

Current Trends in Food and Nutrition

Volume - 6

Chief Editor

Dr. Latika Yadav

Assistant Professor and Head Department of Home Science, Faculty of Arts,
Vijay Singh Pathik Government Post Graduate Degree College, Kairana,
Shamli (affiliated to Maa Shakumbhari University, Saharanpur),
Uttar Pradesh, India

Co-Editor

Dr. Upasana

Assistant Professor, Mahila College Dalmianagar, Dehri-on-Sone, Rohtas,
Bihar, India

Integrated Publications™
New Delhi

Published By: Integrated Publications

Integrated Publications

H. No. 3, Pocket-H34, Sector - 3,

Rohini, Delhi - 110085, India

Toll Free (India) – 18001234070

Phone No.: 9711224068, 9911215212

Website: www.integratedpublications.in

Email: printintegrated@gmail.com

Chief Editor: Dr. Latika Yadav

Co-Editor: Dr. Upasana

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Publication Year: 2025

Pages: 170

E-book ISBN: 978-93-7253-654-6

Paperback ISBN: 978-93-7253-512-9

Book DOI:

Price: ₹780/-

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Chapter - 4
Dietary Choices: Implications for Human Health

Author

Dr. Shipra Sharma

Assistant Professor, IFTM University, Lodhipur Rajput, Delhi
Road Moradabad, Uttar Pradesh, India

Paperback ISBN: 978-93-7253-512-9

E-Book ISBN: 978-93-7253-654-6

Chapter - 4

Dietary Choices: Implications for Human Health

Shipra Sharma

Abstract

In recent years, the prevalence of numerous health disorders has risen considerably, largely attributable to sedentary lifestyles and poor dietary practices. Common examples include diabetes mellitus, hypertension, chronic kidney disease, and obesity. Although these conditions manifest differently, they are intricately interrelated, and effective management of one often exerts a positive influence on the others. Evidence suggests that dietary modification plays a pivotal role in prevention and control. Unhealthy eating patterns—such as excessive consumption of ultra-processed foods, refined sugars, high salt intake, saturated and trans fats, and diets deficient in fiber—should be minimized. Conversely, adopting healthier food choices, when combined with regular physical activity, can exert a synergistic effect in reducing disease risk and improving overall health outcomes.

Keywords: Diabetes, CKD, milk, calcium, yogurt, vitamin

Introduction

The Oxford English Dictionary defines *diet* as the total amount of food consumed by an individual or other organism. From a nutritional science perspective, a balanced diet is one that provides all essential macronutrients and micronutrients necessary for growth, physiological maintenance, and the performance of daily life activities. The type and quality of diet chosen by individuals exert profound influence on overall health status, quality of life, and longevity.

A substantial body of evidence demonstrates that dietary interventions can improve the management and prognosis of numerous chronic diseases. For instance, the International Diabetes Federation (IDF) (2025) reports that India ranks second globally in diabetes prevalence, following China, with approximately 89.8 million adults currently living with the condition. Alarming, nearly 43% of these cases remain undiagnosed, underscoring the

scale of this public health challenge. Among chronic diseases in India, the most prevalent conditions are cardiovascular diseases (CVDs), diabetes, chronic obstructive pulmonary disease (COPD), and cancers, in that order of frequency (Upadhyay, 2012).

Emerging research suggests that dietary modification not only aids in the management of lifestyle-related disorders such as diabetes and hypertension, but also plays a role in cancer prevention and, in some cases, disease progression. The World Health Organization (WHO, 2003) highlights that maintaining a healthy body weight significantly reduces the risk of cancers of the esophagus, colorectum, breast, endometrium, and kidney. Similarly, limiting alcohol intake is associated with reduced risks of cancers of the oral cavity, pharynx, esophagus, liver, and breast. Moreover, sufficient consumption of fruits and vegetables has been shown to lower the incidence of cancers affecting the oral cavity, esophagus, stomach, and colorectum.

These conclusions are drawn from a combination of large-scale prospective epidemiological studies, randomized prevention trials, and shorter-term investigations that focus on intermediate endpoints such as blood pressure regulation and lipid profile modulation. In the sections that follow, we will examine specific chronic diseases and discuss evidence-based dietary recommendations tailored to each condition.

