



Review Article

UNDERNUTRITION IN CHILDREN: AN AYURVEDIC PERSPECTIVE WITH SPECIAL REFERENCE TO KARSYA

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ABSTRACT

Undernutrition is a major health problem affects particularly in preschool children (<6 years) with its dire consequences ranging from physical to cognitive growth and susceptibility to infection. Undernutrition is a condition in which there is inadequate consumption, poor absorption or excessive loss of nutrients. Nutritional supplementation and nutritional interventions are the conventional method for preventing this condition. But even after providing proper nutritional requirements, under weight is getting a serious issue for parents. *Kaumarabruthya* considered health problems of children are different from adults because of their under developed body (*Alpakayatha*), immature *Dhatus* (*Aparipakwa Dhatu*), less *Dosha*, *Dushya* and *Mala* (*Dosha Dushya Mala Alpatha*), unstable digestive power (*Aniyatha vahni*) etc. *Jatharagni* become very weak in children so they cannot digest and assimilate most of the *Guru Aharas*. A *Dhatu* is evolved and transformed into next *Dhatu* as a result of *Pakaprakriya* (biotransformation). *Vridhi* and *Kshaya* of *Dhatu* depends on the strength of *Jatharagni*. If *Agni* impaired in *Dhatus*, such evolution cannot take place and leads to the formation of *Ama* and causing *Srothorodha*, which results insufficient production of *Rasa Dhatu* along with other *Dhatus* chronologically. *Parigarbhika*, *Phakka*, *Balashosha*, *Shuska Revati* and *Karsya* are the conditions mentioned in Ayurveda similar to under nutrition. *Agnideepana*, *Pachana*, *Srothosodhana*, *Samsamana* and *Laghu Santharpana* can be adopted as the line of management in *Karsya*.

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INTRODUCTION

In India, the prevalence of undernourished children is highest in the world with consequences of mortality, morbidity, low productivity and economic growth. According to NFHS 3 Survey, 43% under-five children in India were underweight, and 48% were stunted. Kerala accounts for 23% of under-weight, 24.5% of stunted and 16% of wasted children, according to the latest estimates of UNICEF in 2011.^[1] Undernutrition affects the child at the most crucial period of time of development which can lead to permanent impairment in later life. Undernutrition is used synonymously with malnutrition and malnutrition denotes both undernutrition and overnutrition. The World Health Organization

(WHO) defines malnutrition as "the cellular imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions".^[2] Inadequate consumption, poor absorption or excessive loss of nutrients leads to this condition. But even after providing proper nutritional requirements underweight is getting a serious issue for parents. Good nutritional status not only depends upon the adequate amount of food intake but also based on the proper digestion, absorption and assimilation of the ingested food materials. Nutritional supplementation and nutritional interventions are the conventional method for preventing this condition. *Kaumarabruthya*

considered children are different from adults due to the peculiarities like, they are delicate in nature (*Soukumaryatha*), under developed body (*Alpakayatha*), immature *Dhatus* (*Aparipakwa Dhatu*), GIT not fit to eat all type of food (*Vividhaannaanupasevatha*), less *Dosha*, *Dushya* and *Mala* (*Dosha Dushya Mala Alpatha*), undeveloped secondary sexual characters (*Ajatha Vyanjanam*), cannot tolerate stress of any kind (*Aklesa Saham*), unstable digestive power (*Aniyatha Vahni*), cannot express the needs (*Vak cheshtayorasamartham*), fond of *Madhura rasa* (*Madhura rasa sathmyam*) and poor immunity (*Asampoorna Balam*).^[3] The normal state of *Jatharagni* in children helps in proper digestion and assimilation of food they consumed, which in turn helps in the proper growth and development of the child. *Agni* is maintained in its normal state with the help of *Vata* (*Samana Vayu*) *Pitta* and *Kapha* and should be in equilibrium state. The status of *Agni* in children is weak because of children are predominant of *Kapha Prakriti*, they are more fond of *Madura Rasa* (*Madhura Sathmyam*), and they have unstable digestive power (*Aniyatha Vahni*). A *Dhatu* is evolved and transformed into next *Dhatu* as a result of *Pakaprakriya* (biotransformation). If there is no *Agni* in *Dhatus*, such evolution cannot take place. *Vridhi* and *Kshaya* of *Dhatu* depend on the strength of *Jatharagni*. Proper digestion and assimilation cannot take place if *Agni* get impaired and leads to the formation of *Ama*. *Ama* by the virtue of its quality of *Daurgandhatwa*, *Picchilatva*, *Tantummatva*, *Guruta*, obstructs the minute vessels causing *Srothorodha*, which results the nutritive materials cannot reach their destination. Ultimately there is a sequence of reduction of chronological formation of *Dhatus*. Consumption of food that of no nutritive value is incapable to form *Rakthadhatu*. Consequently the volume of blood depletes and its function gets retarded, since nutritive nutrition is hampered and the degenerative process leads to *Karsya*.

