They help to soften stools and make it easier to pass. Linseed (flax seeds) is a useful source of dietary fibre. Recommended starting dose is 4-12 gms (1-2 Tbsp) up to 24 gms per day always consumed with (150ml) of fluid with each tablespoon of linseeds taken. Eating extra wheat bran is not recommended.

If symptoms include diarrhoea: Replace lost fluids by drinking plenty. Limit caffeine intake from tea, and coffee to three drinks per day and reduce intake of high-fibre food (such as whole-wheat breakfast cereals and breads).[7]

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What is a FODMAP Diet?

The FODMAP diet is the only dietary strategy that has been found appropriate to manage symptoms in individuals with IBS. Low FODMAP involves collective restriction of a group of fermentable oligosaccharides, disaccharides, monosaccharides and polyols, which are short-chain carbohydrates (sugars) that the small intestine absorbs poorly. Some people experience digestive distress after eating them.

Low FODMAP diet is meant to be a dietitian-taught programme to ensure nutritional intake adequacy despite its many food restrictions. It is a three-step elimination diet:

- First, you stop eating certain foods (high FODMAP foods).
- Next, you slowly reintroduce them to see which ones are troublesome.
- Once you identify the foods that cause symptoms, you can avoid or limit them while enjoying everything else worry-free.

Foods to avoid on FODMAP Diet:

- Dairy-based milk, yogurt and Ice cream.
- Wheat-based products such as cereal, bread and crackers
- Beans and lentils
- Some vegetables, such as onions and garlic
- Some fruits, such as apples, cherries, pears and peaches

Instead, base meals around low FODMAP foods such as:

- Eggs and meat
- Grains like rice, quinoa and oats
- Vegetables like potatoes.
- Fruits such as banana, grapes, strawberries, and pineapple

The long-term restriction of FODMAP is not recommended after six weeks to identify which FODMAPs an individual is sensitive to, assess tolerance to individual high FODMAP foods, promote food variety and support long term self-management. Since there is no universal diet for IBS, individual food preferences and symptoms triggers need to be respected.[8]

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CHAPTER NO.16

Nutrition in jejunostomy feeding

Farooq Afzal,[1] Faiza Kamal[2]

Introduction

A jejunostomy feeding tube is inserted into the proximal jejunum primarily to administer nutrition over a prolonged period (≥ 6 weeks) until the person is healthy enough to eat by mouth. A jejunostomy tube is a plastic tube placed through the abdomen's skin into the small intestine's midsection, and it creates a tract between the jejunum and the abdominal surface. It is safer and less expensive than parenteral nutrition (P.N.). This type of feeding is also known as post-pyloric or trans-pyloric feeding. There are several methods of accessing the jejunum for feeding:

- Open Jejunostomy - Placed at laparotomy under general anaesthetic
- Percutaneous Endoscopic Gastrostomy with jejunal extension – involves the conversion of a gastrostomy into a jejunostomy by guiding an extension tube through the existing gastrostomy tube via the pyloric sphincter muscle and into the jejunum. Can be done endoscopically or by radiological guidance. Ideally for long-term feeding and requires less manipulations and hospital admissions each year.
- Fluoroscopic Jejunostomy – Involves radiological access to the jejunum which is achieved directly or trans-gastrically.[1]

Guidelines for jejunostomy tube site management-Observe the site daily for any signs of infection, i.e., inflammation, pain, swelling, exudate or pus. If an infection is suspected, a wound swab should be taken, and if necessary, the patient should be treated with the appropriate systemic antibiotic. The site should be cleaned at least daily using an aseptic technique.

Indications

Jejunal feeds are most appropriate for patients with:

- Gastric outlet obstruction (Obstruction of the upper gastrointestinal tract where tube is placed distal to the obstruction).
- Gastroparesis
- Pancreatitis
- Severe gastro-esophageal reflux disease (aspiration of gastric contents where gastric feeding has failed).
- Proximal small bowel fistulae where the tube is placed distal to the fistula.
- Surgery involving the upper gastrointestinal tract, e.g., gastrectomy, oesophagectomy, or pancreatectomy.[2]

Contraindications

Jejunal feeding may be initiated in any age group of patients, although the duration of feeding can be limited or difficult due to the following factors:

- The tubes are difficult to place
- There is an increased risk of gastro-intestinal infection as the tube bypasses the natural microbiological defenses of the stomach, therefore sterile or pasteurized feeds must be used and an aseptic non-touch technique adhered to when manipulating the feeding set
- The tube can easily become blocked so requires frequent flushing
- Longer periods of feeding result in reduced mobility of the patient
- The type of feed given may require a review
- Radiological exposure and expertise is often required.[3,4]

Water flushing-Jejunal feeding tubes need regular flushing (four to six hourly) and it is recommended that sterile water is always used. Blocking can occur more frequently due to narrow lumens. The jejunal feeding tube should be flushed:

- Before each feeding session
- Before and after administration of medicines
- Four hourly if the tube is used continuously or not in use

Flushing will be more effective with a push-pause technique. 30ml of sterile water can be used for each

