



Research Article

www.ijrap.net



EXPLORATORY STUDY TO ASSESS THE EFFECTIVENESS OF AYURVEDIC MANAGEMENT OF UNDERWEIGHT IN CHILDREN AT A TERTIARY CARE HOSPITAL OF INDIA

Deepthi Viswaroopan ¹, Shailaja U ², Arun Raj GR ^{3*}, Vijayalaxmi Mallannavar ⁴, Jithesh Raj KT ⁵

¹Assistant Professor, Department of Kaumarabhritya, Parul Institute of Ayurveda and Research, Khemdas Ayurveda Hospital, Parul University, Limda. P.O, Wagodia Taluk, Baroda, India

²Professor and Head, Department of Kaumarabhritya, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan, Karnataka, India

³Assistant Professor, Department of Kaumarabhritya, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan, Karnataka, India

⁴Associate Professor, Department of Kaumarabhritya, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan, Karnataka, India

⁵Assistant Professor, Government Ayurveda College, Kannur, Kerala, India

Received on: 08/10/18 Accepted on: 14/11/18

*Corresponding author

E-mail: drdrarunraj26@gmail.com

DOI: 10.7897/2277-4343.096174

ABSTRACT

Objectives: To evaluate the effectiveness of Ashwagandha Ghrita Matra Basti on Karshya (underweight) in children. **Materials and methods:** The study was carried out at inpatient level in a tertiary Ayurveda hospital attached to teaching institute. 30 children satisfying diagnostic criteria and age 6-10 years were included and distributed into two groups of 15 patients each. Group A were given Abhyanga with Tila Taila and Nadisweda followed by Matra Basti with Ashwagandha Ghrita (dose as per age) along with dietary advice for 15 days. In Group B, patients were given only dietary advice for 15 days. The patients of both the groups were followed up after a period of 30 days i.e., on the 45th day. **Results and Discussion:** It was found that Matra Basti with Ashwagandha Ghrita showed highly significant results in subjective as well as objective parameters such as general weakness, state of hunger, activity or interest, weight in Kg, height in cm, chest circumference, mid arm circumference and B.M.I. **Conclusion:** Ashwagandha Ghrita Matra Basti is effective in improving all the anthropometrical measurements and in reducing the associated complaints of Karshya and hence useful in the management of Karshya in children.

Keywords: underweight, Ashwagandha ghrita, matrabasti, malnutrition, undernutrition, karshya

INTRODUCTION

In children, the term 'healthy' refers to the normal growth and development.¹ This is influenced by various factors such as food, education, play and social interactions which help increase the child's bodily strength, intellectual capacity and social endurance thus carving out a healthy intelligent individual for tomorrow. For these young generation, nutrition is directly interlinked to their growth and development; both physical and mental. Malnutrition (literally, —bad nutrition) is defined as —“inadequate nutrition”, while most people interpret this as under nutrition falling short of daily nutritional requirements, it can also mean over nutrition, meaning intake of excess of what the body uses.² A total of 10.4 million children died in 2004, mostly in low- and middle-income countries.³ An estimated 39% of these deaths (4.1 million) were caused by micronutrient deficiencies, underweight, suboptimal breastfeeding and preventable environmental risks.⁴ Around one third of diarrhea, measles, malaria and lower respiratory infections in childhood are attributable to underweight.⁵ Childhood underweight contributes to 3.8% of the deaths worldwide and 6.0% of disability-adjusted life year (DALY).⁴ India accounts for 40% of the world's malnourished children while containing 1/5th of the world's population.⁶ In an analysis of community studies, it was projected that 41% of deaths in under-five children are associated with malnutrition and more than 3/4th of these malnutrition related deaths are linked to mild and moderate malnutrition and not severe malnutrition.⁷ Many people in low- and middle-income countries, particularly children, suffer from under nutrition.⁸ Undernutrition is the outcome of insufficient food intake, inadequate care and

infectious diseases.⁹ It includes being underweight for one's age, too short for one's age (stunting), dangerously thin for one's height (wasting) and deficient in vitamins and minerals (micronutrient deficiencies).¹⁰ Underweight in children is a serious implication of susceptibility to other problems like immunodeficiency, low appetite, low academic performance and behavioral disorders.¹¹ They are also at high risk for respiratory disorders, skin infections, nutritional anemia and other micronutrient disorders. They usually exhibit with improper bowel habits and lack of interest in daily activities along with reduced memory and concentration. Hence the management of undernutrition presents before us a huge task of normalizing and revitalizing the growth and development of the child in respect to his age and peer, both physically and mentally.

