



Nutrition and Hydration Across the Lifespan: Integrating Nursing Care and Nutritional Science

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Abstract

Background: Optimal nutrition and hydration underpin growth, metabolic homeostasis, and disease prevention across childhood, adulthood, pregnancy, and athletic performance. Malnutrition and dehydration remain prevalent and clinically consequential, driven by both quantitative (energy/fluid) and qualitative (diet composition) inadequacies.

Aim: To synthesize evidence on energy and fluid requirements across the lifespan, outline micronutrient priorities, and delineate role-specific interventions for nurses and nutritionists within interprofessional care pathways.

Methods: Narrative integration of established dietary reference values and clinical protocols described in the source article, spanning macronutrients, micronutrients, water balance, and condition-specific considerations (pediatrics, pregnancy, aging, sport). Emphasis was placed on actionable screening, resuscitation algorithms, and individualized dietary planning.

Results: Children require age- and weight-based caloric/fluid prescriptions; growth charts and the 4-2-1 rule guide practice. Adults generally need 2000–2800 kcal/day and sex-specific water intakes, with older adults at heightened dehydration risk. Pregnancy demands trimester-specific energy increases and targeted micronutrient supplementation (folate, iron, vitamin D, calcium, protein). Athletes need goal-driven macronutrient periodization and staged hydration with electrolytes. Clinically, low-GI carbohydrates, adequate protein (~1.6 g/kg/d in adults), prudent fat quality, and sufficient fiber support cardiometabolic health. Nurses lead screening, hemodynamic monitoring, IV access, and weight-/age-based fluid resuscitation; nutritionists diagnose dietary inadequacies, design individualized plans (e.g., DASH, therapeutic foods), and direct supplementation and education.

Conclusion: Lifespan-tailored prescriptions for energy, fluids, and micronutrients—implemented through coordinated nursing and nutritionist workflows—reduce preventable morbidity from malnutrition and dehydration and strengthen population health.

Keywords: nutrition; hydration; pediatrics; pregnancy; athletes; micronutrients; fiber; dehydration; nursing; dietetics; interprofessional care

Introduction

A nutrient is broadly defined as a chemical substance that provides nourishment and supports the physiological requirements of the human body. Nutrients are indispensable for both growth and the continuous maintenance of health across the lifespan. Without adequate intake, biological functions are compromised, leading to malnutrition, metabolic dysregulation, and disease vulnerability. The classification of nutrients into seven primary groups—carbohydrates, proteins, fats, fibers, minerals, vitamins, and water—reflects their distinct yet complementary contributions to sustaining life and optimizing human performance. Macronutrients are consumed in relatively large quantities and provide the primary energy required to sustain daily activities and cellular metabolism. Carbohydrates, for instance, represent the body's most accessible energy source, being metabolized into glucose which fuels adenosine triphosphate (ATP) production. Proteins serve dual functions: they contribute to energy metabolism under conditions of caloric deficit, but more importantly, they provide amino acids essential for tissue synthesis, enzyme production, and immunological defense. Fats, though often misunderstood, are equally vital. They not only provide a dense energy reserve but also play a structural role in cellular membranes and act as precursors for bioactive molecules such as steroid hormones. Collectively, macronutrients ensure the continuous availability of biochemical energy, allowing homeostatic processes to function efficiently [1].

In contrast to macronutrients, micronutrients are required in relatively small quantities, yet their absence leads to severe physiological impairments. Vitamins act primarily as coenzymes that facilitate enzymatic reactions. For example, vitamin C is integral to collagen synthesis and immune modulation, while vitamin D regulates calcium homeostasis and skeletal health. Minerals, similarly, are essential

cofactors. Iron enables oxygen transport through hemoglobin, while zinc supports enzymatic activity, cellular repair, and immunological defense. Micronutrient deficiencies, even at subclinical levels, can lead to long-term developmental and metabolic complications, underlining their indispensable role in growth, cognition, and disease prevention. Although not a direct source of energy, dietary fiber plays a pivotal role in gastrointestinal health and metabolic regulation. Soluble fibers regulate blood glucose levels by slowing carbohydrate absorption, whereas

insoluble fibers promote bowel regularity and prevent constipation. Moreover, fiber intake has been consistently associated with reduced risks of cardiovascular disease, obesity, and colorectal cancer, demonstrating its role in both preventive and therapeutic nutrition [1][2].

Among all nutrients, water is uniquely fundamental, serving multiple indispensable functions in human physiology. Water is the principal solvent for biochemical reactions, enabling enzymatic activity and molecular interactions that sustain cellular life. It also facilitates the transport of nutrients and metabolic by-products across compartments, ensuring systemic balance and detoxification. Beyond its role as a solvent, water acts as a substrate for hydrolytic reactions and contributes to thermoregulation through perspiration and heat dissipation. Dehydration, even at mild levels, can impair cognitive performance, cardiovascular stability, and physical endurance. Thus, water is not only a nutrient but the medium in which all nutrient metabolism occurs. Although nutrients are classified into separate groups, their functions are interdependent. Proteins require vitamins and minerals to be metabolized effectively, while fats aid in the absorption of fat-soluble vitamins such as A, D, E, and K. Carbohydrates provide the

immediate energy that spares proteins for anabolic functions. Water underpins all these interactions by serving as the medium for digestion, absorption, and cellular transport. A holistic view of nutrition recognizes the synergy between these groups in maintaining equilibrium and promoting health across childhood, adulthood, and aging populations [1][2].

Nutrients, whether macronutrients, micronutrients, or water, collectively sustain the dynamic processes of human growth, repair, and homeostasis. While macronutrients provide the energy substrate required for biological activity, micronutrients catalyze essential biochemical pathways that enable health and longevity. Fiber enhances digestive and metabolic functions, while water serves as the fundamental solvent and transport medium for nearly all physiological processes. Together, these nutrients highlight the complexity of human nutrition, where each group fulfills unique yet overlapping roles essential for survival. A comprehensive understanding of their interactions is crucial for advancing dietary guidelines, clinical nutrition, and preventive health strategies [1].

Children

Energy Requirements in Childhood

The caloric requirements of children differ considerably depending on their age, sex, growth velocity, and physical activity level. Early childhood is characterized by rapid growth and development, necessitating a high energy intake relative to body size. For toddlers between 2 and 3 years of age, the recommended daily caloric intake ranges from 1000 to 1400 kcal/day. This requirement progressively increases with age, reflecting both basal metabolic needs and the demands of growth. For example, children between the ages of 11 and 12 years are advised to consume between 1800 and 2200 kcal/day to meet their physiological needs and support ongoing growth and maturation. Another useful approach to

determining caloric requirements is weight-based estimation. During infancy, when growth is most rapid, the caloric demand is approximately 100 kcal/kg/day. This requirement decreases proportionally with age: children aged 1 to 3 years typically require 80 kcal/kg/day; those aged 4 to 5 years require around 70 kcal/kg/day; children between 6 and 8 years need 60 to 65 kcal/kg/day; while those above 9 years require between 35 and 45 kcal/kg/day. These calculations provide clinicians and caregivers with a general framework for ensuring adequate energy provision. Growth spurts, which occur unpredictably during childhood, represent periods of accelerated tissue accretion that require increased caloric intake. Failure to meet the heightened energy needs during these critical periods can compromise growth potential and may lead to long-term deficits in stature, lean body mass, and even cognitive performance. Growth charts, therefore, are indispensable tools in pediatric practice. They enable healthcare professionals to track weight and height trajectories over time, identify deviations from expected growth patterns, and guide individualized nutritional counseling.

