

## ***A REVIEW ON ROLE OF DIGESTIVE COMPONENT i.e. AGNI IN THE MANAGEMENT OF PEM (PROTEIN-ENERGY MALNUTRITION) IN CHILDREN***

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### **ABSTRACT**

Nutrition is the fundamental need of every human being as well as all living organism. To cope up the need of all physiological functions of human body, an uninterrupted supply of food in nutrition channel is must until death. It becomes more essential and subject of concern for infant and children during period of their growth and development. When diet factor is affected with not fulfilling the basic requirement level, it hampers the homeostasis of the body. This may cause impaired nutritional status with mild to moderate malnourishment and if ignored it can lead to severe malnutrition like condition. Increasing prevalence and death rates due to PEM (Protein-Energy Malnutrition) put this disease entity to a hunted area for its intervention with better outcome to the entire medical science. Besides developing country, increase in the prevalence at high rates in developed countries like United States, Canada and Australia reveals something different than usual thinking of food inadequacy. In co-ordinance with this fact another link to evaluate role of digestion, is two resultant variant of malnutrition i.e. Undernutrition and Overnutrition. This conceptual study is aimed to unveil the new direction of management of PEM considering digestive component.

**Key words:** PEM (Protein-Energy Malnutrition), Digestion, Malnutrition, *Ayurveda*, *Agni*

### **INTRODUCTION**

Nutrition is the basic requirement for maintenance of human body as well as all living organism. As the human physiology concerns diet plays very vital role for proper functioning of bodily system. It becomes more essential and subject of concern for infant and children during period of their growth and de-

velopment. When diet factor is affected with not fulfilling the basic requirement level, it hampers the homeostasis of the body. This may cause mild to moderate impaired nutritional status and if ignored it can lead to severe malnutrition like condition.

Children stand for 27.71% of total population in India<sup>1</sup>. At present in India 48% children < 5 years age are chronically malnourished and 43% are underweight (NFHS-3). More than half (54% percent) of all deaths before age five years in India are related to malnutrition. Because of its extensive prevalence in India, mild to moderate malnutrition contributes to more deaths (43 %) than severe malnutrition (11 %)<sup>2</sup>. In worldwide contemplation also India is one of the highest ranking countries in the world for number of children suffering from malnutrition as per the estimation of World Bank<sup>3</sup>. Also for prevalence of underweight children, India stands at the highest in the World with dire consequences for morbidity, mobility, productivity and economic growth<sup>4</sup>. Hence effective management and positive outcome of medical condition like malnutrition becomes prime concern for the nation as well as the world.

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<sup>5</sup>. The term protein-energy malnutrition (PEM) applies to a group of related disorders that include Marasmus, Kwashiorkor and intermediate states of Marasmus - Kwashiorkor. The term Marasmus is derived from the Greek word Marasmus, which means withering or wasting. Marasmus involves inadequate intake of protein and calories and is characterized by

emaciation. The term Kwashiorkor is taken from the Ghana and means "the sickness of the weaning" and it refers to an inadequate protein intake with reasonable caloric (energy) intake. Edema is characteristic of Kwashiorkor but is absent in Marasmus.

Treatment guideline for PEM mainly consists following points<sup>6</sup>.

1. General principles for routine care i.e. to treat / prevent hypoglycemia etc associated conditions; and to treat / prevent infection
2. To correct micronutrient deficiencies and starting cautious feeding (nutritional support)
3. Treatment of SAM (Severe Acute Malnutrition) and its complication (eg. shock).

Food (*Aahara*) is one of the three sub-pillars of life as per Ayurvedic classics and it is also regarded as best Medicine as per *Acharya Kashyapa*<sup>7</sup>. *Kaumarabhritya Tantra* is a specialty of Ayurveda science dealing mainly with the care of child and treatment of childhood disorders starting from newborn to age of sixteen. Here due emphasize is given to nutritional aspect of child starting from first day of life.

Coming to similar disease entities in Ayurveda, these are compiled and drawn in Table-1 along with their descriptions and similarities with current nomenclatures. Treatment mentioned in classics for those conditions are described in Table-2.