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flushing. The lowest volume necessary to clear the tube is recommended for neonatal (1-3ml) and paediatric patients (3-5 ml).[2,4]

Feed Regimen-Feeds delivered into the jejunum should always be given slowly by continuous infusion. The feed given as a bolus directly into the jejunum can cause abdominal pain, diarrhoea, and dumping syndrome. This results from the rapid delivery of hyperosmolar feed into the jejunum. An enteral feeding pump is the best choice of delivery method as it can accurately control the feeding rate into the jejunum. Adults may tolerate jejunal feeds of up to 120ml/hour; however, this is unknown for the paediatric population and individual tolerance needs to be determined by clinical condition and gradual increases in volume delivery. To meet the child's nutritional requirements, the feed will need to be administered over a long period (18-24 hours each day).[1]

Absolute Contraindications	Relative Contraindications
●Distal gastrointestinal tract obstruction.	●Previous small bowel surgery.
●High output small bowel/large bowel fistula.	●Crohn's Disease - if a segment of the bowel to be used is diseased.
●Imminent death.	●Severe diarrhoea.
●Uncorrected coagulopathy.	●Intestinal dysmotility.
●Ascites.	

Frequency of change-There is little evidence to support how frequently jejunal-feeding tubes should be changed. Commonly, tubes are changed when they become blocked or dislodged. Consensus shows results as shown below:

- Naso-jejunal tubes: 3-6 months (or follow tube manufacturer guidelines)
- G-J / PEJ: 6-12 months (12 months when anaesthesia is required for changeover)

Naso-jejunal feeds are a short-term approach to nutrition support. A definitive decision for either PEG + Fundoplication or PEG-J/PEJ feeding should be made within 3 months of commencing on naso-jejunal feeds.[1,5]

Tube Blockages-Tube blockage is a common issue with patients receiving jejunal feeding. Once blocked, jejunal tubes are difficult to clear and the solution may be to remove the intestinal tube and have a new tube inserted under imaging. Before removing, the tube should be attempted to clear the obstruction with additional water flushes. Unblocking must not be performed using pressure as this can result in tube splitting, accidental intubation, esophageal trauma, and gut perforation.[2]

Assessment Notes for jejunostomy.

Baseline information should be recorded clearly in the patient's clinical records. The information that is essential to the ongoing management of the patient is:

- Patient's clinical condition.
- Nutritional status e.g., weight/BMI
- Nutritional requirements.
- Nutritional intake - oral and tube feed.
- Feeding plan including information on tolerance.
- Details concerning biochemical abnormalities.
- Medications prescribed and method of administration.
- Tube details - date of insertion, make of tube, batch number, French gauge, length of external tubing visible, and volume of water in retention balloon, if appropriate.
- Condition of stoma and site and method of fixation if necessary.
- Pump type and serial number.
- Swallowing status (in dysphagic patients)
- Speech and Language Therapy assessment date and recommendations.
- Quantity, frequency and consistency of fluid and food allowed.
- Dentist's assessment, recommendations and details of oral hygiene programme.[1]

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CHAPTER NO.17

Nutrition in tuberculosis

Farooq Afzal,[1] Touseef Fatima,[2] Faiza Kamal[3]

Prevalence of Tuberculosis in Pakistan
Pakistan is the sixth country in the world with the greater figures of T.B., according to WHO. Latest statistics reveal the incidence of T.B. in Pakistan to be 230 per 100 000, a prevalence of 310 per 100 000 and a mortality of 39 per 100 000.[1]

Rapidly spreading disease T.B.: Tuberculosis (T.B.) has a high prevalence in low and middle-income countries due to its strong association with poverty and under-nutrition causing a weak immune system. It is highly contagious and spreads rapidly in undernourished people living in crowded, poorly ventilated houses. The disease has affected a third of the world's population and causes higher mortalities when combined with HIV/AIDS[1]

Symptoms of T.B.: Pulmonary T.B. manifests with chest pains, continuous cough, sometimes accompanied with blood in sputum. Common pulmonary and extra-pulmonary T.B. symptoms include fatigue, fever, sweating at night, decreased appetite and loss of weight. Malnutrition is significantly noticed in both adults and children.[2]

Assessment and management of T.B.: It is essential to assess the nutritional status of the patients and provide appropriate counselling based on them. Throughout the treatment period, re-evaluation for compliance and the presence of comorbidities is necessary, especially in individuals unable to reach the normal body mass index after two months of initiation of the treatment. Children with T.B. need to be managed for under-nutrition to regain adequate weight for height. Pregnant women with T.B. should be treated to overcome under-nutrition and inadequate weight gain, through sufficient intake of nutrient-dense or fortified foods. Individuals with active multi-drug resistant T.B. should be assessed and managed to regain normal nutritional status.[2-4]

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Principles of nutrition treatment for T.B.: Poor nutritional status, low appetite and food intake, with poor absorption, increase the risks and severity of infectious diseases. Therefore, these symptoms should be given due attention in T.B. along with possible micronutrient deficiencies.[2]

Nutrition needs in T.B.