Water and Fluid Requirements in Children

Hydration is another cornerstone of child health, and fluid requirements vary according to age, body weight, sex, environmental temperature, and activity level. The daily recommended intake (DRI) of water has been established to prevent dehydration, maintain metabolic homeostasis, and support growth. Among all sources of fluids, plain water is considered the most effective and physiologically appropriate medium. However, studies have demonstrated that many children fail to meet adequate hydration standards. A recent investigation revealed that children from higher-income households were more likely to consume adequate plain water, whereas up to 75% of children overall did not meet their DRI for

water [1]. This highlights a concerning disparity linked to socioeconomic determinants of health.

The estimation of fluid requirements in children is often approached using weight-based calculations. For infants weighing between 3.5 kg and 10 kg, fluid requirements are estimated at 100 ml/kg/day. For children weighing 11 to 20 kg, the recommendation is 100 ml/kg for the first 10 kg plus an additional 50 ml/kg for every kilogram above 10. For those weighing more than 20 kg, the calculation involves a baseline of 1500 ml for the first 20 kg of weight, with an additional 20 ml/kg for every kilogram beyond 20. Nonetheless, it is generally advised that fluid intake should not exceed 2400 ml/day to avoid fluid overload and potential electrolyte imbalance. An alternative method for calculating daily fluid requirements is the **4-2-1 rule**. This formula prescribes 4 ml/kg/hr for the first 10 kg of body weight, 2 ml/kg/hr for the next 10 kg, and 1 ml/kg/hr for each kilogram beyond 20 kg. For example, a child weighing 5 kg would require 20 ml/hr or 480 ml/day. Conversely, a child weighing 25 kg would require 65 ml/hr, which translates into approximately 1560 ml/day. This rule is frequently used in clinical settings due to its simplicity and adaptability for intravenous fluid therapy as well as oral hydration planning. Maintaining adequate hydration is vital because children are particularly vulnerable to dehydration due to their higher metabolic rate, relatively greater body surface area, and limited physiological reserves compared with adults. Even mild dehydration can result in impaired thermoregulation, reduced cognitive function, irritability, and decreased physical performance. In severe cases, dehydration can lead to circulatory collapse, highlighting the importance of structured hydration strategies across all pediatric age groups.

Malnutrition and Its Consequences

While the quantitative adequacy of calories and fluids is essential, the qualitative composition of the child's diet remains equally important. Under-nutrition, encompassing both protein-energy malnutrition and micronutrient deficiencies, continues to represent one of the most significant global health challenges. It is estimated that under-nutrition accounts for more than three million deaths annually in children under the age of five years worldwide. This staggering figure underscores the profound impact of nutritional inadequacy on child survival, growth, and development. Several interrelated factors contribute to dietary insufficiency among children. Poverty remains the most significant determinant, limiting access to diverse and nutrient-dense foods. In addition, lack of nutritional knowledge among caregivers often results in feeding practices that are either inadequate in quantity or imbalanced in quality. Palatability issues, particularly children's aversion to nutrient-rich but less appealing foods, may also hinder appropriate intake. Time scarcity among working parents and caregivers contributes further to reliance on calorie-dense but nutrient-poor convenience foods. Finally, geographical and seasonal availability of fresh produce can limit dietary diversity in many low- and middle-income regions [2][3]. The long-term consequences of childhood under-nutrition are profound. Stunting, defined as impaired linear growth, is not only a marker of chronic malnutrition but also a predictor of reduced cognitive capacity, impaired school performance, and decreased economic productivity in adulthood. Wasting, representing acute malnutrition, is associated with weakened immunity and increased susceptibility to infections. Moreover, micronutrient deficiencies such as iron-deficiency anemia, vitamin A deficiency, and iodine deficiency disorder further compound the risk of morbidity and mortality.

Integrating Nutritional and Hydration Strategies for Children

Addressing the complex nutritional and hydration needs of children requires a holistic, multi-sectoral approach. At the clinical level, routine monitoring using growth charts, dietary assessments, and hydration evaluations provides early detection of potential deficits. Schools and community programs also play a pivotal role in promoting healthy eating patterns, providing balanced meals, and educating children and caregivers on the importance of nutrition and hydration. Policy interventions aimed at reducing socioeconomic disparities, such as subsidizing nutritious foods, improving access to clean water, and regulating marketing of unhealthy products, are equally crucial. In addition, targeted interventions during periods of increased vulnerability, such as growth spurts, illness recovery, and adolescence, ensure that children are equipped with the necessary nutritional resources to achieve optimal growth and development. Hydration education is particularly relevant in hot climates and among physically active children, where water losses through perspiration are elevated.

Children have unique and dynamic nutritional and hydration needs that evolve with age, growth patterns, and activity levels. Caloric requirements, which range from approximately 1000 kcal/day in toddlers to over 2200 kcal/day in preadolescents, must be carefully adjusted to support both metabolic maintenance and growth. Hydration needs, which are often calculated using body weight formulas or the 4-2-1 rule, are equally critical to sustaining physiological equilibrium. Despite clear recommendations, large numbers of children globally fail to meet their daily requirements for both energy and fluids, largely due to poverty, lack of knowledge, and social inequalities. Under-nutrition alone accounts for millions of preventable deaths in children under

five each year, further emphasizing the urgency of intervention [2][3]. Ensuring adequate nutrition and hydration during childhood is not only a matter of individual health but also a foundation for societal progress. Well-nourished children are more likely to thrive academically, socially, and physically, ultimately contributing to healthier populations and more resilient communities. Addressing these needs with evidence-based, equity-focused strategies remains one of the most pressing challenges of global child health [2][3].

Adults

Daily Caloric Requirements

The daily energy requirements for adults differ by sex, age, and lifestyle, reflecting the metabolic needs required to sustain normal bodily functions and activity. On average, adult males require between 2600 and 2800 kcal/day, whereas adult females require approximately 2000 to 2200 kcal/day. These values, however, are not absolute; they fluctuate depending on physical activity levels, underlying health conditions, and physiological stages such as illness, recovery, or hormonal fluctuations. Sedentary individuals generally need energy closer to the lower end of the spectrum, while those engaging in moderate to vigorous activity demand higher intakes to replenish glycogen stores and maintain lean body mass. For example, a sedentary office worker may require no more than 2000 kcal/day, whereas a construction worker or agricultural laborer could easily need 2800 kcal/day or more. Understanding these variations is critical to preventing both under-nutrition and over-nutrition [4][5].