**Table 1:** Disease conditions found similar to PEM

Sr no	Name of Condition	Description of disease condition	Similar Disease in modern medicine / modern terminology
1	<i>Karshya</i> <sup>8</sup>	Emaciated buttocks, abdomen and neck; a vascular network is visible on skin with prominent joints. Person appears to have skin and bones only.	Emaciation / Severe Emaciation / FTT (Failure to thrive) ? Marasmas (PEM)
2	<i>Balashosha</i> <sup>9</sup>	Suffers from lack of appetite, recurrent respiratory infections, cough, fever, gradually body gets emaciated, pallor of face and eyes (Undernutritional state of child due to excess Kapha in body)	Emaciation ? Marasmas (PEM)
3	<i>Phakka</i> <sup>10</sup>	<i>Phakka</i> - A condition when a child is unable to walk by his own at completion of 1 year age is grossly diagnosed as <i>Phakka</i> .	Delayed development (motor) / Motor developmental delay
		<i>Ksheeraja Phakka</i> It caused by milk vitiated by breast milk due to <i>Kapha, Pita, Vata</i> or <i>Tridosha</i> .	? Marasmas (PEM) / ? Sever PEM leading global developmental delay
		<i>Garbhaja Phakka</i> It occurs in a condition where mother whose baby is still on exclusive breastfeeding conceives again. (deficient breast feeding)	Emaciation / Stunted growth / FTT (Failure to thrive) / ? Sever PEM leading global developmental delay leading to death
		<i>Vyadhija Phakka</i> It is caused by chronic illnesses and unhygienic conditions. It manifests as severe form of malnutrition with clinical features such as wasting of buttocks, thighs and upper limbs, pot belly, big head appearance, inability to walk etc.	severe malnutrition / severe acute malnutrition (SAM) / Sever PEM
4	<i>Parigarbhika</i> <sup>11</sup>	loss of appetite (anorexia), vomiting, lethargy, emaciation, loss of interest in food, vertigo / giddiness and abdominal distension, [specifically it occurs to the baby fed by (qualitatively or / and quantitatively insufficient) breast milk of pregnant mother]	? Marasmas (PEM) / Sever PEM
5	<i>Sushka Revati</i> <sup>12</sup>	progressive emaciation of all body parts, (one type of <i>Balagraha / Graharoga</i> )	severe acute malnutrition (SAM) / Sever PEM /?severe Marasmas
6	<i>Aptarpanjanya Vyadhi</i> <sup>13</sup>	Progressive decrease in digestion, complexion, muscle and strength associated with other diseases specially <i>Vata</i> disorders (pain, constipation, urine retention etc)	Emaciating disorders/ /?FTT (Failure to thrive) in children

{This - '?' sign shows purely author's view about the understanding of similarities between those modern and Ayurvedic diseases, hence no any standard authentic similarities is claimed by author.}

These disease entities found in Ayurveda classics are not exactly compared with the malnutrition, although there are some similarities in

terms of symptomatology and treatment aspect between them. Compilation of those conditions mentioned in different Ayurvedic texts with probable similarities with different types or conditions of PEM like Marasmas, Stunted growth, FTT, Emaciation, Severe malnutrition and condition like developmental delay or complications leading to death; is demonstrated in Table – 1.

**Table 2:** Similar disease conditions and their treatment

Sr no	Name of condition	Treatment principle	Probable understanding behind treatment principle
1	<i>Karshya</i> <sup>14</sup>	Light and nourishing diet	Nourishing diet and conduct
2	<i>Balashosha</i> <sup>15</sup>	-Different formulas mainly in <i>Ghrita</i> form or powder form with <i>Anupan</i> of <i>Ghrita</i> and/or honey - <i>Abhyanga</i> <sup>16</sup>	Herbs with digestive and anabolic properties.
3	<i>Phakka</i> <sup>17</sup>	- <i>Snehana</i> with <i>Kalyanaka Ghrita</i> etc medicated <i>Ghrita</i> followed by <i>Shodhana</i> therapy - <i>Brahmi Ghrita</i> as internal medication - <i>Abhyanga</i> , <i>Basti</i> etc according to disease and <i>Dosha</i> condition -Physiotherapy: use of tricycle for assisting the practice of walking <sup>18</sup>	Purification by <i>Virechana</i> , to rejuvenate physiology of digestion that may help for better result of internal medication
4	<i>Parigarbhika</i> <sup>19</sup>	- <i>Agnideepan</i> is advised as main line of treatment -Use of of <i>Ghrita</i> made of digestive and carminatives herbs <sup>20</sup>	Aim should be to bring <i>Agni</i> to normalcy (correction of digestion and appetite).
5	<i>Sushka Revati</i> <sup>21</sup>	- Treatment with medicated <i>Ghrita</i> with digestive and <i>Rasayana</i> properties must be along with - <i>Daiva Vyapashryaya Chikitsa</i> <sup>22</sup>	-measures for personal hygiene -fumigation, <i>Abhyanga</i> , bath etc - measures to treat and stop spread of infection - assisted psychotherapy and counseling
6	<i>Aptarpanjanya Vyadhi</i>	<i>Santarpana</i> / <i>Brimhana</i> <sup>23</sup>	Nourishing diet and conduct

Ayurvedic treatment found for those similar conditions broadly covers internal as well as external medicaments. These all treatment modalities are aimed to have anabolic effect

(*Brimhana*) on child along with required correction of digestion.