Undernutrition at Different Age Groups

Growing fetus and newborn babies

Undernutrition in pregnancy may lead to anemia or infections which can drastically affect the health of the growing fetus. The inadequate diet and nutrition of the mother is directly responsible for intra-uterine growth retardation and low birth weight. Ayurveda explains the similar conditions *Upavishtaka* and *Nagodhara*.^[4] The well formed and matured fetus will remaining the womb by inhibition of growth, because of bleeding by the intake of hot (*Ushna*), and sharp (*Theekshna*) things by a pregnant women. In *Nagodhara*, pregnant

women resorts to fasting (*Upavasa*), observance of religious rites (*Vrathakarma*), aversion to the intake of fats (*Sneha Dweshi*) will aggravates *Vata* and the foetus does not grow and remaining in womb for a long period without quickening. In newborn period undernutrition throws the baby at risk of nutrition-related chronic diseases in later life.

Infants and Young Children

Disorders of breast milk or inadequate breastfeeding are the major causes of undernutrition below the age of six months because they mainly depend on breast milk for their nutrition. Hence, *Acharyas* have discussed abnormalities of breast milk well in detail. Among the *Doshic* abnormalities of breast milk, *Vata Dushta Stanya*, becomes tasteless and the child becomes emaciated. The child gets reduced of his strength because of this milk which is poor in unctuousness.^[4] *Acharya Charaka* says that a child taking *Pitta Dushta Stanya* will have a warm body always and gets afflicted with anemia and jaundice. *Acharya Kashyapa* also explains a condition, "*Ksheeraja Phakka*"^[5] which is caused due to breast milk vitiated by *Kapha Dosha* and which diminishes the baby's digestive fire, and leads to obstruction of the *Rasavaha Srotas* causing emaciation, weak and withered body resulting in motor function insufficiencies. Qualitative and quantitative reduction in the milk of mother causes *Ksheeraja Phakka* in children. *Acharya Vagbhata* cites a disease called "*Kumarashosha*"^[6] which is caused due to milk vitiated by *Kapha Dosha* where the child suffers from anorexia, rhinitis, fever, cough, emaciation and slimy pale appearance of face and eyes. *Chakradatta* calls this condition as "*Ahitundika*" or "*Ahindika*".^[7] After six months, the major cause for undernutrition is improper weaning practices and infections. Weaning foods can cover the nutrient needs in infant, only if it is rich in energy. The risk of infection also increases as infants lose immunity. Undernourished children are at high risk of permanently stunted growth and development if left unattended. Such an extreme condition has been explained by *Acharya Kashyapa* called "*Phakka*"^[8] where the child ends up in severe acute malnutrition ultimately causing motor disability in the child.

School-age Children and Adolescents

Lack of nutrients and anaemia slow down the process of growth in school children compared to their healthy peers. A child who is physically weak will be mentally weak, and cannot be expected to take full advantages of schooling. Nutrient needs are at peak during puberty as there

is dramatic increase in growth both physically and mentally. Increased incidence of anaemia in girls is prevalent at this age due to start of menstruation.