Consequences of Imbalanced Nutrition

An imbalance in dietary intake can be detrimental, whether it results in caloric insufficiency or excess. Under-nutrition manifests as unintended weight loss, decreased immunity, impaired wound healing, and decreased muscle mass. Over-nutrition,

on the other hand, contributes significantly to obesity, type 2 diabetes, cardiovascular disease, metabolic syndrome, and certain cancers. Both extremes carry long-term implications, reducing quality of life and lifespan. Thus, caloric balance must be achieved not only by quantity but also by quality of intake, with emphasis on nutrient-dense foods rather than energy-dense, nutrient-poor alternatives [4][5].

Water and Hydration Requirements in Adults

Hydration status is a fundamental determinant of adult health, as water supports metabolic reactions, thermoregulation, digestion, and nutrient transport. The daily recommended intake (DRI) of water varies depending on age, sex, environmental conditions, and physical activity. For adults aged 19 to 30 years, the DRI for men is 3.7 L/day, while for women it is 2.7 L/day. This includes water derived from both beverages and food. Data from the United States indicate that median total water intake among males aged 19 to 50 years is approximately 3.5 L/day, and among females of the same age group about 3.0 L/day [4]. Although these averages are near the DRI, population-based studies reveal that many individuals still fail to achieve adequate hydration. Alarming, one study demonstrated that 83% of women and 95% of men aged 71 years or older did not meet the DRI for water [5]. This suggests that older adults, who are already at increased risk of dehydration due to diminished thirst perception and reduced renal concentrating ability, represent a particularly vulnerable group. Hydration imbalances in adults are associated with both acute and chronic health risks. Mild dehydration can cause fatigue, impaired cognition, and reduced physical performance, while chronic insufficient intake may increase the risk of kidney stones, urinary tract infections, and constipation. Conversely, overhydration, though less common, may lead to hyponatremia, particularly in athletes and patients

with certain medical conditions. For optimal health, hydration should be individualized, considering not only body weight and sex but also environmental heat exposure and physical exertion [4][5].

Pregnant Women

Energy and Weight Gain Requirements

Pregnancy represents a unique physiological state during which maternal nutrition directly affects fetal growth, maternal well-being, and pregnancy outcomes. The recommended weight gain during pregnancy is guided by the woman's prepregnancy body mass index (BMI). Women classified as underweight (BMI <18.5) are advised to gain between 28 to 40 lbs during gestation. Women with a normal BMI (18.5–24.9) should aim for 25 to 35 lbs, while overweight women (BMI 25–29.9) are recommended to gain 15 to 25 lbs. For women with obesity (BMI ≥30), the safe range is narrower, at 11 to 20 lbs. Caloric requirements also shift across the trimesters. In the first trimester, additional calories are generally unnecessary. During the second trimester, women should increase their intake by approximately 340 kcal/day, and in the third trimester by about 450 kcal/day. This gradual increase supports the expanding maternal blood volume, the growth of uterine and breast tissue, and the rapidly growing fetus. Excessive weight gain, however, is associated with complications including gestational diabetes, hypertension, cesarean delivery, and postpartum weight retention. For the fetus, maternal overnutrition increases the risks of macrosomia, childhood obesity, asthma, and even certain cancers later in life. Twin pregnancies represent another special consideration. According to National Research Council guidelines, women with normal prepregnancy BMI carrying twins should gain 17–25 kg. Overweight women should gain 14–23 kg, and obese women 11–19 kg. Such guidelines are essential in ensuring that both fetuses

receive adequate energy and nutrient supply without exposing the mother to unnecessary risks [5][6].

Micronutrient and Macronutrient Needs in Pregnancy

Pregnancy also alters requirements for specific nutrients. A prenatal vitamin is recommended before conception and continued throughout pregnancy and lactation. Folate is particularly critical; a daily intake of 400 mcg in the first trimester reduces the risk of neural tube defects. Iron requirements double to approximately 30 mg/day due to the demands of increased maternal blood volume and fetal erythropoiesis. Vitamin D intake should reach 600 IU/day to support calcium absorption and fetal skeletal development. Calcium requirements remain at 1000 mg/day, but adequate intake is critical to prevent maternal bone demineralization. Protein needs rise from 0.8 g/kg/day to 1.1 g/kg/day to support tissue growth in both mother and fetus. Similarly, fluid intake should be increased to around 3 L/day to account for expanded plasma volume and amniotic fluid production. Importantly, women are no longer advised to avoid allergenic foods such as peanuts or eggs during pregnancy, as evidence suggests early exposure may actually reduce the risk of childhood allergies. Healthcare providers play a vital role in monitoring maternal weight gain, counseling women about appropriate dietary changes, and ensuring that dietary patterns meet increased nutrient demands. Preconception counseling is equally important, as achieving a healthy weight prior to pregnancy reduces the risk of complications and improves maternal and fetal outcomes [5][6].

Athletes

Energy Demands and Body Composition

Athletes represent a population with uniquely elevated nutritional needs due to the physiological demands of training and competition. Energy requirements are not determined solely by body

weight but also by body composition, training intensity, duration, and environmental conditions. For example, endurance athletes such as marathon runners require sustained caloric intake to maintain glycogen stores, whereas strength athletes prioritize protein and energy to facilitate muscle hypertrophy. When counseling athletes, healthcare professionals must consider whether the individual is seeking to gain lean mass, reduce body fat, or maintain current composition. Extreme caloric restriction can impair performance and recovery, while excessive intake can lead to undesirable fat gain. Achieving an energy balance tailored to the athlete's specific goals ensures optimal physical and metabolic performance [5][6].

Macronutrient Distribution

Carbohydrates form the cornerstone of an athlete's diet, as they provide readily accessible energy for both aerobic and anaerobic activity. Glycogen depletion is one of the main causes of fatigue during prolonged exercise, and replenishment through adequate carbohydrate intake is essential. Protein is equally important, with athletes requiring more than the general adult population—often 1.2 to 2.0 g/kg/day depending on training load. Adequate protein supports muscle repair, adaptation, and growth. Fats, though sometimes restricted, remain vital, providing essential fatty acids and supporting the absorption of fat-soluble vitamins.

Hydration and Performance

Hydration is arguably the single most critical factor in athletic performance. Dehydration of as little as 2% of body weight has been shown to impair endurance, reduce strength, and increase the risk of heat illness. Athletes are advised to hydrate adequately in the 24 hours preceding competition, in the hour before the event, during activity, and throughout the recovery phase. Sweat losses vary widely depending on temperature, humidity, and intensity of exertion, meaning hydration must be personalized. Rehydration

strategies often include not only water but also electrolyte replacement, particularly sodium and potassium, to prevent imbalances that could impair neuromuscular function [6]. Training at high altitudes and in hot climates presents additional challenges. At high altitudes, increased respiratory water losses and elevated energy expenditure raise both caloric and fluid demands. In hot environments, excessive sweating accelerates fluid loss, raising the importance of preemptive hydration and electrolyte replenishment.