Energy
T.B. patients have higher caloric needs than their normal counter parts. Current recommendations suggest management similar to hyper-catabolic and underweight individuals, approximately 35 to 40 kcals/kg of ideal body weight.[3,4]

Protein
High protein intakes of 1.2 to 1.5 g/kg body weight or 15% of the total daily intake are suggested to avoid muscle wasting.[3,4]

Micronutrients

- Taking a good multivitamin and mineral supplement provides 50 to 150% of the recommended daily allowance (RDA) along with a nutrient-rich diet is advisable.
- A recent study observed a decrease in oxidative stress and increased antioxidant status in pulmonary T.B. patients supplemented with vitamin E (140mg alpha-tocopherol) and selenium (200ug).
- Supplementing T.B. patients with vitamin D (single oral dose of 2.5 mg) has been found to correct hypovitaminosis D and enhance anti-mycobacterial immunity,[3,4]

Drug nutrient interaction in T.B.
Isoniazid is an essential drug for treating T.B. However, it is a vitamin B6 (pyridoxine) antagonist and can cause peripheral neuropathy due to its deficiency. Thus, adult patients are supplemented with 25mg of vitamin B6 /day. Children are given this supplement only if their blood levels are low, or if they are treated with larger isoniazid dosages (more than 10mg/day).[3]

T.B. Antibacterial Drugs

Drug	Guidelines	Potential side effects	Potential drug-nutrient interactions
Isoniazid	Take on empty stomach, 30 minutes before or 2 hours after meal	Increased requirements for pyridoxine, folate, niacin (vitamin B3) and magnesium Hepatitis, Anaemia constipation Fatigue	May decrease absorption of pyridoxine, calcium, vitamin D May react with bananas, beer, pickled fish, yeast and yoghurt
Rifampicin	Take on empty stomach, 30 minutes before or 2 hours after meal. Supplement with 10mg vitamin B6 daily Not to be taken with Alcohol	G.I. irritation, Anaemia Jaundice, ancreatitis Altered taste Anorexia	May interfere with folate and vitamin B12 metabolism

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CHAPTER NO.18

Nutrition in urinary tract infection (UTI)

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Introduction:
Urinary tract infections can affect different parts of the urinary tract, including the kidney, ureter, bladder, or urethra. Infections of the lower urinary tract are more common.

Prevalence in Pakistan: UTI is one of the most frequent and contagious infection, more common in females. It has been estimated that about 150 million people diagnosed worldwide for the presence of gram-negative bacteria causing UTI in ages[1]. In Pakistan UTI in 15-20% of cases is caused by gram positive bacteria and 80-85% by gram negative bacteria. Escherichia Coli is the most predominant uropathogen (43.2%). Studies report a higher prevalence in females as they are more susceptible to UTI with (60.5%), compared to males (39.5%) due to a shorter urethra in closer proximity to the perineum. Adults are more prone to infection (49.5%) compared to children and elderly population.[2,3]

Nutritional consideration:
Cranberry Juice: Cranberry Juice has been found very effective for UTI prevention. People taking cranberry juice have a 20% lower risk for UTI than those not having it.. Stone formers should be cautious due to its high oxalate content.

Lactobacilli and probiotics: There is limited evidence of Lactobacilli preventing UTI.; Females who consume probiotic lactobacilli have a 80% decreased risk for UTI. It is suggested that restoring the urogenital flora with lactobacilli taken orally or intra-vaginally may protect against UTIs. Evidence is lacking regarding the role of probiotics in the treatment of UTIs.

Fiber: Constipation is a risk factor for UTI and people having recurrent UTI should consume high-fibre foods which is a potentially beneficial strategy.

Vitamin C: can help make the urine more acidic, which may prevent bacteria from growing. A supplement of 500 to 1,000 milligrams of vitamin C daily is recommended. Vitamin C can also be had from foods, such as oranges, lemons, grapefruits, strawberries, blueberries, green leafy vegetables, and green peppers. However, evidence on the protective value of vitamin C on UTI in non-pregnant patients is limited.

Fluid: Good hydration ensures to flush the bacteria. Drinking six to eight, 8-ounce glasses of liquid daily is commonly suggested. Fluid intake recommendation should be increased according to climatic conditions.

Commonly used Antibiotics for treatment of UTI[5]:

Name of drug	Dosage	Duration	Possible nutrient interaction
Ciprofloxacin	500-750mg b.i.d	7 days	Reduces absorption of Ca (dairy products), Cu, Zn, Mg, Fe, Should be taken 1 hour before or 2 hrs. after
Levofloxacin	750mg Q.D.	5days	Can cause diarrhoea,
Trimethoprim Sulpha- methoxazol	160/800mg b.i.d	14 days	Can interfere with the activity of folic acid, vitamin B6, and vitamin K if taken
Cefpodoxime	200mg b.i.d	10 days	Causes dysgeusia and decrease the absorption of calcium, iron, magnesium, or zinc
Ceftibuten	400mg QD	10days	N/A

Prevention:
Steps to reduce risk of urinary tract infections:

- Wipe from front to back. Doing so after urinating and after a bowel movement helps prevent

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bacteria in the anal region from spreading to the vagina and urethra.
- Empty your bladder soon after intercourse. Also, drink a full glass of water to help flush bacteria.
- Avoid potentially irritating feminine products. Using deodorant sprays or other feminine products, such as douches and powders, in the genital area can irritate the urethra.
- Change your birth control method. Diaphragms, or unlubricated or spermicide-treated condoms, can all contribute to bacterial growth.