Diabetes mellitus

Diabetes mellitus is a complex, multifactorial metabolic disorder characterized by chronic hyperglycemia resulting from impaired insulin secretion, insulin resistance, or both. According to the International Diabetes Federation (IDF), India has the second highest burden of diabetes globally, with approximately 77 million affected individuals (IDF, 2023).

Diabetes is broadly classified into two major types. Type 2 diabetes mellitus (T2DM), which constitutes nearly 95% of all cases, arises primarily from insulin resistance at the cellular level despite normal or elevated insulin concentrations. Type 1 diabetes mellitus (T1DM), accounting for approximately 5% of cases, results from autoimmune-mediated destruction of pancreatic β -cells, leading to absolute insulin deficiency.

The American Diabetes Association (ADA) recommends fasting plasma glucose levels within the range of 80-130 mg/dL as normal. Persistent hyperglycemia predisposes patients to both microvascular and macrovascular complications, with long-term glycemic control commonly assessed through glycated hemoglobin (HbA1c). HbA1c reflects the average plasma glucose

over the preceding 2-3 months and has been established as a reliable biomarker for diabetes management and complication risk (Zoungas *et al.*, 2012). In the case of T1DM, measurement of C-peptide levels—normally ranging from 0.5-2.0 ng/mL—serves as an additional diagnostic marker for residual β -cell function.

Clinical management of diabetes typically combines pharmacological interventions with structured dietary modification. Evidence indicates that marginal elevations in blood glucose can often be reversed through nutritional interventions alone. Studies have demonstrated that reducing dietary carbohydrate intake and emphasizing foods with a low glycemic index (GI) can significantly improve glycemic control in diabetic patients (Ripsin *et al.*, 2009; Feinman *et al.*, 2016). The glycemic index is a numerical system that assigns foods a value based on their postprandial impact on blood glucose concentrations. Accordingly, the ADA recommends preferential consumption of foods with low GI values as part of individualized dietary plans for diabetes management.

In the following section, we provide a categorized list of foods based on glycemic index, as recommended by the American Diabetes Association.

Dietary classification based on glycemic index

The glycemic index (GI) is a standardized measure that ranks carbohydrate-containing foods according to their effect on postprandial blood glucose concentrations. Foods are categorized as *low GI* (≤ 55), *medium GI* (56-69), or *high GI* (≥ 70), based on the rate at which they are digested, absorbed, and subsequently raise blood glucose levels. Incorporating foods with a lower GI is particularly beneficial for individuals with diabetes mellitus, as it promotes gradual glucose release and improved glycemic control.

Low GI foods (≤ 55)

Low GI foods are digested and absorbed slowly, producing a gradual and sustained increase in blood glucose. This group includes non-starchy vegetables such as leafy greens, tomatoes, carrots, and avocados; whole grains such as sorghum (notably associated with improved outcomes in type 2 diabetes), barley, and oats; legumes including beans, lentils, and chickpeas; nuts; and lean protein sources such as eggs, fish, and poultry.

Medium GI foods (56-79)

Medium GI foods elicit a moderate rise in blood glucose levels. Common examples are whole-grain or multigrain breads, couscous, rye bread, corn,

sweet potatoes, bananas, pineapples, raisins, cherries, and certain dairy-based products such as ice cream.

High GI foods (≥ 70)

High GI foods are rapidly digested and absorbed, leading to sharp spikes in blood glucose concentrations. These include refined carbohydrate sources such as white bread, short-grain white rice, puffed rice, cornflakes, instant oatmeal, oat flakes, and rice-based pasta. Other high GI items include starchy foods like potatoes and watermelon, as well as bakery products such as cakes, doughnuts, and pastries. Sugar-sweetened beverages, including fruit juices and soft drinks, also fall into this category and are strongly associated with poor glycemic outcomes.

Factors influencing the glycemic index of foods

The glycemic index of a food item is not an intrinsic or fixed property but is influenced by multiple factors, including composition, processing, storage, and preparation methods. A deeper understanding of these factors is crucial for clinical and nutritional interventions aimed at optimizing glycemic control.