Nutritional deficiency where the weight loss (underweight) is main event without any other complications can be considered as Karshya. Karshya is a Vata Pradhana Vyadhi, mainly occurring due to Dhatukshaya. Vatopakrama (treatment modalities pacifying vata) and Bruhamana (nourishing therapy) are the general line of treatment that can be adopted. Acharya Charaka advises that Bruhmana Dravya's used in such instances should be Laghu Santarpana in nature because already in an emaciated person Sharirbala (strength of the body) and Agnibala (strength of digestive fire) are reduced. Matra Basti is a Santarpanachikitsa which is Laghu and does Bruhmana karma.¹² It does not have any major contraindications and is always applicable to those who are emaciated due to overwork, physical exercise, in debilitated person as well as in those afflicted with Vata disorders. Ghrita is a gnavardhaka and is considered best among the

agnideepanadravyas. Ghrita contains medium chain triglycerides which improves the metabolic rate.¹³ Ashwagandha is balya, brumhana and rasayana in effect.¹⁴⁻¹⁵ It is with Madhura Tikta Rasa, Snigdha Guna, Ushna Veerya and Madhura Vipaka thus exhibiting Kapha Vardhaka and Vata Pitta Shamana properties.¹⁶ *Withania somnifera* (L.) Dunal¹⁷ possesses a vast range of pharmacological activities like antioxidant, antimicrobial, anti-bacterial, anti-inflammatory, adaptogenic and immunomodulatory activity.¹⁸ Ashwagandha ghrita is referred exclusively in Ayurvedic literature for nourishment and escalating vitality in children.¹⁴ Considering these qualities Aswagandha Ghrita Matra Basti was the choice of treatment in the management of Karshya which was taken up for this study.

MATERIALS AND METHODS

Objective: To study the effect of Aswagandha Ghrita Matra Basti on Karshya (underweight) in children.

Method of collection

Source of data: The patients of Karshya (underweight) were selected from Kaumarabritya In-patient department of Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Hassan, Karnataka. Ethics clearance was obtained from Institutional Ethic committee of SDM College of Ayurveda and Hospital, Hassan (IEC No. SDMAH/IEC/152/13-14 dated 05-04-2014). The assent was taken from subjects and study was carried out in accordance with ICH GCP Guidelines.

Sampling method: Convenience sampling method

Diagnostic criteria: Expected weight for age criteria

Inclusion criteria

- Subjects within age group 6-10yrs were included in the study irrespective of gender, caste & religion.
- Subjects with weight between 60-80 % of the expected weight for age.

Exclusion criteria

Subjects associated with,

- Secondary malnutrition
- Congenital Diseases
- Inborn Errors of Metabolism
- Children who have undergone any serious illness in the past 2 weeks which required hospitalization and antibiotic therapy.

Study design

Plan of study: 30 patients were allocated into two groups of 15 patients each.

Study group: The patients in the study group were given Abhyanga with Tila Taila and Nadisweda followed by Matra Basti with Aswagandha Ghrita (dose as per age) along with dietary advice for 15 days.

Control Group: The patients in the control group were given only dietary advice for 15 days.

Follow Up: The patients of both the groups were followed up after a period of 30 days i.e., on the 45th day.

Assessment criteria: Anthropometrical measurements and state of health was assessed dividing them as objective and subjective parameters.

Objective parameters

- Weight (Wt)¹⁹
- Height (Ht)
- Head Circumference (HC)
- Chest Circumference (CC)
- Mid Upper Arm Circumference (MUAC)
- Mid-thigh Circumference (MTC)
- Hip Circumference
- Abdomen Circumference
- Body Mass Index (BMI)

Subjective parameters (Table 1)

A. Herbal medicinal product name

A.1. Botanical name: *Withania somnifera* Dunal

Family name: Solanaceae

Common name: Indian ginseng / Winter cherry

A.2. Product name: Ashwagandha ghrita

Manufacturer: Teaching pharmacy, Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Thanniruhalla, B M Road, Hassan-573201.