Nutritional Deficiency Disorders Mentioned in Ayurveda:

Bala Sosha and Ksheeraja Phakka

Balasosha and *Ksheeraja phakka* are mentioned by two different authors. The causes of *Bala Sosha* are *Shlaishmika Sthanya Sevana* (intake of *Kapha Dushta Sthanya*), *Seethambu* (drinking cold water), *Diva swapna* (excessive day sleep) done over period leads impairment of *Agni* which further leading clinical features of *Arochaka* (reduced digestive capacity), *Prathishyaya* (Running nose), *Jwara* (fever) and *Kasa* (Cough); these conditions if not detected early may leads to *Sosha* (Emaciated). In *Ksheeraja Phakka* due to the intake of breast milk vitiated by *Kapha Dosha* leads to *Agni Dushti* results in *Bahuvyadhi* (Infectious disease) and *Kshaya* (failure to thrive).

Parigarbhika^[9] and Garbhaja Phakka

Abrupt stoppage of breast milk or child on feeding breast milk of pregnant women which has *Alpa Poshakamsha* (poor nutrients) leads to *Parigarbhika/ Garbhaja Phakka* and the vitiated *Stanya* of pregnant mother diminishes the *Agni* of the child causing *Dhatu Dushti* and vitiation of *Kapha Dosha* with features such as *Kasa* (cough), *Agnisada* (impaired digestive fire), *Vamathu* (vomiting), *Tandra* (stupor), *Jwara* (fever), *Aruchi* (anorexia) and *Koshta Vrudhhi* (pot belly). The reference of "*Sandashi Jataharini*"^[10] is also seen in *Kasyapa Samhita* which is similar to *Parigarbhika*, where *Karsya* is found as an early symptom

Vyadhi Sambhavaja Phakka^[11] (Various diseases leading to Karsya)

Vyadhija Phakka mentioned by *Kasyapa* refers to severe forms of malnutrition. The clinical features like *Shushka Sphik* (wasting of buttocks), *Shushka Bahu* (wasting of upper limbs), *Shushka Uru* (wasting of thighs), *Mahodara* (pot belly), *Mahashira* (head appears big) due to relatively wasting in body parts, *Nischeshta Adho Kaya* (inability to walk) etc., represents grades of protein energy malnutrition.

Shuska Revati

Shushka Revati one of *Graha* (Demon) affecting the child represents infectious spectrum of diseases resulting *Sarvanga kshaya* (Emaciation). In this child though fed with enough quantity of high quality food ends up in malnutrition. When it becomes chronic child presents with *Anna Dwesha* (aversion to food), *Vivarnata* (loss of lustre) *Nanavidha Sakrita* (variegated colour stools), *Udara Granthi* (abdominal nodular swellings), *Jihvayanimnata* (geographic tongue). Child shows progressive emaciation at the outset the clinical condition which can be correlated with abdominal tuberculosis.^[12]

Karsya and Underweight

Karsya is a condition resulting from less intake, *Vatadushta Stanya*^[13] or secondary to debilitating disorder where child becomes undernourished. Nutritional deficiency where the weight loss (under weight) is main event can be considered as *Karsya* and can be viewed under *Apatharpanajanya Vyadhis*. The word "*Karsya*" is derived from the root "*Krish*" which means to become lean or to become emaciated. According to *Amarakosha*, *Krusha* means *Alpa*-decreased body weight and *Krushata* is the result of *Soshita Rasa Dhatu* causing decrease in *Mamsa* of the body^[14] Acharya Dalhana has given the meaning of *Atikarsya* as the reduction in *Upachaya*, *Rupa*, and *Bala*.^[15] In our *Samhitas* there is no direct reference available regarding the symptoms of *Karsya*. Hence the signs and symptoms of *Atikarsya* can be considered as sign and symptoms of *Karsya*.

