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"RANDOMIZED CONTROLLED CLINICAL TRIAL OF EFFICACY OF BALA-ASHWAGANDHA GRANULES OVER VIDARI CHURNA IN BALKARSHYA (UNDER WEIGHT CHILDREN GRADE I AND II)"

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INTRODUCTION

In *Ayurveda* there are eight different faculties described. Among them *KAUMARBHRITYA* is one of the important faculties. Importance of study of *KAUMARBHRITYA* is to achieve high potential for growth and development. Malnutrition is a major contributing factor for inadequate physical psychological, and intellectual development. Recent studies show that in India underweight amounts to 43% in under five children. Annually under nutrition kills or disables millions of children. It often causes disease and disability in the survivors and prevents millions more from reaching their full intellectual and productive potential.

A healthy and nutritionally well-feed population is indispensable for economic growth and development. Health and nutrition status affects the capacity to learn, which in turn determines productivity and economic growth. Nutrition has major effects on health which enables one to lead a socially and economically active life. On the other hand, Malnutrition is a major problem and is

responsible for high incidences of mortality and morbidity, especially in pediatric cases in developing countries like India. Malabsorpotion can occur in many of conditions which leads to symptoms including weakness, fatigue, loss of strength etc. According to one of themajor classifications of disease, *Karshya* can be considered among theApatarpajanya Vyadhi and under nutrition, malnutrition can be considered or compared to *Karshya*, which is caused due to inadequate supplementation and absorption of nutrients. *Karshya* is a clinical entity presented with features like reduced physical activity, arrested growth, underweight etc. This is seen in moderate degree malnutrition Grade I and Grade II condition1.

Childhood undernutrition is an underlying cause in an estimated 35% of all deaths among children under five and 21% of total global disability adjusted life years (DALYs) lost among under 5 children According to the National Family Health Survey (NFHS) 3, carried out in 2005-06, 40% of India's children under the age of three are underweight, 45% are stunted and 23% are wasted (Fig. 6.2). Comparable figures of NFHS 2 (1998-99) are 43%, 51% and 20% respectively, There has been a slow reduction in undernutrition in the country over the years, but we continue to have the highest burden of childhood undernutrition in the world2. Overall, both girls and boys have similar prevalence of undernutrition, Prevalence of undernutrition is higher in rural areas (46%) than in urban populations (33%). Levels of malnutrition vary widely across Indian states, Panjab, Kerala, Jammu and Kashmir and Tamil Nadu accounts for the lowest proportions (27-33%) of underweight children; while Chhattisgarh, Bihar, Jharkhand and Madhya Pradesh report the maximum (52-60%) levels of under-weight children. Choice of ayurvedic drugs, Bala has balya and *Brihan* Karma3. Shatavari helps in reducing daurbalya, rasagnidipan,rasrakta prasadan4. Deepan of agni, pachan of Ama is done by deepan pachan property of *Pimpali*5.

Annually under nutrition kills or disables millions of children. It often causes disease and disability in the survivors and prevents millions more from reaching their full intellectual and productive potential. Chronic malnutrition hampers immunity & makes the child susceptible to various infections. Adding to school absenteeism and poor **4**academic performance, even after different national programmes like Balwadi nutrition Programme, Mid-day meal scheme6, Special nutrition programme, the condition is still prevalent. It mandates medical fraternity for exploration of more acceptabletreatments for better compliance.

NEED FOR STUDY

Malnutrition is like an iceberg, most people in the developing countries live under the burden of malnutrition. Malnutrition makes the child more susceptible to infection,recovery is slower and mortality is higher. In which under nutrition, over nutrition, imbalance and specific deficiency are the 4 forms of malnutrition. Underweight children are a hard social indicator. In addition to the care of the individual patient, the only way in which we can hope to eradicate malnutrition permanently from a community is by an all-round improvement in living conditions, rising of the socio-economic status, increasing food production, improving sanitation and raising the standard of education and population control, Besides correcting the deficiency of one or more nutrients by various supplements and provision of a diet adequate in calories, proteins, fats and nutrients, it is highly desirable to give the safe and non-hormonal anabolic drug, (*Brihan*a drug) to make proper utilization of the food taken and to fasten the catch-up growth of the body.

PREVALENCE

Except for sub- Saharan Africa, the nutritional status of children is improving globally. Progress is however, hindered because of poverty, infection and ineffective governance. In India, since Independence the mortality and death rate have come down to one third and half respectively. Unfortunately malnutrition, which is not much talked about, has come down only by one fifth. This is when the agricultural production has increased many fold and granaries are having
the problem of storing foodgrains. Data from the United States and developed countries indicate that the prevalence of under nutrition is manifested by a low weight for age or height for age is very low. This was further confirmed by the National Health and Nutrition Examination Survey (NHANES) data. The data also showed that population with a high prevalence of poverty do not have a higher prevalence of under nutrition than the general population emphasizing the importance not only of adequate intake but also of adequate care as defined in the United Nations International Children mergency Fund (UNICEF) framework. The World Health Organization estimates that by the year 2015, the prevalence of malnutrition will have decreased to 17.6% globally, with 113.4 million children younger than 5 years affected as measured by low weight for age. The overwhelming majority of these children, 112.8 million, will live in developing countries with 70% of these children in Asia, particularly the south-central region, and 26% in Africa. An additional 165 million (29.0%) children will have stunted
length/height secondary to poor nutrition. Currently, more than half of young children in South Asia have PEM, which is 6.5 times the **7**prevalence in the hemisphere. In Sub-Saharan Africa, 30% of children have PEM. In modern science, many hypothesis have been put forth on this subject but still there is need of more safe, easily available, palatable, cost effective therapy which could be explored from *Ayurveda*. *Ayurveda* considers this emaciation as *KARSHYA* and according to *Ayurvedic* principles obvious treatment is *BRIHANA*. Malnutrition is one of the diseases which is gaining more and more attention of scientists at global level. Many institutions and Medicalschools are making efforts to find a perfect remedy for this burning problem. Keeping in view the above concepts,research work entitled was proposed.

AIM AND OBJECTIVES

Aim:

- To study and evaluate the effect of *Bala-Ashwagandha granules* in *Balakarshya* in underweight children grade I and II .

Objectives:

- To study *Bala-Ashwagandha granules* in detail.
- To study *Balakarshya* and under-weight children's grade I and II in detail.

To prevent the morbidity and mortality occurring in underweight
children grade I and II due to malnutrition.

REVIEW OF LITERATURE

HISTORICAL REVIEW

The term *karshya* refers to the condition in which depletion of bodily dhatus is observed. In our samhitas there is no direct reference available about Disease *karshya* in children, though brihatrayi have not dealt with a separate chapter for *karshya* but, after a gross and dealt study ofsamhitas we can say *karshya* has been described as a pre stage of other disease in samhitas. A brief knowledge of a history creates a pathway in having a complete knowledge of the same. It thus helps one to recognize the challenges in treatment aspects. The science of *Ayurveda* is considered to be eternal which dates back to *vedic kala* i.e., 10,000 500B.C.

1. Vedic Kala

The treasures of ancient Indian knowledge in *rig-veda*, *samveda*, *yajurveda* and *atharvaveda* were the first to enlighten human life. *Ayurveda* is the upaveda of atharvaveda. In all the *Vedas* convern for the human life is given importance, but there is no direct mention of *karshya*.

2. Samhita Kala

***Kashyapa Samhita*:**

The reference of *karshya* is mentioned in *sutra sthana rogadhya* in *vataj roga7* , in *siddhi sthan chikitsa* for *krusha* person is aid as *Brihana*, *karshya* is seen as a symptom of *kshudita* person, has been mentioned in *bhojanakalpa*. It is also described as a pre stage of *kshiraja phakka8*. We can see many references about *karshya* as one of the *lakshana* or *purva rupa* or *upadravas*. In many diseases *karshya*is found to be one of the *nidana*. So *karshya* can be considered as a disease in swatantra vyadhi and as a lakshana in paratantra vyadhi.

***Brihatrayi*:**

Charaka samhita:

In this text there are many references about *karshya* with regards to nidanam samprapti, lakshna and chikitsa krusha vyakti is considered as one of the apatarpana janya vikara in charaka samhita.

1. There is a mention of *karshya* as a svedana ayogya rogi by mentioning the words durbala9, aishushka.
2. Ati*karshya* has been considered as one of the ashta nindita purusha in charaka sutra sthana10 .
3. In charaka sutra sthana *Brihan*a chikitsa is indicated as treatment for *karshya*.
4. There is mention that samyak yoga of *Brihan*a chikitsa is *karshya* dosha nivarana in same chapter 38th sholka.
5. *Karshya* is considered to be the effect of nidranash11 .

***Sushruta Samhita*:**

In sutra sthana, it is clearly mentioned sthaulya and *karshya* are rasa nimittaja, also mamsa kshaya lakshana have been mentioned which are related to *karshya*. It is mentioned that deha is of three type sthula, Madhya, Krisha12 .

1. In sutra sthana, mamsa kshaya lakshana have been mentioned
which are related to *karshya*.**12**
2. In sutra sthana, it is clearly written that sthaulya and *karshya* are rasa nimittaja.

***Ashtanga Sangraha* :**

Maharshi vagbhatta has mentioned krusha as an early symptom of parigarbhika14. It is also mentioned in sutra sthana as a vata vruddhi lakshana. “Kumarah shushyati” reference is found in the description of balashosha. The referene of sandashi jataharini is similar to parigarbhika and *karshya*

is found as anearly symptom of parigarbhika. In kshiraja phakka *karshya* is described as a pre-state of it, whereas kshina mamsa has been described as a symptom of vyadhija phakka.

***Ashtanga Hridaya* :**

In sutra sthana *karshya* is described to be the effects of atilanghana. Lakshana and treatment of *karshya* has been explained5.

1. In sutra sthana krusha person in contraindicated for vamana.
2. In sutra sthana, *karshya* has been mentioned as lakshana of vata vyadhi16 .

Laghutrayi

***Sharangdhara Samhita*:**

The word *karshya* is mentioned in 7 th chapter while dealing with vata vyadhi17 .

***Madhav Nidana*:**

In madhav nidana it is also said that child become krusha due to intake of vatadusta milk18 .

***Bhavprakash* :**It is the only text where *karshya* hetu, lakshana, samprapti, sdyasadyata & chikitsa is explained in detail and have been assigned separate chapter as *karshya* rogadhikara.

***Yogaratnakar*:**

In yogarathnakar chikitsa of *karshya* in children is mentioned in a separate chapter balarogadhikar

LITERATURE REVIEW OF *KARSHYA*

Derivation:

The term *karshya* is derived from a root 'Krish", which means to have shortage of food, become lean, thin and emaciated.

कृ श तनुकरणे+ अच प्रत्यय तनुकरणम -काशशननकणंम /

(शब्दकल्पद्रुम)

Synonyms:

The word *karshya* had synonyms like *shosha, heenabala, krusha,shushka, kshata, ksheena, tanu*

Table No. 1

Amarkosha	***Ayurvediya Shabda Kosha***	***Shabda Kalpadruma***
Stoka, alpa, sookshmam dabhara,karshya, tanu, maatra, lesha, anu, laya triti.	*Amedaswi, durbhala, alpamamsa, nirmamsa.*	*Krushapullaksheen alpa sukshma, abala, kshma, tama,talima, amamsa, peliva.*

Definition:

मासक्षयस्फ़िक्गण्ड ओष्ठउपफ़थ उरु वक्षकक्षापपस्ण्डकोदर ग्रीवा शुष्कता रौक्ष्यतोदौ गात्राणाां सदनां धमनीशैथल्य च //

.सु.15/1320

The definition indicates that diminution or wasting of mamsa dhatu (muscular tissue) is the main feature of *karshya* which is clearly seen in emaciated patient.

1) *Karshya* is a condition in which the person becomes lean and thin.
2) Kalhana in his commentary says *karshya* shows dhatu kshaya as the main event and hence *karshya* comes under apartarpanjanya disease.
3) *Karshya* is that which leads to leanness. (Ayurvediya Shabdakosha).
4) *Karshya* means alpa sookshma-intolerance due to decreased nutrition and decreased body weight.
5) Krushta is the result of shoshita rasa dhatu causing decrease in mamsa of shareera

In charaka samhita, ashtonindita purusha has been explained in whichati*karshya* is one of them. In sushruta samhita krushta is included in rasa pradoshajka vyadhi, description of nidana, samprapti, lakshana and chikitsa of ati*karshya* is mentioned. Ashtanga hridaya has not metion the symptomatology of *karshya* but has mentioned treatment of *karshya*. In bhavprakash there is a separate chapter for explaining *karshya* symptoms,etiology. Pathogenesis, prognosis and treatment of krusha person.Acharya kashyapa has motioned *karshya* as a disease caused by vata.Sharangdhara included *karshya* in nanatmaja vyadhi of vata.

***Karshya* as *Swatantra Vyadhi*:**

When *karshya* develops because of swatantra hetu or its own etiological factors, then it is called as *karshya* roga. If it is associated with a symptom in other disorders it is only called as *karshya*ta or krushya. It is the condition in which person is losing its weight due to rooksha *annapana,langhana, pramitashna* etc. patient is appetite (*Kshudha*) reduces, becomes *durbala*, immunity is reduced in both aspects i.e.
vyadhibalavirodhitwa and *vyadhi utpada pratibhandhakatwa*. This results in *rasa-rakta-mamsa dhatus kshaya*,which gives rise to *shareerabala kshaya* and *alpa pran shakti*. Due to which impairment or dosha-dhatu and mala is seen and the disease becomes one of the separate entity. According to acharya charaka in cases where lakshana of desease manifest independently, then they should be considered as a separate disease. In the same manner when the lakshana papear as a part of disease then they are not called as independent disease. In the present study *karshya* is neither a complication of any disease condition nor a cause of any disease. It may be said that any lean, thin or underweight for age person, having no other complaint may besaid as krusha. But if it persists for longer period it may leadtobalashoshaand parigarbhika whin *karshya* occurs in early infancy. If *karshya* occurs at later childhood and persist for longer period then it maylead to ati*karshya*. It
is now clear form mentioned references that *karshya* represent a mild
form of malnutrition while parigarbhika, balashosha, ati*karshya* represent severe form of malnutrition.

NIDANA (AETIOLOGY OF *KARSHYA*)

According to *karyakarna vada*, no *karya* is possible without karna. *Utpanna vyadhi* is *karya* and its nidana or *hetus* are *karana*. Based on references regarding *nidana* of *karshya* in both *brihatrayi* and *laghutrayi*, the following classification are made.

1. *Aharaja* - (a) Qualitative
   (b) Quantitative
2. *Viharaja* - (a) Sharirika
   (b) Mansika
3. Others

Table No. 2 Nidana

Aharaja		***Viharaja***		**Others**
Qualitative	Quantitative	Sharirika	Mansika	
Rukshaanpan	*Alpashana*	*Kriyatiyoga*	*Ati shok*	*Vatika Prakriti*
Vatika Annapana	*Pramitashana*	*Ativyayam*	*Atichinta*	*Nitya rogi*
Kashaya, katu, tikta rasa sevana	*Anashana*	*Mala mutradi nigrah*	*Ati krodha*	*Grishma ritu*
	Langhana	*Ruksha*	*Ati bhaya*	*Bhutabhighataja*
	Upavasa	*Ati-adhyayana ,atapa, sevana, dukha, asana, balavata nigraha, mala ati-vartana, ati-bhramana, ruksha udavartana , vata sevana*		

Due to all above factors dhatu kshaya takes place, specially *mamsa* and *meda kshaya* which manifest as *karshya roga*. From another point of view, the dietic factors like *rooksha anna*, *rooksha pana* can beincluded in malnutrition where food is qualitatively less. *Anashana*, *alpashana* in under nutrition where food is quantitatively less. In *viharaja* factor, mainly excessive exhaustive procedures are described namely *vata* and *atapa sevana*, *ratrijagarana*, excessive exercise etc. along with this indulgence of hunger is also included. Here comparative to food intake, calories are spent more and thus energy malnutrition.

When sufficient amount of shadrasayukta ahara, in occurs appropriate quantity, is not available, then the rasa dhatu is not formed properly. Due to formation of less quantity of rasa dhatu, the uttarotara dhatu's are not formed correctly, leads to *karshya*.

Charaka has given broad opinion regarding *karshya* nidana, also explained prakriti i.e. beejaswabhava is also one of the hetu and *karshya*ta arise in chirakaleena vyadhi avastha and it is also one of the nidan.

In calorie intake output ratio, output is more than the intake hence body tissues are degraded in order to get energy thus producing emaciation. A psychological factors lead to the disturbed mental condition hence hunger is decreased or no proper intake of food is taken, this leads to emaciation. But in all these, dhatu kshaya is the main event. Though *karshya* is found as a whole entity or a part of diseased condition, for the present work *karshya* is not a compilation of any disease or not a result of any diseased condition, has been taken into consideration.

PURVARUPA

Due to Nidana Sevana, the doshas get aggravated and they cross prasaravastha stage and they then settle in dhatuvaha srotas and try to produce disease, at the same time beeja swaroopa lakshana are present then it is called as puvarupa. Purvarupa of *karshya* is not mentioned any where in the samhita. So in this situation lakshana of *karshya* is to be considered as a purvarupa of that disease. produce disease, at the same time beeja swaroopa lakshana are present then it is called as puvarupa.

Purvarupa of *karshya* is not mentioned any where in the samhita. So in this situation lakshana of *karshya* is to be considered as a purvarupa of that disease.

SAMPRAPTI

Morbid changes in different events and reaction in the body resulting in manifestation of a disease are termed as samprapti (chakradtta). Vagbhatta has clearly mentioned the samprapti, he mainly emphasizes the importance of nature, manner of vitiation of doshas and as well as the nature and manner of its spread, inclusive of the role of dhatu's and srotas. Occurrence of sthanasamshraya followed by the dosha-dushya sammurchana of the dosha is the supreme importance in samprapti. Unless this stage is reached, the disease will not be manifested.