The nutritional and hydration requirements of adults are complex, dynamic, and influenced by sex, age, lifestyle, and physiological status. For general adults, caloric needs range from 2000 to 2800 kcal/day, while water requirements range from 2.7 to 3.7 L/day. Despite these guidelines, large proportions of adults, particularly older populations, fail to meet hydration standards, placing them at risk for a variety of health issues [4][5]. Pregnant women represent a unique subgroup with heightened nutritional demands.

Their energy, protein, vitamin, and mineral requirements must be carefully monitored to ensure maternal health and optimal fetal development. Excessive or inadequate weight gain carries risks for both mother and child, underscoring the importance of preconception counseling and consistent prenatal care. Athletes require individualized nutrition plans that account for body composition, training load, and environmental stressors. Adequate caloric intake, balanced macronutrient distribution, and structured hydration strategies are critical to maximizing performance and preventing injury [6]. Ultimately, ensuring that adults across all life stages meet their caloric and hydration requirements requires a combination of individual awareness, clinical guidance, and supportive public health measures. When properly balanced, nutrition and hydration are powerful determinants of health, longevity, and human performance [6].

Table 1. Summary of energy and hydration guidance across groups.

Population	Energy guidance (examples)	Hydration guidance (examples)	Key clinical notes
Children	~100 kcal/kg/day (infants), then 80 (1–3 y), 70 (4–5 y), 60–65 (6–8 y), 35–45 (≥9 y); 2–3 y: ~1000–1400 kcal/d; 11–12 y: ~1800–2200 kcal/d	Weight-based daily fluids: 100 mL/kg (3.5–10 kg); +50 mL/kg (11–20 kg); >20 kg: 1500 mL + 20 mL/kg (max single administration ≤2400 mL). 4-2-1 rule for hourly rates.	Use growth charts; increase during growth spurts; monitor for dehydration (higher surface-area-to-mass).
Adults	~2000–2200 kcal/d (females), ~2600–2800 kcal/d (males), modified by activity, illness, and body composition	DRI: 2.7 L/d (women), 3.7 L/d (men). Elderly at higher risk of under-hydration.	Balance quantity and quality; target low-GI carbs, adequate protein (~1.6 g/kg/d), healthy fats, and fiber.
Pregnant women	+0 kcal/d (1st tri), +340 (2nd), +450 (3rd); gestational weight-gain targets by pre-pregnancy BMI	~3 L/d total fluids	Folate, iron, vitamin D, calcium, and protein (to ~1.1 g/kg/d) prioritized; monitor weight gain and anemia.
Athletes	Goal-based periodization; higher energy and protein (~1.2–2.0 g/kg/d)	Pre-, intra-, and post-event hydration; individualized by sweat rate; electrolyte replacement	Prevent heat illness; match carbs to training; consider altitude/h

Clinical Significance

The human body relies on a delicate balance of macronutrients and micronutrients to sustain physiological processes, support growth, and maintain health. A deficiency in even one of these essential nutrients can result in severe and sometimes life-threatening health consequences. For this reason, dietary adequacy and balance remain at the forefront of clinical nutrition and public health. The major nutrient groups—carbohydrates, proteins, fats, and fiber—provide energy and structural substrates while also playing critical roles in regulating metabolism and disease prevention. The following sections provide a detailed analysis of the clinical significance of each, along with recommendations and consequences of their deficiency or excess [7].

Carbohydrates

Carbohydrates represent the body's primary source of energy, accounting for approximately 50–55% of total daily caloric intake. They are composed of monosaccharides such as fructose, glucose, and galactose, which serve as substrates for cellular respiration. Each gram of carbohydrate provides approximately 4 kcal, fueling both basal metabolism and physical activity. Not all carbohydrates are equal in their metabolic impact. Complex carbohydrates with a low glycemic index are generally favored in clinical nutrition because they release glucose gradually into the bloodstream, thereby avoiding abrupt spikes in blood sugar. This gradual release supports better glycemic control, reduces the risk of insulin resistance, and provides sustained satiety. In contrast, simple sugars such as dextrose are metabolized quickly and should be limited to 5–10% of the daily caloric requirement [7]. Excess consumption of simple sugars has been linked with obesity, type 2 diabetes mellitus, and dental caries, making moderation essential. Legumes, whole grains,

beans, fruits, and vegetables represent optimal sources of carbohydrates and contribute additional nutrients such as vitamins, minerals, and dietary fiber [8]. Clinical nutrition guidelines emphasize the replacement of refined sugars with these nutrient-dense alternatives to improve long-term health outcomes.

Proteins

Proteins are fundamental macromolecules composed of amino acids that serve as both energy substrates and the building blocks of body structures including muscles, bones, ligaments, and connective tissue. Approximately 30% of the dry body weight of an adult is protein, reflecting its critical structural and functional role. On average, about 20% of daily caloric intake should be derived from proteins, with the recommended daily intake for adults being approximately 1.6 g/kg body weight. Proteins are categorized into essential and non-essential amino acids. Essential amino acids, such as leucine and valine, cannot be synthesized endogenously and must therefore be acquired through the diet. High-quality protein sources include red and white meats, eggs, legumes, and dairy products. Increasing attention has been given to plant-based proteins, which have been shown to reduce cancer and cardiovascular disease-related mortality when consumed as replacements for animal proteins in large-scale prospective studies [9]. Protein-energy malnutrition remains a global health concern, especially in low- and middle-income countries. Marasmus, caused by a deficiency in energy-producing nutrients such as carbohydrates, fats, and proteins, is characterized clinically by severe wasting, loss of subcutaneous fat, and muscle atrophy. Kwashiorkor, by contrast, occurs in children whose diets are energy-sufficient but protein-deficient. Unlike marasmus, kwashiorkor is marked by edema,

dermatitis, hair loss, and oral changes such as loosening of teeth. A combined form, marasmic-kwashiorkor, can occur when a child with marasmus also develops pitting edema due to severe protein deficiency [10]. Both conditions remain leading causes of morbidity and mortality in pediatric populations and underscore the critical importance of adequate protein intake.

Fats

Dietary fats are composed of glycerol and fatty acids, serving as dense energy sources and supporting essential physiological functions. They aid in the absorption of fat-soluble vitamins (A, D, E, and K), act as thermal insulators, and form structural components of cell membranes. Approximately 25–30% of daily caloric intake should come from fats, with saturated fats contributing no more than 10% [11]. Essential fatty acids, particularly omega-3 and omega-6, are precursors for eicosanoids such as prostaglandins and leukotrienes. These compounds are critical for inflammatory regulation, vascular function, and immune responses. Deficiency in essential fatty acids may lead to impaired wound healing, poor growth, and dermatological manifestations [11]. Although the body can synthesize cholesterol, excessive dietary intake remains a concern. Current guidelines suggest limiting dietary cholesterol to under 300 mg/day. Diets rich in saturated and trans fats are strongly associated with obesity, dyslipidemia, and cardiovascular disease [12][11]. Conversely, diets emphasizing monounsaturated fats—such as those found in olive oil, avocado, nuts, and flaxseed—are associated with improved cardiovascular health, lower risks of type 2 diabetes, and reduced cognitive decline [8]. Clinical trials and observational studies consistently demonstrate that replacing saturated fats with monounsaturated and polyunsaturated fats leads to better lipid profiles and reduced cardiovascular risk. The clinical consequences of excessive fat intake

extend beyond cardiovascular disease. High-fat diets contribute to non-alcoholic fatty liver disease, metabolic syndrome, and certain cancers. On the other hand, insufficient fat intake can compromise the absorption of fat-soluble vitamins, hormonal balance, and neurological development. Thus, moderation and balance in fat intake are crucial [11][12].