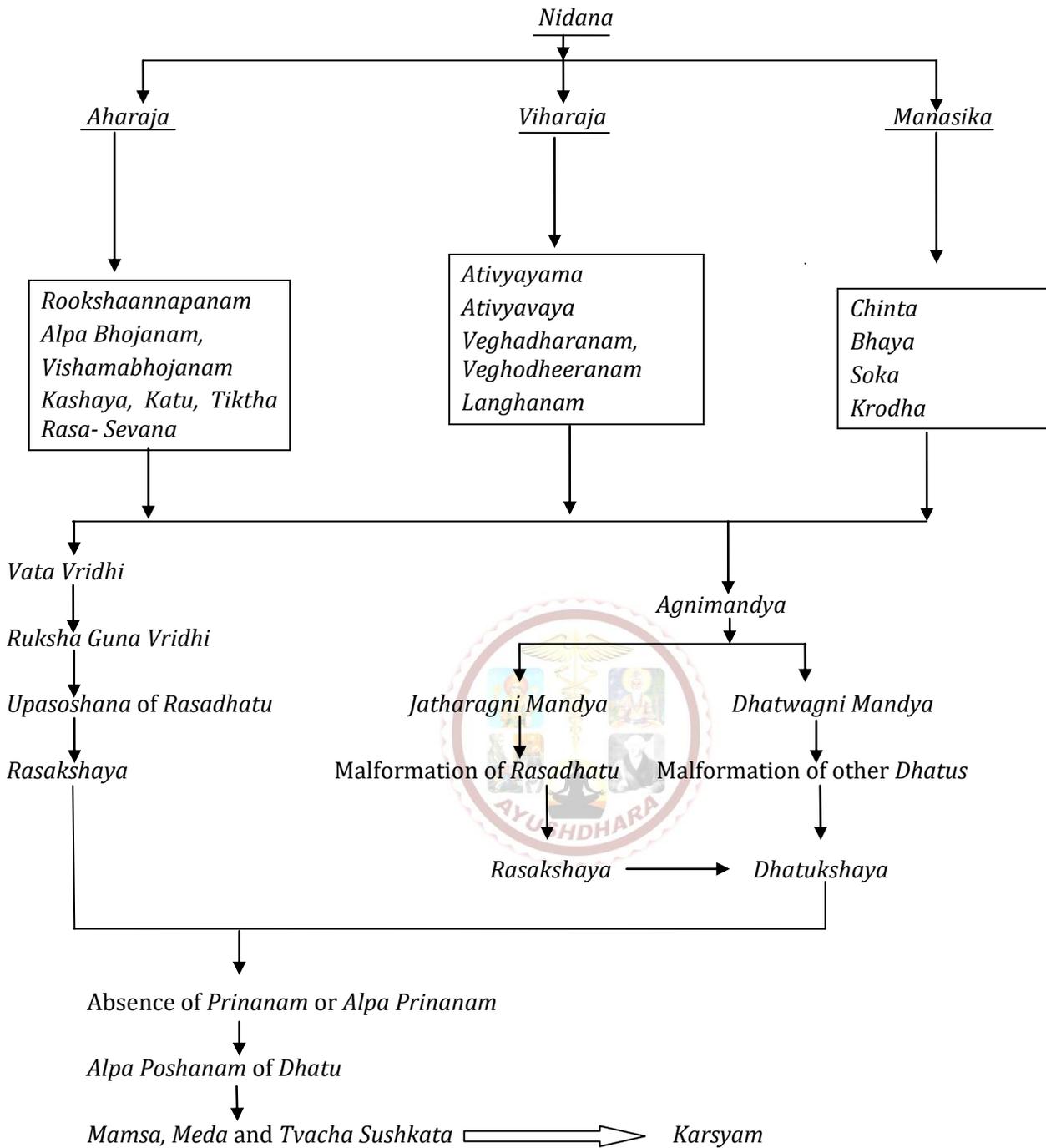
Clinical Features (Rupa of Karsya)^[16]

- *Sushka, Sphig, Udara, Griva* (Emaciated buttock, abdomen, neck region)
- *Dhamanijala Santata* (Prominent venous network)
- *Twak Asthi Sosha* (Skin bone appearance)
- *Sthula Parva* (Prominent joint)

Patient can't tolerate

- *Ativyayama* (excessive exercise)
- *Kshut, Pipasa*, (Hunger, Thirst)
- *Ati Sita Ushna maithuna* (excessive cold, hot, sexual intercourse)

Etiology of Undernutrition



The etiological factors of nutritional deficiency disorders can be broadly classified under 3 separate headings.