Diagrammatic representation of samprapti nidana

Sevana

Viharaja	***Aharaja***	***Mansika***
Ativyayama, Ativyavaya	*Rookshan Annapana*	Chinta, Bhaya, Shoka
Adhyayana, Bharavahana	Alpa Bhojana, Langana	Krodha, Ati Dhyana
Vita Prakopa	**Vita Prakopa**	**Vata Prakopa**
Dhatu Kshaya	Jatharagnimandhya (Vishamagni)	
Due to Ativyavaya		
Dhatu Kashaya	Formation of ALPA Rasa Dhatu	
Vata Prakopa	Rasa Dhatwagni (deepti)	

↓

Upashoshana of alpa rasa Dhatu by vayu

Alpata of Poshaka Dhatu's

↓

Alpa Poshana of Sapta Dhatu

↓

↓

Dhatu Kshaya

↓

KARSHYA

SAMPRAPTI GHATAK

***Dosha* :**	*Vata Vruddhi*
	Pitta Kshaya
	Kapha Kshaya
***Dushya*:**	*Rasakshya* leading to *uttarotara dhatu kshaya*
	Especially *rasa, mamsa, meda*.
***Agni* :**	*Manda* and *Vishama*
***Ama* :**	Jatharagnijanya and Dhatwagnijanya ama
***Strotas* :**	*Rasavaha, mamsavaha, medovaha* and involvement of other *srotas*.
***Dushtiprakara*:**	*Sanga*

***Udhava Sthana* :** Amashaya, Pakwashaya

***Sanchra Sthana* :** Sarva Shareera

***Adhistana* :** Rasavaha Srotas

***Vyaktha Prakara* :** *Chirkari*

***Sadhyasadhyata* :** *Sukha sadhya* in *naveena avastha*. *Kastha sadhya* in *deergha kaalanubandhi*.

DOSHA

1. *Vata*:

Acharya Sushruta and *Vagbhata* have clearly mentioned that vitiated *Vata dosha* leads to *karshya*, in *charaka samhita vimana sthana* 8th chapter *archarya* sah described *vata prakriti* person which clearly shates *vata dosha* is responsible for *apachita sharira*.

It is also mentioned by sharangdhara as one of the nanatmaja disease produce by vata dosha. Here predominant vata dosha not only shows the physical effects but also the mental disabilities.

2. *Pitta*:

Vitiated pitta mainly pachka pitta responsible for the pathogenesis of *karshya*. As vitiation of pachaka pitta leads to agni dushti as a result of wichi the dhatus are not produced properly leading to anuloma kshaya. On the other hand agni dushti also promotes the vata prakopa, which is responsible for the *karshya*ta of the body.

***3.Dushya*:**

Rasa, mamsa and meda dhatus are the main dushya responsible for the *karshya* in sushruta samhita. In *karshya* roga agni dushti lead to formation of annavisha. This annavisha helps to the improper formation of rasa dhatu leading to rasa dhatu kshaya. As rasa dhatu is the first dhatu and if it is vitiated then remaining all the dhatu which are formed by rasa dhatu will get vitiated and proper nourishment will not take placeresulting in to anuloma kshaya in which *karshya* is the chief symptom.Acharya vagbhatta said in sutra sthana said that,

मांसे अक्ष ग्लानी गंड स्फिक शुष्कता संधीवेदना /

(A.H.Su.11/18)

Hence both mamsa and meda dhatu are also responsible for *karshya*.

Agni :

In *karshya*, agni dusti is jathragni mandya. That's why acharyacharka advocates laghu Santarpan type of treatment for the *Brihan*a.

Koshta:

As vata is the main dosha in the pathogenesis of *karshya* thekoshta of the *karshya* children become krura.

Udbhavasthana:

The udbhavasthana of this disease is amashaya and pakwashaya. as it is said that formation of dhatus starts after the separation of ahara by samana vayu in to Sara and kitta bhaga in the pakwashaya. If the separation is not done properly which is due to agni dusti and dosha prakopa thus nourishment of the dhatus are stopped.

Rogamarga:

This disease manifest all over the body but originates from koshta.So *karshya* becomes a disease of abhayantara roga marga.

Srotas:

Due to agni dusti corresponding srotas like annavaha, rasavaha, mamsavaha and medovaha srotas gets affected.

Rupa of *Karshya* :

Detail description of clinical sign and symptoms is carried out on the basis of symptomatology of ati*karshya*. Which is mentioned by acharya Chark. These signs and symptoms of *karshya* can be broadly arranged in two separate headings.

1. Pratyatma Lakshana
2. Samanya Lakshana

Table No. 3 Rupa

Lakshana	Charka	Sushruta	Bhavprakash
Vyayam asahishnuta	+	+	_
Atisauhitya asahishnuta	+	_	_
Koshtha nigraha asahisnuta	+	+	_
Pipasa nigaraha asahusnuta	+	+	+
Mahoushadha	+	_	_
Ati ushna asahishnuta	+	+	+
Maithuna asahisnuta	_	_	_
Kriyashu alpa prana	_	_	+

PRATYATM LAKSHAN				
LAKSHANA	**CHARAK**	**SUSHRUT**	**ASHTANG** H.	**BHAVPRAKASH**
Sushka sphika	+	_	+	+
Sushka udara	+	_	+	+
Sushka griva	+	_	+	+
*Dhamani jal*a	+	_	+	+

darshana				
Tvaka asthi shesha	+	_	_	+
Vata roga pravah	_	+	+	_
Sthula parva	+	_	_	+

Upadravas of *karshya*

Upadravas of *karshya* are mentioned according to various acharya in tabular form.

Table No. 5 Upadrava

Samanya Lakshana				
Upadrava	**Charka Su21/14**	**Sushruta su 15/39**	**Ashtanga sangrahasu 24/50**	**BhavprakashU 40/400**
Swasa	+	+	+	+
Kasa	+	+	+	+
Kshaya	+	-	+	+
Shosha	-	+	-	-
Gulma				
Arsha	+	+	+	+
Grahani roga	+	-	+	+
Pliha roga	+	-	-	+
Rakta pitta	+	+	+	+
Agni sada	-	-	+	-
Mandata	-	-	-	+
Jwara	-	+	-	-
Vata vyadhi	-	-	+	-

Pleeha – Because of meda kshaya

Swas, kasa- Because of lowered immunity, infection

Kshaya- If *karshya*ta is ingnored – leads to kshaya of other dhatu. Gulma, udara, arsha – Due to agnimandya, produced after one another.Grahani – Due to agnimandya.

Sadyasadyata of *Karshya*

According to Charaka samhita sutra sthana 21st chapter,

स्थौल्यं कार्श्यम् कृच्छ्रं कार्श्यं //

च.सू.21/17

That means the *karshya* person is supposed to be easier to treat than sthula person. *Brihan*a therapy is usually implemented to treat *karshya*, as it increases utlarotara dhatu poshana which is easier to treat and is said as sukha sadhya. The *karshya* afflicted with complications with different Upadravas involving all Marga,s and is of longer durationis considered as Asadhya or incurable.

Principles of management of *Karshya*

Karshya being a vata pradhan vyadhi, mainly occurring due to dhatu kshaya. So as general. line of treatment i.e. vata upakrama can be adopted. As specific line of treatment all the acharya's observed importance of *Brihan*a therapy. According to acharya charaka *Brihan*a therapy should be laghu santarpana in nature. Because in *karshya* patient agni, shareerabala and other related aspects are functioning poorly. Theprinciple of management of *karshya* be prepared in following manner.

a) Nidan Parivarjana

b) Samshodana

c) Samshaman

d) Ahara

e) Vihar

Nidana Parivarjana:

In *karshya* nidana parivarjana is the 1st line of treatment. Here the nidana like rooksha annapana, alpa bhojana, vatika annapana, katu, kashaya, tikta rasa sevana, ati-vyavaya etc. should be avoided. As it has two fold benefits, being a prophylactic measure further progression of the disease will be halted. The other aspect is the future relapse of the same disease can be prevented. in preventing, controlling as well as eradicating the disease acharya sushruta described samshodana ahara, vihara are helpful.

Samshodana:

It is of two types

i) Bahir Parimarjana

ii) Antaha Parimarjana.

Bahir parimarjana-taila abhyanga, snigdha udvartana is indicated in *karshya* patient. antaha parimarjana- acharya charaka in context of ati krusha quotes that doshavsechana should be performed. in the same manner acharya sushruta and vagbhatta recommended that *Brihan*a basti having mridu, snigdha properties should be used for *karshya* patient.

Samshamana:

It is nothing but the conservative therapy. According to acharya charaka rasayana, vrishya, balya, *Brihan*a, jeevaniya type of drug shouldbe administered in *Karshya*.

AHARA:

Ahara also plays an important role in avoiding the disease. different dietic and nutritional regimens like mamsa, milk, guda, ghrita etc. employed for the management of *karshya* mentioned in charaka samhita.

Vihara:

This includes various preventive as well as rehabilative measures effective for both mind and body. Like Feeling of joy, peace of mind, abstinence of anxiety.

Importance of Beneficial Diet:

Body is derived from food. All living beings are formed from food. They sustain and grow on food. The food is indispensable for living creatures. Even if the patient does not take medication, taking a beneficial diet and avoiding a harmful diet can cure the disease. If the patient does not follow the diet advised by the physician, medication alone will not cure him/her.

Definition of Ahara:

Definition of Ahara:

Ahara (food) is the one, which does pushti (nourishes) the shareer food is defined as essential substance having a pleasant aroma & taste which is capable of being digested, absorbed & utilized when consumed in proper manner & in appropriate quantity, so as to help living organism to replenish the wear & tear of body tissues, produces new body components & that which imparts energy, strength & happiness.Body is derived from food. All living beings are formed from food. They sustain and grow on food. The food is indispensable for living creatures. Even if the patient does not take medication, taking a beneficial diet and avoiding a harmful diet can cure the disease. If the patient does not follow the diet advised by the physician, medication alone will not cure him/her.

PROPERTIES OF AHARA:

Food provides life, building material for the body, strength, enthusiasm, and a sense of color, luster, memory, intellect, inspiration, satiety and helps in conception and propagation of the species. Food

Provodes energy to carry out lie activities. which can lead one to heaven or help to attain “Moksha”. Health and happiness depend on food. A beneficial diet gives happiness, health and prolongs one’s lifespan. A harmful diet promotes disease and makes one depressed.

Wholesome diet:

The diet should be satmya i.e. congruent to the body and should be laghu, ushna, snigdha and compatible. One should get accustomed to all 6 rasas, which is called *pravara satmya*. To get used to a single rasa is avara and combination of less than 6 rasas is *madhyama*. a warm meal promotes apatite and digestion, melts sieshma and put vayu in its normal path of activity. Snigdha meals promote growth of tissues, complexion and virility. Thus the wholesome diet should consist of all 6 rasas

with above qualities, so as to nourish the tissue and give vigor to the body. It has a high nutritional value and keeps the health, agnibala and dhatu satmya. In a child to whom milk become satmya, it act as rasayana and builds the body plump strong without the disposition of the fat. It helps in growth of muscular tissue. Ghrita satmya child grows soft and delicate with increased memory and intelligence and attains beautiful complexion.

Diet Requirements

Laghu substances can be taken to full satiety, while Guru Substances are taken till half or 3/4th contended. One should eat half of the belly with food and drink 1/4th of the belly with water, so that vayu shall be able to move freely in the remaining 1/4th of the stomach. Charaka advocates 1/3rd of belly to be filled with solid foods another 1/3rd with water and rest 1/3rd left for free movement of vata, pitta and kapha. kashyapa description allows more foods than that of charaka saying and hence may be more rightly applicable in pediatrics practice, where caloric requirement is more than that of adults per unit 30 Measurement of the body. So quantity and frequency of the food and milk feeds depends upon the capacity of stomach and its emptying time. The capacity of stomach at birth is 30 ml, increases to 1000 ml at puberty and reaching 1500 ml in adults. The allowance of individual substances in the diet is called parigraha and of the total quantity is called sarvagraha.**Rule of eating food** (Principle and Practice Pediatrics in *Ayurveda* by Dr. CHS Shastry)

Kashyapa describes 24 rules of eating food. Not all these are rules but include some of the nutritional disorders arising from wholesome food. The food eaten is not digested properly in emotional states, so one should have tranquility of mind. The food taken previously should have been digested, the person should have got his bowels evacuated, taken bath and be clean and pious. Feel light and hungry; this is the time to take meals. Food should be first offer to ancestors, give to beggar and feed the athithi or guest. The children also need to be fed first. Giving food to children, is a good as giving cow in a charity. Timely meals are palatable become digested easily and helps growth of the body. There is no time specification for feeding milk to infants but as they grow up and take solids, they can be put upon 3 feeds twice a day.

One should eat, enjoying the taste of different substances but not hurriedly. Too slow eating makes the substance cool and loses their taste. Initially one should eat snigdha and sweet substances, later the other sour and saline substances and at the end kashyapa and liquid substances. One should drink water in between for better appreciation of taste. Kashyapa says that water taken in

the beginning, middle and at the end of meals leads to emaciation, moderate body and obesity in childrenrespectively.

The water is advised to boil, as it has often many germs and is polluted with excreta of different animals and birds. After completion of taking meals, one should clean the teeth, take the breath freely for a while, walk a hundred steps slowly and then sit down for easy digestion. Sushruta orders to lie in left lateral position.

Effects of combination of foods.

Some food stuffs are suitable for the body and are called hita, as they would be transformed in normal benefiting state to the tissue, while other either individually or by combination or by refinement become unsuitable for the body and do not get properly digested. Even after the digestion they remain in a no congruent state, opposing the tissues of the body with hostility and excite the vata (humors) giving rise to number of disorders. They are called as Ahita substances.

Ayurvedic views of malnutrition

1.Parigarbhika

According to Acharya Vagbha ta –

मतु कुमारी गर्भिण्या स्तन्यं प्रायो ऽपिबन्ति /

अ .स.उ .2/64

Parigarbhika is a disease of first child which is displaced form the breast due to second child which is on the way. Clinical features of parigarbhika and kwashiorkor are same, so we can conclude that parigarbhika is a severe form of malnutrition. A successive early pregnancy in the mother makes the child to be prematurely weaned. The child though breast-fed may not get adequate milk or sometimes the breast simply acts as a comforter. Thus the child becomes humiliated and does not get adequate quantity of protein at a time when its requirement is high for the rapidly growing body, and so consequently suffers. The word paribhava means to humiliate or disrespect. Thus parigarbhika indicates the disregard child consequent to pregnancy. Two factors i.e., deficit intake of milk and the resultant proteins, when the mother becomes pregnant; and secondly the unstable Agni (seen in ksheerannada avastha) are mainly responsible for parigarbhika roga. The unstable appetite gives rise to two types of cases. Infant either suffers from loss of appetite, nausea and vomiting or from periods of voracious appetite. There is apathy and the child does not show interest in surroundings.

2. Balashosha

Balashosha is also a nutrition deficiency disorder mentioned in our classics. Acharya vagbhatta says. The causes of balashosha are qualitative deficiency of breast milk to the childll. Clinical manifestation of balashosha can be compared with marasmic kwashiorkor. In marasmic kwashiorkor, the marasmic child shows the symptom of edema. 50 here also balashosha is an extreme form of malnutrition quitesimilar with marasmic kwashiorkor.

The child who sucks the kapha vitiated milk or drinks cool water repeatedly and who sleeps for a long time gets the rasavaha 5rotas blocked with the kapha and suffers from anorexia, running nose, cough and fever. The blockage in the nutritional channels in turn causes wasting of the body of the child giving a marasmic appearance with white puffy and slimy face. Kashyapa says that the milk vitiated with kapha is called as phakka dugdha and the child who sucks it becomes emaciated. Continued emaciation in such a condition brings out slow movements in the child leading to

phakka roga it is mainly a picture of caloric malnutrition while parigarbhika is protein malnutrition. at a time when a protein requirement is high for the body for its constructive activity, the solid introduction when fails to supply the required protein in a digestible form the child suffers with the signs and symptoms of protein deficiency and this consists of the main features of all weaning disorders.

3. Ati*karshya*

Ati*karshya* has been described in our classics. the clinical features of ati*karshya* are equal to marasmus. according to acharya charaka symptoms of Ati*karshya*.

शुष्क स्फिक् गुद ग्रीवो धमनी जाल सन्तः /

त्वगास्थि शेषो ऽतिकृश स्थुल पर्वा नरो मतः //

च.सू.21/15

"In ati*karshya* affected children exhibit extreme wasting and have an old man appearance with just skin and bones" wasting of thigh and buttock, Abdomen, Neck.

4. Phakka Roga[23]

Normally a child who attains one year of age should be able to walk with support. The word "Phak" indicates the slow movements or creeping, or fa'i1ure of the skill of Locomotion. So when the child becomes crippled with wasting of the body, apathy, and slow movements, he is said to be suffering from phakka roga. Weaning is the optimum period when the child failure usually suffers from this disease. A mismanaged child failure to thrive and becomes a victim to phakka roga, as he is prone to a number of infections and requires to be fed properly by the mother. Thus the etiology of phakka roga can be tracedto 3 groups of cases :

1. Kshiraja Phakka.
2. Garbhaja Phakka.
3. Vyadhija Phakka.

Kshiraja Phakka:

Milk vitiated by sieshma is called phakka dugdha. It blocks the nutritional channels of the child and the resulting impaired nutrition brings marasmus (shosha) in child.

Garbhaja Phakka:

The early weaning of a child from breast milk when the mother becomes pregnant requires again careful attention towards the child in giving proper feeding. A child not taken care, first shows signs of arrest in the growth pattern (like weight), and later loose weight and become emaciated to attain the slow movements. It is very difficult to save such a child. The parigarbhika is an early stage of garbhaja phakka roga.

Vyadhija Phakka:

Any of the constitutional or accidental diseases in the child can cause suffering. Prolonged suffering from diseases like Grahani, results in malnutrition in an uncared child, resulting in growth failure, emaciation and finally crippling. This is the Vyadhija Phakka Roga and should be born in mind in all cases of failure to thrive.

Concept of *Karshya* and Ati*karshya*:

An apparently lean and thin looking person may be known as krusha. to understand this precisely, the word like sthula, ati sthula, krusha, and ati*karshya* should be considered. according to the sushruta, the human body can be divided in to three groups based on its looking via- sthula, madhyama and krusha. There are some places in the body where generally fat deposits and these are - sphik (hips), udara (abdomen) and griva (neck). Apparently a normal looking person having more bulk of fat at these places may be taken as Sthula, on other hand when they have less fat at these places. Then termed as *karshya* and person with apparently well knitted body having requisite amount of fat at the above places may be termed as madhyama. In this way sthula and *karshya* may be considered as apparently abnormal. However they are prone to turn in to the stages of ati sthula and ati*karshya* respectively, which are definitely diseased entities and *Ayurveda* has included them under ashtonindita purusha i.e. Eight types of undesired person. By the definition stated before, it may be said that a thin person having no other complaint may be taken as krusha but when this condition persist for a longer period and on indulging in the etiological factors then turn in to ati*karshya*. While discussing about ati*karshya* dalhana he says,

So here one can say that the word *karshya* and ati*karshya* show 2 degrees of malnutrition, i.e. moderate and severe respectively. The description of ati*karshya* by sushruta in sutra sthana 15 nearly equals to that of severe malnutrition where shosha denotes the muscular wasting and loss of subcutaneous fat over buttocks and in the extremities, then lowered strength of the body has been

suggested by the word alpaprana and bharadaneshu asahishnuta. also shwasa, kasa like disease are due to the lowered immunity status. Plihodara indicates distended abdomen and involvement of liver and spleen as in kwashiorkor and by the word murnamupayati it has been suggested that the under nourishment is so extreme that it threatens ones existence directly.