Authorization: S.D.M. center for research in Ayurveda and Allied Sciences (AYUSH Centre for Excellence and Recognized SIROs by DSIR), Laxminarayana Nagar, P.O. Kuthpady – 574 118, Udupi, Karnataka

B. Characteristics of the herbal product

B. 1. The part(s) of plant used to produce the product or extract: Root

B. 2. The type of product used: raw (dry)

B. 3. Drug authentication: Department of Dravyaguna (Ayurveda Pharmacology), Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Thanniruhalla, B M Road, Hassan-573201
Sample coded as: 15033105

C. Dosage regimen and quantitative description

C.1. Dosage of the product: calculated as per age²⁰

Duration of administration: 15 days²⁰

D. Qualitative testing²¹

E. Placebo/control group: The patients in the control group were given only dietary advice for 15 days.²⁰

F. CONSORT flow diagram

Statistical analysis: The data obtained was tabulated and statistically analyzed using statistical analysis tools like SPSS version 20, Independent Samples t-Test and Mann-Whitney U Test (t-Test for between subject's designs) and Paired Samples t-Test and Wilcoxon Test (t-Test for within subjects designs).

OBSERVATIONS AND RESULTS

Age wise distribution of registered subjects showed that 07 patients (23%) were of 6 years, 7 patients (23%) were of 7 years, 05 patients (16%) were of 8 years, 02 patients (06%) were of 9 years and 09 patients (30%) were of 10 years of age. Gender wise distribution showed that 14 patients (46%) were females and 16 patients (53%) were male. The religion-based distribution showed that 24 patients (80%) were Hindu, 06 patients (20%) were Muslims. The socio-economic status-based distribution showed that 02 patient (6.7%) were of upper class, 09 patients (30%) were of upper middle class, 18 patients (60%) were of lower middle class, 01 patients (3.3%) were of upper lower class and there were no patients of lower class. This assessment was done using Kuppuswamy scale. Observation on presenting complaints 26 children (86.7%) had growth failure, 28 children (93.3%) had reduced appetite 23 (76.7%) had general weakness,

and 27 (93.3%) had emaciation of buttocks and abdomen. Observation on associated complaints showed that 4 children (13.3%) had inability to tolerate hunger and thirst, 10 children (33.3%) had inability to tolerate heat & cold, 9 (30%) had skin changes, 10 (33.3%) had hair changes and mild pallor was seen in 22 children (73.3%).onset of disease has been since school going age in 11 children (36.7%) and since weaning period in 19 children (63.3%).70% (n=07) were with worm infestation. 60% (n=06) were with reduced concentration.

Worm infestation was seen in 23 children (76.7%), recurrent infections in 19 children with more than 3 attacks per year (63.3%), there was history of infectious diseases in 2 subjects (6.7%), history of use of antibiotics in 17 subjects (56.7%), history of frequent illness during breast feeding in 11 children (36.7%), antenatal infections and preterm delivery was present in 1 subject (3.3%), low birth weight in 4 children (13.3%) and newborn complications was present in 5 children (16.7%). Delayed initiation of breast feeding was present in 1 subject (3.3%), early weaning of breast milk was seen in 8 subjects (26.7%), 10 children (33.3%) were bottle fed, and 16 (53.3%) were formula fed. Unwholesome dietary habits such as habitual drinking of tea was seen in 5 children (16.7%), coffee in 7 children (23.3%), cool drinks in 10 children (33.3%), excessive intake of chocolate was seen in 26 children (86.7%), ice cream in 21 children (70%), and biscuits in 20 children (66.7%). 3 children (10%) had one sibling, 24 children (80%) had 2 siblings, 2 children (6.7%) had 2 siblings and 1 child (3.3%) had 6 siblings. 11 children's (36.7%) parents were well nourished, 18 children's (56.7%) parents were moderately nourished, 1 child's (3.3%) parents were poorly nourished. 22 patients (55%) were of Vata-Pitta Prakriti and 22 patients (30%) were of Pitta-Kapha Prakriti and 06 patients (15%) were of Vata-Kapha Prakriti. 19 patients (63.3%) were of mixed food habits and 11 patients (36.7%) were vegetarian. 2 patients (6.7%) had good appetite, 4 patients (13.3%) had moderate appetite and 24 children (80%) had poor

appetite. 1 patient (3.3%) had disturbed sleep, 29 patients (96.7%) had good sleep. 1 patient (3.3%) had disturbed sleep, 29 patients (96.7%) had good sleep. In present study among 30 patients, all 30 were immunized. The results of therapy on objective parameters within study and control group is detailed in table 2. The results of therapy on objective parameters between study and control group is detailed in table 3. The results of therapy on subjective parameters is detailed in table 4.