Aharaja

Quantitative: Less food intake (*Alpashana*), intake of nutritionally deficient food (*Pramithashana*), absolute no food intake (*Anashana*), Fasting (*Langhana*).

Qualitative: Food which causes dryness (*Rooksha Annapana*), excessive intake of astringent (*Kashaya*), Spicy (*Katu*), Bitter (*Tiktha Rasa*).

Viharaja

Sareerika: Excessive purification therapies (*Kriya Atiyoga*), excessive exercise (*Ativyayama*), Suppression of natural urges (*Malamutradi Nigraha*), excessive learning (*Ati Adhyayana*), excessive exposure to wind (*Vata Sevana*), excessive exposure to sunlight (*Atapa Sevana*), child labour (*Ati Bharagamana*).

Manasika

Anger (*Atikrodha*), worry (*Ati Chinta*), fear (*Ati bhaya*).^[17]

Others

Milk protein allergy/lactose intolerance (*Ksheeralasaka*), Unwanted child (*Anatha*), Worm infestation (*Krimi*), Inflammatory bowel disease (*Grahani*), Infective diarrhoea (*Visuchika*), body constitution (*Vatika prakriti*), Chronic debilitating disease (*Chirakalina vyadhi*).

Infants and children are particularly susceptible to undernutrition because of their high demand for energy and essential nutrients. Inadequate diet and affliction by diseases, qualitative and quantitative reduction in the breast milk of the mother is the main cause in infants. In Ayurveda, *Doshic* disorders of breast milk explained by Acharyas such as *Vataja*, *Pittaja* or *Kaphaja* is an immediate cause for undernutrition in infancy. Any pathology pertaining to gastrointestinal diseases or respiratory disorders, diseases like intestinal *Mala* absorption, tuberculosis, intestinal parasitic infestations, diabetes and other metabolic disorders often end up secondary malnutrition. In closely spaced families when pregnancies occur rapidly, perhaps every year the incidence of undernutrition is much higher. The incidence of malnourished children is also seen to be higher where mothers are daily labourers who find little time to take care of child's feeding and rearing. More often than not "mothering" is done by an elder sibling which is also an underlying cause of undernutrition.

Etiopathogenesis (Samprapthi)

The causative factor of *Karsya* aggravate *Vayu* which ultimately vitiate the *Agni*. (*Vata*, *Agni* and *Rasa* are interrelated). This vitiated *Agni*, subsequently leading to the formation of *Ama*. Following the absorption of *Ama* in gastrointestinal tract the system treats the *Ama* as a toxic material. *Ama* migrates to the heart and spread through the rest of the body channels. *Ama* by the virtue of its quality of *Daurgandhatva*, *Picchilatva*, *Tantumtva*, *Guruta* obstructs the minute vessels and causing *Srothorodha*, which results the nutritive materials cannot reach their destination. Ultimately there is a sequence of reduction of chronological formation of *Dhatu*s. Consumption of food that of no nutritive value is incapable to form *Rakthadhatu*. Consequently the volume of blood depletes and its function gets retarded, since nutrition is hampered and the degenerative process leads to *Karsya*.