Summing up we can say that krusha is the pre stage which is to be treated with proper care which otherwise leads to other diseases depends upon the age at which it occurs. If kkrusha occurs at early infancy it may lead to either balashosha or parigarbhika, if it ccurs in later child hood or onward ad persists for a longer period it may leads to ati*karshya*. There is no direct reference available regarding the symptomatology of *karshya*. Hence in the present study the sign and symptoms of ati*karshya* has been considered as the sign and symptoms of *karshya* they may appear in minor degree in *karshya*.

REVIEW OF MODERN LITERATURE

Globally, hunger and malnutrition are two of the most significant challenges. Globally, malnutrition is a risk factor for illness and death, with millions of pregnant women and young children being affected due to infections, poor and inadequate diet. Malnutrition increases the risk and worsens the severity of infections. Infants and young children are most affected by malnutrition as they have increased nutritional needs to support growth.

Malnutrition refers to the situation where there is an unbalanced diet in which some nutrients are in excess, lacking or wronqproportion. Undernourished children, as well as children with severe malnutrition, have higher risk of dying. Malnutrition is frequently part of a vicious cycle that includes poverty and disease, inadequate parenting, discrimination, violence, poor housing and poor education.' These factors are interlinked in such a way that each contributes to the presence and permanence of others.

One of the major causes for malnutrition in India is gender inequality. Due to the low social status of Indian women, their diet often lacks in both quality and quantity. Women who suffer malnutrition are less likely to have healthy babies. In India, mothers generally lack proper knowledge in feeding children. They do not breast-feed their children or feed them poorly. Consequently, new born infants are unable to get adequate amount of nutrition from their mothers.

Deficiencies in nutrition inflict long-term damage to both individuals and society. Compared with their better-fed peers, nutrition- deficient individuals are more likely to have infectious diseases such as pneumonia and tuberculosis, which lead to a higher mortality rate. In addition,

nutrition-deficient individuals are less productive eat work. Low productivity not only gives them low Pay that traps than in a vicious circle of under-nutrition, but also brings inefficiency to the society, especially in India where labor is a major input factor for economic production. On the other hand, over nutrition also has severe consequences. Subodh varma, writing in The Times of India, states that on the Global Hunger Index India is on place 67 among the 80 nations having the worst hunger situation which is worse than nations such as North Korea or Sudan. 25% of all hungry people worldwide live in India. Since 1990 there have been some improvements for children but the proportion of hungry in the population has increased. In India 44% of children under the age of 5 are underweight. 72% of infants and 52% of married women have anemia. Research has conclusively shown that malnutrition during pregnancy causes the child to have increased risk of future diseases, physical retardation, and reduced cognitive abilities.

CLASSIFICATION

Deficiency of a single nutrient is an example of under nutrition or malnutrition, but deficiency of a single nutrient usually accompanied by a deficiency of several nutrients. PEM is manifested primarily by inadequate dietary intakes of protein and energy. PEM is almost accompanied by deficiencies of other nutrients. Historically, the most severe forms of malnutrition, marasmus and kwashiorkor were considered distinct disorder. 2 Some of the risk factors and clinical features of the two severe forms of PEM may be similar, but the main feature of marasmus is non edematous with severe wasting and kwashiorkor is edematous malnutrition. Children with PEM can have different symptoms depending on what caused the malnutrition. Severe PEM includes deficiencies of protein, energy or both, resulting in kwashiorkor, marasmus and marasmic kwashtorkor, primary PEM is caused by an inadequate food intake that may be the result of a variety of factors. Diseases cause secondary PEM through low food intake, decreased absorption and usage of nutrients, increased requirements and increased losses. Failure to achieve normal growth is sensitive indicator of ma I nutrition. Anthropometry is used to assess nutritional status and growth retardation and to differentiate between acute or chronic malnutrition. The clinical findings and biochemical criteria are not effective to use for classification if the disease is not advanced.

The three combination of anthropometric measurements that are usually used to categorize malnutrition are, low weight-for-age, an indicator for underweight; low height-for-age, an indicator for stunting;and low weight-for-height, an indicator of wasting.

KWASHIORKOR

It was first described more than 70 years ago in 1933. Where kwashiorkor means, an "evil spirit that affects the first child when the second is born". It occurs form early infancy to 5 years of age. It is most commonly seen in the second year of life. When the second child is born, the first is weaned so that the second can be breastfed. All systems and functions are affected in kwashiorkor. It is difficult to determine which factors are major contributors and which are responses. In combination with weight loss, edema has been accepted as the main criteria to identify kwashiorkor. Growth retardation, skin changes (lesions), abnormal hair, swollen belly, lack of growth, lack of stamina, loss of muscle tissue, vomiting, diarrhea, hepatomegaly and children have a well-nourished appearance with some retention of body fat and even though some tissue wastage and weight loss is present, it may be over shadowed by the oedema. The edema begins in the feet and legs and then spread to the hands, face and body. The children are apathetic, have little interest in surroundings. Changes should be identified in the early stagesonly and treated accordingly.

MARASMUS

It is the commonest type of severe PEM that occurs in preschool children and results in growth retardation and muscle wasting without edema. Marasmus is characterized by failure of linear growth (stunting), loss of weight (wasting) and loss of subcutaneous fat leads to old man appearance." Marasmus is linked to severe deprivation or impaired absorption of protein, energy, vitamins and minerals. Anthropometrically, marasmus is seen as a weight-for-age below 60% of the expected weight for age. Mortality in these children is relatively low if there is no underlying illness or infections.

MARASMIC KWASHIORKOR

Pure conditions of marasmus and kwashiorkor are uncommon as there are many cases which are not purely one or the other, but present rather with signs of both. This can be due to changes in diets and seasons. The term Marasmic kwashiorkor therefore is used to describe the wasted form of PEM. The child is said to have this condition when all of the following features are present; weight-forage less than 60%, edema, marked wasting and stunting, anemia, mental pathy. Wasting is more obvious in upper part of the body and edema in the lower part of body.

UNDERWEIGHT

The child is malnourished, but does not have any features of marasmus or kwashiorkor. The weight for age is 61-80% of expected.

The underweight child is common and an important presentation of PEM, which is missed a lot of times. When a diet is inadequate, poor absorption then there will be a slowing down of linear growth, failure to gain weight or weight loss and this is seen when the child is exposed to an acute food shortage.

Childhood malnutrition is an under lying cause in an estimated
35% of all deaths among children under five and 11% of total global disability adjusted life years (DALYs) lost. According to national family heath survey, NHFS-3, carried out in 2005-06, 40% of India's children under the age of 23% are under weight, 45% stunted 23% arewasted. Comparable figures for NFHS-2, 98-99 are 43%, 51% and 20% respectively. The proportion of children who are underweight increases rapidly with the child's age.

ETIOLOGY OF PEM

PEM is a disease of multi factorial deprivation. The etiology of malnutrition includes factors such as poor food availability and preparation, recurrent infections, and lack of nutritional education. Each of these is also impacted by political instability and war, lack of sanitation, poor food distribution, economic downturns, health care provision and community.

I. Primary causes

1. Perinatal causes :

All children have the same genetic potential especially in early childhood and their growth is more influenced by nutrition, illness and environment rather than by hereditary. Marasmus is much common in infants than in older children. Low birth weight child requires more energy for catch up growth.

2. Dietary factors:

A) Breast feeding:

- Early cessation of breast feeding
- Continuing breast feeding for long period
- Multiple gestation
- Lactation failure

- Disturbed maternal child relationship
- Poor health of mother.

B) Weaning

- Starting very late
- Ignorance and excessive feeding of carbohydrate diet.

C) Faulty feeding and customs

- Prejudice against colostrums
- Prolonged breast feeding without supplementation.

D) Inadequate food intake

- Under nutrition, over dilute feeds, poor appetite
- Socio-economic factors, congenital anomalies, cleft palate,CHD, mental retardation etc.
- Psychological factors; Anorexia nervosa, depression, childneglect and abuse.

E) Inadequate absorption of food

- Malabsorption syndrome; steatorrhea', giardiasis, cysticfibrosisetc.
- Congenital mega colon. Crohn's disease (defective proteinabsorption).

F) Social factors

- Illiteracy
- Spacing between children more than two years
- Urbanization and industrialization
- Change in food habits

G) Economical factor

- Developing and non-developed countries.
- Low gross net production
- Low per capita income

H) Political factors

- Poor health care delivery system
- Failure in controlling epidemic diseases
- Defects in policy making and preventive strategies

II. Secondary causes

- Infection
- Chronic Vomiting- Achalasia cardia, diaphragmatic hernia
- Congenital diseases
- Serious organic diseases of heart, brain, kidney
- Metabolic diseases-diabetes,galactosaemia, renaltubularacidosis.

Infection as a cause of Malnutrition

- Reduction of intake
- Increased excretion of nitrogen and negative nitrogen balance
- Increased catabolism of protein
- Increased cortisol
- Intra uterine infection causing blood loss
- Gastro enteritis leads to protein losing enteropathy.

Infection as a result of malnutrition

- Malnutrition may increase susceptibility to and severity of infections by destroying cell mediated immunity-Hence child is more prone to tuberculosis, viral diseases~kin and mucosal infection by fungus.
- Reduced humoral immunity- There is slight production of secretary IgA and these produced antibodies are functionally ineffective
- Hence PEM is a result of complex interplay of interacting factors between individual, family and society.
- Cell mediated Immunity- Chronic or severe form of PEM destroys cell- mediated immunity, hence child id prone to tuberculosis, viral disease, skin and mucosal contamination by fungus. This effect may be because of depressed lymphocyte formation subsequent to lack stimulation or high levels of cortisol predisposing to thymo lymphatic depletion.
- Humoral immunity- PEM does not impair antibody production, rather levels, of IgG, IgM are higher than infections.

Patho-physiology

Malnutrition affects virtually every organ system. Dietary protein is needed to provide amino acids for synthesis of body proteins and other compounds that have a variety of functional roles. Energy is essential for all biochemical and physiologic functions in the body. Micronutrients are essential in many metabolic functions in the body as components and cofactors in enzymatic processes. In addition to the impairment of physical growth and of cognitive and other physiologic functions, immune response changes occur early in the course of significant malnutrition in a child. These immune responses changes correlate with poor outcomes and mimic the changes observed in children with acquired immune deficiency syndrome. Changes in immunity predispose children to severe and chronic infections, most commonly infectious diarrhoea, which further compromises nutrition causing anorexia, decreased nutrient absorption, increased metabolic needs and direct nutrient losses. Early studies of malnourished children showed changes in the developing brain, a slowed rate of growth of the brain, lower brain weight, thinner cerebral cortex, and decreased number of neurons, insufficient myelination and changes in the dendritic spine. These changes are similar to those described in patients with mental retardation of different causes. There have not been definite studies to show that these changes are causal rather than coincidental. Some other pathologic changes include fatty degeneration of the liver and heart, atrophy of small bowel and decreased intravascular volume leading to secondary hyper aldosteronism.

STAGE-I PEM

In First stage depletion of stored carbohydrate in the body takes place. Low glucose level stimulates glucagon secretion by pancreas. As a result glycogen is converted to glucose released from the liver. This restore blood glucose level to normal and makes the glucose available for use by body cells, including brain cells.

STAGE-II PEM

The primary energy source for most body cells is fatty acid from lipid stores. As the liver metabolizes the fatty acid, ketone bodies are produced in large quantities and transported to body cells. Even the brain cells use ketone bodies as a source of energy. However since body cells are limited in amount of ketone bodies, they can metabolize, excess ketone bodies appear in the blood, resulting in the condition called ketosis. This in turn leads to metabolic acidosis. Metabolic

acidosis results in depression of CNS that may lead to ketosis. Metabolic acidosis are frequently associated with crush dieting, low carbohydrate diet, high protein diets and other foods. During early stage of starvation large quantities of muscle protein not essential to cellular functioning are broken down to amino acid. These in turn are converted by liver in to glucose. Although this glucose is used to maintain a fairly normal blood sugar level, muscles and other tissues use ketone bodies as a source of energy. The length of second stage of starvation is primarily determined by the amount of stored fat in the body.

STAGE-III PEM

When reserved fat is depleted, third stage of pathology occurs. During this time, even the proteins needed to maintain cellular function are broken down as a source of energy. It is estimated that once stored proteins are depleted to about V2 of their normal level, death results. Virtually every organ of the body can undergo structural and functional changes in response to under nutrition. The most obvious change is a loss of body weight.

Long Term Effects of PEM on Growth

Growth retardation is the most common feature of PEM, evidenced by weight loss, wasting and stunting. Catch up growth in weight is almost always satisfactory with intervention but the catch up in height tends to fall short of well-nourished controls. Continuing malnutrition and late intervention are responsible for permanent stunting of growth. The head circumference also continues to remain reduced.

Diagnostic criteria for Malnutrition

The frequency of under nutrition cannot be easily estimated by the prevalence of commonly recognized clinical syndrome of malnutrition such as marasmus and Kwashiorkor. Because nutritional marasmus and kwashiorkor are extreme form of malnutrition. In clinical practice such extreme account only for a small proportion of malnutrition. Reliable anthropometric norms are not easily available in most developing countries. Only the data provided by national Centre for health statistics and the Centre for disease control (CDC) USA are currently accepted international standard for diagnosis.

Classification of Malnutrition

A large number of classification have been proposed for measuring malnutrition by different criteria. Protein energy malnutrition is a generalized syndrome complex and it is very difficult to classify it by using a single parameter.

1. Syndromal Classification
2. IAP Classification
3. Wellcome Trust Classification
4. Gomez Classification
5. D.B. Jellife's Classification

1. Syndromal Classification

a. Kwashiorkor

b. Nutritional Marasmus

c. Marasmic Kwashiorkor

d. PreKwashiorkor

e. Nutritional Dwarfing f. Under-weight

g. Invisible PEM

2. IAP Classification

Grade I - 70-80% of expected weight Grade II - 60-70% of expected weight Grade III - 50-60% of expected weight Grade IV - < 50% of expected weight

3. Wellcome trust Classification

Percentage of expected weight (Harvard standard)Edema present, No edema

4. Gomez Classification

Grade I - 90-75% of expected weight Grade II - 75-60% of expected weightGrade III - <60% of expected weight

5. D. B. Jellife's Classification

Grade I - 81-90% of expected weight Grade II - 71-80% of expected weight Grade III - 61-70% of expected weight Grade IV - <61% of expected weight

GROWTH STUDIES AND PERCENTILES.

Cross sectional study

This is very convenient, easy, less time consuming, a economical method to study growth, for example- Children of each age group in large number are collected, their weight are recorded and an average is found out. These groups of children are studied just once.

Concept of Percentiles

While expressing the growth, the term percentile is often used. This may be explained in a simple way, for example the height of 100 one year old normal children is not exactly the same, they are arranged in such a way that the shortest is number one and the tallest is number 100, and the shortest is number one and the tallest is number 100, and the mean of each number is worked out. The child at number one is one percentile, the number 10th is 10th percentile, and number 50th is 50th percentile and so on.

Charts are available from 3rd to 97th percentiles and this is considered as the acceptable range for normal. The percentile curves indicate the percentage of children at a given age on the X- axis whose measured value falls below the corresponding value on Y-axis. By definition 50th percentile is the median.

The data presented in 5 charts.

- Weight for age
- Height for age
- Head circumference for age
- Weight for height
- BMI for age

Separate Charts are provided for boys and girls.

GROWTH DURING PRE-SCHOOL YEARS

During the third, fourth and fifth year of life, gains in weight and height are relatively steady at approximately 2kg and 5-6cm per year, respectively. Most children are lean relatively to their earlier body configuration. By 3years most children can state their ages and whether they are boys or girls. The increasing awareness that they are becoming larger children and adults, children in the later preschool period begin to seek adequate models by which to learn and play their future roles. Parents and other member of family are a role model for their children.

GROWTH DURING EARLY SCHOOL YEARS

The early school years are a period of relatively steady growth beginning by about the age of 6 years and ending in a preadolescent growth apart by about the age of 10 in girls and about 12 in boys. The average gain in weight during these years is about 3 to 3.5kg per year, and that in height approximately 6cm per year. Growth in head circumference is much slower than earlier, the circumference increasing form about 51cm to 53cm between the ages of 5 and 12 years. At the end of this period the brain has reached virtually adult size.

PREVALENCE

The world health organization estimates that by the year 2015, the prevalence of malnutrition will be decreased up to 17.6% globally, with 113.4 million children younger than 5 years affected as measured by low weight for age. The overwhelming majority of these children, 112.8 million, will live in developing countries with 70% of these children in Asia, particularly the south central region, and 26% in Africa. An additional 165 million (29.0%) children will have stunted length/height secondary to poor nutrition. Currently, more than half of young children in south Asia have PEM, which is 6.5 times the prevalence in the western hemisphere. In sub Saharan Africa, 30% of children have PEM.

Mortality /Morbidity:

It is directly responsible for death up to 300,000 per year in children of age younger than 5 years in developing countries and contributes indirectly to over half the deaths in childhood worldwide.

Management of Malnutrition

The Management of malnutrition depends on its severity. While mild to moderate malnutrition can be managed on ambulatory basis, severe malnutrition is preferably managed in

hospital.

Mild and Moderate malnutrition:

It makes up the greatest proportion of malnourished children and >80% of malnutrition associated death occur in such children. It is therefore, vital to intervene in children with mild to moderate malnutrition at community level before they develop malnutrition.

The mainstay of treatment is provision of adequate amounts of protein and energy. It is being recognized increasingly that a relatively small increase over normal protein requirements is sufficient for rapid catch-up growth 3g/day protein is sufficient. Milk is the most frequent source of protein used in therapeutic diets, though other sources including vegetable protein source and nonvegetarian source are used. The best measure of the efficacy of treatment of mild and moderate malnutrition is weight gain.

Severe Malnutrition:

Children with severe malnutrition undergo physiologic and metabolic changes to preserve essential process, which includes in reduction of functional capacity of organs and slowing of cellularactivities.

Principles of treatment are:

Careful surveillance and prompt remedial, action and bytreating primary cause to avoid complications.

a) Initiation of feeding by all available means available locallyand culturally.

b) To prevent further relapse by regular follow up.

Nutritional status and identification of the underlying aetiology of malnutrition, collaboration with dietician or other nutritional professionals should be initiated.

REVIEW OF MODERN LITERATURE

Globally, hunger and malnutrition are two of the most significant challenges. Globally, malnutrition is a risk factor for illness and death, with millions of pregnant women and young children being affected due to infections, poor and inadequate diet. Malnutrition increases the risk and worsens the severity of infections. Infants and young children are most affected by malnutrition as they have increased nutritional needs to support growth.

Malnutrition refers to the situation where there is an unbalanced diet in which some nutrients are in excess, lacking or wronqproportion. Undernourished children, as well as children with severe malnutrition, have higher risk of dying. Malnutrition is frequently part of a vicious cycle that includes poverty and disease, inadequate parenting, discrimination, violence, poor housing and poor education.' These factors are interlinked in such a way that each contributes to the presenceand permanence of others.