- 1) **Macronutrient composition:** The presence of fat and dietary fiber reduces the rate of gastric emptying and carbohydrate absorption, thereby lowering the GI of a food.
- 2) **Ripeness and storage:** Prolonged storage often leads to increased ripening, which elevates the GI. For example, a ripe banana has a significantly higher GI compared to its less ripe counterpart.
- 3) **Processing:** Food processing generally raises the GI. For instance, fruit juice exhibits a higher GI compared to whole fruit, and mashed potato has a higher GI than a whole baked potato. Similarly, bread produced using stone-ground flour (chakkiatta) retains more structural integrity and exhibits a lower GI than industrially processed whole wheat bread.
- 4) **Cooking methods:** Thermal processing alters starch gelatinization, thereby influencing GI. For example, baked sweet potatoes have a higher GI than boiled sweet potatoes. Likewise, pasta cooked *al dente* has a lower GI compared to soft-cooked pasta.
- 5) **Varietal differences in cereals:** Grain variety impacts GI significantly. Converted (parboiled) long-grain white rice generally exhibits a lower GI than short-grain white rice, both of which differ from brown rice in their glycemic properties.

- 6) **Glycemic load consideration:** While GI indicates the quality of carbohydrates, it does not reflect the total carbohydrate quantity in a serving. Therefore, the concept of **glycemic load (GL)** is also important in assessing the overall impact on blood glucose regulation.
- 7) **Food combinations:** Consuming high-GI foods together with low-GI foods can moderate the glycemic response. For instance, pairing white rice (high GI) with legumes (low GI) yields a more balanced glycemic effect.
- 8) **Nutritional value versus GI paradox:** Not all foods with a lower GI are nutritionally superior. For example, oatmeal has a higher GI than chocolate; however, its fiber, micronutrient, and satiety benefits make it a healthier choice. Thus, food selection should be guided by both glycemic properties and overall nutritional value.

Percentage of carbohydrate and glycemic index as predictors of blood glucose regulation

There is no universally applicable dietary prescription for individuals with diabetes mellitus. Instead, dietary plans must be personalized, taking into account an individual's physiological requirements, lifestyle patterns, and comorbidities, with the overarching goal of achieving and maintaining normoglycemia, optimal lipid profiles (triglycerides and cholesterol), blood pressure regulation, and healthy body weight.

Scientific evidence indicates that both the quantity and quality of dietary carbohydrates influence glycemic control. The glycemic index (GI) provides an assessment of carbohydrate quality by quantifying the postprandial glycemic response to a given food. However, empirical data suggest that the total carbohydrate content of a meal is a stronger determinant of blood glucose levels than GI alone. Consequently, carbohydrate counting has become an essential component of dietary planning for patients with diabetes.

It is important to note that while excessive carbohydrate intake can result in sustained hyperglycemia, excessively low carbohydrate consumption, particularly in individuals receiving exogenous insulin therapy, may precipitate hypoglycemia—a condition with potentially life-threatening consequences. Therefore, careful balancing of carbohydrate intake is imperative.

In addition to carbohydrate monitoring, current dietary recommendations emphasize the importance of low-fat and high-fiber diets, both of which contribute to improved insulin sensitivity, glycemic regulation, and long-term cardiovascular health outcomes in individuals with diabetes.

Hypertension

Hypertension, commonly referred to as high blood pressure, is a multifactorial condition characterized by a sustained elevation in arterial pressure. Clinically, normal blood pressure is defined as approximately 120/80 mmHg, while values up to 139/89 mmHg are considered within the upper limit of normal (prehypertensive range). Persistent elevation beyond these thresholds is associated with increased cardiovascular morbidity and mortality.

The etiology of hypertension is complex and involves the interaction of genetic, metabolic, and environmental factors. Major risk determinants include obesity, physical inactivity, excessive dietary sodium intake, alcohol consumption, tobacco use, psychosocial stress, advancing age, family history, chronic kidney disease (CKD), and thyroid dysfunction.

Management of hypertension typically requires a combination of pharmacological and lifestyle interventions. Among non-pharmacological approaches, dietary modification plays a pivotal role. A low-sodium diet is strongly recommended for patients with elevated blood pressure. Plant-based dietary patterns, rich in fruits, vegetables, and whole grains, are associated with improved blood pressure regulation. In contrast, diets high in sodium-characteristic of processed and refined foods, certain meat products, and full-fat dairy-contribute to increased blood pressure levels.

According to current dietary guidelines, the recommended sodium intake should not exceed 2-3 grams per day (2000-3000 mg), which is approximately equivalent to one teaspoon of salt. Reducing sodium intake to within this range has been shown to lower blood pressure and reduce the risk of cardiovascular complications.

