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Review Article

UNDERSTANDING NUTRITIONAL DISORDERS - A COMPREHENSIVE ANALYSIS OF AYURVEDIC CONCEPTS

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ABSTRACT

Nutrition is a vital component of health at individual and community levels. Food system has changed dramatically after green revolution, but malnutrition still persists as a challenge. Coexistence of nutritional deficiency along with overweight and obesity is the double burden faced by most of the countries. Ayurveda explains nutrition, giving utmost importance to the state of individual, in a much customised manner. Conventionally the meaning of '*Santarpana*' is understood as superfluity and '*Apatarpana*' as deficiency. There are some inadequacies in this understanding. While examining the descriptions in Ayurvedic classics and comparing them with contemporary knowledge it is seen that *Santarpana* can lead to some deficiencies also. This understanding is very much important in present scenario. Nutritional disorder is not a single entity as far as Ayurveda is considered. It is spreading throughout a wide range of diseases, since *Ahara* is an essential component in the development of many diseases. Various kinds of nutritional deficiencies occur due to the impairment in *Ahara parinamakara bhava*, *Ashtahara vidhi viseshayatana* and *Ahara vidhi vidhana*. The primary and secondary causes of nutritional deficiency in modern science are mainly related to food and body respectively. But, for bringing out a better classification, this should be revised by including tertiary causes consisting of psychological factors and feeding habits.

INTRODUCTION

After the period of green revolution, India's status changed from a food deficient country to one of the leading agricultural nations, and bring about positive impact on people's caloric intake. But, despite impressive progress over the past two generation, malnutrition still poses a major public health and development challenge. Nowadays, the main issue faced by many countries is the double burden of malnutrition- i.e., the coexistence of nutritional deficiency along with overweight and obesity. That shows, the affluence of food does not effectively eradicate the issue of nutritional deficiencies. Critical analysis of *Santarpana* and *Apatarpana* provides important insights about nutritional disorders in Ayurveda.

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The determinants of nutrition according to Ayurveda and the management strategies are to be understood properly by the comprehensive analysis of various concepts.

AIM: To critically review Ayurvedic concepts for a comprehensive understanding of the base of nutritional disorders.

MATERIALS AND METHODS

Relevant areas of Ayurveda Samhitas and articles from internet source were reviewed, and content analysis was done. Critical review was done after identifying domains which are comparable with concepts in contemporary knowledge on nutrition and dietetics. Necessary comparisons and tabulation were done to derive comprehensive understanding on nutritional disorders relevant in the present society.

Santarpana Leading to Deficiencies

Conventionally *Santarpana* means surplus, and *Apatarpana* means deficiency. It's strange to know that *Santarpana* also leads to some kind of deficiencies. Some *Santararpana janya vikaras*[1] enlisted in *Santarpaniya adhyaya* of *Caraka Samhita*, and their

nutritional status are tabulated in table-1. For this, the diseases mentioned under *Santarpanajanya vikara* were enlisted, and the possible modern correlations for the symptoms are searched for weather these are found in the deficiency feature of any nutrients.

Table 1: Comparison of *Santarpanajanya vikara* with nutritional deficiency

Santarpanajanya Vikara	**Deficient Nutrient**
Pandu (Anemia/pale or yellowish skin)	Fe deficiency/Vit B 12 deficiency
Sopha (swelling of extremities)	Protein deficiency
Kushta *Kotha* *Kandu* (skin diseases)	Vit B3 deficiency
Tandra (fatigue)	Fe deficiency
Klaibya (impaired reproductive health)	Vit D, Vit B deficiency
Buddhermoha (confusion, short term memory loss/dementia)	Vit B1 deficiency/ Vit B3 deficiency
Arochaka (nausea or poor appetite)	Vit B 12 deficiency
Sthaulya (obesity)	Deficiency of vit. D, biotin, vit. C

Studies shows that, there is growing evidence that vitamin and mineral deficiencies are prevalent among overweight and obese individuals across a variety of populations in both developing and industrializing countries.[2] From this, it is evident that, most of the *Santarpana janya vikaras* show some or other kinds of deficiency features