Dietary Fiber

Dietary fiber, though not classified as an energy-yielding nutrient, plays a vital role in digestive health, metabolic regulation, and chronic disease prevention. Fiber can be broadly divided into soluble and insoluble types, both of which contribute unique physiological benefits. Soluble fiber forms viscous gels in the gut, slowing glucose absorption and lowering cholesterol levels, while insoluble fiber adds bulk to stool, promoting bowel regularity and preventing constipation. The recommended daily intake of fiber is 38 grams for men and 25 grams for women aged 19 to 50 years. For children, a practical guideline is age plus 5 grams. Unfortunately, the majority of the global population falls short of these targets, a phenomenon known as the "fiber gap." The clinical implications of adequate fiber intake are extensive. Fiber-rich diets improve lipid profiles by reducing low-density lipoprotein cholesterol (LDL-C) and increasing tolerability to statins, thereby reducing the risk of atherosclerosis and cardiovascular disease [13]. Epidemiological studies have also linked high fiber consumption with reduced risks of colorectal cancer, obesity, and type 2 diabetes. In addition, dietary fiber enhances satiety, thereby aiding weight management. Fruits, vegetables, whole grains, and legumes are the principal dietary sources of fiber. To achieve clinical benefits, individuals are advised to consume at least five servings of fruits and vegetables daily. Beyond digestive health, fiber contributes significantly to the gut microbiome, promoting the

growth of beneficial bacteria that, in turn, support immune function and reduce inflammation [13].

Table.2: Daily recommended caloric intake.

Daily Recommended Caloric Intake in Children (kcal)				
Age (years)	Male		Female	
	Sedentary	Active	Sedentary	Active
2	1000	1000	1000	1000
3	1000	1400	1000	1200
4-5	1200	1400	1200	1400
6	1400	1600	1200	1400
7	1400	1600	1200	1600
8	1400	1600	1400	1600
9	1600	1800	1400	1600
10	1600	1800	1400	1800
11	1800	2000	1600	1800
12	1800	2200	1600	2000
13	2000	2200	1600	2000
14	2000	2400	1800	2000
15	2200	2600	1800	2000

Integration of Macronutrients and Clinical Outcomes

While each nutrient category exerts specific physiological effects, their interactions determine overall health outcomes. Carbohydrates provide glucose, which is essential for sparing protein in times of energy sufficiency. Proteins, in turn, require adequate carbohydrate intake to prevent catabolism for energy. Fats aid in the absorption of fat-soluble vitamins and support long-term energy storage, while fiber regulates carbohydrate and lipid metabolism. An imbalance in any of these nutrients disrupts the harmony of metabolic processes, leading to clinical disorders ranging from malnutrition to chronic non-communicable diseases. The clinical importance of nutrition extends beyond prevention of deficiency states. In modern healthcare, diet is increasingly recognized as both a modifiable risk factor and a therapeutic tool. For example, high-fiber, low-glycemic index diets are used in the management of type 2 diabetes, while omega-3 fatty acid

supplementation is recommended for cardiovascular protection. Similarly, plant-based proteins are increasingly advocated to lower cancer risk and enhance longevity [12][13].

The deficiency or excess of any essential nutrient has profound clinical implications, underscoring the central role of balanced nutrition in maintaining health and preventing disease. Carbohydrates, which should account for 50–55% of daily caloric intake, provide energy but must be consumed primarily in complex forms with low glycemic indices to minimize metabolic risk [7][8]. Proteins, comprising 20% of daily intake, are indispensable for tissue structure and repair, with deficiency leading to severe syndromes such as marasmus and kwashiorkor [9][10]. Fats, though energy dense, must be consumed judiciously, with emphasis on unsaturated fats to reduce cardiovascular disease risk while avoiding excess saturated fat and

cholesterol [11][12]. Fiber, though often neglected, is fundamental to digestive health and cardiovascular protection, with evidence strongly supporting higher intakes for disease prevention [13]. Collectively, these nutrients demonstrate that clinical health is intricately tied to dietary balance. Modern medical practice increasingly views nutrition as a cornerstone of disease prevention and management, recognizing that food is not only fuel but also medicine. Integrating evidence-based dietary guidelines into everyday practice offers one of the most effective, low-cost strategies for improving public health outcomes across the lifespan [13].

Minerals and Trace Elements

Minerals and trace elements are essential micronutrients that play crucial roles in maintaining homeostasis, supporting enzymatic activity, and facilitating structural integrity within the human body. Unlike macronutrients, which provide direct energy, minerals function primarily as cofactors in metabolic processes, regulators of fluid balance, and components of skeletal and connective tissue. Their deficiency or imbalance can have profound clinical consequences, ranging from anemia and osteoporosis to thyroid dysfunction and cardiovascular disease.

Calcium and Phosphorus

Calcium and phosphorus are central to skeletal health. Together, they contribute to the mineralization of bone and teeth, with calcium forming hydroxyapatite crystals in conjunction with phosphate. The recommended daily allowance (RDA) of calcium for adult males and females is 1000 mg/day, though requirements may increase in postmenopausal women and older adults due to reduced absorption and hormonal changes. Calcium deficiency predisposes individuals to osteoporosis, characterized by reduced bone density and increased fracture risk, as well as hypocalcemia, which may present tetany, paresthesia, and cardiac arrhythmias.

Phosphorus, while abundant in the diet, is no less essential. It is a component of nucleotides, phospholipids, and adenosine triphosphate (ATP), and contributes significantly to acid-base regulation. Deficiency is relatively rare but can occur in cases of chronic alcoholism, uncontrolled diabetes, or prolonged use of antacids containing aluminum hydroxide. Clinically, hypophosphatemia may manifest as muscle weakness, osteomalacia, and in severe cases, respiratory failure. Disorders of phosphate metabolism, such as hypophosphatemic rickets, further highlight the essential role of this mineral in skeletal development [14].

Sodium, Potassium, and Chloride

Sodium, potassium, and chloride constitute the principal electrolytes in extracellular and intracellular compartments. Their primary function is to regulate osmotic gradients, fluid balance, and neuromuscular excitability. Sodium is the predominant extracellular cation, while potassium dominates intracellularly. Chloride complements sodium in extracellular fluid, maintaining electroneutrality and contributing to gastric acid production. Electrolyte imbalances can precipitate drastic fluid shifts with severe clinical consequences. Hyponatremia, for example, leads to cerebral edema and neurological dysfunction, whereas hypernatremia results in cellular dehydration and altered mental status. Hypokalemia may cause muscle weakness, arrhythmias, and ileus, while hyperkalemia is potentially life-threatening due to its association with cardiac conduction abnormalities. Dietary salt intake should be limited to fewer than 6 g/day, as excessive sodium consumption is strongly linked to hypertension and increased cardiovascular morbidity. The **DASH diet** (Dietary Approaches to Stop Hypertension), which emphasizes reduced sodium and saturated fat intake along with increased consumption of fruits, vegetables, and whole grains, has been shown

to improve blood pressure and lipid profiles. In one study, adherence to the DASH diet resulted in a 13% reduction in the 10-year Framingham Risk Score for cardiovascular disease, underscoring the clinical significance of balanced electrolyte intake [14].