One of the major causes for malnutrition in India is gender inequality. Due to the low social status of Indian women, their diet often lacks in both quality and quantity. Women who suffer malnutrition are less likely to have healthy babies. In India, mothers generally lack proper knowledge in feeding children. They do not breast-feed their children or feed them poorly. Consequently, new born infants are unable to get adequate amount of nutrition from their mothers.

Deficiencies in nutrition inflict long-term damage to both individuals and society. Compared with their better-fed peers, nutrition- deficient individuals are more likely to have infectious diseases such as pneumonia and tuberculosis, which lead to a higher mortality rate. In addition, nutrition-deficient individuals are less productive eat work. Low productivity not only gives them low Pay that traps than in a vicious circle of under-nutrition, but also brings inefficiency to the society, especially in India where labor is a major input factor for economic production. On the other hand, over nutrition also has severe consequences. Subodh varma, writing in The Times of India, states that on the Global Hunger Index India is on place 67 among the 80 nations having the worst hunger situation which is worse than nations such as North Korea or Sudan. 25% of all hungry people worldwide live in India. Since 1990 there have been some improvements for children but the proportion of hungry in the population has increased. In India 44% of children under the age of 5 are underweight. 72% of infants and 52% of married women have anemia. Research has conclusively shown that malnutrition during pregnancy causes the child to have increased risk offuture diseases, physical retardation, and reduced cognitive abilities.

CLASSIFICATION

Deficiency of a single nutrient is an example of under nutrition or malnutrition, but deficiency of a single nutrient usually accompanied by a deficiency of several nutrients. PEM is manifested primarily by inadequate dietary intakes of protein and energy. PEM is almost accompanied by deficiencies of other nutrients. Historically, the most severe forms of malnutrition, marasmus and kwashiorkor were considered distinct disorder. 2 Some of the risk factors and clinical features of

the two severe forms of PEM may be similar, but the main feature of marasmus is non edematous with severe wasting and kwashiorkor is edematous malnutrition. Children with PEM can have different symptoms depending on what caused the malnutrition. Severe

PEM includes deficiencies of protein, energy or both, resulting in kwashiorkor, marasmus and marasmic kwashtorkor, primary PEM is caused by an inadequate food intake that may be the result of a variety of factors. Diseases cause secondary PEM through low food intake, decreased absorption and usage of nutrients, increased requirements and increased losses. Failure to achieve normal growth is sensitive indicator of ma I nutrition. Anthropometry is used to assess nutritional status and growth retardation and to differentiate between acute or chronic malnutrition. The clinical findings and biochemical criteria are not effective to use for classification if the disease is not advanced.

The three combination of anthropometric measurements that are usually used to categorize malnutrition are, low weight-for-age, an indicator for underweight; low height-for-age, an indicator for stunting;and low weight-for-height, an indicator of wasting.

KWASHIORKOR

It was first described more than 70 years ago in 1933. Where kwashiorkor means, an "evil spirit that affects the first child when the second is born". It occurs form early infancy to 5 years of age. It is most commonly seen in the second year of life. When the second child is born, the first is weaned so that the second can be breastfed. All systems and functions are affected in kwashiorkor. It is difficult to determine which factors are major contributors and which are responses. In combination with weight loss, edema has been accepted as the main criteria to identify kwashiorkor. Growth retardation, skin changes (lesions), abnormal hair, swollen belly, lack of growth, lack of stamina, loss of muscle tissue, vomiting, diarrhea, hepatomegaly and children have a well-nourished appearance with some retention of body fat and even though some tissue wastage and weight loss is present, it may be over

shadowed by the oedema. The edema begins in the feet and legs and then spread to the hands, face and body. The children are apathetic, have little interest in surroundings. Changes should be identified in the early stagesonly and treated accordingly.

MARASMUS

It is the commonest type of severe PEM that occurs in preschool children and results in growth retardation and muscle wasting without edema. Marasmus is characterized by failure of

linear growth (stunting), loss of weight (wasting) and loss of subcutaneous fat leads to old man appearance." Marasmus is linked to severe deprivation or impaired absorption of protein, energy, vitamins and minerals. Anthropometrically, marasmus is seen as a weight-for-age below 60% of the expected weight for age. Mortality in these children is relatively low if there is no underlying illness or infections.

MARASMIC KWASHIORKOR

Pure conditions of marasmus and kwashiorkor are uncommon as there are many cases which are not purely one or the other, but present rather with signs of both. This can be due to changes in diets and seasons. The term Marasmic kwashiorkor therefore is used to describe the wasted form of PEM. The child is said to have this condition when all of the following features are present; weight-forage less than 60%, edema, marked wasting and stunting, anemia, mental pathy. Wasting is more obvious in upper part of the body and edema in the lower part of body.

UNDERWEIGHT

The child is malnourished, but does not have any features of marasmus or kwashiorkor. The weight for age is 61-80% of expected.

The underweight child is common and an important presentation of PEM, which is missed a lot of times. When a diet is inadequate, poor absorption then there will be a slowing down of linear growth, failure to gain weight or weight loss and this is seen when the child is exposed to an acute food shortage.

Childhood malnutrition is an under lying cause in an estimated

35% of all deaths among children under five and 11% of total global disability adjusted life years (DALYs) lost. According to national family heath survey, NHFS-3, carried out in 2005-06, 40% of India's children under the age of 23% are under weight, 45% stunted 23% arewasted. Comparable figures for NFHS-2, 98-99 are 43%, 51% and 20% respectively. The proportion of children who are underweight increases rapidly with the child's age.

ETIOLOGY OF PEM

PEM is a disease of multi factorial deprivation. The etiology of malnutrition includes factors such as poor food availability and preparation, recurrent infections, and lack of nutritional education. Each of these is also impacted by political instability and war, lack of sanitation, poor

food distribution, economic downturns, health care provision and community.

III. Primary causes

1. Perinatal causes :

All children have the same genetic potential especially in early childhood and their growth is more influenced by nutrition, illness and environment rather than by hereditary. Marasmus is much common in infants than in older children. Low birth weight child requires more energy for catch up growth.

2. Dietary factors:

A) Breast feeding:

- Early cessation of breast feeding
- Continuing breast feeding for long period
- Multiple gestation
- Lactation failure
- Disturbed maternal child relationship
- Poor health of mother.

B) Weaning

- Starting very late
- Ignorance and excessive feeding of carbohydrate diet.

C) Faulty feeding and customs

- Prejudice against colostrums
- Prolonged breast feeding without supplementation.

D) Inadequate food intake

- Under nutrition, over dilute feeds, poor appetite
- Socio-economic factors, congenital anomalies, cleft palate,CHD, mental retardation etc.
- Psychological factors; Anorexia nervosa, depression, childneglect and abuse.

E) Inadequate absorption of food

- Malabsorption syndrome; steatorrhea', giardiasis, cysticfibrosisetc.
- Congenital mega colon. Crohn's disease (defective proteinabsorption).

F) Social factors

- Illiteracy
- Spacing between children more than two years
- Urbanization and industrialization
- Change in food habits

G) Economical factor

- Developing and non-developed countries.
- Low gross net production
- Low per capita income

H) Political factors

- Poor health care delivery system
- Failure in controlling epidemic diseases
- Defects in policy making and preventive strategies

IV. Secondary causes

- Infection
- Chronic Vomiting- Achalasia cardia, diaphragmatic hernia
- Congenital diseases
- Serious organic diseases of heart, brain, kidney
- Metabolic diseases- diabetes, galactosaemia, renal tubularacidosis.

Infection as a cause of Malnutrition

- Reduction of intake
- Increased excretion of nitrogen and negative nitrogen balance
- Increased catabolism of protein
- Increased cortisol
- Intra uterine infection causing blood loss
- Gastro enteritis leads to protein losing enteropathy.

Infection as a result of malnutrition

- Malnutrition may increase susceptibility to and severity of infections by destroying cell mediated immunity-Hence child is more prone to tuberculosis, viral diseases~kin and mucosal infection by fungus.
- Reduced humoral immunity- There is slight production of secretary IgA and these produced antibodies are functionally ineffective
- Hence PEM is a result of complex interplay of interacting factors between individual, family and society.
- Cell mediated Immunity- Chronic or severe form of PEM destroys cell- mediated immunity, hence child id prone to tuberculosis, viral disease, skin and mucosal contamination by fungus. This effect may be because of depressed lymphocyte formation subsequent to lack stimulation or high levels of cortisol predisposing to thymo lymphatic depletion.
- Humoral immunity- PEM does not impair antibody production, rather levels, of IgG, IgM are higher than infections.

Patho-physiology

Malnutrition affects virtually every organ system. Dietary protein is needed to provide amino acids for synthesis of body proteins and other compounds that have a variety of functional roles. Energy is essential for all biochemical and physiologic functions in the body. Micronutrients are essential in many metabolic functions in the body as components and cofactors in enzymatic processes. In addition to the impairment of physical growth and of cognitive and other physiologic functions, immune response changes occur early in the course of significant malnutrition in a child. These immune responses changes correlate with poor outcomes and mimic the changes observed in children with acquired immune deficiency syndrome. Changes in immunity predispose children to severe and chronic infections, most commonly infectious diarrhoea, which further compromises nutrition causing anorexia, decreased nutrient absorption, increased metabolic needs and direct nutrient losses. Early studies of malnourished children showed changes in the developing brain, a slowed rate of growth of the brain, lower brain weight, thinner cerebral cortex, and decreased number of neurons, insufficient myelination and changes in the dendritic spine. These changes are similar to those described in patients with mental retardation of different causes. There have not been definite studies to show that these changes are causal rather than coincidental. Some other pathologic changes include fatty degeneration of the liver and heart, atrophy of small bowel and decreased intravascular volume leading to secondary hyper aldosteronism.

STAGE-I PEM

In First stage depletion of stored carbohydrate in the body takes place. Low glucose level stimulates glucagon secretion by pancreas. As a result glycogen is converted to glucose released from the liver. This restore blood glucose level to normal and makes the glucose available for use by body cells, including brain cells.

STAGE-II PEM

The primary energy source for most body cells is fatty acid from lipid stores. As the liver metabolizes the fatty acid, ketone bodies are produced in large quantities and transported to body cells. Even the brain cells use ketone bodies as a source of energy. However since body cells are limited in amount of ketone bodies, they can metabolize, excess ketone bodies appear in the blood, resulting in the condition called ketosis. This in turn leads to metabolic acidosis. Metabolic acidosis results in depression of CNS that may lead to ketosis. Metabolic acidosis are frequently associated with crush dieting, low carbohydrate diet, high protein diets and other foods. During early stage of starvation large quantities of muscle protein not essential to cellular functioning are broken down to amino acid. These in turn are converted by liver in to glucose. Although this glucose is used to maintain a fairly normal blood sugar level, muscles and other tissues use ketone bodies as a source of energy. The length of second stage of starvation is primarily determined by the amount of stored fat in the body.

STAGE-III PEM

When reserved fat is depleted, third stage of pathology occurs. During this time, even the proteins needed to maintain cellular function are broken down as a source of energy. It is estimated that once stored proteins are depleted to about V2 of their normal level, death results. Virtually every organ of the body can undergo structural and functional changes in response to under nutrition. The most obvious change is a loss of body weight.

Long Term Effects of PEM on Growth

Growth retardation is the most common feature of PEM, evidenced by weight loss, wasting and stunting. Catch up growth in weight is almost always satisfactory with intervention but the catch up in height tends to fall short of well-nourished controls. Continuing malnutrition and late intervention are responsible for permanent stunting of growth. The head circumference also continues to remain reduced.

Diagnostic criteria for Malnutrition

The frequency of under nutrition cannot be easily estimated by the prevalence of commonly recognized clinical syndrome of malnutrition such as marasmus and Kwashiorkor. Because nutritional marasmus and kwashiorkor are extreme form of malnutrition. In clinical practice such extreme account only for a small proportion of malnutrition. Reliable anthropometric norms are not easily available in most developing countries. Only the data provided by national Centre for health statistics and the Centre for disease control (CDC) USA are currently accepted international standard for diagnosis.

Classification of Malnutrition

A large number of classification have been proposed for measuring malnutrition by different criteria. Protein energy malnutrition is a generalized syndrome complex and it is very difficult to classify it by using a single parameter.

1. Syndromal Classification
2. IAP Classification
3. Wellcome Trust Classification
4. Gomez Classification
5. D.B. Jellife's Classification

6. Syndromal Classification

a. Kwashiorkor

b. Nutritional Marasmus

c. Marasmic Kwashiorkor

d. PreKwashiorkor

e. Nutritional Dwarfing f. Under-weight

g. Invisible PEM

7. IAP Classification

Grade I - 70-80% of expected weight Grade II - 60-70% of

expected weight Grade III - 50-60% of expected weightGrade IV -

< 50% of expected weight

8. Wellcome trust Classification

Percentage of expected weight (Harvard standard)Edema present, No edema

9. Gomez Classification

Grade I - 90-75% of expected weight Grade II - 75-60% of

expected weightGrade III - <60% of expected weight

10. D. B. Jellife's Classification

Grade I - 81-90% of expected weight Grade II - 71-80% of

expected weight Grade III - 61-70% of expected weightGrade IV -

<61% of expected weight

GROWTH STUDIES AND PERCENTILES.

Cross sectional study

This is very convenient, easy, less time consuming, a economical method to study growth, for example- Children of each age group in large number are collected, their weight are recorded and an average is found out. These groups of children are studied just once.

Concept of Percentiles

While expressing the growth, the term percentile is often used. This may be explained in a simple way, for example the height of 100 one year old normal children is not exactly the same, they are arranged in such a way that the shortest is number one and the tallest is number 100, and the shortest is number one and the tallest is number 100, and the mean of each number is worked out. The child at number one is one percentile, the number 10th is 10th percentile, and number 50th is 50th percentile and so on.

Charts are available from 3rd to 97th percentiles and this is considered as the acceptable range for normal. The percentile curves indicate the percentage of children at a given age on the X-axis whose measured value falls below the corresponding value on Y-axis. By definition 50th percentile is the median.

The data presented in 5 charts.

- Weight for age
- Height for age
- Head circumference for age
- Weight for height
- BMI for age

Separate Charts are provided for boys and girls.

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DRUG REVIEW

Introduction:

Prime tool of a physician to cure the illness is nothing but oushadha (drug-dravya). *Ayurveda* being science of life considers oushadha as one of the four-fold constituent of chikitsa chatushpada. It is most important and essential tool of an ideal treatment in maintaining health. It has got special place in chikitsa chatushpada after the physician; though physician occupies most important position amongst four, but he becomes handicap without proper drug. The drug is rich in pharmacological activities, which could be made into various kind of medicaments, having specific therapeutic action and available in plenty are praised by acharya's of ayurvedic science. Charaka has elaborated first four chapters as 'bheshaja chatushka' thus describing the importance of bheshaja. But for the success in the cure, the yukti which is based on mantra and kala is essential along with the knowledge of druqs. charaka has described four characteristics of drug namely Abundance (bahuta), potency to alleviate the disease (yogtatva), multiple forms of drug (anek vidh kalpana) and presence of allnatural characteristic.

The term 'Drug' is derived from a French word 'Drogue' meaning a 'Dry Herb' WHO defines the drug as A substance or product that is used or intended to be used to modify or to explore the physiological system or pathological status for the benefit of the recipient. This definition is more suitable as for the view of *Ayurveda* is concerned. Because it gives enough attention to the mitigation of diseases as well as prevention of good health. It is fact that the drug covers the wide range of area. It is not only concerned with mankind, but it is also concerned with all living bodies. acharya charaka says that the best medicine is one which relieves the patient from his suffering.

The medicinal drug prescribed for specific disorder must have panch-bhautika properties because our bodies made up of pancha mahabhutas. It is our basic principle that every drug in creation must have a pancha-bhautika combination. But it should be implied in a proper way and in

adequate doses and duration considering the whole body as a single unit. “Nothing in the world exist which does not have therapeutic utility”. This Statement has given some single as well as compound drug for the cure of various diseases.” So there are many single or compound drugs given in our classics for disease *karshya*. As *Bala Ashwagandha granules* is an oral therapy and it can be taken safely at home without the necessity of coming to hospital everyday.

The world's oldest Pharmacological therapeutic writing come from India and China. Description of various drugs are available right from the Vedic period. *Ayurveda* was the first to give an elaborate description of various therapeutic measures calculated aim at not merely of radical removal of causative factors but also at the restoration of doshika equilibrium. Many of the single and compound form of drugs has been advocated in the vast literature of *Ayurveda* for *Brihan*a effect and especially for disease *karshya*. It means disease is cause of troubles and medicine is cause of pleasures, the same medicine properly used in appropriate quantity becomes nectar otherwise becomes like a poison.

SELECTION OF DRUG

The selection of proper drug which has the capacity to breakdown and check the samprapti process is an essential part in planning the management of any patient. After selection of topic, a detailed survey of literature was made to select drug formulation acting on worms as whole or as particular.

In *Ayurveda* there are many *Brihan*a therapy and dravya has been explained in different texts, many studies have been conducted by taking single drug compound and combination of drugs. The selection of drugswas based upon the not only *Brihan*a but overall effect of dravya.

In *Bala Ashwagandha granules* drugs which are having *Madhura* rasa with *Madhura* vipaka, which are vata shamaka, srotoshodhaka property which helps in clearing the channels, drugs having guru, sheeta, snigdha and mridu guna were taken. rasayana property, vrishya and jeevaniya property drugs were selected and combination of all drugs was made to form *Bala Ashwagandha granules*. Our body is made of panchamahabhuta, so the medicinal drugs which are having properties of panchamahabhuta should be prescribed for specific disorder. it is our basic concept that every drug must have a pancha bhautika combination. It should be implied in a proper doses and in adequate way and doses considering thewhole body as a single unit.

Keeping this in mind, for present study the drugs that have been selected from bhavprakash sarnhlta are as follows,

1) Bala

2) Ashwagandha

The combination of these drugs was taken separately according to their balya and *Brihan*a properties and by following sharangdhara kashaya kalpana Granules where made to make it more palatable to children. The particular details of individual drugs used in thisformulation are given below.

Sr. No.	Dravya	Latinname	Rasa	Virya	Vipaka	Guna
1	Bala[24]	Sida cordifolia linn	*Madhur*	*Sheet a*	*Madhura*	Laghu, picchil, snigdh a
2.	*Ashwagandha*	Withania somnifera Linn	*Madhura* , tikta,kashay	*ushn*	*Madhura*	Guru, snigdha

BALA

Botanical name: Sida cordifolia

Family: malvaceae

Classical names: Varahakarni, Balada,Varada.

Vernacular names:

English - Country MallowHindi - *Bala*

Marathi - Chikana

Chemical Composition:

Ephedrine, sterculic acid, malvalic and coronaric acld, pseudoephedrine, fatty acid, saponine hypaphorine, ecdysterone, indolealkaloids, palmitic acid, stearic acid and ole beta sitosterol.