Malnutrition

In modern science, malnutrition is classified into overnutrition and undernutrition. The superfluity of either macronutrients or the micronutrients leads to overnutrition. Undernutrition is the deficiency of the same. Nowadays, macronutrient overnutrition is more prevalent in the population as overweight and obesity. Studies are showing that the overconsumption of carbohydrate, proteins and fat leads to the decreased absorption of micronutrients. Overweight and obesity appears to impact on the bioavailability and utilization of micronutrients. Also, the diet of an obese individual is typically energy dense and nutrient poor, thus low micronutrient levels may result from inadequate dietary intake or alterations in nutrient absorption over time. By statistics, micronutrient deficiencies are seen relatively more on the people with high BMI.[3] This is the mechanism of *Santarpana* leading to deficiencies.

Symptomatology of Nutritional Disorders from Ayurvedic Classics

There is a spectrum of diseases ranging from *Jwara* to *Rajayakshma* contains the symptoms of nutritional deficiency. Some examples are tabulated in Table-2.

Table 2: Symptoms of nutritional deficiency from Ayurvedic classics[4,5]

S.no	**Symptom**	**Disease**	**Nutritional disorder**
1.	*Paridagdha khara sparsa jihwa* (burning tongue)	*Sannipata jwara*	Deficiency of iron, zinc, vitamin B1 B2, B6, and B12
2.	*Bahu mutrata* (increased urination)	*Ama jwara, Prameha*	Vitamin D deficiency
3.	*Akrisasyapi daurbalyam* (feels weak even if not emaciated)	*Kaphaja grahani*	Iodine deficiency (hypothyroidism)
4.	*Grddhi sarvarasanam* (craving for all tastes)	*Vataja grahani*	Malabsorption syndrome
5.	*Ganda* (goitre)	*Mamsa pradoshaja vyadhi*	Iodine deficiency
6.	*Bheka varna* (yellow skin similar to frog)	*Kamala*	Vit B12 deficiency, jaundice
7.	*Bahvaasi durbala krisa:* (consume excess food but weak)	*Kshayaja kasa*	Malabsorption syndrome
8.	*Kramat veeryam balam varnam ruchiragnischa heeyate* (successive depletion of strength)	*Kshata ksheena*	Malabsorption syndrome
9.	*Asnato api balakshaya* (weak even if taken food)	*Rajayakshma*	Malabsorption syndrome
10.	*Alpa rakto alpamedasko nisara:* (malnourished tissues) *Soonakshikuta* (peri orbital oedema)	*Pandu*	Fe deficiency Vitamin K, B12 deficiency Fe, Zn, Vit. D, E, A and Fatty acid

	Seernaloma (hair fall) *Soona ganda akshikoota bhru* (puffy face)		deficiency Fe deficiency, Iodine deficiency
11.	*Janthu jushta iva druma* (loss of ability of giving shelter like a worm-eaten tree) *Soona pani pada vadana akshikoota* (swelling of extremities and orbit)	*Arshas*	Protein deficiency
12.	*Sushka vaktra* (dry mouth) *Krisa gatra* (emaciation) *Adhmatodara kukshi* (distended abdomen) *Pranashtaagni bala* (loss of power of digestion) *Sarvacheshtasu aneeswara* (incapability of doing any work)	*Udara*	Kwashiorkor

Causes of Nutritional deficiency

Weakness of *Agni* is the corner stone of occurrence of any disease[6] according to Ayurveda. Hence, there is a nutritional component in any disease.

In modern science, the causes of nutritional disorders are mainly classified into two - primary and secondary. Primary factor is related to diet. Not getting adequate nutrients from food will lead to primary nutritional deficiency. Secondary nutritional deficiency occurs when an individual's dietary intake is sufficient, but nutrients are not adequately absorbed by the body due to some underlying disease or conditions that interfere with nutrient intake, i.e., basically, primary factors are related to the quality and quantity of food, and secondary factors are the factors related to "body" causing impaired absorption.

Integrating Determinants of Nutrition in Ayurveda into Modern Classification

In Ayurveda, these 3 factors can be considered as determinants of nutrition. They are- *Ashtahara vidhi visesayatana, Ahara parinamakara bhava* and *Ahara vidhi vidhanam*

Let's see how to classify these 3 elements into primary and secondary factors. Here, primary implies the factors influencing the quality of food, and secondary implies the factors affecting ability of the body to digest and absorb.