DISCUSSION

Mild- moderate malnutrition is defined as the level of intake of energy or specific nutrients that is below the recommended daily allowances, which is associated with less than adequate physical growth or/and changes in metabolism, but not the degree that would lead to significant wasting, stunting or clinical symptoms.²² Krushata is the result of Shoshita rasa dhatu causing decrease in mamsa of the body.²³ Acharya Dalhana has given the meaning of Atikarshya as the reduction in Upachaya, Rupa, and Bala.²⁴ Ahara Doshha is the main predisposing factor of this disorder and Alpasana and Vishamasana (false habits of intake) especially results in the development of Karshya. Pharmacotherapies like Bruhmana, Rasayana, Vrisya have been advocated in the classics for the management of Karshya. In modern pediatrics diet management and restoration of the different deficiencies have been advised for treatment of undernutrition.²⁵ Bruhmana refers to the phenomenon of healthy growth of Dhatus, particularly Kapha, Mamsa and Meda leading to proper development and enhancement of the body. Bruhmana Dravya predominantly comprises of Parthiva and Apya Bhavas. Phenomenon of Bruhmana can be understood in two stages viz by means of Aahar and Aushadha. Being Veerya Pradhana Bruhmana Aaushadha causes quicker results than that of Bruhmana Ahara.

Table 1: Subjective parameters

Domain	Assessment	Grades
Daurbalya (General weakness)	Dull	3
	Moderately active	2
	Active	1
	Very Active	0
Kshudha (Appetite)	Child does not take food considerably even by force	3
	Child does not ask but takes food considerably by request	2
	Child himself ask food but not take adequately	1
	Child himself asks food and take adequately	0
Nidra (sleep)	Crood	3
	Disturbed	2
	Short but sound	1
	Long and sound	0
Appearance	Ill at ease	3
	Dull looking	2
	Playful look	1
	Healthy looking	0
Constipation	Irregular for more than 2 days	3
	On alternate day	2
	Daily but hard stool	1
	No constipation	0
Buccal pad of fat	Cheeks inside with prominent bones	3
	Cheeks inside	2
	On surface level	1
	Cheeks everted	0
Interest in activities	Dull	3
	Involves when forced	2
	Actively involves on motivation	1
	Very active	0
Academic performance	Poor performance	3
	Below average	2
	Average	1
	Above average	0

Table 2: Results of therapy on objective parameters within study and control group

Parameters	Groups	Pair	Mean	SD	t	Sig. (2-Tailed)	Remarks
Weight	Study	Wt_1 - Wt_45	-1.19267	.57640	-8.014	.000	HS
	Control		.01258	.59079	.082	.935	NS
Height	Study	Ht_1 - Ht_45	-1.47857	.77477	-7.141	.000	HS
	Control		-.95333	.84335	-4.378	.001	S
Head circumference	Study	HC_1 - HC_45	-.03333	.12910	-1.000	.334	NS
	Control		-.03333	.12910	-1.000	.334	NS
Chest circumference	Study	CC_1 - CC_45	-1.03571	.81958	-4.728	.000	HS
	Control		-.60000	.63246	-3.674	.003	S
Mid arm circumference	Study	Mac_1 - Mac_45	-.86429	.53293	-6.068	.000	HS
	Control		-.18000	.26511	-2.630	.020	S
Mid thigh circumference	Study	MTC_1 - MTC_45	-.84286	.76933	-4.099	.001	S
	Control		-.50000	.50000	-3.873	.014	S
Abdominal girth	Study	Abd_1 - Abd_45	-1.70000	1.33532	-4.764	.000	HS
	Control		-.43333	.72866	-2.303	.037	S
Hip circumference	Study	Hip_G_1 - Hip_G_45	-1.00000	.55470	-6.745	.000	HS
	Control		-.50000	.62678	-3.090	.008	S
Body mass index	Study	BMI_1 - BMI_45	-.56429	.56768	-3.719	.003	S
	Control		.24933	.55724	1.733	.105	NS

Table 3: Results of therapy on objective parameters between study and control group