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CHAPTER NO.19

Nutrition in urolithiasis

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Introduction:
Urolithiasis is the term used for a condition when there is the presence of a stone within the urinary tract. Stone is mostly formed by the precipitation of crystal-forming substances like calcium, oxalate, phosphate, sodium, and uric acid. Low urinary volume, decreased levels of urinary crystals concentrate inhibiting substances like citrate and magnesium, or low urinary P.H.

Prevalence in Pakistan
In Asia, 5-19% of the population suffers from urolithiasis[1]. At present, approx. 15% of the Pakistani population is affected. The recurrence rate ranges from 21-53% after 3-5yrs. Calcium Oxalate is the most common and frequent type (75-90%). The second most frequent component is Uric Acid 5- 20%, followed by Calcium Phosphate (6-13%), struvite 2-15% apatite, and cysteine 0.5-1%. Its prevalence peaks in populations over 30-60yrs of age and more in males1. Apart from being hereditary, diet, and environmental risk factors (heat, sweating, water loss), some demographic characteristics and comorbidities like obesity, diabetes, and metabolic syndrome can also increase the risk of kidney stone formation.

Types of calculi:
Calcium stones: The most common type of calcium stones is composed of calcium oxalate or in combination with calcium phosphate or calcium urate.

- **Calcium oxalate stones:** caused by low urine volume (<2 L/day), hypercalciuria, hyperoxaluria, hyperuricosuria, hypocitraturia and hypomagnesuria.
- **Calcium phosphate stones:** caused by low urine volume (<2 L/day), hyperphosphaturia, excessively alkaline urinary pH (>7.0), hypercitraturia, and hypercalciuria
- **Uric acid stones:** caused by low urine volume (<2L/day), hyperuricosuria, hyperuricemia, and excessively low urinary pH (<5.5)
- **Cysteine stones:** cystinuria is an autosomal recessive genetic condition leading to hypercystinuria and stone formation due to the low solubility of cystine at low urinary pH.82
- **Struvite stones:** These stones (magnesium ammonium phosphate) occur only in association with a urinary infection by urea-splitting bacteria

Diagnosis: Usually, apart from routine screening, radiological tests like ultrasound KUB/X-ray and laboratory investigations like 24-hour urine metabolic study, urine D/R, Serum creatinine, Na, K, Ca, P.O., Uric Acid, and Parathormone are done followed by C.T. pyelogram.

Clinical Features: may include severe pain in the groin and/or side, nausea and vomiting, burning sensation during urination, persistent urge to urinate, fever and chills if there is an infection in the kidneys, blood in urine, pus in the urine and reduced amount of urine excreted[2].

Nutrition intervention and treatment:
High Fluid Intake: Fluid intake of greater than 2.5 L (10-12 cups) per day should be encouraged to decrease the risk of stone formation and spread out as evenly as possible during the day. If the patient is not getting up once at night to urinate, they are not drinking enough. For a refreshing flavor, add some sliced lemon or lime to a glass of water.
Sugary drinks rich in fructose, such as packed fruit juices, soda beverages, sweetened soft drinks, cold drinks, and specialty coffee and tea drinks, are not good for increasing fluid intake. They may increase the risk of kidney stones.

Oxalate: Reduce dietary oxalate to no more than 40 to 50 milligrams per day to lower urinary oxalate and the risk of calcium oxalate stones. Foods like spinach (and dark leafy greens), beets (root and green), sweet potato, brinjal, okra pods, potato chips, legumes, nuts (peanuts, almonds, cashews, hazelnuts), soybeans (including tofu and meat substitutes made with soy), wheat bran, and dark chocolate (including chocolate bars and cocoa powder used for baking) are rich in oxalate, and its intake should be limited in daily diet[3,4].

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Sodium: Sodium intake should be limited to less than 2300 mg (100 mmol) per day. The recommended salt intake is consuming less than 2000 mg or one teaspoon of salt per day. Add salt while kneading chapatti dough; salt shakers and products containing high sodium content, like chips, nimko, etc. should be avoided. When reading nutrition labels, be cautious as "Sodium-free" foods also contain less than 5 mg of sodium per serving.

Caffeine: causes increased urinary flow (diuresis) through action on both the proximal and distal tubules of the nephron and decreases the maximal concentrating ability of the kidneys (natriuresis). Caffeine is mainly found in tea and coffee, and its intake should be limited.

Calcium: Dietary calcium binds intestinal oxalate and lower urinary oxalate, and a high intake causes a higher risk of calcium oxalate stones. Individuals should achieve the DRI (the recommended 1200 milligrams of calcium per day) for calcium through dietary sources like 2-3 servings of milk, yogurt, and dairy products. Calcium intake through supplements should be discouraged. If a calcium supplement must be taken, it should be taken with food.
In the past, calcium stone formers were advised to restrict their dietary calcium intake. Current evidence, however, suggests that limiting dietary calcium may lead to an increased risk of stone formation.[5] However, dietary calcium restriction is no recommended.