Ashtahara vidhi viseshayatana[10]

It describes 8 factors determining the utility of food- they are: *Prakriti, Karanam, Samyoga, Rasi, Desa, Kala, Upayogasamstha, Upayokta*.

1. ***Prakriti*:** It is the Inherent attributes of the substance. so, it can be considered as a primary factor.
2. ***Karanam:*** Processing of food substance, resulting in transformation of the attributes of the substance. Eg- if churned, the curd which *Abhishyandi* turns into *Takra* which is *Ruksha* and *Laghu*. Similarly, studies show that, overprocessing of food leads to loss of its micronutrient contents[7]. *Karana* again influences the quality of food, so it is also a primary factor.
3. ***Samyoga:*** It is the combination of two or more substance, exhibiting peculiar features. Since it is also influencing the quality of diet, it comes under the primary factors. In the context of *Samyoga*, the concept of anti-nutrients is highly relevant, on which so many recent discussions are going on. These are natural or synthetic compounds that interfere with the absorption of nutrients, when taken together[8]. Anti-nutrients may take the form of drugs, chemicals, proteins or overconsumption of nutrients themselves. Some of them are tabulated in Table-3

Table 3: Anti-nutrient components

Anti-nutrient	Source	Inhibited absorption
Phytates	Whole grains, seeds, legumes	Fe, Zn, Mg, Ca
Tannin	Tea, coffee	Fe
Glucosinolates	Cruciferous vegetables (Broccoli, cabbage)	Iodine
Oxalates	Green leafy vegetables	Ca
Ca	Milk, cheese and other dairy foods, green leafy vegetables	Both heme and non-heme Fe
Lectins	Legumes (Beans, Pea nuts, Soybeans)	Ca, Fe, P, Zn
Polyphenols	Black tea, herbal tea, coffee, legumes	Non-heme Fe
Casein, whey, egg white	Animal protein	Fe

Soy Protein	Soya beans	Fe
Thiaminase	Certain fish, shell fish	Vit B1
Alcohol	Alcohol	Vit B6
Goitrogens	Cabbage, broccoli, spinach, cauliflower	Iodine
Ca	Milk, cheese and other dairy foods, green leafy vegetables	Mg
Folic acid	Broccoli, brussels sprouts, cabbage, spinach, peas, chick peas, kidney beans, liver	Zn
Zn	Whole grains, milk, oysters, red meat, poultry, baked beans, cashews, mushroom	Ca, Mg

This can be substantiated by a study conducted by Anamika singh et al, in Punjabi farm women in the context of iron deficiency anaemia[9]. It reveals that though the intake of food was adequately nutritious, 83% of the subjects were anaemic with low haemoglobin concentration, but calcium was found adequate in them. Calcium is an anti-nutrient of iron.

4. ***Rasi*****:** *Rasi* is the quantum of total or individual substances. It is two types- *Sarvagraha* and *Parigraha*. *Sarvagraha* is the quantity as a whole and *Parigraha* is the quantity of individual substances in case of food having multiple components. *Sarvagraha* and *Parigraha* both should be sufficient to ascertain the effect of any food article taken. For example, consuming single type of food everyday may satisfy us in the terms of *Sarvagraha*, but for assuring the availability of all nutrients from around, one should satisfy *Parigraha* also *Sarvarasabhyasa: Balakaranam sreshtam*[11] is highly relevant nowadays. *Sarva rasa*, in a broader sense implies food from multiple sources. Since *Rasi* refers to the quantity of food, it comes under primary factor. Consuming excess or fewer amounts than required, will result in diseases.
5. ***Desa:*** Relates to the habitat of plants, as well as an individual's *Desa satmya*. *Desa* influences the people as well as the plants growing there. The food articles grown on desert and equator shows variation in qualities, similarly the plants cultivated in chemically fertilized soil and in an organic manner also differ in their qualities. In that sense, *Desa* of the food article comes under primary factor. In the sense of *Desa satmya* (the habitat of the individual), *Desa* falls under secondary factor since *Desa* has a significant influence in tuning our body's physiological function. It is told that people habituated in dessert region are healthier. So, *Desa* falls under both primary and secondary factor.
6. ***Kalam:*** It is time, and is of two types- *Nityaga*, based on seasons and *Avasthika*, based on state of individual either in terms of age or disease condition. One should take food compatible to the season and compatible to the state of the individual. Since seasons and diseases influence our body in terms of digestive capacity, it can be considered under the secondary factors.
7. ***Upayoga samstha:*** It is *Upayoga niyama* or the dietetic rules. This depends on the features of digestion. It clearly depends on an individual's body. Therefore it comes under secondary factors. It is expected that one should eat only when previous diet is digested.
8. ***Upayokta*****:** *Upayokta* is the one who consumes the food. On him the capacity of digestion and the compatibility of food depend. So, it comes under secondary factor.