Chronic Kidney Disease (CKD)

Chronic Kidney Disease (CKD) represents a progressive and irreversible decline in renal function, often culminating in end-stage renal disease if not appropriately managed. According to recent community-based studies, the prevalence of CKD in India is estimated at 13.24%, with a rising trend observed between 2017 and 2023 (Talukdar, 2025). Among the leading

etiological factors, diabetic nephropathy has emerged as the most common cause in population-based cohorts (Agrawal, 2009).

Clinically, CKD is characterized by a constellation of symptoms and laboratory abnormalities, including frequent urination, elevated serum creatinine and uric acid levels, reduced glomerular filtration rate (GFR <15 mL/min/1.73 m²), pedal edema, periorbital puffiness, and generalized fluid retention. The two primary drivers of CKD are long-standing diabetes mellitus and uncontrolled hypertension, though other contributors include autoimmune disorders, genetic predispositions, and lifestyle-related risk factors.

Nutritional management is an essential component of CKD care. Patients are generally advised to follow a diet restricted in protein, sodium, potassium, phosphorus, and other electrolytes, in addition to maintaining controlled fluid intake. Such interventions aim to reduce renal workload, delay disease progression, and minimize metabolic complications.

Hyperuricemia, frequently associated with CKD, may arise due to comorbidities such as diabetes, autoimmune disease, or genetic predisposition. Elevated uric acid levels warrant restriction of purine-rich foods, including broccoli, cauliflower, spinach, peas, and mushrooms. Conversely, consumption of foods with uric acid-lowering potential, such as citrus fruits, apples (rich in malic acid), berries, cherries, cucumber, beetroot, and bananas, is recommended. Traditional remedies like apple cider vinegar (2-3 times/day) and curry leaves have also been suggested to aid in lowering serum uric acid. Additionally, maintaining an alkaline intestinal environment is believed to further support uric acid reduction.

Thyroid disorders

Thyroid disorders encompass a spectrum of conditions arising from dysregulation of thyroid hormone secretion, resulting in either hypothyroidism (reduced hormone production) or hyperthyroidism (excessive hormone production). Both conditions exert systemic effects and require careful medical as well as nutritional management.

Hypothyroidism is characterized by insufficient secretion of thyroxine (T₄) and triiodothyronine (T₃). Clinical manifestations include fatigue, unexplained weight gain or, in some cases, weight loss, facial puffiness, and heightened sensitivity to cold. From a nutritional perspective, certain foods can interfere with thyroid hormone synthesis and should be consumed with caution. These include soy-based products (e.g., tofu), cruciferous vegetables (cabbage, broccoli, cauliflower, spinach), starchy tubers such as sweet

potatoes and cassava, as well as certain fruits (peaches, strawberries), nuts, seeds, and some millets (e.g., pine nuts, peanuts). Collectively, such items contain goitrogenic compounds, which may impair iodine uptake and thyroid hormone production.

Hyperthyroidism, by contrast, results from excessive thyroid hormone secretion, leading to symptoms such as increased appetite, anxiety, arrhythmias, and palpitations. Nutritional interventions aim to support metabolic regulation and minimize further stimulation of thyroid activity. Recommended dietary choices include non-iodized salt, beverages such as black coffee or tea (without milk or cream), egg whites, unsalted nuts, oats, potatoes, honey, and natural sweeteners such as maple syrup. These foods are generally considered safe as they do not significantly contribute to iodine intake or exacerbate thyroid hormone synthesis.

Cardiovascular Diseases (CVDs)

Cardiovascular diseases (CVDs) represent a broad category of disorders affecting the structure and function of the heart and blood vessels. According to epidemiological estimates, the prevalence of CVD in India was approximately 54.5 million cases in 2016 (Prabhakaran, 2016), highlighting its significant public health burden.

The clinical spectrum of CVD includes conditions such as coronary artery disease (characterized by narrowing or blockage of coronary vessels leading to angina, myocardial infarction, or stroke), arrhythmias (irregular heartbeat), structural abnormalities (e.g., atrial septal defects), and heart failure. The most common pathophysiological mechanism underlying coronary artery disease is atherosclerosis, wherein the deposition of lipids and fibrous elements within arterial walls leads to luminal narrowing, reduced blood flow, and subsequent ischemic complications.

Several modifiable and non-modifiable risk factors contribute to the development and progression of CVD. Modifiable factors include hypertension, dyslipidemia, smoking, physical inactivity, obesity, and high dietary sodium and fat intake, while non-modifiable determinants encompass genetic predisposition, age, sex, and ethnicity.