Protein: A moderate protein intake in the form of poultry, eggs, meat (beef/mutton), and fish should be advisable. Animal protein should be limited to no more than 2 – 3 servings of Meat and Alternatives and 2 – 3 servings of Milk and Alternatives daily. This will prevent stone formation. A high intake of animal protein (>2 g/kg body weight per day) alters urinary uric acid, calcium and citrate excretion rate, which are correlated with kidney stone formation[6].

Purine: Animal protein is a good source of purines, which contribute to hyperuricosuria, and acid load, lowering urinary pH. Moderating dietary animal protein and limiting other purines to lower urinary uric acid lowers the risk of uric acid stones. Animal protein consumption like chicken, fish, mutton, and beef should be limited to no more than 2-3-oz or150gm/day. All sorts of organ meat (heart, liver, kidney, brain, etc.) are extremely rich in purine and should be avoided. To prevent uric acid stones, food containing yeast like Pizza, bread, bun, and naan should be avoided.

Green leafy vegetables such as spinach, legumes, cauliflower, mushroom, and all types of lentils should be limited to 2 servings /per week. Bakery and fried products should be avoided as they are hazardous to health[3,4,6].

Citrate: Lemonade therapy appears to be a reasonable alternative to help prevent the recurrence of kidney stones in patients who cannot tolerate potassium citrate. Citrate, or citric acid, is an antioxidant and known inhibitor of calcium-based stone formation found naturally in fruits and vegetables, particularly citrus fruits.

Vitamin C: A dietary vitamin C restriction is not warranted in healthy individuals to prevent kidney stone formation. Individuals with a history of stones should not be >500mg/day. High amounts of vitamin C may increase the risk of stones; therefore, high, dose vitamin C supplements are not recommended. If necessary, vitamin C supplements should be given less than 1000 milligrams per day.

Vitamin D: Supplemental vitamin D, combined with calcium-vitamin D supplements, should be avoided.

Urinary P.H.: An important factor in the formation of kidney stones. Urine PH is affected by the acid and alkaline ash from the diet. Mineral salt like sodium, potassium, magnesium, and calcium are alkaline, and sulfur, chlorine, and phosphorous are acidic, which predominates in food and determines the residue, ash acidity, or alkalinity. High animal protein diets with high purine and sulfur-containing amino acids reduce urine P.H. and increase the risk of uric acid atone. An alkaline ash diet rich in citrate from fruits and vegetables increases urine P.H. and citrate excretion.

Overweight and obesity: Observational studies controlled for age and dietary intake, suggest that weight gain and obesity increase the risk of kidney stones in healthy adults; the magnitude of risk is greater in women than in men. Therefore, aim for healthy body weight.

Cysteine and struvite stone: No specific diet recommendations for cysteine stones except increasing fluid intake. Struvite stones require antibiotic therapy for treatment. However low sodium diet can help in prevention[7].

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CHAPTER NO.20

Nutrition in chronic kidney disease (Non-Dialysed)

Ayesha Nasir,[1] Fayza Khan[2]

Introduction

Chronic kidney disease (CKD) is a progressive disorder that refers to a long-term loss of kidney function. Due to the rising incidence of Diabetes Mellitus, the risk for CKD has also increased. This is followed by Hypertension, Glomerulonephritis, and recurrent Urinary Tract Infections (UTIs).[1]

Prevalence of CKD in Pakistan

Among adults in Pakistan, the prevalence of CKD is 21.2%[2]. According to recent studies, the highest prevalence was reported as 29.9% in men and 32.5 % in women[2,3], and the lowest prevalence was 15.5%.[3]. 50% of ESRD develop due to diabetes mellitus (DM). Pakistan's 3rd largest population with DM due to lifestyle and dietary practices and 33 million people living with type 2 diabetes in Pakistan[4]. Similarly, the prevalence of hypertension is high in Pakistan[5], and risk for faster progression of CKD. The lack of a central registry makes an epidemiological assessment of CKD extremely difficult in Pakistan, and most data regarding disease burden estimates are usually centre-based.

The National Kidney Foundation (NKF) divides CKD into five stages related to the estimated GFR (eGFR), the rate at which the kidneys filter wastes shown in Table 1 .[4]

Stages	Percentage of Kidney functioning	Symptoms
1	90% of kidney functions	Possibly symptom-free
2	60-89% of kidney functions	Some symptoms may appear
3	40-59% of kidney functions	Changes in urination, swelling of extremities, kidney pain, etc.
4	15-29% of kidney functions	High blood pressure, anaemia, bone disease, heart disease, possible
5	<15% kidney functions	End Stage Renal Disease requires dialysis or renal transplant.

CKD Diagnosis: Diagnosis is usually made with the following two tests, decreased estimated glomerular filtration rate (eGFR) and increased Urinary Albumin Creatinine Ratio (ACR) over three months, followed by renal ultrasound scan and full blood count. CRP, ESR.