## DISCUSSION

Observing different treatment protocol of these conditions, it mainly focused on three areas i.e. Diet, Digestion and Measures to prevent/treat infection. Thus PEM is one of the diseases interrelated to *Annavaha Srotas*. Ayurvedic physiology clearly defines the theories of metabolism and attribute known as ‘Agni’ - factors responsible for digestion and metabolism of food. In nutrition dynamics ‘Agni’ acts at different levels of organization viz. one *Jathragni* (Transformation at Gastro Intestinal Tract level); seven *Dhatwagnis* (Transportation, selection at tissue level) and five *Bhutagnis* (Highly selective regulation of micro nutrition at organ level). While describing importance of *Agni*, Acharya Charaka clearly affirms that *Bala* (Strength/Immunity), *Aarogya* (Health), *Aayu* (life expectancy) and

*Prana* (liveliness/vitality) are depended on one factor *Agni* (Digestion). In addition it is mentioned that with the fuel of food *Agni* is stimulated and its absence lead to abate state of *Agni* leading to death<sup>24</sup>.

The aim of these management protocols is correcting the digestive capacity by various formulations and afterward using nutritious dietary supplements which are light and easy to digest but possessing the best qualities i.e. *Balya*, *Rasayana*, *Brimhana*, *Prinana*, *Pushtikar* etc. The present overview has been conducted with an aim to highlight the review of various Ayurvedic treatment protocols employed in disease conditions similar to PEM and consideration of digestive constituent.

Ingredients and properties mentioned in above references regarding treatment of different disease condition related to PEM or malnutrition are demonstrated in Table-3

**Table 3:** Compilation of medicines and ingredients used in treatment of those conditions

Sr no.	Medicines used in treatment modality / dietary intervention	Compilation of ingredients working on Gastro-intestinal Tract	Properties of ingredient (as per API <sup>25</sup> )
1	<i>Kalyanaka Ghrita</i> (S.Y. Ghrita Prakarana)  Indication - <i>Shosha</i> , <i>Pandu</i> , <i>Pushtikar</i>	<i>Danti</i> ( <i>Baliospermum montanum</i> ), Triphala – combination of three herbs (1. <i>Amalaki-Emblia officinalis</i> , 2. <i>Bibhitaki-Terminalia bellerica</i> 3. <i>Haritaki-Terminalia chebula</i> ), <i>Talisapatra</i> ( <i>Abies webbiana</i> ), <i>Ela</i> ( <i>Elettaria cardamomum</i> ), <i>Daadim</i> ( <i>Punica granatam</i> ), <i>Vidanga</i> ( <i>Embelia ribes</i> ),	<i>Deepan</i> , <i>Rochaka</i> , <i>Pachana</i> , <i>Hridya</i> , <i>Anuloman</i> , <i>Tarpana</i> , <i>Kriminashana</i> , <i>Balya</i>
2	<i>Brahmi Ghrita</i> ( <i>Ashtanga Hridayam</i> <i>Uttara Sthana</i> 6/23-25)	<i>Saindhav</i> (Sodium chloride / rock salt), <i>Pippali</i> ( <i>Piper longum</i> ), <i>Trivrit</i> ( <i>Operculina turpethum</i> ), <i>Vidanga</i> ( <i>Embelia ribes</i> ) etc	<i>Deepan</i> , <i>Rochaka</i> , <i>Pachana</i> , <i>Hridya</i> , <i>Kriminashana</i> , <i>Vatanuloman</i> , <i>Rechana</i> , <i>Rasayana</i> ,