Nutritional interventions play a central role in both prevention and management of CVD. A low-fat, cardioprotective diet is strongly recommended, consisting of whole grains, fruits, vegetables, lentils, skimmed milk, low-fat yogurt, and reduced-fat cheese. Such a diet helps reduce serum cholesterol levels, improve vascular function, and lower overall

cardiovascular risk. Conversely, foods rich in saturated fats, trans fats, and sodium-including butter, processed meats, mayonnaise, ketchup, fried foods, and commercially prepared fast foods-should be minimized or eliminated, as they are strongly associated with adverse cardiovascular outcomes.

Vitamin B12 Deficiency

Vitamin B12 (cobalamin) is a water-soluble vitamin that plays a critical role in DNA synthesis, erythropoiesis, and the maintenance of normal neurological function. Like other B-complex vitamins, it is essential for energy metabolism and neurocognitive processes, including memory, mood regulation, and executive function.

The prevalence of Vitamin B12 deficiency in India is notably high; one community-based study estimated a 47% deficiency rate in the North Indian population (Singla, 2019). Interestingly, individuals with diabetes are often prescribed Vitamin B12 supplementation due to long-term use of metformin, which may reduce serum cobalamin levels. Consequently, supplementation in this subgroup may lead to comparatively higher circulating B12 concentrations.

Clinical manifestations

Deficiency of Vitamin B12 can lead to pernicious anemia, an autoimmune condition that impairs intrinsic factor production, thereby reducing B12 absorption. This condition frequently progresses to megaloblastic anemia, characterized by the production of macrocytic red blood cells (large in size but reduced in number), resulting in fatigue and generalized weakness. Common clinical manifestations include shortness of breath (due to reduced oxygen-carrying capacity), palpitations, dizziness, weight loss, cold extremities, glossitis (sore tongue), brittle nails, pallor or jaundice of the skin, diarrhea, and irregular or painful menstruation.

Neurological and neuropsychiatric symptoms are also prominent, given the vitamin's role in myelin synthesis. These include numbness and tingling in extremities, difficulty maintaining balance, confusion, depression, cognitive impairment, memory loss, fatigue, and in severe cases, psychosis, mania, and dementia. Infants with Vitamin B12 deficiency may present with developmental delays, irritability, abnormal movements (such as facial tremors), impaired reflexes, and feeding difficulties, with prolonged deficiency resulting in growth retardation. If untreated, Vitamin B12 deficiency can cause irreversible neurological damage.

Etiology and Risk factors

The primary causes of Vitamin B12 deficiency include inadequate dietary intake (particularly in populations consuming vegetarian or vegan diets), impaired absorption due to conditions such as Crohn's disease, celiac disease, pernicious anemia, or bacterial overgrowth in the intestine, and prolonged use of certain medications (e.g., metformin, proton pump inhibitors).

Recommended Dietary Allowances (RDA) and Sources

According to the National Institutes of Health (NIH), the recommended daily allowance (RDA) for Vitamin B12 is:

- **2.4 micrograms (µg)** for adults over 14 years of age.
- **2.6 µg** for pregnant women.
- **2.8 µg** for lactating women.

Dietary sources of Vitamin B12 include animal-derived foods such as meat, fish, poultry, eggs, and dairy products, as well as fortified cereals and nutritional supplements.

Even mild deficiencies may produce measurable clinical effects, particularly neurocognitive disturbances. Thus, early identification and intervention are essential to prevent long-term complications, including irreversible nerve damage and neuropsychiatric disorders.

Populations at risk of Vitamin B12 deficiency

Vitamin B12 deficiency can arise not only from inadequate intake but also from impaired absorption. Certain populations are at higher risk, including:

- **Individuals dependent primarily on plant-based diets:** Since Vitamin B12 is naturally found in foods of animal origin, vegetarians and vegans are particularly vulnerable to deficiency.
- **Patients with pernicious anemia:** This autoimmune condition leads to the absence of **intrinsic factor**, a glycoprotein essential for intestinal absorption of cobalamin, thereby predisposing affected individuals to severe deficiency.
- **Post-surgical patients with intestinal resection:** Individuals who have undergone gastrointestinal surgery resulting in a shortened small intestine are unable to effectively absorb cobalamin.
- **Patients with gastrointestinal disorders:** Conditions such as **Crohn's disease, inflammatory bowel disease (IBD), gastritis, and celiac disease** impair nutrient absorption and significantly

increase the risk of Vitamin B12 deficiency.