Difference btw groups	Group	Mean	SD	t	Sig. (2-Tailed)	Mean Difference	Remark
Dif_Weight	Study	1.1921	.59815	5.455	.000	1.20472	HS
	Control	-.0126	.59079				
Df_Height	Study	1.4786	.77477	1.743	.093	.52524	NS
	Control	.9533	.84335				
Df_HC	Study	.3571	.41271	.165	.870	.02381	NS
	Control	.3333	.36187				
Df_CC	Study	1.0357	.81958	1.609	.119	.43571	NS
	Control	.6000	.63246				
Df_MAC	Study	.8643	.53293	4.425	.000	.68429	HS
	Control	.1800	.26511				
Df_MTC	Study	.8429	.76933	1.433	.163	.34286	NS
	Control	.5000	.50000				
Df_Abd_Girth	Study	1.7000	1.33532	3.201	.003	1.26667	S
	Control	.4333	.72866				
Df_Hip_Girth	Study	1.0000	.55470	2.268	.032	.50000	S
	Control	.5000	.62678				
Df_BMI	Study	.5643	.56768	3.894	.001	.81362	S
	Control	-.2493	.55724				

Table 4: Results of therapy on subjective parameters - study and control group

	Daurb alya	Kshud ha	Nidra	Appear ance	Consti pation	Buccal pad	Interes t	Acade mic
Mann-Whitney U	34.50	7.500	82.50	15.00	32.50	82.50	45.00	67.500
Wilcoxon W	139.50	112.50	187.5	120.00	137.50	187.5	150.0	172.50
Z	-3.360	-4.785	-1.858	-4.511	-3.650	-1.861	-3.348	-2.500
Asymp. Sig(2tailed)	.001	.000	.063	.000	.000	.063	.001	.012
Exact Sig. [2(1-tailed)]	.001 ^b	.000 ^b	.331 ^b	.000 ^b	.001 ^b	.331 ^b	.008 ^b	.102 ^b
Remarks	S	HS	NS	HS	HS	NS	S	S

Aswagandha is a known rasayana (rejuvenator) with growth promoting activity.²⁶⁻²⁷ A rasayana is one that does therapeutic nutrition, immune enhancement and increases longevity.²⁸⁻³⁰ Rasayana remedies are molecular nutrients and nutrition enhancing agents which acts through three mechanisms: rasa enhancing or direct nutrient effect, agni enhancing or promoter of digestion and metabolism and srotas purifying agents or promoters of microcirculation and tissue perfusion.³¹ Animal studies conducted with the aqueous suspensions of roots of Aswagandha have proved to show significant increase in body weights of mice and gain in wet weight of levatorani muscle.³² Long term studies conducted in animals have shown increase in weight of mice (227% increase from initial weight) and an increase in glycogen storage because *Withania somnifera* Dunal contains many steroids and glucocorticoids known to enhance liver glycogen stores.³³ It was observed parameters like height, chest circumference, mid thigh circumference and abdominal girth improved significantly in children of both groups but growth was seen to be more in the children treated with Aswagandha ghrita matra basti as *Withania somnifera* Dunal promoted maximum growth acceleration during active growth period. Acceleration of the body growth is a result of anabolic activity of *Withania* which is attributed to the presence of steroidal lactones called withanolides.²¹ It has also been postulated that the anabolic effects may be due to the anti-serotonergic activity which would lead to an increase in appetite and therefore weight gain.³⁴

An increase in anthropometrical measurements in treated group is seen due to the action of Ashwagandha which has Bruhmana and Balya property which increases the mamsa and medodhatu. Ghrita by its snigdha guna does dhatuposhana which in turn helps in helps uttarotaradhatuposhana. As Karshya is Rasa kshayavikara, rasa vardhana property of gritha does the poshana of the rasa dhatu. Aswagandha ghrita corrects the rasa dhatwagni and helps in mamsamedodhatuposhana. Aswagandha³⁵ has been included in the balya and bruhmaniyagana by Acharya Charaka because of its laghu, snigdha guna, madhura rasa and its mamsavivardhana karma. Improvement is seen in parameters like general weakness and appearance in the Aswagandha ghrita treated group. It can be postulated that Rasa-mala is Kapha and if Rasadhatu is properly formed the Shleshma will be in Prakrutaavastha which is responsible for producing bala and ojas. Matrabasti is said to be Balya (strengthening), Bruhmana (nourishing) and Vatarogahara (eliminates neurological disorders).³⁶ Constipation, one of the major associated problems