Table 4: *Ashtahara vidhi viseshayatana* in terms of primary and secondary factors

Primary factors (Influencing food)	Secondary factors (Influencing body)
Prakriti	*Desa*
Karanam	*Kala*
Samyoga	*Upayoga samstha*
Rasi	*Upayokta*
Desa	-

The utility of these types of classification is, it helps in precisely addressing the areas where corrections are needed.

Aharaparinamakara bhava**[12]**

Ahara parinamkara bhava are the six physiological factors responsible for digestion. These are *Ushma, Vayu, Sneha, Kleda, Kala* and *Samayoga*.

1. ***Ushma:*** it refers to *Agni*. It is the main force behind digestion and absorption of any diet article. Due to its effect the food which is taken in gets digested and *Ahara rasa* is formed. Leading to the nourishment of *Rasa-raktadi dhatus*. Since *Agni* is a feature inside the body deciding the ability of body to digest, it comes under the secondary factor.
2. ***Vayu:*** It is the principal force behind the movement of dietary elements inside the body. *Vayu* transports food to near the site of *Agni* to facilitate digestion. The increased tendency to suppress natural urges nowadays (*Vegadharana*) causes *Vayu kopa*- which in turn affect digestion.

Since *Vayu* is also a factor inside the body facilitating digestion, it can be included under secondary factor

3. ***Kleda:*** *Kleda* literally means the water component. It loosens the food particles helping in digestion. This function is carried on by the actions of both *Kledaka kapha* (in stomach) and *Bhodaka kapha* (in oral cavity). That is why chewing the food is important while eating. It is a factor related to body, so comes under secondary factors.
4. ***Sneha:*** It is the unctuous factor which softens the food material inside the stomach. This *Sneha* refers to the unctuousness inside the body. Therefore it falls under the secondary factor of nutrition. It is also said that *Snehameva param vidyat durbala anala deepanam*[11].
5. ***Kala:*** It is the time taken for the digestion of food. Even in the presence of all other factors, digestion requires time for completion. It varies from person to person, so it is a secondary factor. It is the most underestimated factor while addressing nutritional problems. In our science, *Kala bhojana* is considered as most beneficial habit for health *(Kalabhojanam arogyakaranam sreshtam*[12]*)*
6. ***Samayoga*:** It is the synergetic effect of all the above factors.

Summing up, all these six factors are the peculiarity of body in the process of digestion. So *Aharaparinamakara bhava* can be taken as the secondary factors for digestion.

Ahara vidhi vidhana [13]

Ahara vidhi vidhaana says about how an ideal eating should be like. They are: *Ushnam*, *Snigdham*, *Matravat*, *Jeerne*, *Veeryaavirudham, Ishte dese ishta sarvopakaranam, Naati drutam, Naati vilambitam, Ajalpan, Ahasan, Tanmana, Atmanam abhisameekshya samyak asneeyat.*

Table 5: *Ahara vidhi vidhana* in terms of primary and secondary factors of nutrition

Primary factors (Influencing food)	Secondary factors (Influencing body)
Ushna	*Jeerne*
Snigdham	*Naati drutam*
Matravat	*Naati vilambitam*
Veerya aviruddham	*Ajalpan ahasan*

