Section 1

Energy Malnutrition

CHAPTER 1

Role of Nutrition in Skin Health and Disease

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Chapter Highlights

- Overview of malnutrition and its causes.

Nutritional deficiencies are most prevalent in underdeveloped and developing countries of the world. Nutritional disorders are seen in all age group but certain groups such as children and elderly are more vulnerable. Malnutrition in children occurs when the nutritional requirements are not met during the periods of rapid growth along with marked developmental changes in organ function and composition. In elderly, it is usually due to nutritional deprivation, malabsorption and comorbidities.

The integrity and functions of the skin barrier are supported by an adequate supply of micronutrients, such as several vitamins. The World Health Organization has estimated that more than 2 billion people worldwide experience deficiencies in the intake of essential vitamins and minerals.[1]

The reasons are complex, including social factors such as poverty and food shortages in many developing countries. Poor food choices and diets in the developed world have resulted in imbalanced diets that contain a lot of processed and high-energy foods, which exacerbates the issue. Changes in farming and intensive cultivation methods have further led to a reduction in vitamin content in certain foods. Others have suggested that the level of reduction is more than compensated through higher yields and therefore, plentiful supply.[2] WHO further reports that in 2020, worldwide, 462 million people are underweight, but 1.9 billion people are overweight or obese. Being overweight increases the risk from a range of diseases including the metabolic syndrome and type 2 diabetes mellitus.

Nutrients are the chemical substances found in food. Many nutrients are essential for life, and an adequate amount of nutrients in the diet is necessary for providing energy, building and maintaining body organs and for various metabolic processes. Malnutrition results from deficiency in one or more of these basic nutrients. It may be caused by (1) insufficient dietary intake, (2) malabsorption, (3) poor utilization of nutrients, and (4) increased catabolism. A range of clinical and metabolic changes occurs as a result of profound and generalized abnormalities at a cellular level. The skin (epidermis and dermis) functions normally when adequate nutrition is provided. These nutrients are divided into micro- and macronutrients based on the requirements. While proteins, carbohydrates and fats are called macronutrients, minerals (iron, zinc) and vitamins are called micronutrients. Dietary imbalance in the form of nutritional deficiency, specific nutrient inadequacy or excess and toxic components can disturb the equilibrium of the skin. Deficiencies of several vitamins, minerals, and fatty acids have distinct cutaneous manifestations.

Mucocutaneous changes constitute one of the variable and multisystem clinical manifestations of malnutrition. Although some signs are characteristic of a specific nutrient deficiency, an overlap of skin manifestations is observed in multiple deficiency states. The periorificial glazed erythema and hair loss of zinc deficiency also may be seen in patients with essential fatty acid deficiency, biotinidase deficiency, and even kwashiorkor. Mucous membrane changes associated with deficiency of many water-soluble vitamins may likewise be difficult to distinguish from each other.

Additionally, the possibility of multiple deficiencies coexisting in individual patients should always be considered. Though these remain uncommon in developed countries it is commonly observed in developing world. The significant potential for high morbidity and mortality mandates that clinicians remain familiar with the various presenting signs and symptoms.

Skin diseases may lead to metabolic imbalances and cause nutritional deficiencies. The demand for nutrients in skin is altered under stress conditions. Excessive inflammation of the skin is known to increase the requirements of specific nutrients like folic acid and protein. The photoprotective potential of antioxidants, the effects of micronutrient supplementation on the skin immune system, and the modulating effects of fatty acids on skin disorders. Deficiencies of vitamin A, vitamin C, riboflavin, niacin, pyridoxine, vitamin E, zinc, selenium, and certain essential fatty acids or amino acids have been shown to cause skin and hair anomalies.[3]

Alcohol is an important beverage that can cause malnutrition by displacing other nutrients, either due to excessive consumption of empty calories, or secondary to maldigestion or malabsorption of nutrients resulting from gastrointestinal complications in chronic consumption of alcohol.[4] Individuals with moderate alcohol intake showed little nutritional differences from nondrinkers. In the diet of light drinkers, alcoholic calories were additive to the energy derived from carbohydrates or fats, but in the diet of moderate and heavy drinkers, alcoholic calories replaced other sources of energy in a dose-dependent manner. As alcohol intake increased to 40% caloric intake, the percentage of energy derived from protein, fat, and carbohydrates is decreased, and the intake of vitamins A, C, E, and of thiamin also decreased.[5]

Chronic alcoholics accumulate significant amounts of iron. The mechanism of alcohol toxicity involves oxidative stress. The iron overload, and prooxidative metabolites of ethanol, may be additional factors for depletion of antioxidant vitamins E and C in heavy drinkers, which contribute to vitamin deficiency states.[5]

Only a few studies have reported the cutaneous features of nutritional deficiencies.

In a study from South India, a total of 100 malnourished children were studied. The cutaneous features seen include xeroderma (58%), lusterless hair (53%), pigmentary changes (36%), loss of subcutaneous fat (31%), flag sign (29%), angular cheilitis (20%), etc. Other features seen were monkey-like facies (4%), long eyelashes (16%), ichthyotic and lichenoid skin changes (16%), and flaky paint dermatosis (2%).[6]

Addressing nutritional dermatosis in the Indian context requires a multifaceted approach, including public health education, improved access to diverse and nutritious foods, and targeted interventions to address specific nutrient deficiencies. Collaboration between healthcare professionals, nutritionists, and public health authorities is crucial to developing effective strategies for prevention and management.

Since the percentage of classical features of nutritional dermatoses is decreasing, a provisional diagnosis of malnutrition should be suspected even in the presence of subtle cutaneous features. These cutaneous manifestations if recognized early could act as mirrors

for the underlying malnutrition and corrected easily by the early implementation of nutritional supplements along with proper skin care. Information obtained from this study might help to assess the changing trends of nutritional dermatoses.

Modern nutritional science is now developing new insights into the relation between food intake and health and skin is no exception. Further the role of diet, specific food ingredients, and supplements in reducing the risk of skin disorders is the subject of interest. The effects of food ingredients on skin conditions may prove to be biologically relevant. The growing attention to health maintenance has been accompanied by an increased use of vitamin and mineral supplements by healthy individuals.

Take Home Message

- Nutritional dermatoses can be seen in all age groups though it is most prevalent in children and elderly.
- Different nutritional deficiencies have distinct clinical manifestations.
- Malnutrition results from deficiency in one or more basic nutrients caused by insufficient dietary intake, malabsorption, poor utilization of nutrients, and increased catabolism.
- Hence, treatment of nutritional deficiency requires multifaceted approach.

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