of Karshya is relieved by the excretory mechanism of Basti therapy.³⁷ The distension caused by basti stimulates pressure which produces evacuatory reflex.³⁸ The sigmoidal, rectal and anal regions of large intestine are considerably better supplied with parasympathetic fibres than other part of intestine; they are mainly stimulatory in action and function especially in defecation reflexes.³⁹ The root of *Withania somnifera*⁴⁰ is found to have acetylcholinesterase inhibitory activity resulting in the accumulation of acetylcholine which causes continuous stimulation of the muscles, glands, and central nervous system.⁴¹ This shows the action of *Withania somnifera* Dunal in improving the general health of the subjects.⁴² Ashwagandha by virtue of its Laghuguna Ushnaveerya and basti by its vatanulomana action acts as Agnidheepana thus improving the appetite of Karshya patients. It is studied that even though there are no structural changes in the CNS, chronic mild malnutrition may reduce the child's interactions with the environment (e.g. activity and exploration) as well as the child's ability to elicit appropriate stimulation from the environment.²⁰ There also appears to be a low but significant correlation between anthropometric measurements of chronic mild malnutrition and measures of cognitive development of children. Aswagandha ghrita matra basti improves the interest in activities and intellect of the child by its Rasayana action and uttarotaradhatuposhana karma.

CONCLUSION

The clinical features of Karshya like growth failure, reduced appetite, general weakness and emaciation of buttocks and abdomen were seen in more than 80% of the subjects along with pallor. By the administration of Aswagandha gritha Matra basti, significant improvement obtained in most of the parameters considered. Hence it may be concluded from the clinical study that Aswagandha Ghrita Matra Basti is effective in improving all the anthropometrical measurements and in reducing the associated complaints of Karshya and hence the said drug is useful in the management of Karshya (underweight) in children.

REFERENCES

1. Manna Indranil. Growth Development and Maturity in Children and Adolescent: Relation to Sports and Physical Activity. American Journal of Sports Science and Medicine 2014; 2.5A:48-50.