			Vrishya,
3	Treatment of <i>Balasho-sha</i> <sup>26</sup>	<i>Trikatu</i> - combination of three herbs ( <i>Sunthi</i> – <i>Zinziber officinalis</i> <i>Maricha</i> – <i>Piper nigrum</i> <i>Pippali</i> – <i>Piper longum</i> ), <i>Panchakola</i> - combination of five herbs (1. <i>Pippali</i> - <i>Piper longum</i> , 2. <i>Pippali moola</i> – root of <i>Piper longum</i> , 3. <i>Chavya</i> – <i>Piper chaba</i> , 4. <i>Chitraka</i> – <i>Plumbago zeylanica</i> , 5. <i>Sunthi</i> - <i>Zinziber officinalis</i> ), <i>Pippali</i> ( <i>Piper longum</i> ), <i>Tulasi</i> ( <i>Ocimum sanctum</i> ), <i>Saindhav</i> (Sodium chloride / Rock salt), <i>Ghrita</i> (Ghee / Clarified butter)	<i>Deepan</i> , <i>Rochaka</i> , <i>Pachana</i> , <i>Rasayana</i> , <i>Vrishya</i> ,
4	Treatment of <i>Parigarbhika</i> <sup>27</sup>	<i>Pippali moola</i> (root of <i>Piper longum</i> ), <i>Katuki</i> ( <i>Picrorhiza kurroa</i> ), <i>Bida lavana</i> (Sodium chloride / Black salt), <i>Kshara-dwaya</i> ( <i>Sarjjikakshar</i> & <i>Yavakshar</i> ) <i>Jeeraka</i> ( <i>Cuminum cyminum</i> ), <i>Ajamoda</i> ( <i>Trachyspermum roxburghianum</i> ), <i>Chitraka</i> ( <i>Plumbago zeylanica</i> )	<i>Deepan</i> , <i>Rochaka</i> , <i>Pachana</i> , <i>Rasayana</i> , <i>Vrishya</i> , <i>Vatanuloman</i> , <i>Shulahara</i> , <i>Krimighna</i> ,
5	Use of <i>Ghrita</i> ( <i>Charaka Samhita- Sutra Sthan</i> - 28 <sup>th</sup> chapter )	<i>Ghrita</i> – Ghee / Clarified butter  Either as medium of drug or as medicated <i>Ghrita</i> preparation	<i>Smruti</i> , <i>Buddhi</i> & <i>Agnivardhana</i> , <i>Shukra</i> , <i>Oja</i> , <i>Kapha</i> and <i>Meda Vardhana</i>
6	Use of Honey ( <i>Susruta Samhita- Sutra Sthan</i> - 45 <sup>th</sup> chapter)	Either as ingredient or as a medium of drug as <i>Anupan</i> or <i>Sahapan</i>	<i>Agnideepan</i> , Useful in disease of RS, GI Tract, worms, toxicity.
7	Use of <i>Yusha</i> – a dietary preparation ( <i>Kashyapa Samhita-Khila Sthan</i> 4 <sup>th</sup> chapter )	repeatedly advised dietary preparation at many places	<i>Rochana</i> , <i>Deepana</i> , <i>Vrushya</i> , <i>Swara-Varna-Bala-Agni-Krut</i> , <i>Sukhavaha</i> , <i>Praswedajana</i> , <i>Tushti-Pushti kara</i>
8	<i>Saindhava</i> ( <i>Charaka Samhita- Sutra Sthan</i> – 28 <sup>th</sup> chapter)	<i>Saindhav</i> (Sodium chloride / rock salt),  frequently found as an ingredient in medicine formulation and dietary preparations	<i>Rochana</i> , <i>Deepana</i> , <i>Vrushya</i> , <i>Pachaka</i> , <i>Chakshushya</i>

## CONCLUSION

Surveillance of collected and explored literary material shows availability of such malnutri

tional disorders at ancient era and also effective treatment for the same problem. Extensive vision and wisdom of Ancient Acharya about



nutrition, digestion and negative impact on child's physical as well as neuronal growth if left untreated or ignored for prolonged period. Properties of medicaments and ingredients illustrated in Table – 3 are likely to work mainly on GI tract along with secondary work on nutritional level and immunity. GI tract is the fundamental organ system place from where essential nutrients from the food get entry to the body by absorption. Acharya Charaka explains in *Grahani Chikitsa* that quality of food is secondary and role of *Agni* is superior to them. Because if food is not digested properly then no matter how nutritious value it possess, it is unable to produce good quality *Dhatu Rasa*, *Rakta* etc (bodily tissue) if not digested properly by *Agni*.

These findings and observation demonstrates positive inputs to the hypothesis of having important role of *Agni* (digestion and metabolism) in the condition like malnutrition and PEM. Though the better way to have effective answers for treatment of PEM from Ayurveda side, clinical trial should be initiated with focusing prime role of digestion. If positive result found, there are the chances to be accepted and implemented on large scale. Thus it can be a great help to thousands of life suffering from this serious nutritional health problem.

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