Botanical description:

Sida cordifolia is perennial herb that grows 30 mts in hight. Bala leaves are oblong or ivale and are 2.5 to 7 cm long and 2.5 - 5 cm boart with 6-7 veins. Bala leaves are sarrate truncate, heart shaped. Plant bears small, solitary axillary and white or yellow colored flowers both Bala roots and stems are stout and strong. Bala roots are bitter in taste, odorless and yellowish in color. Tap roots are generally branched at the tip. Bala fruits are moons sized, disc shaped nad velvety in upper half about 6-8mm in diameter, bala seeds are smoth grayish back and are bajibandda in *Ayurveda*, flowering season of plant is August to December and and fruits appears for October to january

Distribution: Found through out in parts of India.

Parts used: Root, seed, leaves.

Action and uses:

Bala helps to control the symptoms of respiratory system problems like cough cold. Those is because it helps to balance kaph and expel out the mucus from the lungs, it also helps to increase immunity due to its Rasayan property.

Pharmacodynamics;

Rasa	*Madhura*
Guna	Laghu, Snigdha, picchil.
Virya	Shit
Vipaka	Madhur
Doshaghanta	Vatashamak, pittashamak
Rogaghnata	Daurbalya, Pitaai Rajyakshma, Prameh

Karma Balya, *Brihan*, Rasayan, Prajasthapan.

Dose - 3-6gm with milk

Pharmacognosy:

The roots of Bala is ascribed with cooling, astringent, stomachic, and tonic properties and used for nervous and urinay disorder. Leaves are considered usefull in ophthalmia and seeds for gonorrhoe.

Pharmacological activities:

Analgesic, Antiinflammatory, Hypoglycemic Activities.

2) Ashwagandha

Botanical Name: Withania somnifera

Kula: *Kantakari Kula*

Family: *Solanaceae*

Gana: Balya, Bruhaniya, Madhurskandha,, , .

Classical Name: Warahakarni,Wajigandha, Gandhata, Warha, Kushthgandhini, Wanya .

Chemical Composition:

The biologically active chemical constituents of Withania somnifera include **alkaloids (isopelletierine, anaferine, cuseohygrine, anahygrine, etc.), steroidal lactones (withanolides, withaferins) and saponins** Sitoindosides and acylsterylglucosides in Ashwagandha are anti-stress agents.

Dose: Dried powder of tuber 2 to 3gm with milk.

Pharmacodynamics:

Rasa- *Madhura, Tikta,Kashay*

Guna- Guru, Snigdha,

Virya- Ushna

Vipaka- *Madhura*

Doshaghanta- Vata kafaghn

Rogaghnata- shothhar, Vednasthapan Daurbalya,

Pharmacological properties:

It is unctuous, anabolic, nutritive, carminative, cardio tonic, hemostatic, demulcent, diuretic, complexion enhancer and rejuvenator. Hence it is used to reduce intestinal dryness, in hepato-splenomeghaly, cardio debility, bleeding disorder, hoarseness of voice, cough, dysuria and phthisis.

SHARKARA:

It is a type of Ikshu Vikara.

1. **Botanical Name:**

   Saccharum officinarum Linn.

2. **Family:**

   Graminae

3. **Classical Names:**

   Sita, Khanda, Matsyandika

4. **Regional Names:**

   Hindi: Shakkara

   Marathi: Sakhara.

   English: sugar.

5. **Gana:**

   Sushruta - Trinapanchamoola.

6. **Actions and Uses:**

Preservative, demulcent, antiseptic cooling, laxative, rapid innocent stimulant and diuretic. It acts as food and nutrient to adipose tissue. Hence sugar or sugar forming food is necessary for heath; absence of it leads to rapid emaciation. It produces heat and energy. It is used in catarrhs, as a vehicle to nauseous medicines, to preserve foods. It protects active ingredients from fermentation

and certain iron preparations from oxidation.

7. Pharmacodynamics:

a) Rasa: *Madhura*.

b) Veerya: Sheeta.

c) Vipaka: *Madhura*.

d) Guna: Snigdha, Guru.

e) Doshaghnata: Vata-Pittahara.

f) Rogaghnata: Pitta Vikara, Rakta Vikara, Daha, Murcha, Vamana, Jwara.

g) Karma: Balya, *Brihana*, Vrushya, Avidahi, kaphaprada.

8. Chemical constituents:

Carbohydrates, Vitamin B complex, Calcium, Magnesium, Iron, Potassium, Zinc, Sodium.

ANUPAN:

Benefits of Anupana:[29]

यथा तैलं जलेक्षिप्तं क्षणेनैवप्रसत /
अनुपन बल दडोत थासपति भेषजं //

शा.सं.म.6/5

Acharya Sharangdhara before explaining the benefit of using, anupana or vehicle. Mentioned a beautiful sholka and then explained the benefit of it. He says that just as a drop of oil spreads fast on water surface, the drug that is taken with anupana spreads fast within the body. Anupana facilitates absorption, assimilation and efficacy of drug. Anupana is a substance, which does not affect the basic constitution and properties of the drug, but enhance its action. Anupana is selected on the basis of type of drug, way of administration, and patient's condition, as well as condition of disease and dosha.

Dugdha

Ksheera is a normal product of mammary gland secretions. It is the primary source of nutrition for newborns before they are able to digest other types of food. But after specific period mother milk is replaced by other milk received from different species. After mothers milk the best milk for child is cow's milk. It is preferable after one year of age. The nutritional value of milk as a whole is greater than the value of its individual because of its unique nutritional value, for families whorarely or never eat meat, milk and milk product may represent importantsource of protein.

Go-Dugdha

It is a Janghama Dravya described as ekantahita Dravya used in Pana, Anupana, Nasya, Alepa, Abhyanga, Vamana, Ashtapana,

Virechana, Snehana and Shodhana etc. It is an important dietary sources of calcium, Vit.D, Vit.A, Vit.b12, and other micronutrients. In fact, studies suggest that milk consumption can play a crucial role in maintaining calcium levels and vitamin D and protein and calcium in cow's milk contribute to better overall nutrition and bone health.

Composition of Cow's Milk

Nutrient	**Kcal/G**
Water	88.0
Energy, Kcal	61.0
Protein, g	3.2
Fat,	9 3.4
Lactose, g	4.7
Minerals, g	0.72 (Ca,P,mg,K,Na,Zn,CO,Fe,Cu, Sulphates, Bicarbonates)
Acid	0.18% (Citrates, formats, acetate, lactate, oxalate)
	Enzymes peroxidase, catalex, phosphatase, lipase.

Gases	Oxygen, nitrogen
Vitamins	A, C, D, B1 (thiamine), B2 (riboflavin), others.

According to *Ayurveda* go-dugdha, is more superior to other mammal milk. as it possesses the properties like *Madhura*m, jivaniyam, prinanam, rasayanam, *Brihan*am, vrishyam, medya, balya, dipanaiya, shonita pitta haram, shreshtham etc.

Rasa-	*Madhura*
Guna-	Guru, Snigdha
Virya-	Sheeta
Vipaka-	*Madhura*
Doshaghanta-	Vata-pitta Shamaka
Karma-	Balya, *Brihan*a, Rasayana, sandhanakara, Ashtapana, medhya, Oja-Vardhak, Jeevaniya, vaya-sthapana.
Rogaghnata-	Kshata Kshaya, Shwasa, Kasa, Pandu, Daha, Jwara, Mutraroga.

Comparison of qualities of cow milk with ojas qualities

Qualities of cowmilk	Qualities ofOjas
Guru	Guru
Sheeta	Sheeta
Mridu	Mridu
Shlakshana	Shlakshana
Bahala	Bahala
Swadu	Swadu
Manda	Manda
Prasanna	Prasanna
Snigdha	Snigdha

PREVIOUS WORK DONE

- Anabolic effect of certain ayurvedic drugs in infancy andchildhood. shashtri krishna (1983).
- *Brihan*a effect of certain ayurvedic drug compound in underweight children-jamnagar (1985).
- A study of nutritional status in children based on ayurvedicconcept. surendra sharma (1986).
- *Brihan*a effect of certain indigenous drug in pediatric practicejamnagar (1987).
- A comparative study on *Brihan*a effect of ashwagandha granules and ashwagandha siddha kshira basti in krisha children (1999).
- A study on the effect of an indigenous drug compound in underweight children-hassan (2002-03).
- Clinical study on underweight children & their management with withania somnifera- puri (2004).
- A study on the effect of an indigenous drug compound in underweight children, r.g.u.h.s bangalore (2005).
- A clinical study on the effect of the *Vidari Churna* in balakrushata w.s.r. to underweight children (2013).
- To study the efficacy the efficacy of shatavaryadi *Churna* in management in *Balkarshya* w.s.r. to under – weight children (2018)

Materials & Methods

Materials:

1) Drugs
2) Patients

Methods:

1) Drug preparation method
2) Collection of data

Preparation of *Churna*:

The classical method of preparation of *Churna* has been explained in *Sharangdhara Samhita madhyama khanda* in 6th *adhyaya*.

***Churna Kalpana*:**

Definition:

अत्यन्तंषुष्कं यद द्रव्यं सुपिष्टं वस्त्रालितम् /

तस्य चूर्ण रज क्षोद तन्मात्रा कोल्सन्मितं //

शा .सं .म .6/1

By crushing the extremely dried material to convert it into fine powder form and filter through clothes is called as *Churna*.

Synonyms: *Churna*, Raja, Kshoda.

Types of *Churna*:

1. Types according to fineness of *Churna*: It is measured in terms of number of holes per square centimeter.

*i)*Sthul *Churna*

ii) Pruthu *Churna*

iii) Pata *Churna*

iv) Suskhmatara *Churna*

v) Sukshmatama Churna

2. Types according to its ingredients

i)*Ekeri Churna- Churna* of single drug.

ii) *Mishra Churna*- Mixing the different single drugs.

DOSE OF *Bala Ashwagandha granules*:[32]

Matra will be given as per age of the child. child

बालस्यप्रथमेमासिदेयाभेषजरक्तिका ।

अवलेहीकृतैकैव क्षीरक्षौद्रसिताघृतैः ॥

वर्धयेतावदेकैकांयावभ्दवतिवत्सरः ।

माषैः वृध्दिः तद्ऊर्ध्वस्यात्यावत् षोडशवत्सर //

मात्रयकल्कचूर्णानांकषायस्यचतुर्गुणा

शा.सं. पू

I. e. for 2 year dose= 2.5gm, 3 years= 3.5gm and so on.

Drug:

1) Requirement of Drugs:

1) For the preparation of *Bala Ashwagandha granules*, *Bala Churna* , *Ashwagandha churn* are required.

2) *Anupana dravya dugdha* (cow's milk)

3) These Drugs are obtained from a drug store.

2) Authentification:

The above said drugs obtained in the crude form, were authentificated prior to the use by the renowned university.

3) Standardization:

The final product prepared from these drugs was standardized from renowned Pharmacy.

Method of preparation of *Bala Ashwagandha granules* in granules form

was prepared by the classical method of *Churna* as explained in *Sharangdhara Samhita Madhyama Khanda* in 6th *Adhyaya*.

Method of Preparation

- The granules of *Bala Ashwagandha granules* were Prepared in Rasashala of our *Ayurveda* Institute.
- Standardized raw material was taken in same quantity of eachdrug.
- All drugs were mixed together in a large container with water inthe ratio of 1:16[33]
- Then it was boiled and reduced up to 1/4th volume of totalmixture in a container.
- Then the amount remained was filtered through cotton cloth and purified form of kashaya was taken for further procedure.
- Then 1/2 litre of kashaya and 1.5kg sugar was taken stirred together on mandagni till

formation of granules.

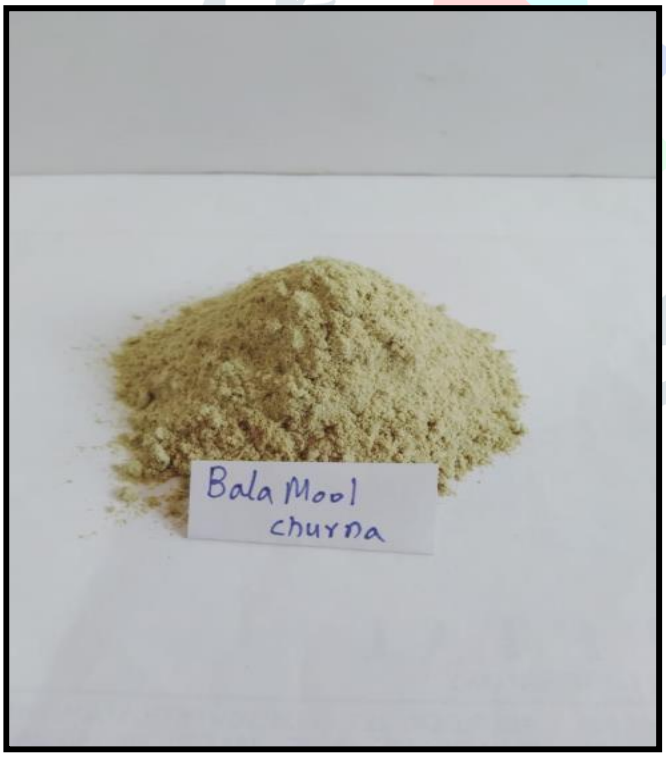
- Hot granules were cooled down to room temperature and then packed in a clean and fumigated container.
- Under all aseptic precaution preparation of granules was done.
- The formation of granules was done to make drug more palatable as the drug was administered to children.

Description of physical test of *Baladi* Cilurna (Granules)

Appearance: Yellow is color crystal granules,odour sweet, test bitter & sweet.

Saviryata Kala of *Bala Ashwagandha granules*[34]

1 year.



Patients

Sample size: 40 Patients.

Source of patients:

Patients were selected from the OPD of *Kaumarbhritya*.

Plan of study:

Selection of patients:

Open randomized controlled trial design was studied. Patients with the clinical features of *karshya* coming under grade I & II were selected after screening with inclusion and exclusion criteria from OPDof *Kaumarbhritya* department of our *Ayurveda* rugnalaya.

- **Group A** - Trial Group
- **Group B** - Control Group

INCLUSION CRITERIA:

1) The children of both sex irrespective of their religion, geographical area and socio-economic status.
2) The children between the age group of 2-14 yrs.
3) The children from grade I & II Under-nutrition according to IAP classification.

BOYS			
AGE(YR)	(80-90%) IN KG	(70-79%) IN KG	(60-69%) IN KG
2	9.76-10.85	8.54-9.63	7.14-8.32
3	11.44-12.72	10.01-11.29	8.28-9.72
4	13.04-14.50	11.41-12.87	9.27-10.77
5	14.64-16.23	12.81-14.45	10.26-11.96
6	16.4-18.24	14.35-16.19	11.52-13.43
7	18.32-20.38	16.3-18.09	12.6-14.6
8	20.32-22.60	20.32-22.60	13.56-15.82
9	22.48-25.00	22.48-25.00	14.64-17.08
10	24.96-27.76	24.96-27.76	16.2-18.9

GIRLS			
AGE(YR)	(80-90%) IN KG	(70-79%) IN KG	(60-69%) IN KG
2	9.2-10.23	8.05-9.08	6.9-9.59
3	11.12-12.37	9.73-10.98	8.34-9.59
4	12.88-14.32	11.27-12.71	9.66-11.10
5	14.56-16.19	12.74-14.37	10.92-12.55
6	16.16-17.97	14.14-15.95	12.12-13.93
7	17.92-19.93	15.68-17.69	13.44-15.45
8	22.56-25.09	17.5-19.75	15-17.25
9	25.52-28.39	19.74-22.27	16.92-19.45
10	25.52-28.39	22.33-25.2.	19.14-22.01

EXCLUSION CRITERIA:

1) The children suffering from infectious and chronicsystemic disorders.

2) The children of chromosomal, genetic, other metabolic orcongenital disorders.

3) The children of Grade III and IV malnutrition.

Criteria for withdrawal:

During the course of the treatment if any serious condition or serious adverse effect which required urgent treatment or if patient himself want to withdraw from the study, such patients were withdrawnfrom the clinical trial.

Objective Criteria:

1) Weight for age according to IAP classification.

2) Mid-arm circumference.

Subjective Criteria:

1) *Kshudhamandya*.

2) *Dhamanijal darshan* .

Study design

Type of study: randomized control clinical trial.

40 diagnosed patients from patients attending the OPD of *Kaumarbhritya* Department of our institute between 2 to 14 years of age irrespective of caste, religion, sex, socioeconomic status were randomlyselected and divided into two groups.

Group A: (20 patients) - Trial Group.

Group B: (20 patients) - Control Group.

Management of patients:

Consent:

After the proper diagnosis of patients, an informed written consent of parents or guardians of the patients included in this study was taken in the language best understood to them following line of

treatment were given.

Group A: In total 20 patients were taken in this group and they were administered trial drug *Bala Ashwagandha granules*.

Group B: 20 patients were given *Vidari Churna* for the same period as group

	Group A (Trial)	**Group B (Control)**
Number of patients	20	20
Age group	2-14	2-14
Gender	Both	Both
Drug given	*Bala Ashwagandha granules* in granule form	Vadari *Churna* in granule form
Time of administration	Twice in a day with cows milk	Twice in a day with cows milk
Route of adm.	Oral	Oral
Follow-up	Every 15 days	Every 15 days

Dose of *Bala Ashwagandha granules*:

Granthoktha *Churna* Matra According to Sharangdhar smahita

बालस्यप्रथमेमासिदेयाभेषजरक्तिका ।
अवलेहीकृतैकैव क्षीरक्षौद्रसिताघृतैः ॥
वर्धयेतावदेकैकांयावभ्दवतिवत्सरः ।
माषैः वृध्दिः तद्उर्ध्वस्यात्यावत् षोडशवत्सर //
मात्रेयकल्कचूर्णानांकषायस्यचतुर्गुणा

शा.सं. पू

I. e. for 2 year dose= 2.5gm, 3 years= 3.5gm and so on.

METHOD OF STUDY:

1. Routine anthropometrical measures signs and symptoms scoring were carried out before and

after treatment.

2. Proper administration of drug was done perfectly during treatment duration (3 months).

3. Trial drug was assessed on the basis of clinical observation in course of the treatment, especially the anthropometrical measures and sign and symptoms before and after the course of treatment.

4. The efficacy of drug was assessed based on the scoring pattern by calculating the overall percentage improvement.

5. Follow-up study was done after the completion of treatmentfor 3 months.

Criteria of Assessment:

Change in anthropometrical measures weight and mid-arm circumference and dhamni *jal*a *darshan*a, sign and symptoms *Kshudha* mandya was considered for assessment during and after the treatment. a proform prepared incorporated the features and outcome of the treatment before, during and after treatment.

Assessment of study:

Depending upon subjective and objective criteria of the study a proforma was prepared for the study in which regarding the changes due to the treatment was recorded before and after the treatment. The resultwas statistically analyzed and the conclusions were drawn.