Nutrition Assessment: Patients should be routinely assessed for malnutrition. Clinical practice guidelines based on expert opinion recommend a panel of tools for evaluation of nutritional status and to screen Protein Energy Malnutrition (PEM), including dietary assessment, BMI, body weight and weight loss, bioimpedance analysis, handgrip strength, and normalized protein nitrogen appearance (nPNA) in non-dialyzed patients as no one individual tool has been validated and shown to impact clinical outcome. Malnutrition-Inflammation Scores are valid to assess protein-energy malnutrition. Actual oedema-free (dry) weight should be used to determine energy and nutrient requirements for most adults.

Nutritional Management: The primary objective of nutrition therapy is to maintain good nutritional status while managing the symptoms associated with the syndrome (oedema, hypoalbuminaemia, and hyperlipidaemia) and to control blood pressure and hyperglycaemia that may decrease the risk of progression to renal failure and reduce inflammation. Key dietary components to slow the progression of CKD are:

- Decreasing sodium intake to control hypertension
- Decrease protein intake if excessive and
- Monitoring carbohydrate intake to maintain glycaemic control in Diabetics.

A balanced diet with various foods should be encouraged, including vegetables, fruits, whole grains, lean meat, poultry, fish, eggs, legumes, dairy, and fats in appropriate portions as required. Nutrition recommendation for people with CKD eGFR > 30ml/min/1.73m2 should have access to Individualized dietary intervention involving a Registered Dietitian.

Energy: Recommended daily intake is 30-35 kcals/kg/day. Diet should provide sufficient energy to spare protein for tissue repair and maintenance. In most cases, sufficient intake of carbohydrates and fats is needed to meet energy requirements and spare protein to meet

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anabolism.[1,6] For overweight patients, some adjustments should be made to normalize requirements.[6]

Protein: People with excess protein intakes should reduce the quantity to the DRI (Dietary Recommendation Intakes).[7] Clinical practice guidelines recommend a protein intake ranging from 0.6-1.0 g/kg ideal body weight (IBW)/day for non-dialysed individuals with CKD and avoiding high protein intake (>1.3 g/kg). However, studies have shown that reducing protein intake to as low as 0.8 mg/kg/day may decrease proteinuria without adversely affecting serum albumin.[8]

Fat: The important consequence of dyslipidaemia is cardiovascular disease. Correction of hypercholesterolaemia is intended to reduce the risk of cardiovascular disease, which is increased in patients with CKD[9].
Dietary fat intake should be similar to that of healthy adults: 15-35% total energy from fat, ≤7% total energy from saturated fat, and replacement of saturated fats with monounsaturated and polyunsaturated fatty acids. [8]
In the case of weight loss, energy intake can be increased by adding healthy fat to compensate for energy intake.

Vitamins: CKD patients are routinely recommended a water-soluble renal customized vitamin supplement because restrictions on fruits, vegetables, and dairy foods may cause the diet to be inadequate.4 Administration of Vitamin D2 (ergocalciferol) or D3 (Cholecalciferol) is not given routinely but is used based on blood levels of D 25-OH and PTH.[10-12]

Sodium: Oedema, the most clinically apparent manifestation, indicates total body sodium overload. Therefore, control of oedema in this group of diseases should be with a daily dietary intake of 1500 g of sodium.4 Salt substitutes that contain high amounts of potassium salts should be avoided. Consumption of a balanced diet with fruits and vegetables should be encouraged, as it appears to reduce blood pressure and have reno-protective effects comparable to sodium bicarbonate.[7]

Potassium: Potassium restriction is individualized, based on serum levels, eGFR, dietary customs, use of medications that increase potassium levels, and rate of progression of CKD. In early-stage CKD, potassium-wasting diuretics, angiotensin-converting enzyme inhibitors, beta-blockers, non-steroidal and anti-inflammatory drugs, cyclosporin, tacrolimus, trimethoprim/sulfamethoxazole, pentamidine or angiotensin II receptor blockers and gastrointestinal cation exchangers may raise plasma potassium levels.9 Patients with persistent hyperkalaemia should restrict their dietary potassium intake with the assistance of a qualified dietitian.[7]

Calcium: In CKD stage 3-4 adults, an intake of 800-1,000 mg/d (including dietary calcium, calcium supplementation, and calcium-based phosphate binders) should be prescribed to maintain a neutral calcium balance.[8]

Phosphorus: Those with an eGFR of less than 60 should be evaluated for renal bone disease. Ongoing monitoring of the patient's phosphorus and use of phosphate binders is essential. The dose of 0.8-1.2 g/day or 8-12 mg/kg Ideal body weight (IBW) phosphorus is recommended. Diet is modified to allow no more than 1000 mg of phosphates daily, a limit that allows approximately 1 to 2 dairy foods per day.[4]
In adults with CKD stages 1-5, it is reasonable to restrict phosphorus by considering the bioavailability of phosphorus sources (e.g., animal, vegetable, additives).[8,13]

Fluid: Fluid allowance is recommended according to individual needs and CKD stage. Restricted water intake is required only when serum sodium concentration is <135 mmol/L or there is heart failure or severe edema.[9]

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CHAPTER NO. 21

Nutrition in post renal transplant

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Introduction:
Kidney Transplantation is the most common type of solid organ transplantation and is the preferred treatment for end stage renal failure.