Samprapthi Ghataka

- **Dosha** - *Vata*, *Kapha*
- **Dushya** - *Rasa dhatu*

➤ **Agni** - *Mandagni*

➤ **Udbhavasthanam** - *Amasaya*

➤ **Srotas affected**- *Rasavaha*, *Rakthavaha*, *Medovaha*, *Mamsavaha*

➤ **Type of Srotodushti** - *Sangam*

➤ **Rogamarga** - *Abhyantharam*

➤ **Vyakthasthanam**- *Sphig* (buttocks), *Udara* (Abdomen), *Griva* (Neck), *Twak*, *Asthi*

➤ **Vyadhiprakaram** - *Chirakari*

➤ **Sadhyasadhyatwa** - *Kricchasadhyatwa*

Upadravas of Karsya^[18]

Dyspnoea (*Swasa*), *Cough* (*Kasa*), *Wasting* (*Kshaya*), *Emaciation* (*Sosha*), *Poor digestion* (*Agnisada*), *Gaseous tumour* (*Gulma*), *Spleen enlargement* (*Pliha roga*), *Piles* (*Arsas*), *Abdominal disease* (*Udara roga*), *Bleeding disorders* (*Rakta pitta*), *Fever* (*Jwara*) are the main *Upadravas* of *Karsya*.

Management of Undernutrition

Karsya can occur due to *Kaphavarana*, where *srothas* being covered by *Kapha* resulting in improper *Dhatu Parinama* as in *Kumarasosha* here the treatment can be adopted as *Amapachana*, *Srothosodhana* etc, for reducing the *Avaranatwa*, which can be taken as the general line of treatment. As specific line of treatment all Acharyas have observed the importance of *Brimhana* therapy. According to Acharya Charaka, *Brimhana* therapy should be *Laghu Santarpana* in nature. Because in a *Krishna* patient *Agni*, *Sharira Bala* and other related aspects are functioning poorly. Acharya Sushruta described that proper application of *Samsodhana*, *Samshamana Ahara* and *Achara* are helpful in preventing, controlling as well as eradicating the disease. The principle of management of *Karsya* due to *Kapha Avarana* should be in following manner.

- 1) *Agnisthapana* by *Pachana* and *Deepana*
- 2) *Srothosodhanam*
- 3) *Samshamana*
- 4) *Ahara*
- 5) *Achara*

Agni Deepana: In *Karsya*, the first line of *Samshamana Chikitsa* is to improve the proper functioning of *Agni* through the *Aushadhis*, *Pathya Ahara* and *Vyayama*.^[19]

Pachana: In *Samprapthi* of *Karsya* it can be seen that the *Ama* has an important role in the manifestation of the disease. So to treat *Karsya*, the prerequisite is to adopt *Ama Pachana Chikitsa*. *Pachana Dravyas* like *Shunti* can be administered.^[20]

Samsodhana: *Karsya* being an *Apatarpanajanya Vyadhi*, *Brimhana* therapy is indicated. But *Mridu*

Samsodhana can be advised to the *Krisa* patient^[21] while considering the *Vata Kopa* and *Agni Mandya*. *Samsodhana* should be adopted to enhance the quality of absorption and assimilation of nutrients provided through *Brimhana* and *Balya Chikitsa*. *Samsodhana* therapy is of two types.

- i) *Bahir Parimarjana*
- ii) *Antaha Parimarjana*

Bahir Parimarjana can be obtained through *Taila Abhyanga* and *Snigdha Udwartana* which are indicated in *Krisa* patient.

Antaha Parimarjana: In the context of *Atikarshya*, Acharya Charaka says that *Doshavasechana* should be performed. Acharya Sushruta and Vagbhata recommend *Brimhana Vasti* having *Mridu*, *Snigdha* properties to be given in *Karsya*.^[22]

Samshamana: *Shamana* therapy is conservative treatment. It is mainly employed in the form of drug treatment according to severity of disease as well as the condition of the *Rogi*.^[23] Some examples of *Samshamana* drugs are *Aswagandha Churna*,^[24] *Aswagandha ghrita*^[25], *Karshyahara*^[26] *Yoga* etc.