- **Chronic alcohol users:** Excessive alcohol consumption reduces nutrient absorption efficiency and contributes to cobalamin depletion.
- Individuals on long-term metformin therapy: Patients with type 2 diabetes treated with metformin are predisposed to B12 deficiency, as the medication interferes with intestinal absorption of the vitamin.

In cases of impaired absorption, parenteral Vitamin B12 injections or high-dose oral supplementation are often required to restore adequate levels.

Dietary Sources of Vitamin B12

Vitamin B12 is primarily found in foods of animal origin, including fish, poultry, red meat, eggs, and dairy products (milk, cheese, yogurt). For individuals who follow plant-based diets, fortified foods such as cereals, breads, and nutritional yeast represent important alternative sources. In populations at risk, dietary fortification and supplementation are considered essential strategies for maintaining adequate Vitamin B12 status.

Osteoporosis

Osteoporosis is a progressive skeletal disorder characterized by decreased bone strength, leading to increased susceptibility to fractures. The condition is marked by reduced bone mineral density and deterioration of bone microarchitecture, rendering bones fragile and prone to fracture even under minimal stress. In severe cases, routine activities such as bending, coughing, or minor falls may result in fractures. The most common osteoporotic fractures occur in the vertebrae, wrist, and hip, which are associated with significant morbidity and reduced quality of life.

The pathophysiology of osteoporosis is primarily attributed to an imbalance between bone resorption and bone formation, wherein the rate of bone resorption exceeds that of new bone formation. This imbalance leads to a net reduction in bone mass over time. Osteoporosis affects both men and women across all ethnic groups; however, postmenopausal women, particularly those of Asian and Caucasian descent, are at a significantly higher risk due to estrogen deficiency and genetic predisposition.

Clinical manifestations of osteoporosis may include chronic back pain, progressive loss of height, kyphotic posture, and increased bone fragility. Diagnosis typically involves the assessment of bone mineral density (BMD), most commonly measured using dual-energy X-ray absorptiometry (DEXA).

Preventive and therapeutic strategies include weight-bearing exercises, a diet rich in calcium and vitamin D, lifestyle modification, and pharmacological interventions aimed at either reducing bone resorption or promoting bone formation. Early diagnosis and intervention are crucial in minimizing fracture risk and improving long-term outcomes in individuals with osteoporosis.

Dietary considerations in osteoporosis

Optimal nutrition plays a critical role in the prevention and management of osteoporosis. A diet adequate in calcium and vitamin D is fundamental to maintaining bone health, as calcium contributes to bone mineralization while vitamin D facilitates its intestinal absorption and regulates calcium-phosphorus homeostasis.

Recommended foods for osteoporosis

- 1) **Fruits:** Certain fruits provide essential vitamins and minerals that support bone strength. Examples include oranges, grapefruits, papaya, pineapple, bananas, and sweet potatoes, which supply vitamin C, potassium, and other phytonutrients beneficial for bone metabolism.
- 2) **Vegetables:** Dark green and leafy vegetables are important sources of calcium, magnesium, and vitamin K. Okra, collard greens, broccoli, Chinese cabbage, dandelion greens, spinach, beet greens, legumes, and finger millet (notably rich in calcium) contribute significantly to bone mineral density.
- 3) **Dairy products:** Low-fat milk, yogurt, and cheese are excellent sources of bioavailable calcium and vitamin D, making them staple components of an osteoporosis-friendly diet.
- 4) **Fish:** Fatty fish such as mackerel, tuna, and sardines provide vitamin D and omega-3 fatty acids, both of which contribute to bone health and reduce inflammation associated with bone loss.
- 5) **Fortified foods:** In populations with limited natural dietary sources of calcium and vitamin D, fortified products such as juices, breakfast cereals, soy milk, rice milk, snacks, and breads serve as valuable alternatives to ensure adequate nutrient intake.

Foods to avoid in osteoporosis

Certain dietary components may adversely affect calcium absorption and bone health. Caffeine, commonly present in coffee, tea, and carbonated

beverages, has been associated with reduced calcium absorption and increased urinary calcium excretion, thereby contributing to bone loss when consumed in excess.