2. Luchuo Engelbert Bain, Paschal KumAwah, Ngia Geraldine, Njem Peter Kindong, Yelena Sigal, Nsah Bernard, Ajime Tom Tanjeko. Malnutrition in Sub-Saharan Africa: burden, causes and prospects. *Pan Afr Med J.* 2013; 15:120.
3. FACTBOX: World's leading global health risks [Internet]. United States: Reuters; 2016 [updated 2009 Oct 27; cited 2016 May 16]. Available from: <http://www.reuters.com/article/us-who-health-risks-factbox-idUSTRE59Q39Z20091027>
4. Mortality and burden of disease attributable to selected major risks [Internet]. Geneva: World Health Organization; 2009 [cited 2016 Mar 31]. Available from: http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf
5. Laura E Caulfield, Mercedes de Onis, Monika Blössner, Robert E Black. Undernutrition as an underlying cause of child deaths associated with diarrhea, pneumonia, malaria, and measles. *Am J Clin Nutr* July 2004. vol. 80 no. 1 193-198.
6. Anup Shah. Poverty Facts and Stats [Internet]. India: 1998 Jul 20 [updated 2013 Jan 7; cited 2016 May 17]. Available from: <http://www.globalissues.org/print/article/26>
7. Yalew BM (2014) Prevalence of Malnutrition and Associated Factors among Children Age 6-59 Months at Lalibela Town Administration, North Wollo Zone, Anrs, Northern Ethiopia. *J Nutr Disorders Ther* 4:132.
8. Robert E Black, Cesar G Victora, Susan P Walker, Zulfiqar A Bhutta, Parul Christian, Mercedes de Onis, Majid Ezzati, Sally Grantham-McGregor, Joanne Katz, Reynaldo Martorell, Ricardo Uauy. Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet.* Volume 382, No. 9890, p427-451, 3 August 2013.
9. Hunger and Nutrition [Internet]. Washington, D.C. 20017: World Hunger Education Service; [cited 2016 May 17]. Available from: http://www.worldhunger.org/articles/Learn/hunger_and_nutrition.htm
10. Tracking progress on child and maternal nutrition [Internet]. New York: United Nations Children's Fund (UNICEF); 2009 Nov [cited 2016 May 17]. Available from: http://www.unicef.org/publications/files/Tracking_Progress_on_Child_and_Maternal_Nutrition_EN_110309.pdf
11. Jessica Fanzo. The Nutrition Challenge in Sub-Saharan Africa [internet]. WP, United Nations Development Programme, Regional Bureau for Africa; 2012-012: 2012 Jan [cited 2016 May 17]. Available from: <http://www.undp.org/content/dam/rba/docs/Working%20Papers/Nutrition%20Challenge.pdf>
12. Mumtaz Ali, Shukla VD, Dave AR, Bhatt NN. A clinical study of *Nirgundi Ghana Vati* and *Matra Basti* in the management of *Gridhrasi* with special reference to sciatica. *Ayu.* 2010 Oct-Dec; 31(4): 456-460.
13. Hari Sharma, Xiaoying Zhang, Chandradhar Dwivedi. The effect of *ghee* (clarified butter) on serum lipid levels and microsomal lipid peroxidation. *Ayu.* 2010 Apr-Jun; 31(2): 134-140.
14. Nutrition in congenital heart disease [Internet]. South Africa: Christiaan Barnard Memorial Hospital; 2007 Apr [updated 2009; cited 2016 Apr 4]. Available from: <http://www.adsa.org.za/portals/14/documents/clinical20guidelines20cardiac20disease205.3.pdf>
15. Rakesh Kumar Mishra, Rujuta Trivedi, Meera A Pandya. A clinical study of *Ashwagandha ghrita* and *Ashwagandha granules* for its *Brumhana* and *Balya* effect. *Ayu.* 2010 Jul-Sep; 31(3): 355-360.
16. Shailaja U, Rao PN, Girish KJ, Arun Raj GR. Clinical study on the efficacy of Rajayapana Basti and Baladi Yoga in motor disabilities of cerebral palsy in children. *Ayu* 2014; 35:294-9.
17. Deepthi Viswaroopan, Arun Raj GR, Shailaja U, Dharmendra Maurya, Shradha Gawade, Shivanand P, Jithesh Raj KT. Preparation of *Ashwagandha (Withania somnifera)* (L.) Dunal ghee - A practical approach inspired by traditional knowledge. *The Pharma Innovation* 2015; 4(4): 85-89.
18. Arun Raj GR, Shailaja U, Rao Prasanna N, Preventive Medicine in Children: An Ayurvedic Approach Highlighting Native Vaccinations. *International Journal of Innovative Research and Development* 2013; 2(6): 886-893.
19. Ruchi Tiwari, Sandip Chakraborty, Mani Saminathan, Kuldeep Dhama and Shoorvir Singh, 2014. *Ashwagandha (Withania somnifera)*: Role in Safeguarding Health, Immunomodulatory Effects, Combating Infections and Therapeutic Applications: A Review. *Journal of Biological Sciences*, 14: 77-94.
20. Deepthi Viswaroopan, Shailaja U, Arun Raj GR, Jithesh Raj KT, Shivanand Patil. Ayurvedic management of underweight in children at a tertiary care teaching hospital of Southern India: A pilot clinical study. *Int. J. Res. Ayurveda Pharm.* Jul - Aug 2016; 7(4): 46-49.
21. Paredes-López O, et al. Berries: improving human health and healthy aging, and promoting quality life. *Plant Foods Hum Nutr.* 2010 Sep; 65(3): 299-308.
22. Theodore D Wachs. Relation of mild-to-moderate malnutrition to human development: correlational studies [Internet]. University of California, Davis, CA: International Dietary Energy Consultative Group (IDECG) Task Force workshop on malnutrition and behavior; 1993 Dec 6-10 [cited 2016 May 17]. Available from: <http://archive.unu.edu/unupress/food2/UID04E/UID04E0B.HTM>
23. Sushruta Samhita, Prof. K.R. Srikantha Murthy, Vol III, 1st Edn, Chaukhamba Orientalia, Varanasi, 2000 : pp 108.
24. Sushruta Samhita and Dalhana's commentary, Shastri R. Sharma, 1st Edn, Rastriya Ayurvedeeya Vidhyapeetha, New Delhi, 2002 : pp 182.
25. Malnutrition [Internet]. Yeadon, Leeds LS19 7BY: EMIS Group plc.; [cited 2016 May 17]. Available from: <http://patient.info/doctor/malnutrition>
26. Narendra Singh, Mohit Bhalla, Prashanti de Jager, Marilena Gilca. An Overview on *Ashwagandha*: A Rasayana (Rejuvenator) of Ayurveda. *Afr J Tradit Complement Altern Med.* 2011; 8(5 Suppl): 208-213.
27. Arun Raj GR, Shailaja U, Prasanna N Rao, Parikshit Debnath. *Nutraceuticals and Functional foods*. 1st ed. Houston-Texas, USA: Recent Progress in Medicinal Plants. Studium Press LLC; 2016. Chapter 10, Nutraceuticals and Functional foods in Ayurvedic perspective; Vol 42. p.172-199.
28. Gaurav Mahesh Doshi, Hemant Devidas Une, Pradnya Palekar Shanbhag. Rasayans and non-rasayans herbs: Future immunodrug - Targets. *Pharmacogn Rev.* 2013 Jul-Dec; 7(14): 92-96.
29. Vishal G, Narayan Prakash B, Suhas K Shetty, Savitha HP, Arun Raj GR. Comparative study on the efficacy of *Ashwagandha Churna* and *Ashwagandha compound* in the management of generalized anxiety disorder (*Chittodvega*). *International Journal of Pharmacy & Therapeutics.* 2014; 5(3): 220-226.
30. Shailaja U, Rao Prasanna N, Arun Raj GR, Mallannavar V. Effect of *Kumarabharana Rasa* on Chronic Tonsillitis in children: A pilot clinical study. *Int. J. Res. Ayurveda Pharm.* 2013; 4(2): 153-157.
31. Anuradhagranthi et al., a comparative pharmacological investigation of *Ashwagandha* and *Ginseng*, journal of ethnopharmacology, vol 44, issue 3 pg 131-135.
32. Wilson L, Review of adaptogenic mechanisms: *Eleuthero coccussenticosus*, *Panax ginseng*, *Rhodiolarosea*, *Schisandrac hinensis* and *Withania somnifera*, *Australian Journal of Medical Herbalism*, 19(3) 2007.
33. Lakshmi Chandra Mishra, Betsy B Singh. Scientific Basis for the Therapeutic Use of *Withania somnifera* (*Ashwagandha*): A Review. *Alternative Medicine Review.* 2000; 5(4): 334-46.