Unlike the *Ushma* of *Ahara parinamakara bhava*, *Ushna* here, is the hotness of food. Similarly, *Singdha* here denotes the *Snigdhatwa* of food article. *Matra* and *Veerya* are directly bases on food only. Therefore they come under the primary factors. *Jeerne* implies digestion of the previous meal. It is a secondary factor. Some feeding habits also come under secondary factors which, directly influences the digestion. They are *Naati drutam, naati vilambitam*, *Ajalpan* and *Ahasan*. Eating too fast/*Atidrutam* causes obstruction of food particles somewhere in the pathway. Eating too slow may delay satiety thereby causing consumption of food more than needed. This way they are it directly influences the digestion. Laughing or speaking while eating also causes the same effects as *Ati druta asana.*

Introducing Tertiary Factors Related to Nutrition

In *Ahara vidhi vidhana*, some other factors which are not directly related to food and body are explained. They are- *Ishte dese, Ishta sarvopakaranam, Tanmana, Atmanam abhisameekshya asneeyat*. These mental/ psychological factors are not specifically included in the contemporary classification of nutritional deficiency. These psychological factors can be together considered as tertiary factors for the accuracy of understanding nutritional disorders.

Levels of Correction

For managing nutritional disorders through Ayurveda, corrections are to be made in the primary, secondary and tertiary level.

For the primary level correction, the corrections are to be made on the diet itself. Which include- good quality food, warm, properly processed in the right quantity and including multiple food sources in diet. Food grouping is an effective way for this.

Secondary level nutrition deficiencies occur mainly due to the impairment in bodily factors. So, first of all, *Agni* is to be corrected since all diseases arise from weak digestive power. Along with that, *Vayu* other *Ahara parinamakara bhavas* should also be addressed. For that, we can utilize various medicines and methods according to the condition. Taking food on proper *Ahara kala* by following the guidelines of taking food is also important.

Maintaining the psychological wellness is an important thing in the tertiary level correction. If there are any prevailing mental discomforts, it deserves the primary attention in the management. For that, the help of counselling, yoga, music therapy etc can be adopted. Also, taking food with due concentration without engaging in other thoughts is also important.

DISCUSSION

Nutrition is a vital component of the individual and community health. But there is a double burden of coexistence of nutritional deficiency along with overweight and obesity. The conventional meaning of *Santarpana* as superfluity is not always true. Comparative analysis of deficiency symptoms in connection with *Santarpanajanya vyadhi* proved that *Santarpana* can cause deficiency also. Various studies on nutritional deficiency also confirm the superfluity of some nutrients leading to the inhibition of absorption of some other nutrients. Therefore, a balanced diet is the primary requisite to beat nutritional disorders.

The symptomatology of nutritional disorders in Ayurveda spreads within a spectrum of diseases including *Jwara, Pandu, Arsas, Udara, Grahani, Rajayakshma* etc. It is evident that, considering the importance of *Agni*, any disease involves a nutritional thread. Besides the balanced diet, one should ensure adequate power of digestion to assimilate nutrients into the body.

Ayurveda explains nutrition, giving utmost importance to the state of individual, in a much customised manner. Various kinds of determinants of nutrition in Ayurveda are- *Ahara parinamakara bhava, Ashtahara vidhi viseshayathana* and *ahara vidhi Vidhana*. These determinants include various factors related to food, body, mind and feeding habits for perfect nourishment of tissues. Classifying these factors under primary and secondary causes of nutrition according to contemporary style was found insufficient and a tertiary level also was found necessary to explain the determinants in a wholesome way. Psychological factors which can be considered as tertiary cause of nutrition and feeding habits play an equally important role in defining nutrition. Management of nutritional diseases should consider the involvement of all the three levels comprehensively

CONCLUSION

Santarpana is not strictly superfluity, it can lead to deficiencies also. The symptomatology of nutritional disorders is spreading in a wide range of diseases in Ayurveda. In principle any disease can have a nutritional component. The causes of nutritional deficiency in modern science in terms of primary and secondary factors, should be revised into primary, secondary and tertiary factors considering the importance of mind and habits. The management should comprehensively include the three levels of correction- food level, body level and mind & habit level.

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