Vitamin D deficiency: Vitamin D deficiency although an age-related problem but it is growing rapidly in population irrespective of age. Vitamin D is obtained from the UV rays or from the dietary supplements. Role of vitamin D in calcium homeostasis and bone health is well documented (Holik MF, 2007). Concentration of 25-hydroxyvitamin D gives the idea of Vitamin D in blood. Symptoms of vitamin D deficiency include bone pain, fatigue, depression, fertility issues, respiratory illness, hypertension, CKD etc. People having dark skin, those who stay indoors for long time, obese, those who use sunscreen are at greater risk of having vit D deficiency. Salmon, a kind of fatty fish is a rich source of vitamin D. Besides, Herring and sardines, Cod liver oil are also rich source of Vit D. Cod liver oil is a popular supplement. Canned tuna. Egg yolks. Mushrooms. Fortified foods like dairy products, soy milk, orange juice, cereals are few sources of vitamin D. Food rich in calcium content like spinach, soybeans, whitebeans, collard, fishes mentioned above etc. will also help to reverse this deficiency.

Obesity

Obesity has emerged as a major public health concern in India and is recognized as a significant risk factor for numerous chronic diseases. According to the ICMR-INDIAB study (2025), the MONO (Metabolically Obese Non-Obese) a subtype of obesity associated with adverse consequences is more prevalent in rural India showing that obesity is no longer an urban problem.

Clinical features

Obesity is associated with a variety of clinical manifestations, which may include dyspnea (shortness of breath), excessive snoring, fatigue, profuse sweating, musculoskeletal pain in the back and joints, and limited tolerance to sudden or strenuous physical activity. In addition to physical symptoms, psychological consequences such as low self-confidence and diminished self-esteem are frequently observed.

Etiology

The etiology of obesity is multifactorial, involving an interaction between lifestyle, genetic, and pathological determinants. The most common contributing factors include:

- **Dietary factors:** Excessive consumption of calorie-dense foods high in fats and refined carbohydrates.
- **Lifestyle factors:** Sedentary behavior and reduced physical activity.
- **Genetic predisposition:** Familial and hereditary influences that may alter energy balance and fat metabolism.
- **Medication-related causes:** Certain pharmacological agents have been implicated in weight gain as a side effect.
- **Medical conditions:** Endocrine and metabolic disorders such as hypothyroidism, insulin resistance, polycystic ovary syndrome (PCOS), and Cushing's syndrome are known to predispose individuals to obesity.

Body Mass Index (BMI) is used to diagnose obesity which is shown in the table.

Grades of obesity	Body Mass Index (BMI in (kg/m ²))
Underweight	≤ 18.5
Normal weight	18.5-24.9
Overweight	25-29.5
Obesity	≥ 30

Diagnosis and management of obesity

In addition to the **body mass index (BMI)**, other anthropometric and biochemical parameters are employed to assess and diagnose obesity. These include **waist circumference** (≥ 94 cm in men and ≥ 80 cm in women) and **body fat percentage**, both of which provide important insights into central adiposity and metabolic risk.

1. Management approaches

The management of obesity involves a multimodal strategy encompassing lifestyle modifications, pharmacological therapy, and surgical interventions. Of these, lifestyle interventions-particularly those focusing on diet and physical activity-are considered the cornerstone of obesity treatment and prevention.

1.1 Dietary interventions

Several dietary patterns have been proposed for the management of obesity, each with varying mechanisms and metabolic effects:

- 1) **Low-fat diet:** Restricts overall fat intake, with evidence suggesting that diets containing 10-45% of total energy from fats are associated

with a reduction in risk factors for type 2 diabetes and cardiovascular disease (CVD).

- 2) **Low-carbohydrate diet:** Demonstrated efficacy in lowering triglycerides (TAG) and very low-density lipoproteins (VLDL), while simultaneously increasing high-density lipoprotein (HDL) concentrations.
- 3) **Low glycemic index (GI) diet:** Emphasizes foods that produce a slower postprandial rise in blood glucose, thereby improving glycemic control and insulin sensitivity.
- 4) **High-protein diet:** Associated with a reduction in fat mass and plasma triglyceride (TAG) levels, particularly among individuals with dyslipidemia or those at risk of developing type 2 diabetes.

1.2 Quality of Fat Intake

The type of dietary fat consumed is also a critical determinant of metabolic outcomes. Unsaturated fats (e.g., from avocados, nuts, and oily fish) are considered beneficial, whereas **saturated fats** (commonly derived from meat and high-fat dairy products) are associated with adverse health outcomes.