Prevalence in Pakistan
Kidney disease is a global public health problem, affecting over 751 million persons worldwide, Meta-analysis and review found worldwide prevalence of CKD 23.4% in stage 1-5 and 10.6% in 3-5 stage. According to the data from Global Observatory on donation and transplantation number of kidney transplants in Pakistan is 5.0—14.9 per million population[1].

Kidney Donation: Source of kidney donation are 1) Live related donor, 2) Deceased organ donor 3) Cross over transplantation. Living donor has better results and it should be encouraged

Immunosuppression After Kidney Transplant: CNIs (cyclosporine / Tacrolimus) Mycophenolate mofetil (Mycophenolate Sodium) and Steroids are standard initial Immunosuppressive drugs used and they provide good efficacy and outcome of graft. Induction therapy used is ATG / Similac.

Contraindications of Renal Transplant: Contraindications include 1) Malignancy 2) Infection 3) Advanced cardiac disease 4) Obesity 5) Age > 65 years.

Complications Related to Immunological Drugs: Immunological rejection in renal transplant may be hyperacute, accelerated, acute or chronic. Weight gain and infection, are the most common complications. Malignancy is also a complication of renal transplant.

Causes of CKD: The most frequent causes are Diabetes mellitus, Hypertension, Glomerulonephritis, Congenital, Urological disease (stone, infection etc.) The prevalenceof CKD is 750 Million population[2].

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Nutritional Assessment and Management:
Pre -Transplant Phase: Nutrition support is optimised before surgery to correct or avoid malnutrition. Renal transplant recipient (RTR) should achieve target BM1 accordingly. Cut-off of BMI> 18.5 and <40 are for RTRs and >18.5 and 35 for donors (<30BM1) and may differ according to transplant institutes protocols. Fluid, blood pressure control and other comorbidities should be managed prior to transplant. Pre-transplant malnutrition is associated with poor graft and patient survival[3].

Principles of Nutrition therapy after transplant: Nutritional considerations are in two phases: acute phase (first 4-6 weeks) and chronic phase (after 6 weeks) Nutritional assessment should be as follows:

Energy and Macronutrients: It is important to prevent unwanted weight gain and other health issues after renal transplant. Energy intakes between 23-35kcal/kg dry body weight/day are adequate to prevent signs of malnutrition. In Chronic phase, a healthy balanced diet for weight maintenance is recommended. Carbohydrates should provide 50-70% of non-protein calories in the acute phase and decrease to 40-50% of total calories. Emphasis should be placed on a complex carbohydrate diet encouraging 20-30 grams of fibre per day. Glucose intolerance in early phase may warrant limiting simple sugars[4].

Fat: Fat intake should be 30-50% of non-protein calories. 7- 10% saturated fat, up to 10% from polyunsaturated fat, up to 20% from monounsaturated fat and dietary cholesterol <200 mg/day. This should be followed by less than 30% of the total calories in the chronic phase.

Protein: Patients receiving high dose glucocorticoids require high protein intake to avoid negative nitrogen balance and help prevent lean body mass loss. In acute phase, protein requirement is increased by at least 1.3-2g/kg. Followed by recommended maintenance protein intake of 0.8 -1g/kg/day in stable patients. Moderate protein diets of 0.7-0.8 g/kg may improve the course of chronic rejection.

Micronutrients: Supplementation of phosphorus, magnesium, and calcium may be required as per individual requirements. Limiting sodium intake to less than 100mmol/day (or <2.3 g/day) reduces blood pressure and improves volume control. Magnesium is recommended about 300-400 mg/day.
Patients receiving anticoagulant medicines known to inhibit vitamin K activity (e.g. warfarin compounds) do not receive vitamin K. supplements and avoid Vitamin K rich foods. Prescribing folate, Vit B12 and/or B-complex supplement to correct for folate or Vitamin B12 deficiency/insufficiency based on clinical signs and symptoms[5].

Foodborne infections Food safety is also important for immunosuppressed individuals, especially in the acute phase (first 4 weeks). Key ways to decrease this risk are cooking foods well, avoiding high-risk foods such as raw and undercooked seafood and meats and foods containing raw egg, prepared or prepacked fruits or vegetable salads, and unpasteurized dairy products. Use good hygiene practices by washing hands well with soap and water and drying them thoroughly. Food preparation surfaces should be cleaned with hot water and soap, especially after contact with raw poultry, meat and seafood. Food storage should be separate for raw and cooked foods while purchasing, storing and preparing foods, in the refrigerator or microwave or at room temperature. Eating out should be avoided, or ask for freshly prepared food.

Hydration must be closely monitored, generally 2 L/day is recommended depending upon individual urine output and graft functioning. Fluid requirements are higher in the hot and humid climatic regions and recommended accordingly[3-5].

Drug Nutrient interactions: Most of the immunosuppressants increase blood glucose levels. Following are commonly used drugs after renal transplant[6-8].
Avoiding herbal supplements and grapefruit or its juice is recommended since these affect many transplant medicines[9].