Gradations of the symptoms are as follows:

Table No. 11 *Kshudha* Mandya

0	Child himself ask food and taking adequately
1	Child himself aks food but not taking adequately
2	Child does not ask but takes food considerably by request.
3	Child does not ask but not takes food considerably even by force.

Table No. 12 Weight for age according to IAP classification

0	90-100% of expected weight for that age
1	80-89% of expected weight for that age
2	70-79% of expected weight for that age
3	60-69% of expected weight for that age

Table No. 13 Mid-arm circumference

0	>14Cm
1	12.5-14 Cm
2	10.12.5 Cm
3	<10 Cm

Table No. 14 Dhamni *Jala Darshana*

0	Not visible easily even after pressure
1	Visible and prominent on pressure
2	Visible
3	Prominence

OBSERVATIONS AND RESULTS

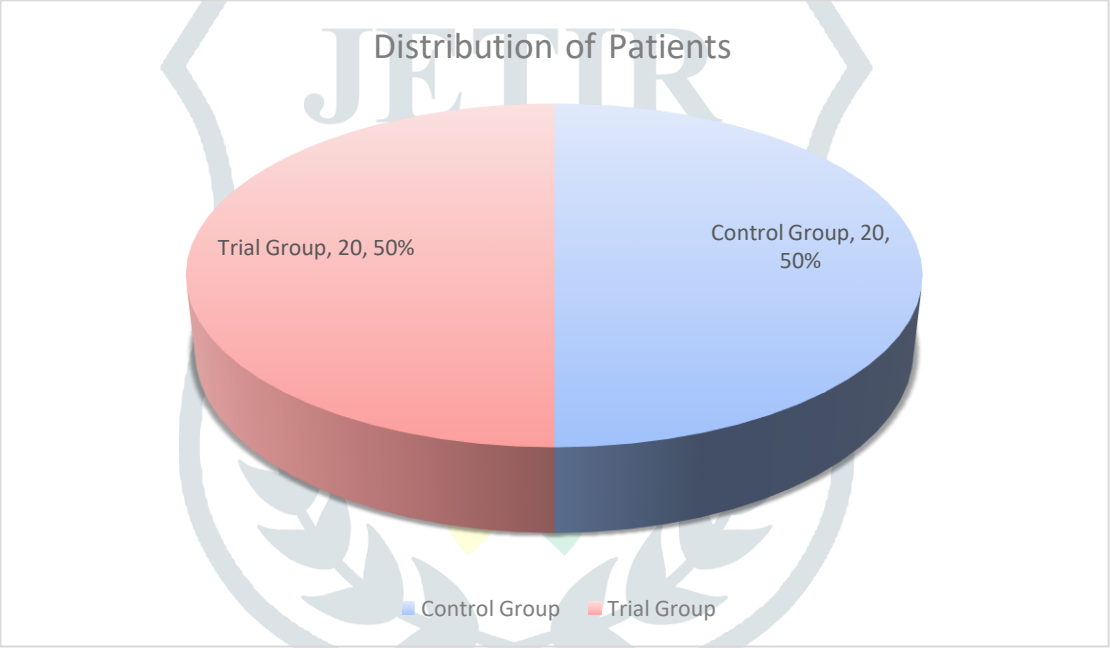
5.1. General Observations

A) Distribution of patients

Table 5.1 Shows distribution of patients in groups

Group	No of Patients	%
Trial Group	20	50
Control Group	20	50
Total	**40**	**100**

Figure 5.1 Shows distribution of patients in groups

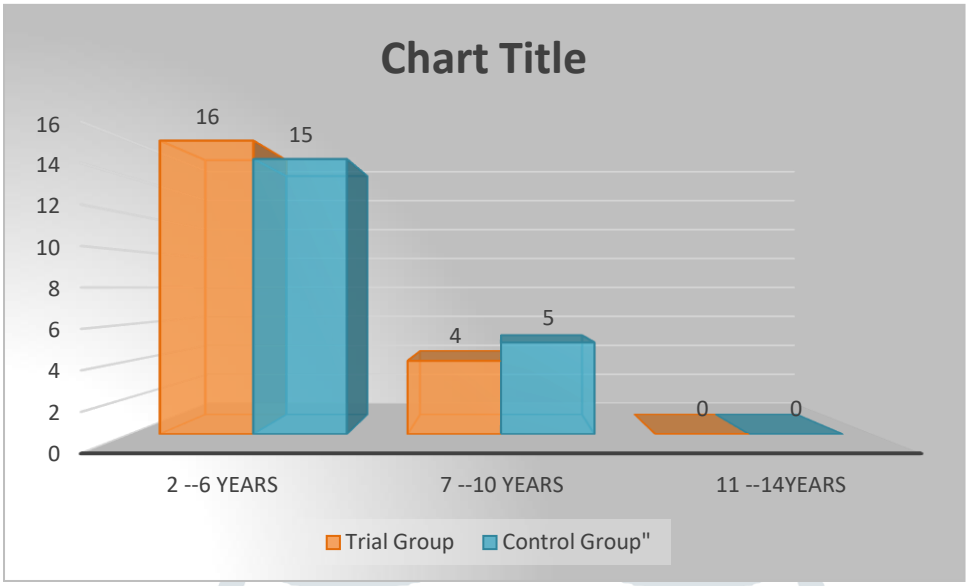


B) Age:

Table 5.2 Shows Age wise distribution in both groups

Sr. No.	No of Patients			Total	%
	Age (yrs)	Trial Group	Control Group		
1	**2-6**	16	15	31	77.5
2	**7-10**	4	5	9	22.5
3	**10-14**	0	0	0	0
	Total	**20**	**20**	**40**	**100**

Figure 5.2 Shows Age wise distributions in both groups

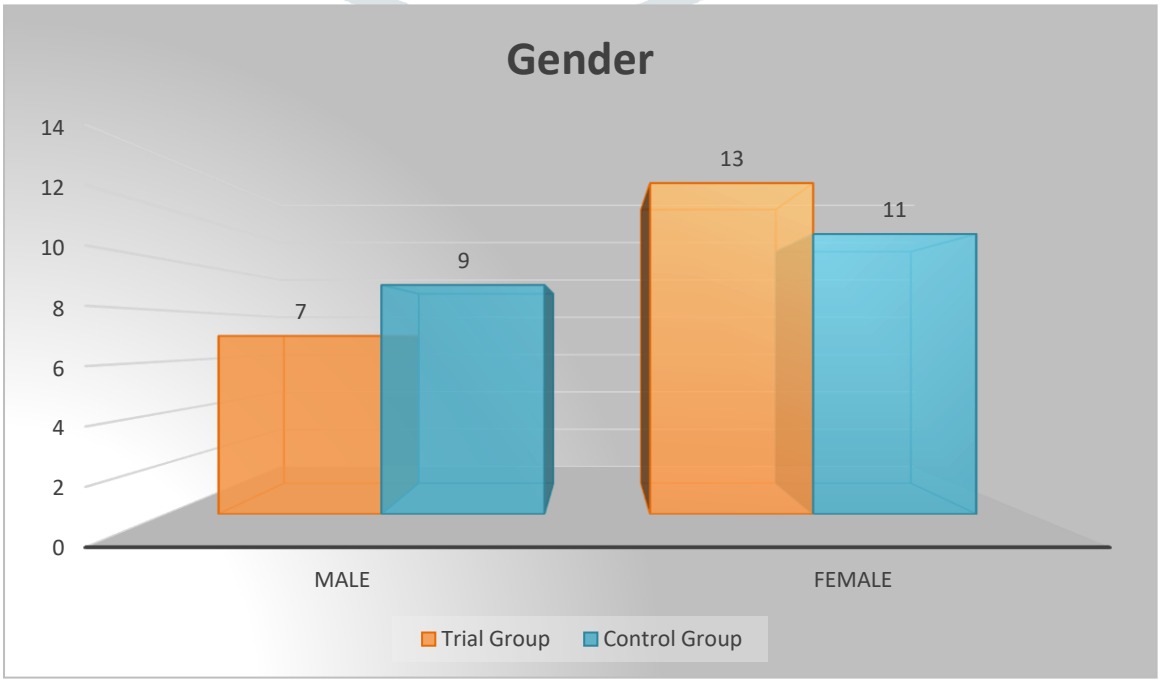


C) Gender

Table 5.3 Shows Gender wise distribution in both groups

Sr. No.	No of Patients			Total	%
	Gender	Trial Group	Control Group		
1	Male	7	9	16	40
2	Female	13	11	24	60
	Total	20	20	40	100

Figure 5.3 Shows Gender wise distributions in both groups

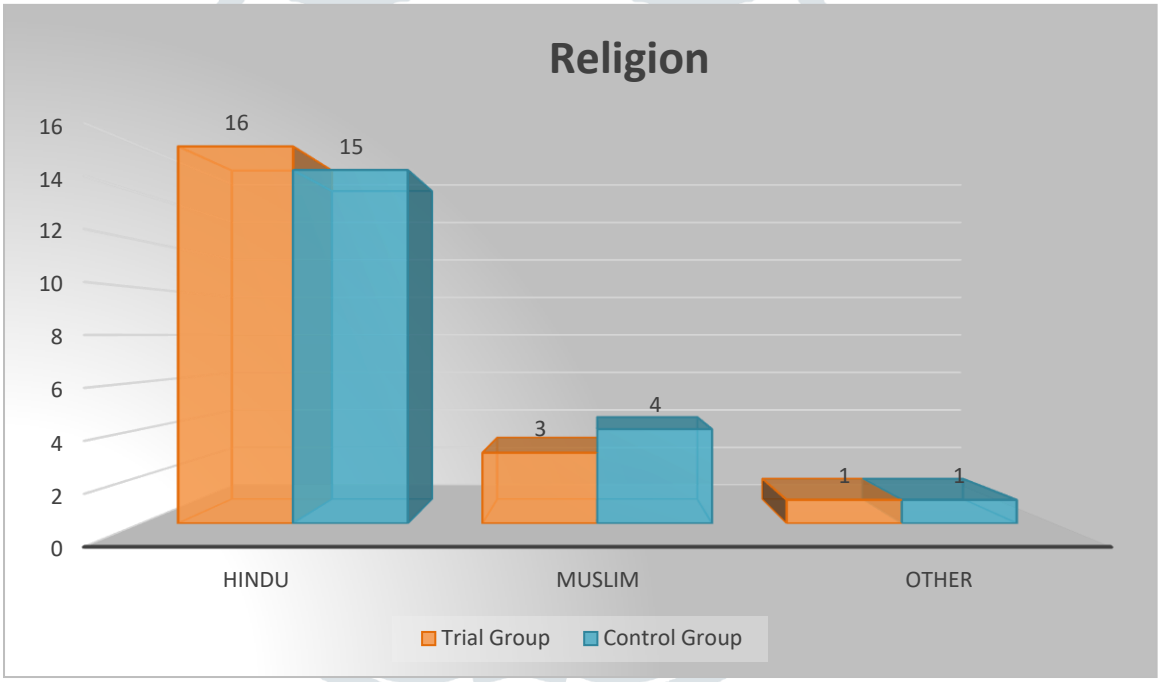


D) Religion

Table 5.4 Shows Religion wise distribution in both groups

Sr. No.	No of Patients			Total	%
	Religion	Trial Group	Control Group		
1	Hindu	16	15	31	77.5
2	Muslim	3	4	7	17.5
3	Other	1	1	2	5
	Total	20	20	40	100

Figure 5.4 Shows Religion wise distributions in both groups

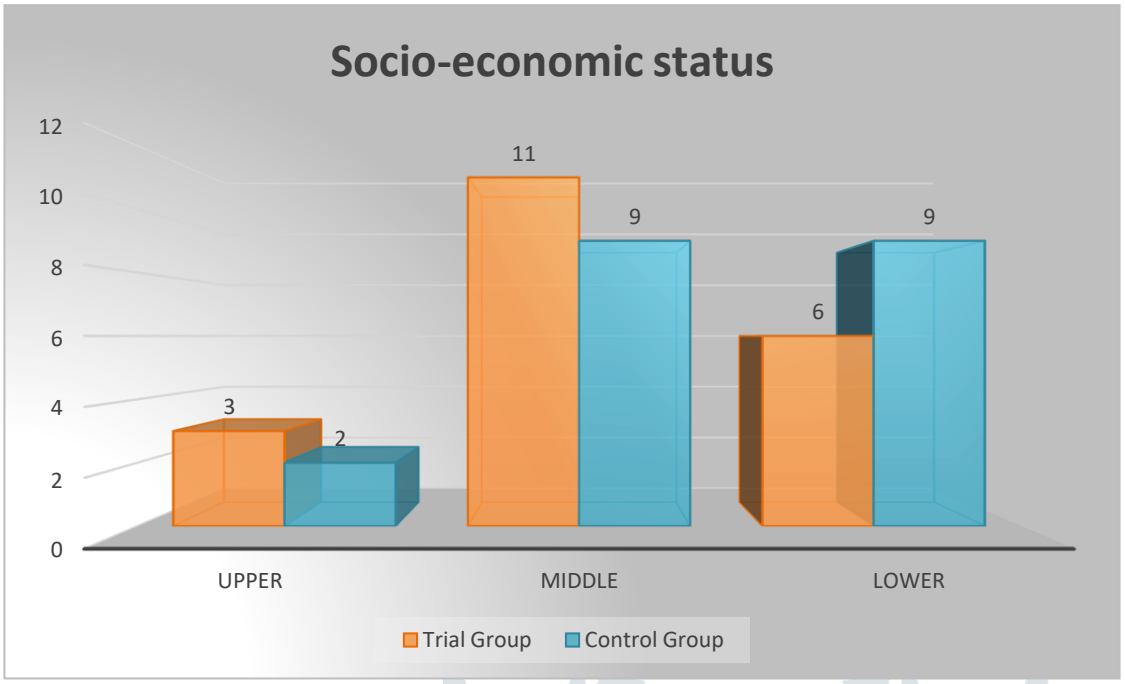


E) Socio-economic status:

Table 5.5 Shows Socio-economic status wise distribution in both groups

Sr. No.	No of Patients			Total	%
	Socio-economic status	Trial Group	Control Group		
1	Upper	3	2	5	12.5
2	Middle	11	9	20	50
3	Lower	6	9	15	37.5
	Total	20	20	40	100

Figure 5.5 Shows Socio-economic status wisegroups

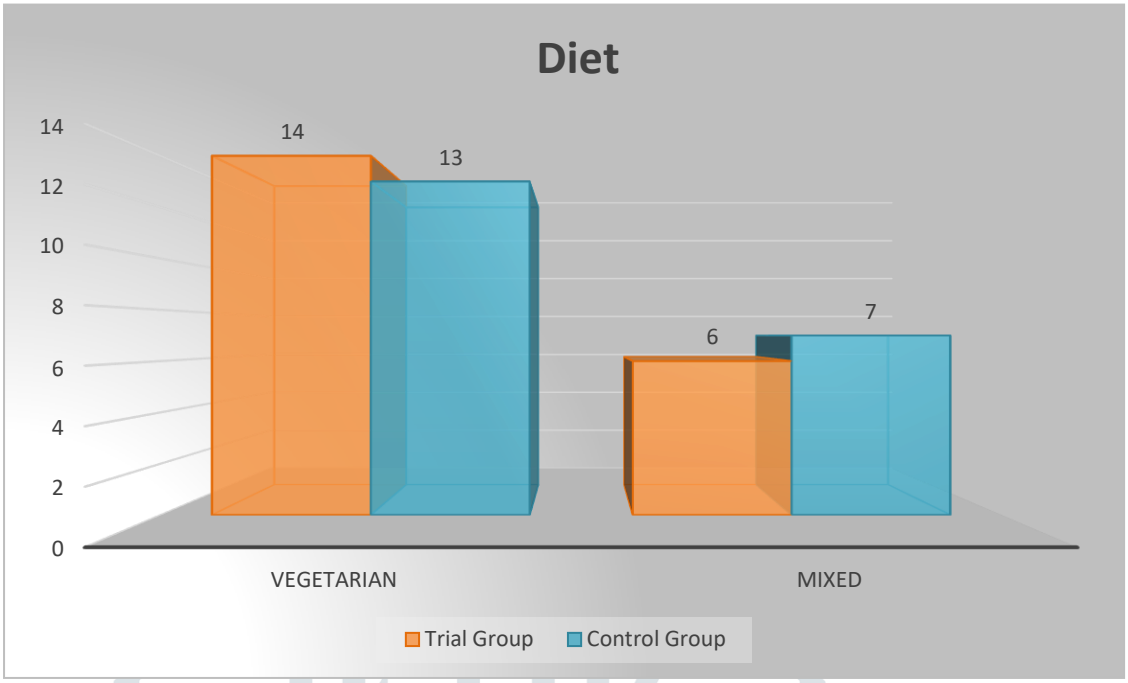


F) Diet:

Table 5.6 Shows Diet wise distribution in both groups

Sr. No.	No of Patients			Total	%
	Diet	Trial Group	Control Group		
1	Vegetarian	14	13	27	67.5
2	Mixed	6	7	13	32.5
	Total	20	20	40	100

Figure 5.6 Shows Diet wise distributions in both groups

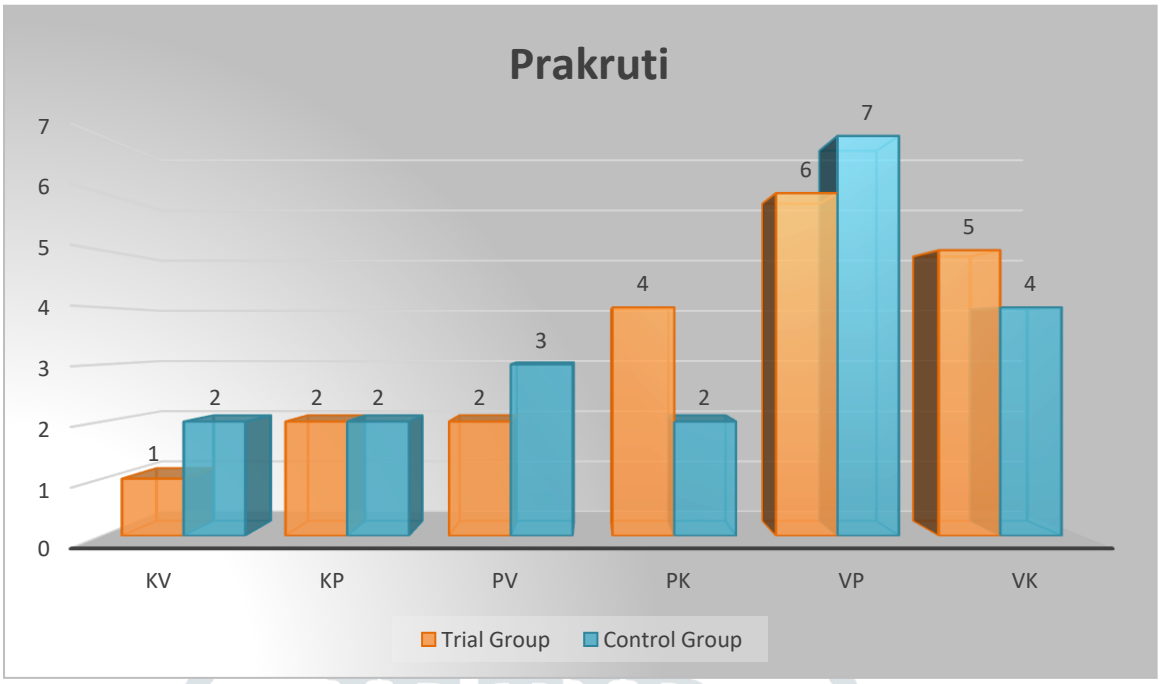


G) Prakruti:

Table 5.7 Shows Prakruti wise distribution in both groups

Sr. No.	No of Patients			Total	%
	Prakruti	Trial Group	Control Group		
1	KV	1	2	3	7.5
2	KP	2	2	4	10
3	PV	2	3	5	12.5
4	PK	4	2	6	15
5	VP	6	7	13	32.5
6	VK	5	4	9	22.5
7	Total	20	20	40	100

Figure 5.7 Shows Prakruti wise distributions in both groups



5.2. Changes before and after treatment

5.2.1 Changes in subjective

Parametres before and after treatment

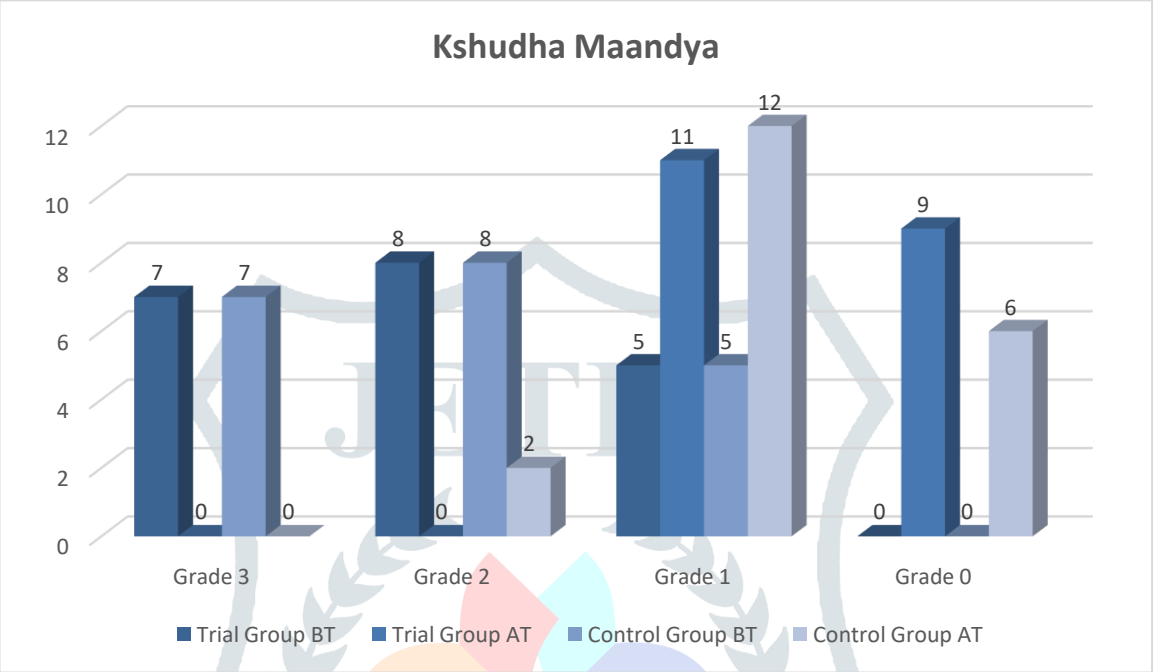
A) Changes in *Kshudha* Maandya (Loss of Appetite) (BT and AT)in Trial Group and Control Group

Table5.8: Shows Changes in *Kshudha* Maandya (Loss of Appetite) in Trial Group and Control Group

No. of Patients of Grade				
Grade	**Trial Group**		**Control Group**	
	BT	**AT**	**BT**	**AT**
Grade 3	7	0	7	0
Grade 2	8	0	8	2
Grade 1	5	11	5	12
Grade 0	0	9	0	6
Total	**20**	**20**	**20**	**20**

Figure 5.8: Shows Changes in *Kshudha* Maandya (Loss of Appetite) in Trial Group and Control Group

Figure 5.8: Shows Changes in *Kshudha* Maandya (Loss of Appetite) in Trial Group and Control Group

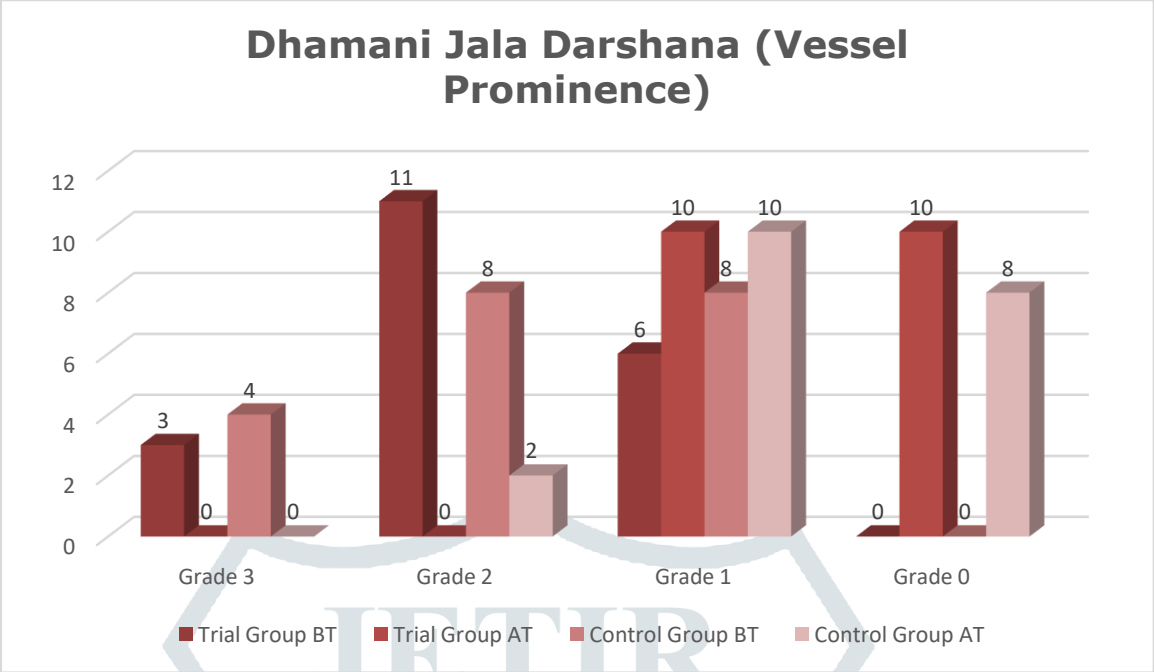


B)Changes in *Dhamani Jala Darshana* (Vessel Prominence) (BTand AT) in Trial Group and Control Group

Table 5.9: Shows Changes in *Dhamani Jala Darshana* (Vessel Prominence) in Trial Group and Control Grooup.

No. of Patients of Grade				
Grade	**Trial Group**		**Control Group**	
	BT	**AT**	**BT**	**AT**
Grade 3	3	0	4	0
Grade 2	11	0	8	2
Grade 1	6	10	8	10
Grade 0	0	10	0	8
Total	**20**	**20**	**20**	**20**

Figure 5.9: Shows Changes in *Dhamani Jal*a *Darshan*a (Vessel Prominence) in Trial Group and Control Group



It was observed that, *Dhamani Jal*a *Darshan*a (Vessel Prominence) has decreased more in Trial Group than in Control Group.

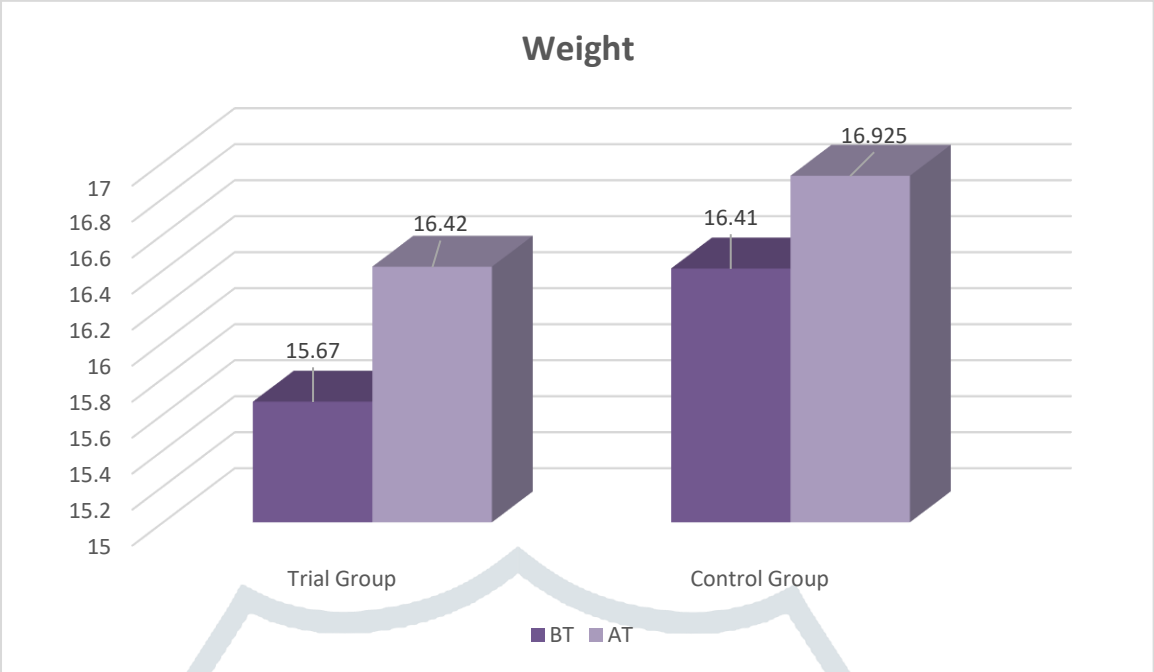
5.2.2. Changes in Objective criteria before and after treatment

a) Changes in Weight (BT and AT) in Trial Group and ControlGroup

Table 5.10 Shows Changes in Weight in Trial Group and Control Group

No. of Patients of Grade				
Weight	**Trial Group**		**Control Group**	
	BT	**AT**	**BT**	**AT**
Mean	15.67	16.42	16.41	16.925

Figure 5.10 Shows Changes in Weight in Trial Group and Control Group



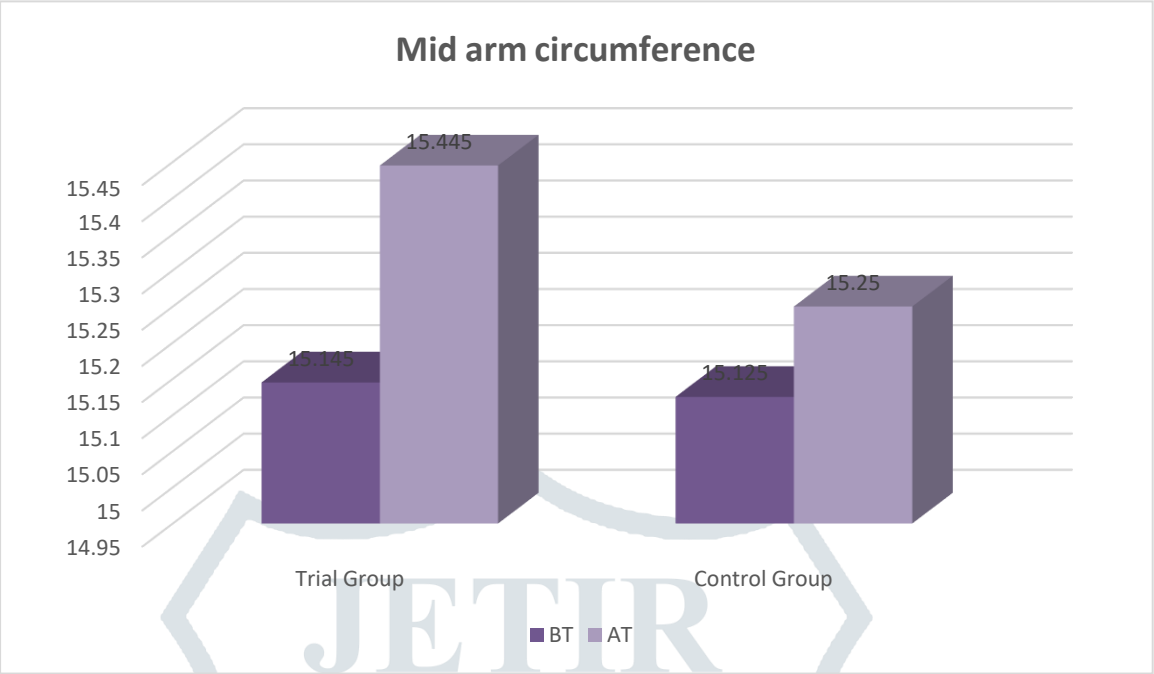
It was observed that, Weight has improved more in Trial Group than in Control Group.

B) Changes in Mid arm circumference (BT and AT) in Trial Groupand Control Group

Table 5.11 Shows Changes in Mid arm circumference in Trial Group and Control Group

No. of Patients of Grade				
Mid arm circumference	**Trial Group**		**Control Group**	
	BT	**AT**	**BT**	**AT**
Mean	15.145	15.445	15.125	15.25

Figure 5.11 Shows Changes in Mid arm circumferencein Trial Group and Control Group



It was observed that, Mid arm circumference has improved more in Trial Group than in Control Group.

Statistical Analysis within Trial Group and Control Group

Subjective Parameters (By Wilcoxon Singed Ranks Test)Trial Group

Table 5.12 Wilcoxon Signed Ranks Test in the Trial Group

Sr. No.	Symptom	BT/AT	N	Mean	Median	SD	W	P
1	***Kshudha* Maandya**	**BT**	**20**	2.1	2	0.788	190	<0.0001
		AT	**20**	0.55	1	0.510		
2	***Dhamani Jala Darshana***	**BT**	**20**	2.05	2	0.759	210	<0.0001
		AT	**20**	0.5	0.5	0.513		

***Kshudha* Maandya (Loss of Appetite):**

As value of p is less than 0.05, significant difference was observed between mean of BT and AT score in *Kshudha* Maandya (Loss of Appetite) symptom. Hence it is concluded that *Bala Ashwagandha granules* is highly effective to reduce *Kshudha Maandya* (Loss of Appetite) in *Balkarshya*.

***Dhamani Jala Darshana* (Vessel Prominence)**

As value of p is less than 0.05, significant difference was observed between mean of BT and AT score in *Dhamani Jala Darshana* (Vessel Prominence) symptom. Hence it is concluded that *Bala Ashwagandha granules* is highly effective to reduce *Dhamani Jala Darshana* (Vessel Prominence)in *Balkarshya*.

Control Group:

Table 5.13 Wilcoxon Signed Ranks Test in the Control Group

Sr. No.	Symptom	BT/AT	N	Mean	Median	SD	W	P
1	*Kshudha* Maandya	BT	20	2	2	0.794	171	<0.0001
		AT	20	0.95	1	0.604		
2	*Dhamani Jala Darshana*	BT	20	1.8	2	0.767	190	<0.0001
		AT	20	0.7	1	0.656		

A) *Kshudha Maandya* (Loss of Appetite)

As value of p is less than 0.05, significant difference was observed between mean of BT and AT score in *Kshudha Maandya* (Loss of Appetite) symptom. Hence it is concluded that *Vidari Churna* is highly effective to reduce *Kshudha Maandya* (Loss of Appetite) in *Balkarshya*.

B) *Dhamani Jala Darshana* (Vessel Prominence)

As value of p is less than 0.05, significant difference was observed between mean of BT and AT score in *Dhamani Jala Darshana* (Vessel Prominence) symptom. Hence it is concluded that *Vidari Churna* is highly effective to reduce *Dhamani Jala Darshana* (Vessel Prominence)in *Balkarshya*.

5.3.2. Objective Parameters (By paired t Test)Trial Group

Table 5.14 Paired t Test in the Trial Group

Sr. No.	Symptom	BT/AT	N	Mean	SD	t	P
1	Weight	BT	20	15.67	3.189	8.974	<0.0001
		AT	20	16.42	3.480		
2.	Mid arm circumference	BT	20	15.145	0.759	10.338	<0.0001
		AT	20	15.445	0.775		

A) Weight:

As value of p is less than 0.05, significant difference was observed between mean of BT and AT score in Weight. Hence it is concluded that *Bala Ashwagandha granules* is effective to improve weight in *Balkarshya*.

B) Mid arm circumference:

As value of p is less than 0.05, significant difference was observed between mean of BT and AT score in Mid arm circumference. Hence it is concluded that *Bala Ashwagandha granules* is effective to improve mid arm circumference in *Balkarshya*.

Control Group:

Table 5.15 Paired t Test in the Control Group

Sr. No.	Symptom	BT/AT	N	Mean	SD	t	P
1	Weight	BT	20	16.41	3.864	11.186	<0.0001
		AT	20	16.925	3.865		
2.	Mid arm circumference	BT	20	15.125	0.836	5.483	<0.0001
		AT	20	15.25	0.814		

A) Weight

As value of p is less than 0.05, significant difference was observed between mean of BT and AT score in Weight. Hence it is concluded that *Vidari Churna* is effective to improveWeight in *Balkarshya*.

B) Mid arm circumference:

As value of p is less than 0.05, significant difference was observed between mean of BT and AT score in mid arm circumference. Hence it is concluded that *Vidari Churna* is effective to improve mid arm circumference in *Balkarshya*.

5.4. Statistical Analysis in between the Trial Group and Control Group

5.4.1. Subjective Parameters (By Mann Whitney's U Test)

Table 5.16 Mann Whitney's U Test between the Trial Group andControl Group

S. N.	Symptom	Group	N	Mean	SD	U	P
1	***Kshudha Maandya***	Trial	20	1.55	0.686	118	0.024
		Control	20	1.05	0.510		
2	***Dhamani Jala Darshana***	Trial	20	1.55	0.604	123.5	0.035
		control	20	1.1	0.447		

A) *Kshudha Maandya* (Loss of Appetite)

As value of p is less than 0.05, significant difference was observed between the mean of difference of Trial Group and Control Group in *Kshudha Maandya* (Loss of Appetite) symptom. As the mean of trial group is higher than that of control group; it is concluded that *Bala Ashwagandha granules* is more effective than *Vidari Churna* to reduce *Kshudha Maandya* (Loss of Appetite) symptom in *Balkarshya*.