2. Adherence and Sustainability

Although each dietary approach offers specific metabolic benefits, current evidence suggests that long-term weight management is more strongly influenced by sustained adherence to a chosen dietary pattern rather than the specific type of diet prescribed (Makris *et al.*, 2012).

Polycystic Ovary Syndrome (PCOS)

Polycystic Ovary Syndrome (PCOS) is a prevalent endocrine disorder affecting women of reproductive age. The reported prevalence in India ranges from 3.7% to 22.5%, depending upon the population studied and the diagnostic criteria applied (Ganie *et al.*, 2019). PCOS is primarily characterized by hyperandrogenism, which manifests clinically through hirsutism, acne, and menstrual irregularities. A hallmark feature is the presence of anovulation or oligo-ovulation, leading to prolonged or irregular menstrual cycles and impaired fertility outcomes.

Although the term “polycystic ovary syndrome” suggests the presence of ovarian cysts, this is not universally observed. Instead, diagnostic imaging may reveal multiple small ovarian follicles on ultrasonography, which represent the arrested development of immature ovarian follicles rather than true pathological cysts.

Women with PCOS are at significantly increased risk for metabolic and cardiovascular comorbidities, including type 2 diabetes mellitus, insulin resistance, hypertension, dyslipidemia, cardiovascular disease, and endometrial carcinoma. These risks underscore the importance of early diagnosis and long-term management.

Dietary recommendations in PCOS

Nutritional interventions form a cornerstone in the management of PCOS, as diet plays a central role in modulating metabolic and hormonal imbalances. Recommended dietary strategies include:

- **High-fiber diets:** Incorporating foods such as broccoli, cauliflower, lettuce, beans, and lentils, which improve satiety, regulate blood glucose, and reduce insulin resistance.
- **Avoidance of pro-inflammatory and high-glycemic foods:** Diets high in saturated fats, refined carbohydrates, and red meat are associated with exacerbation of insulin resistance and systemic inflammation and should therefore be minimized.

A structured dietary approach, often combined with physical activity and behavioral interventions, is considered highly effective in the comprehensive management of PCOS.

Dental Caries

Dental caries is among the most prevalent oral health conditions worldwide and represents a major public health concern. It is primarily caused by the demineralization of enamel and dentin, the mineralized tissues of the tooth, due to the action of organic acids. These acids are produced by bacterial fermentation of dietary carbohydrates within the oral cavity.

The microorganism *Streptococcus mutans*, among other cariogenic species, plays a central role in the pathogenesis of dental caries. It resides within dental plaque, a biofilm of bacteria and extracellular matrix that adheres to the tooth surface. Under anaerobic conditions, these bacteria metabolize fermentable carbohydrates, especially sucrose, leading to the production of lactic acid and subsequent localized demineralization of tooth structure.

The development and progression of dental caries are influenced by several factors, including:

- **Dietary habits:** Frequent intake of fermentable carbohydrates, particularly refined sugars, increases the risk of caries.

- **Oral hygiene practices:** Poor mechanical removal of plaque facilitates bacterial colonization.
- **Exposure to fluoride:** Fluoride strengthens enamel and inhibits bacterial metabolism, thus serving as a protective factor.
- **Dietary acids:** Beverages and foods high in acids can contribute directly to enamel erosion, further predisposing teeth to decay.

Preventive strategies include reducing the frequency and amount of sugar consumption, maintaining adequate fluoride exposure through water, toothpaste, or professional treatments, and practicing regular oral hygiene.

Conclusion

A balanced diet, combined with regular physical activity, plays a pivotal role in the prevention, management, and treatment of various diseases. In recent years, the prevalence of sedentary lifestyles and unhealthy eating habits has contributed to a marked rise in lifestyle-related illnesses. Effective dietary management can significantly support clinicians in disease treatment, while attention to genetic predispositions and physical activity remains essential for comprehensive care. Beyond individual health, adopting healthy dietary practices also promotes environmental sustainability and contributes to broader public health goals. Although hospitals employ dietitians and nutritionists, there is an urgent need to raise awareness at the community level. Collaboration among diverse stakeholders is critical to implementing educational campaigns, empowering individuals to make informed dietary choices, and ultimately reducing the burden on healthcare systems.

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