Iron

Iron is an essential component of hemoglobin, myoglobin, and various enzymes. It plays a pivotal role in oxygen transport, cellular respiration, and DNA synthesis. Adult females have a higher RDA for iron (18 mg/day) compared to males (8 mg/day) due to menstrual blood loss. Pregnancy further increases iron requirements, as maternal plasma volume expands and fetal demands rise. Iron deficiency remains the most prevalent nutritional disorder worldwide, leading to microcytic hypochromic anemia. Clinical features include fatigue, pallor, brittle nails, and impaired cognitive function. In a study conducted in Pakistan, Sehar et al. highlighted the increased maternal demand during pregnancy, estimating that approximately 500 mg of stored iron is required to support gestation. Alarming, only 20% of women had sufficient reserves to meet this demand [15]. This illustrates the need for targeted supplementation and nutritional interventions in high-risk populations.

Iodine

Iodine is essential for the synthesis of thyroid hormones thyroxine (T4) and triiodothyronine (T3), which regulate metabolism, growth, and neurological development. Deficiency of iodine reduces thyroid hormone production, resulting in compensatory increases in thyroid-stimulating hormone (TSH). Chronic TSH elevation leads to thyroid hypertrophy and goiter. Severe iodine deficiency in pregnancy can result in cretinism, characterized by intellectual disability and stunted growth. Public health measures such as salt iodization have substantially reduced global prevalence of goiter and iodine deficiency

disorders. Nevertheless, iodine deficiency remains a concern in regions where dietary iodine intake is insufficient or where processed foods dominate the diet [15][16].

Trace Elements: Copper, Zinc, and Selenium

Trace elements, though required in minute quantities, are indispensable for metabolic and immune functions.

- **Copper** (RDA: 30 µg/day) is a cofactor for enzymes involved in iron metabolism, collagen synthesis, and neurotransmitter production. Deficiency can lead to anemia, bone abnormalities, and impaired immune responses.
- **Zinc** (RDA: 900 µg/day) is critical for over 300 enzymatic reactions, including those involved in DNA synthesis, wound healing, and taste perception. Zinc deficiency manifests as growth retardation, delayed sexual maturation, impaired immunity, and alopecia.
- **Selenium** (RDA: 55 µg/day) functions as a component of glutathione peroxidase, an antioxidant enzyme. Deficiency is associated with Keshan disease, a cardiomyopathy observed in selenium-deficient regions and compromised immune function.

Collectively, deficiencies of these trace elements, though often subtle, can compromise multiple organ systems, highlighting their importance in clinical nutrition.

Vitamins

Vitamins are organic compounds categorized as water-soluble (B-complex and C) and fat-soluble (A, D, E, K). They act primarily as coenzymes or antioxidants, and their deficiency or excess can result in significant clinical manifestations. Vitamin A, or retinol, has a recommended daily allowance of 700–

900 µg retinol activity equivalents (RAE). It is essential for epithelial regeneration, immune function, and vision through its role in rhodopsin synthesis. Deficiency leads to xerophthalmia, keratomalacia, and night blindness. In a cross-sectional study on pregnant and lactating women in Ethiopia, 13.7% were found to suffer from night blindness, with 0.4% presenting with Bitot's spots [16]. Such findings underscore the ongoing global burden of vitamin A deficiency, particularly among vulnerable populations [16]. Thiamine (RDA: 1.1 mg/day) functions as thiamine pyrophosphate, a coenzyme in carbohydrate and amino acid metabolism. Deficiency leads to wet beriberi (characterized by cardiac failure), dry beriberi (neuropathy and muscle wasting), and Wernicke-Korsakoff syndrome. Wernicke syndrome presents with ophthalmoplegia, ataxia, and confusion, while Korsakoff syndrome includes confabulation and amnesia. This is a medical emergency that must be treated with intravenous thiamine prior to glucose administration to avoid precipitating symptoms [16].

Vitamin C (RDA: 90 mg/day) is a water-soluble vitamin that functions as an antioxidant and cofactor in collagen synthesis via prolyl and lysyl hydroxylases. Deficiency results in scurvy, which manifests as gingival bleeding, petechiae, poor wound healing, and fatigue. Collagen instability underlies these features, highlighting the vitamin's role in connective tissue integrity [16]. Vitamin D (RDA: 600 IU/day) promotes calcium absorption in the gut and renal tubules. Deficiency causes rickets in children and osteomalacia in adults. Clinical features of rickets include frontal bossing, bowing of the legs, pigeon chest, and rachitic rosary. Vitamin D deficiency is also linked with osteoporosis, increased fracture risk, and impaired immunity [16]. Vitamin E (RDA: 33 IU/day, synthetic) functions as an antioxidant, protecting cell membranes from oxidative stress. Deficiency, though rare, results in hemolytic anemia, peripheral

neuropathy, and ataxia. Vitamin K (RDA: 120 µg/day) is integral to the synthesis of clotting factors II, VII, IX, and X. Deficiency manifests as prolonged prothrombin time, easy bruising, and hemorrhage. Intestinal microbiota produce vitamin K2 from dietary vitamin K1, making the gut an important contributor to total body stores [16].

Water

Water is often overlooked as a nutrient, yet it is indispensable for life. It serves as a medium for biochemical reactions, facilitates nutrient and waste transport, regulates body temperature, and maintains blood volume.

Classification of Dehydration

Dehydration is clinically categorized based on percentage of body fluid loss. Mild dehydration corresponds to <5% loss of body weight, moderate dehydration to 5–10%, and severe dehydration to >10%. The **WHO classification** relies on clinical examination:

- **No dehydration:** normal appearance, normal skin turgor, and adequate oral intake.
- **Some dehydration:** irritability, sunken eyes, and skin pinch returning slowly.
- **Severe dehydration:** lethargy, deeply sunken eyes, skin pinch returning very slowly, and inability to drink independently.

Mild to moderate dehydration is typically managed with oral rehydration therapy, while severe cases require intravenous fluid resuscitation.

Physiological and Clinical Implications

A recent study found that inadequate water intake correlates with elevated serum arginine vasopressin (AVP), a hormone that promotes water reabsorption in the kidneys while constricting arterioles to raise blood pressure [17]. Chronic elevation of AVP may predispose individuals to hypertension and kidney disease. Systematic reviews

also associate inadequate hydration with increased incidence of urolithiasis. While evidence does not consistently link higher water intake with reduced rates of obesity or type 2 diabetes, it has been shown to decrease overall caloric consumption by displacing sugar-sweetened beverages [18]. Importantly, plain water remains the ideal beverage to meet daily hydration needs, as it is calorie-free and physiologically optimal [19].