34. Ram Harsh Singh, Neuronutrient impact of Ayurvedic Rasayana therapy in brain aging, Biogerontology, December 2008, Volume 9, Issue 6, pp 369-374.
35. Arun Raj G R, Shailaja U, Rao Prasanna N, Mallanavar V. Review on the therapeutic efficacy of an Ayurvedic compound drug in Chronic Tonsillitis in children. Unique Journal of Pharmaceutical & Biological sciences 2013;1(2):2-11.
36. Kurubar A Deepti, B.T. Munnoli, Vijaykumar.D, Arbar Aziz, PatilAmol. Role of Matra Basti (Enema) over Abhyanga (Massage) and Sweda (Sudation) in Reducing Spasticity in Cerebral Palsy with Suddha Bala Taila-A Randomized Comparative Clinical Study. Int. J. Ayur. Pharma Research 2014; 2(2): 47-52.
37. Rakesh R Shukla. Management of malavastambha with chatuha Prasarutikabasti and tilataila basti: A comparative study. Int. J. Res. Ayurveda Pharm. 2014;5(2):149-154.
38. Gyanendra D Shukla, Shweta Pandey, Anup B Thakar. Pharmacodynamic understanding of Basti: A contemporary approach. International Journal of Pharmaceutical and Biological Archives 2012; 3(4):893-896.
39. Diane K Newman. Anatomy of the large intestine [Internet]. 2003 Feb [updated 2009 Jul; cited 2016 May 17]. Available from: <http://www.seekwellness.com/incontinence/anatomy-large-intestine.htm>
40. Viswaroopan D, Arun Raj GR, Shailaja U. Standardization of Ashwagandha Ghrita: A Herbal Ghee Based Ayurvedic Medicinal Preparation. Int J Pharm Sci Res 2016; 7(2): 819-23.
41. Acetylcholine [Internet]. 2016 May 14; cited 2016 May 17]. Available from: <https://en.wikipedia.org/wiki/Acetylcholine>
42. G.R. Arun Raj, U. Shailaja, Parikshit Debnath, Subhadip Banerjee, Prasanna N. Rao. Exploratory studies on the therapeutic effects of Kumarabharana Rasa in the management of chronic tonsillitis among children at a tertiary care hospital of Karnataka. J Tradit Complement Med. 2016 Jan; 6(1):29-33.

Cite this article as:

Deepthi Viswaroopan *et al.* Exploratory study to assess the effectiveness of Ayurvedic management of underweight in children at a tertiary care hospital of India. Int. J. Res. Ayurveda Pharm. 2018;9(6):71-77 <http://dx.doi.org/10.7897/2277-4343.096174>

Source of support: Nil, Conflict of interest: None Declared

Disclaimer: IJRAP is solely owned by Moksha Publishing House - A non-profit publishing house, dedicated to publish quality research, while every effort has been taken to verify the accuracy of the content published in our Journal. IJRAP cannot accept any responsibility or liability for the site content and articles published. The views expressed in articles by our contributing authors are not necessarily those of IJRAP editor or editorial board members.