Name of Drug	Possible Nutrient Interactions
Azathioprine	Should be taken with food, can cause macrocytic anaemia: adequate folate intake/supplementation required.
Corticosteroids	Cause sodium retention: sodium restriction in diet and adequate intake of Ca, Vit D, Vit A, Vit C and zinc.
Cyclosporine (Neoral)	Cause hyperkalaemia, dyslipidaemia, hypertension and hypomagnesaemia: limit sodium, potassium and dietary fat accordingly.
Mycophenolate mofetil (Cellcept)	(Taken on an empty stomach. Take separately from antacids,) can cause G.I. Disorders constipation, diarrhoea, nausea. vomiting, dyspepsia
Sirolimus	cause hypokalaemia: encourage potassium rich foods
Tacrolimus(Prograf)	can cause hyperkalaemia: restrict potassium rich food

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Livity

is useful for

and helps to

Maintain **Muscle**[1] mass

Strengthen **Bones**[2]

Improve **Heart**[3] health

Provide **Energy**[4]

Build **Immunity**[5]

Livity

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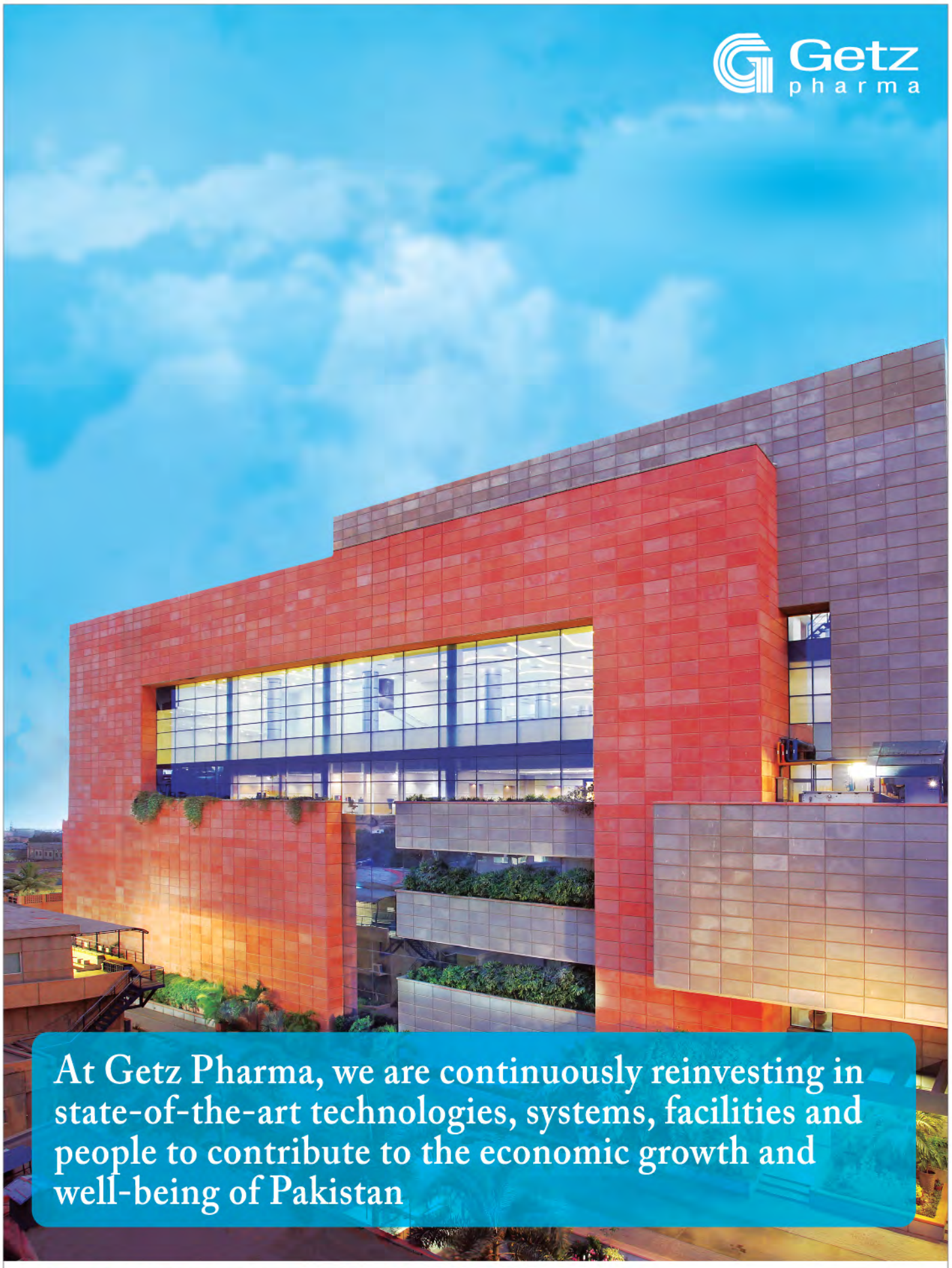

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BECAUSE DISEASE KNOWS NO BOUNDARIES, OUR COMMITMENT IS WORLDWIDE