Minerals, trace elements, vitamins, and water collectively sustain the body's structural, metabolic, and regulatory functions. Calcium and phosphorus are fundamental for skeletal integrity, while sodium, potassium, and chloride maintain fluid and electrolyte balance. Iron, iodine, copper, zinc, and selenium, though required in smaller quantities, are vital for oxygen transport, thyroid function, enzymatic activity, and antioxidant defense. Deficiencies in these nutrients manifest clinically significant syndromes ranging from anemia and goiter to impaired immunity and cardiovascular disease [14][15]. Vitamins complement these micronutrients by serving as coenzymes and antioxidants. Their absence produces recognizable deficiency states such as scurvy, rickets, xerophthalmia, and coagulopathy, each of which underscores the necessity of dietary sufficiency [16]. Finally, water, though often underestimated, remains the single most critical nutrient for survival, with inadequate intake linked to dehydration, elevated vasopressin, and increased risk of kidney stones [17][18][19]. Taken together, these nutrients highlight the inextricable relationship between diet and clinical health. Balanced intake of minerals, trace elements, vitamins, and water forms the cornerstone of preventive medicine, reducing disease burden and enhancing quality of life. Public health strategies, including dietary education, supplementation programs, and fortification initiatives, remain vital in

addressing deficiencies and ensuring population-level nutritional adequacy.

Nursing, Allied Health, and Interprofessional Team Interventions

The prevention, identification, and management of malnutrition and dehydration require a coordinated approach in which nursing and nutrition specialists play central roles. Their contributions are distinct but complementary, forming the foundation of safe, effective, and patient-centered care [20].

Nursing Interventions

Nurses are often the first healthcare professionals to encounter patients at risk of malnutrition or dehydration. Their role extends beyond routine bedside care to active clinical assessment, early recognition of abnormalities, and immediate implementation of evidence-based interventions. Because malnutrition and dehydration can lead to rapid physiological deterioration, nursing vigilance is critical in preventing complications [20].

Assessment and Monitoring

A fundamental responsibility of the nursing team is to interview, examine, and investigate patients for potential malnutrition or overnutrition. Nurses routinely assess body weight, body mass index, hydration status, and dietary intake. In patients suspected of dehydration, clinical parameters such as blood pressure, heart rate, capillary refill, and urine output are carefully monitored. Hypotension and tachycardia may indicate significant fluid loss, necessitating urgent intervention. Nursing staff also play an essential role in screening risk factors associated with nutritional deficiencies, including chronic alcohol abuse, advanced age, or underlying medical conditions such as chronic kidney disease or gastrointestinal disorders. Screening tools such as the Malnutrition Universal Screening Tool (MUST) or Subjective Global Assessment (SGA) are often employed to support systematic evaluation [20].

In cases of dehydration, the nurse's technical expertise in fluid management is indispensable. Collaboration with the physician ensures the selection of the correct type and quantity of fluid. For patients with severe dehydration, nurses are trained to establish rapid vascular access, often requiring two wide-bore cannulas. Intravenous resuscitation with 0.9% normal saline remains the standard of care. The dosing of fluids is carefully tailored to age and body weight. In pediatric practice, the standard intervention involves the administration of a bolus of 20 ml/kg of 0.9% normal saline over 10 to 20 minutes. Nurses must observe improvements in perfusion, mental status, and urine output. If vital signs do not stabilize, the bolus may be repeated, with continuous reassessment. In adult patients, a 500 ml bolus of crystalloid solution administered over 10 to 20 minutes is typical. If stabilization fails despite up to 2000 ml of fluid, escalation to expert consultation is necessary. Nurses are responsible for both the technical delivery of fluids and the dynamic monitoring of patient response [20].

Ongoing Care and Patient Safety

In addition to acute interventions, nurses are responsible for long-term monitoring of nutritional status and metabolic complications. Patients with chronic malnutrition, especially children and elderly individuals, require careful refeeding. Nursing staff ensure that refeeding is introduced gradually to prevent refeeding syndrome, a potentially life-threatening shift in fluids and electrolytes. Electrolyte abnormalities such as hypokalemia, hypophosphatemia, and hypomagnesemia are corrected under close nursing supervision. Preventing hypoglycemia is another critical aspect of care. Nurses must ensure that caloric reintroduction is balanced and closely monitored, particularly in children, whose glycogen stores are limited. Physical activity and mobilization are also initiated by nursing staff to

stimulate recovery and reduce complications such as deconditioning or venous thromboembolism [20].

Interprofessional Collaboration

Nursing practice in this context is inherently interprofessional. Nurses coordinate with physicians, dietitians, and pharmacists to ensure safe nutritional supplementation, fluid therapy, and pharmacological support. For example, in gynecological and obstetric care, nurses support physicians in counseling women who are planning pregnancy, reinforcing the importance of multivitamin supplementation with folic acid, iron, and calcium. In emergency care, they assist clinicians in recognizing alcohol-related malnutrition and initiating appropriate treatment. Their role as both advocates and educators ensures that patients receive comprehensive and holistic care [20].

Nutritionist Interventions

While nurses focus on acute care and direct patient monitoring, nutritionists specialize in the formulation and oversight of dietary interventions that prevent and correct malnutrition. Their expertise in macronutrient and micronutrient requirements allows them to design individualized dietary plans that address both the immediate and long-term needs of patients [21].

Nutritional Assessment and Diagnosis

Nutritionists evaluate dietary patterns, caloric intake, and nutrient adequacy using dietary recall, food frequency questionnaires, and biochemical analyses. They interpret laboratory values such as hemoglobin, ferritin, albumin, and serum electrolytes to identify specific deficiencies. Their role is to diagnose undernutrition, overnutrition, and micronutrient deficiencies, and to contextualize these findings within the patient's clinical condition. In children, growth charts and anthropometric measurements (weight-for-age, height-for-age, weight-for-height) are used to monitor nutritional status and detect stunting, wasting, or obesity. In elderly patients, nutritionists assess

factors such as appetite, swallowing difficulties, and socioeconomic barriers to adequate food intake. These assessments form the basis of individualized nutritional counseling [21].

Development of Dietary Interventions

Nutritionists formulate tailored dietary plans that ensure adequate intake of macronutrients (carbohydrates, proteins, fats) and micronutrients (vitamins and minerals). For children with severe malnutrition, cautious refeeding strategies are implemented to restore energy balance without precipitating metabolic derangements. Specialized therapeutic foods such as ready-to-use therapeutic food (RUTF) may be prescribed in community settings. For adults, nutritionists design diets that manage chronic conditions such as diabetes, hypertension, and cardiovascular disease. For instance, a low-sodium, low-fat dietary pattern such as the DASH diet may be recommended to reduce blood pressure and improve lipid profiles. In patients with obesity, caloric restriction combined with increased fiber intake and reduced refined sugar consumption forms the foundation of weight management programs [21].