Rasayana: Acharyas opines that *Rasayana* and *Vajikarana*, *Balya*, *Brihmana* type of drugs should be administered specially the drugs belonging to *Madhura Skanda* along with *Withania somnifera* (*Aswagandha*), *Purera tuberosa* (*Vidari*), *Asperagus Racemosus* (*Shatavari*) *Sida cordifolia* (*Bala*), *Abutilon indicum* (*Atibala*), *Sida veronicaefolia*, (*Nagabala*) recommended by Acharya Susrutha.^[84]

Pathyaapathya ^[28]

Ahara and Vihara

Different dietetic and nutritional regiments are employed in the management of *Karsya*. Particular mention is available on the usage of meat soup of domestic marshy aquatic animals (*Gramya*, *Anupa Mamsa*), milk (*Dugdha*), curd (*Dadhi*), ghee (*Ghrita*) *Shashtika* and *Sali* rice (*Shashtika*, *Shali*), wheat (*Godhuma*), *Masha*, sugar candy preparations (*Ikshu Rasa*, *Nava madya*). It is claimed that preparations of *Mamsa* are unique preparations causing maximum *Brihmana*. The *Ahara Vargas* mentioned in the context of general etiology of *Karsya* can be considered as *Apathya Ahara Varga*, hence should be avoided by the patients. On the other hand, various food preparations having *Brihmana*, *Balya* and other allied activities should be consumed by the patient.^[29] *Viharas* are sleep, joy, comfortable bed, abstinence from anxiety, regular oil massage etc.

CONCLUSION

Health is preserved by maintaining the internal homeostasis of the body. This is influenced

mainly by *Agni*, *Doshas*, *Dhatus* and *Malas*. The normal state of *Jatharagni* in children helps in proper digestion and assimilation of food consumed which in turn helps in the proper growth and development of the child. *Agni* is maintained in its normal state with the help of *Vata* (*Samana Vayu*), *Pitta* and *Kapha* and should be in equilibrium state. Individual who used to consume the food having sweet taste, taking heavy meal *Kapha Dosh* get aggravated causing diminished activity of *Agni* resulting in slow digestion. The status of *Agni* in children is unstable because children are predominant of *Kapha Prakriti*, children are very fond of *Madura Rasa* (*Madhura Sathmyam*), and they have unstable digestive power (*Aniyatha Vahni*). A *Dhatu* is evolved and transformed into next *Dhatu* as a result of *Pakaprakriya* (biotransformation). If there is no *Agni* in *Dhatus*, such evolution cannot take place and *Mandagni* leads to the production of *Ama* and causing *Srothorodtha* which leads to deficient production of subsequent *Dhatus*. "*Karsya*" is a condition in which the *Dhatu Parinama* gets affected resulting in *Dhatu Kshaya*, *Vatakopa* occurs in *Karsya* due to *Dhatukshaya*. Vitiating of *Vata Dosh* can lead to *Agni Dushti* or *Agni Dushti* can in turn leads to *Vata Prakopa* and *Pitta Dushti* which results in improper digestion and assimilation of ingested food causing *Aamatva* and *Sama Rasa* formation. As per *Asraya-Asrayi Bhava*, *Rasa Dhatu* is the abode of *Kapha Dosh*; so *Rasakshaya* cause *Kapha Dushti* i.e., *Kapha Kshaya*. In short all the *Tridoshas* are involved in the *Samprapthi* of *Karsya*. *Srotosodhana*, *Deepana*, *Brimhana* and *Rasayana* are the treatment principles of *Karsya*. In Ayurveda no much description is found regarding *Karsya* especially in children. According to Acharya Kashyapa described "*Vyadhi Sambhavaja Phakka*" and it is similar to malnutrition. "*Balashosha*" and "*Kshiraja Phakka*" are nutritional deficiency disorder mentioned by Acharya Vagbhata and Acharya Kashyapa respectively. Similarly, "*Parigarbhika*" and "*Garbhaja Phakka*" are caused by child on feeding breast milk of pregnant mother which has *Alpa Poshakamsha* (poor nutrients). "*Shuska Revati*" one *Graha* (demon) affecting the child represents infections spectrum of disease resulting *Sarvanga Kshaya* (emaciation) and child becomes emaciated even though consuming food of many kinds. All the disease described in Ayurveda texts is related to each other and possible to correlate to malnutrition like protein energy malnutrition (PEM).

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