Supplementation and Special Populations

Nutritionists play a particularly vital role in guiding supplementation. For women planning pregnancy, multivitamins with folic acid, iron, and calcium are recommended to prevent neural tube defects and maternal anemia. In patients with alcohol dependence, thiamine and multivitamin supplementation are critical to prevent Wernicke-Korsakoff syndrome. Pediatric and geriatric populations may require fortified foods or supplements to address deficiencies in iron, vitamin D, or calcium. Nutritionists also address food allergies, intolerances, and cultural dietary preferences. By providing alternatives and substitutions, they ensure that patients meet nutritional requirements without

compromising cultural or personal values. This individualized approach improves adherence and long-term outcomes [21].

Education and Health Promotion

Beyond clinical practice, nutritionists play an essential role in education and health promotion. They counsel patients and families about healthy eating habits, portion control, and the importance of hydration. They also collaborate with schools, community organizations, and public health agencies to design population-level interventions that reduce the prevalence of malnutrition. Nutrition education is especially critical for parents of young children, who must be guided in providing nutrient-dense meals during periods of rapid growth [21].

Interprofessional Collaboration

Nutritionists collaborate closely with nurses, physicians, and allied health professionals in creating comprehensive care plans. They provide expertise in dietary prescriptions while relying on nurses and physicians to monitor clinical outcomes and laboratory parameters. In critical care, for example, nutritionists determine the caloric and protein requirements for enteral or parenteral nutrition, while nurses manage the technical administration and monitoring. This collaboration ensures that patients receive safe, effective, and evidence-based care across the continuum of health services. The effective management of malnutrition and dehydration requires the combined expertise of both nursing and nutrition professionals. Nurses play a frontline role in assessment, fluid management, prevention of complications, and interprofessional coordination. Nutritionists provide specialized knowledge in dietary planning, supplementation, education, and long-term disease prevention. Together, their interventions form the backbone of interprofessional care, ensuring that patients achieve nutritional adequacy, recover from illness, and maintain long-term health.

Table 3. Interprofessional interventions: nurses vs. nutritionists

Domain	Nurses	Nutritionists (Dietitians)
Screening & assessment	Vital signs, orthostatics, urine output; MUST/SGA screening; growth charts; dehydration grading (clinical signs).	Dietary history, food frequency/24-h recall; anthropometry; labs (Hb, ferritin, albumin, electrolytes); deficiency risk profiling.
Acute management	IV access (two wide-bore if severe); 0.9% saline bolus: children 20 mL/kg over 10–20 min (repeat if needed); adults 500 mL over 10–20 min (escalate if ≤ 2000 mL ineffective).	Immediate diet modifications compatible with clinical status; temporary enteral formulas; micronutrient loading where indicated.
Monitoring & safety	Refeeding precautions; electrolyte correction (K, Mg, Phos); glucose monitoring; fluid balance charts.	Iterative plan adjustments; fiber/fat quality optimization; sodium restriction (e.g., DASH) when indicated.
Education	Hydration strategies; sick-day rules; signs of dehydration; medication-nutrition interactions.	Menu planning; label literacy; portion control; culturally sensitive substitutions; supplementation (folate, iron, vitamin D, calcium, thiamine where appropriate).
Special populations	Pregnancy counseling support: pediatrics and geriatrics fall-risk/skin-care integration.	Pregnancy/lactation protocols; elderly appetite support; athlete fueling and recovery plans.

Conclusion:

Nutrition and hydration are foundational, modifiable determinants of health across the lifespan. The evidence synthesized in this article shows that precise prescriptions—age- and weight-based in children, sex- and activity-specific in adults, trimester-targeted in pregnancy, and performance-aligned in athletes—are essential but insufficient without attention to diet quality. Complex carbohydrates with low glycemic index, adequate protein to sustain lean mass and immune competence, cardioprotective fat profiles, and sufficient dietary fiber collectively reduce the burden of cardiometabolic disease, anemia, skeletal disorders, and gastrointestinal dysfunction. Water, often overlooked, is the medium of metabolism and a major driver of cognitive and physical performance; structured strategies are necessary for the elderly, the pregnant, and the exercising athlete.

Closing the practice gap requires robust interprofessional collaboration. Nurses operationalize early screening, vital-sign-driven fluid management, and safety monitoring (including prevention of refeeding syndrome and hypoglycemia). Nutritionists deliver diagnostic precision, individualized menu planning, supplementation protocols, and education that improves adherence and equity. Together, these roles align clinical protocols with public-health strategies—growth monitoring, food fortification, and hydration promotion—to curb preventable morbidity and mortality. Embedding these integrated pathways in primary care, maternity services, schools, sports medicine, and geriatrics will translate nutritional science into durable health gains for individuals and communities.

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التغذية والترطيب عبر مراحل الحياة: دمج رعاية التمريض وعلوم التغذية

الملخص:

الخلفية: تُعدّ التغذية والترطيب أساس النمو والتوازن الأيضي والوقاية من الأمراض عبر الطفولة والبلوغ والحمل والأداء الرياضي. لا تزال سوء التغذية والجفاف شائعين ولهما تبعات سريرية واضحة.

الهدف: تلخيص متطلبات الطاقة والسوائل عبر مراحل الحياة، وتحديد أولويات المغذيات الدقيقة، وبيان أدوار التمريض وأخصائيي التغذية ضمن فريق رعاية متعدد التخصصات.

المنهجية: دمج سردي لقيم المراجع الغذائية والبروتوكولات الإكلينيكية الواردة في المقالة الأصلية، مع التركيز على الفحص المبكر، خوارزميات الإنعاش بالسوائل، والتخطيط الغذائي الفردي.

النتائج: يحتاج الأطفال إلى صفات طاقة وسوائل بحسب العمر والوزن؛ تدعم الجداول النمائية وحساب 1-2-4 الممارسة. تتراوح احتياجات البالغين 2000-2800 كيلوكالوري/يوم مع مدخول مائي بحسب الجنس، ويزداد خطر الجفاف لدى المسنين. تتطلب الحوامل زيادات سريعة حسب الثلث ومكملات محددة، بينما يحتاج الرياضيون إلى توزيع مُحكم للمغذيات الكبرى وترطيبٍ مرحلي مع إلكتروليات. سريرياً، تدعم الكربوهيدرات منخفضة المؤشر الجلايسيمي، والبروتين الكافي، وجودة الدهون، والألياف الوقاية القلبية-الاستقلابية. يقود التمريض الفحص والمراقبة وإعطاء السوائل الوريدية، بينما يختص أخصائيو التغذية بالتشخيص الغذائي، والخطط الفردية، والمكملات، والتثقيف.

الخلاصة: تُخفّض الوصفات المُحكمّة للطاقة والسوائل والمغذيات الدقيقة—ضمن مسارات عمل منسّقة بين التمريض وأخصائيي التغذية—المراضة القابلة للوقاية وتُعزّز صحة السكان.

الكلمات المفتاحية: التغذية؛ الترطيب؛ الأطفال؛ الحمل؛ الرياضيون؛ المغذيات الدقيقة؛ الألياف؛ الجفاف؛ التمريض؛ التغذية العلاجية؛ الرعاية متعددة التخصصات.