B) *Dhamani Jala Darshana* (Vessel Prominence):

As value of p is less than 0.05, significant difference was observed between the mean of difference of Trial Group and Control Group in *Dhamani Jala Darshana* (Vessel Prominence)

symptom. As the mean of trial group is higher than that of control group; it is concluded that *Bala Ashwagandha granules* is more effective than *Vidari Churna* to reduce *Dhamani Jala Darshana* (Vessel Prominence) symptom in *Balkarshya*.

5.4.2. Objective Parameters (By unpaired t Test)

Table 5.17 Unpaired t Test between the Trial Group and Control Group

S. N.	Symptom	Group	N	Mean	SD	t	P
1	Weight	Trial	20	0.755	0.376	2.503	0.0168
		Control	20	0.515	0.205		
2.	Mid arm circumference	Trial	20	0.3	0.129	4.742	<0.0001
		control	20	0.125	0.102		

A) Weight

As value of p is less than 0.05, significant difference was observed between the mean of difference of Trial Group and Control Group in Weight.As mean of trial group is found more than that of Control group; it is concluded that *Bala Ashwagandha granules* is more effective than *Vidari Churna*to improve weight in *Balkarshya*.

B) Mid arm circumference:

As value of p is less than 0.05, significant difference was observed between the mean of difference of Trial Group and Control Group in Weight. As mean of trial group is found more than that of Control group; it is concluded that *Bala Ashwagandha granules* is more effective than *Vidari Churna*to reduce Weight in *Balkarshya*.

Effect of therapy

Effect of therapy according to % Relief in Patients Table 5.18 Relieved score and % Relief in Patients of both groups

Pt. No.	Trial Group				Pt. No	Control Group			
	B.T.	A.T.	Relieved	% Relief		B.T.	A.T.	Relieved	% Relief
1	5	1	4	80.00	**1**	4	2	2	50.00
2	5	1	4	80.00	**2**	3	1	2	66.67
3	2	0	2	100.00	**3**	4	2	2	50.00
4	5	1	4	80.00	**4**	4	1	3	75.00
5	4	0	4	100.00	**5**	4	1	3	75.00
6	4	1	3	75.00	**6**	5	3	2	40.00
7	5	2	3	60.00	**7**	5	2	3	60.00
8	5	2	3	60.00	**8**	5	2	3	60.00
9	5	0	5	100.00	**9**	3	1	2	66.67
10	4	1	3	75.00	**10**	3	1	2	66.67
11	5	2	3	60.00	**11**	3	1	2	66.67
12	3	1	2	66.67	**12**	5	3	2	40.00
13	5	2	3	60.00	**13**	4	3	1	25.00
14	2	1	1	50.00	**14**	4	2	2	50.00
15	5	2	3	60.00	**15**	2	0	2	100.00
16	3	0	3	100.00	**16**	3	1	2	66.67
17	4	1	3	75.00	**17**	4	2	2	50.00
18	5	2	3	60.00	**18**	5	3	2	40.00
19	4	0	4	100.00	**19**	2	0	2	100.00
20	3	1	2	66.67	**20**	4	2	2	50.00
	Average % Relief			**74.7%**		**Average % Relief**			**56.58%**

Average % Relief in Patients of Trial Group is **74.7%** and in Patientsof Control Group is **56.58%**.

Average % Relief in Symptoms score

Table 5.19 Relieved score and % Relief in Symptoms of Trial Group

Sr. No.	Symptoms (Trial Group)	B.T.	A.T.	Relieved	% Relief
1	*Kshudha Maandya*	42	11	31	73.81
2	*Dhamani Jala Darshana*	41	10	31	75.65

Table 5.20 Relieved score & % Relief in Symptoms of Control Group

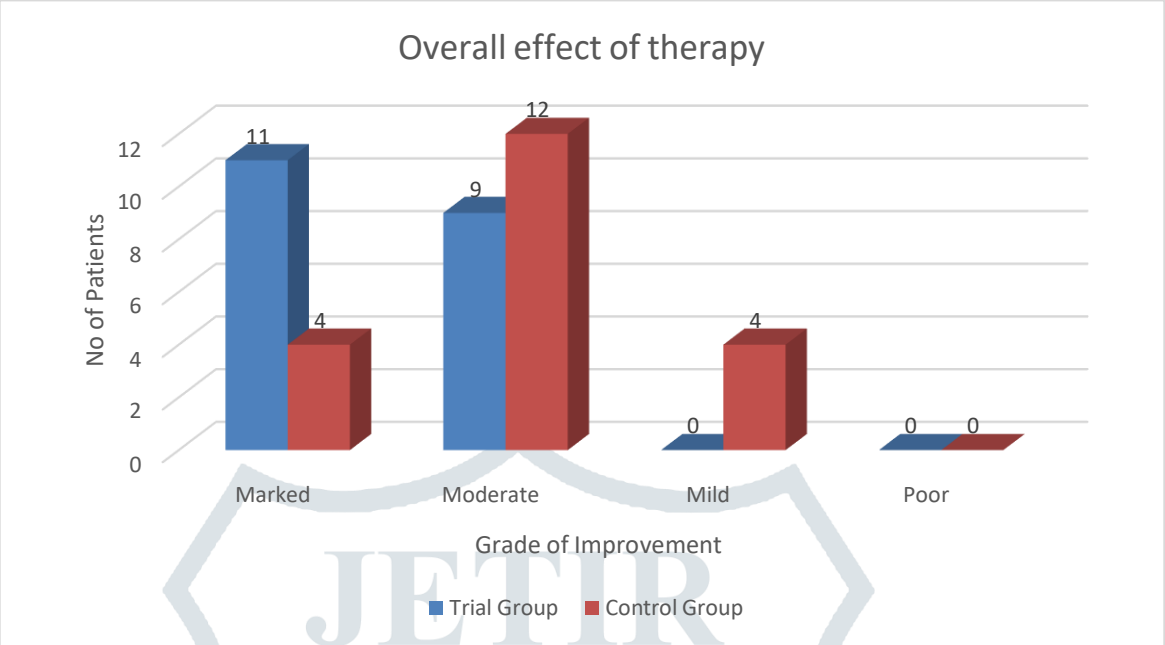
Sr. No.	Symptoms (Control Group)	B.T.	A.T.	Relieved	% Relief
1	*Kshudha Maandya*	40	19	21	52.5
2	*Dhamani Jala Darshana*	36	14	22	61.11

Overall Effect of Therapy

Table 5.22 Effect of Therapy according % Relief in Patients

Sr. No.	Improvement Grade	Criteria	No. of patients	
			Trial Group	Control Group
1	Marked	> 75%	11	4
2	Moderate	50% - 75%	9	12
3	Mild	25% - 50%	0	4
4	Poor	< 25%	0	0

Figure 5.14: Shows Overall effect of therapy



Relief in Patients

In Trial Group, 11 patients have shown Marked improvement, 9 patients have shown Moderate Improvement while no patientshown Mild have improvement and Poor improvement.

In Control Group, 4 patients have shown Marked improvement, 12 patients have shown Moderate Improvement, 4 patients have shown Mild improvement while no patient have shown Poor improvement.

Trial Group has shown **better effect** than **Control Group** to reduce Patient's score.

Hence in overall effect of therapy *Bala Ashwagandha granules* is effective than *Vidari Churna* to reduce subjective parameter and improve objective parametersin *Balkarshya* Patients.

DISCUSSION

Discussion is important part of Dissertation which links the findings of trial with conclusion. Science cannot stand without proper implementation of principle & concise. As mentioned by *Acharya Charaka* in *Vimansthana*, everything should be seen properly and it should be discussed with its all possible approach, then final conclusion drawn from study should be put in to practice. In other words conclusion remains incomplete unless and until it is dominantly supported by discussion. The study begins with formation of hypothesis which is based on *Aptopdesh*. Then leads to observation and ultimately to results, got through *pratyaksha & yukti*. Each of these should be supported by proper proof which helps in *ayurvedic* research.

A study was conducted to know the *Brihana* effect of *Bala Ashwagandha granules* on *Balakarshya* among 2-14 years of children residing in urban, rural area along with it this study throws light upon determinants of assessing the nutritional status of children and providing a statistical reference of malnourished children.

The study was conducted for period 3 months completely by open randomized control trial and divided into two groups. Group A was trial drug i.e. *Baladi* granules and *Vidari* granules was taken as Group B.

In order to achieve this aim the study has been divided into 2 parts.
In *Bala Ashwagandha granules* drugs having a property of *Madhura rasa* and *Madhura* Vipaka which is *Vata Shamaka*.

Vrishya property helps in triglyceride synthesis which is *Dehavridhikara Bhava*. On other hand, *Guru*, *Sheeta*, *Snigdha* and *Mridu* gunas are directly responsible for *Balya* and *Brihana* effect in Body, improves general health and immunity and maintains equilibrium of *Dosha*, *Dhatu* and *Malas*. *Rasayana* property of *Pimpali* improves general health and improves immunity.

***Baladi* churn:**

In *Bala Ashwagandha granules* (granules) all drugs are **Balya** and ***Brihana*** in property.

Bala has *balya & Brihana karma*.

Discussion on the observations and results of the clinical study:Demographic Data

The data obtained and recorded during the process of observation is analyzed and interpretations are drawn in all its dimensions through the process of discussion. Discussion is the process where in different aspects of problem is analyzed, thus facilitating conclusion. All the cases were analyzed for the incidence of *Karshya* in relation to age, sex, occupation, Prakriti etc.

1. Age:

In the present study 77.5% from 2-6 Yrs. of age & 22.5% from age groups 7-10 Yrs. of age. Children in age group 2-6 Yrs.are more prone due to the fact there is increased growth velocity, increased activity, increased calorie demand & poor calorie intake.

2. Gender:

40% patienrs in the study were male and 60% were female However the incidence of *Karshya* in Female children was foundmore in study.

3. Religion:

Among the 40 patients for study 77.5% were Hindu and 17.5% were from Muslim community and 5% from other community. This may be due to fact that area around college is Hindu dominated area. Hindus are vegetarian and likely to be under nourished.

4. Socio- economic status:

Socio-economic status is always a matter of concern to cure or prevent any ailment. High class people can afford for better health care. Amidst from 40 patients maximum i.e. 50% patients were from middle socio- economic class, 37.5% patients were from lower class and 12.5% were from upper middle class. Though it is proved that malnutrition lives in poverty, but in present study middle class people cannot afford the food which fullfills the nutritional demand and in lower class it may because of lack of awareness regarding health and nutritious diet. Hence becomes prone to rnalnutrition.

5. Diet:

In this study 67.5% patients were found to be having veg diet and 32.5% patients were found to be having mixed diet. Vegetarian people are more prone to malnutrition is seen inpresent study.

6. Prakriti:

In this study, Maximum no. of patients i.e. KV- 7.5%, KP-10%, PV- 12.5%, PK- 15%, VP 32.5%, VP22. 5%

Overall effect of therapy was assessed on the basis of the followingcriteria:

1. Increase in Weight.
2. Increase in Appetite.
3. Increase in Anthropometry measures.

Assessment of criteria:

1. *Kshudhamandya* (Loss of Appetite):

In Group A improvement in *Kshudha* (appetite) was observed 73.81% which is significant and in group B improvement in *Kshudha* (appetite) was 52.5%. Increase in appetite in both group was seen but, in *Bala Ashwagandha granules* i.e. group A increment was significant which is due to *Srotoshodhaka* property of *Bala*, and which helps in improving and maintenance of *Agni* and relieves in loss of appetite. It was also observed due to proper counselling about daily diet regimen which results slight improvement in group B.

2. *Dhamani jal darshan* :

Dhamani jal darshan was relived 75.65% in Group A which was significant. While in group B result is significant and relief in percentage is 61.11%. It is observed that in group A *Dhamani jal darshan* was improved as compared to group B.

3. Mid arm circumfarance:

In Group A, the effect on mid-arm circumference is significant (P <0.05), with percentage wise improvement in mid arm circumference is 0.30 % in group A , in group B the effect on mid arm circumference was 0.125%. The increment seen in both group was significant. These increase in circumference at various level are probably due to increase in musculature and deposition of fat under the skin.

4. Weight:

In group A the effect on weight gain is highly significant (p<0.05) with mean improvement in weight gain 0.75 kg. In group B weight gain is significant (P<0.05) with mean improvement in weight gain is 0.52 kg.

Overall assessment of therapy:

TRIAL GROUP: 11 patient have shown marked improvement, 9 patient have shown moderate improvement, while no patient haveshown mild improvement and poor improvement.

CONTROL GROUP: 4 patient have shown marked improvement, 12 patient have shown moderate improvement, 4 patient have shown mild improvement while no patient has shown poor improvement.

Trial group has shown better effect than control group to reduce patient score.

Hence in overall effect of therepy *Bala Ashwagandha granules* is effective than *Vidari Churna* to reduce subjective parameters andimprove objective parameters in *Balkarshya* patients.

SUMMARY

The dissertation entitled as "Randomized controlled clinical trial of efficacy of *Bala Ashwagandha granules* with control of *Vidari Churna* in *Balkarshya* (under-weight children grade I and II) comprises following sections viz. Introduction, Aim and objectives, Disease Review, Drug Review, Materials and methods, Observations and results, Discussion, conclusion and Summary.

- **INTRODUCTION:** In this chapter importance of topic, selection of disease, prevalence of disease and importance of *Brihan*a effectin *Balakarshya* has been described.
- **AIM AND OBJECTIVES:** In the second section aim and objectives of the present study are given.
- **DISEASE REVIEW:** It explains the term *Karshya*, brief history of *Karshya* in various classics, citation of *Nidana*, *Purvarupa*, *Samprapti*, *Upadrava* and *chikitsa* are mentioned. Different aspects of disease Malnutrition such as definition, etiology, typesand treatment are elaborately explained.
- **DRUG REVIEW:** In this section the description of *Bala Ashwagandha granules* has been carried out on the basis of classics. Detailed description of drug and their ingredients under study along with their pharmacological properties, chemical constituents on the basis of Ayurved as well as modern literature has been given.
- **MATERIALS AND METHODS:** Deals with description of clinical study with specific reference to patient selection, inclusion and exclusion criteria, criteria for assessment, method of treatment, dose, duration, follow up etc. for present study.
- **OBSERVATION AND RESULT:** In this chapter observations made on demographic incidence such as age, sex, Weight, Height, Mid arm circumference, Economic status, Diet, etc. are explained in

tabular as well graphical presentation. The results obtained from clinical study has been analyzed statistically to evaluate thesignificance of the *Brihan*a properties of therapy.

- **DISCUSSION:** The present research work has been thoroughly discussed here with all the possible ways and manners. The observations of the patients have been presented with the data and record and the discussion on these observations presented as:

1. Discussion on general observation of the patient like Age, Sex etc.
2. Discussion done on changes which observed after using of *Bala Ashwagandha granules*. Then total effect of therapy was discussed.

CONCLUSION

From the present study entitled "Randomized controlled clinical trial of efficacy of *Bala Ashwagandha granules* with control *Vidari Churna* in *Balkarshya* (under-weight children grade I and II)" following conclusions were drawn.

1. On the basis of results of therapy, it can be concluded that *Bala Ashwagandha granules* increases weight effectively and improve *Kshudha Mandya*.
2. While in group B there was only increase in weight.
3. While increment in mid arm circumference was not effectively improved in both the group.
4. Middle and poor class people cannot afford nutritious food and they are more prone to malnutrition.
5. Bad food habits, lack of nourishment and environmental pollution are also the cause of disturbance in physiological and psychological aspect of children leading to *Karshya*.
6. School going children are more prone to *Karshya* due to lack of personal attention in school, unhealthy food habits.

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MASTER CHART
Trial group A

Sr. No.	OPD No.	Age(years)	Gender	Religion	Socio Economic status	Aahar	Prakruti
1		6	M	Hi	Mi	Veg	VK
2		3	F	Hi	Mi	Veg	KP
3		4	F	Hi	L	Veg	PK
4		5	M	Mu	L	Mix	VP
5		7	M	Hi	Mi	Mix	VK
6		5	F	Hi	L	Veg	PV
7		5	F	Hi	Mi	Veg	PK
8		9	M	Mu	U	Veg	VP
9		4	F	Hi	L	Veg	VK
10		4	F	Hi	Mi	Mix	VP
11		8	F	Hi	L	Mix	PK
12		3	M	Mu	Mi	Veg	KP
13		4	F	Hi	Mi	Mix	KV
14		3.5	F	Hi	Mi	Veg	VK
15		5	F	Hi	U	Veg	VP
16		4	F	Hi	Mi	Veg	PK
17		6	M	Jain	L	Mix	VP
18		3	M	Hi	Mi	Veg	VK
19		8	F	Hi	U	Veg	VP
20		5	F	Hi	Mi	Veg	PV

Control group B

Sr. No.	OPD No.	Age(years)	Gender	Religion	Socio Economic status	Aahar	Prakruti
1		5	F	Hi	Mi	Veg	VP
2		6	M	Hi	L	Veg	PV
3		3	F	Mu	L	Mix	VK
4		6	F	Hi	Mi	Mix	KP
5		4	M	Hi	Mi	Veg	VP
6		4	M	Hi	L	Veg	PK
7		5	F	Mu	Mi	Mix	VK
8		8	F	Hi	U	Veg	KV
9		4	M	Hi	Mi	Mix	VP
10		8	F	Buddha	L	Veg	VP
11		3	F	Hi	Mi	Veg	PV
12		4	F	Hi	L	Mix	PK
13		9	M	Hi	Mi	Veg	KP
14		4	M	Mu	L	Veg	VP
15		4	F	Mu	U	Veg	VK
16		3	M	Hi	L	Veg	VP
17		6	M	Hi	Mi	Mix	PV
18		8	F	Hi	Mi	Mix	KV
19		6	F	Hi	L	Veg	VK
20		9	M	Hi	L	Veg	VP

3. Trial Group A: Subjective& Objective Parameters

Sr. No.	OPD No.	Subjective Parameters				Objective Parameters			
		Kshudha mandya		*Dhamani Jal Darshan*		Weight (Kg)		Mid arm circumference (cms)	
		BT	AT	BT	AT	BT	AT	BT	AT
1		3	1	2	0	17.3	18.3	15.6	15.9
2		2	0	3	1	11.8	12.6	14.5	14.8
3		1	0	1	0	13.5	14.1	14.9	15
4		2	1	3	0	16.2	16.8	15.2	15.6
5		2	0	2	0	18.1	18.6	15.7	16.1
6		3	1	1	0	14.8	15.3	15	15.3
7		3	1	2	1	16.4	17	14.9	15.3
8		2	1	3	1	23.5	25.2	17.2	17.4
9		3	0	2	0	12.8	13.7	14.8	15.3
10		1	0	3	1	13.5	14	14.7	15
11		3	1	2	1	21	22.6	16.6	16.9
12		2	1	1	0	12.3	12.7	14.3	14.5
13		3	1	2	1	14.5	15	15	15.2
14		1	1	1	0	12.7	13.2	14.7	14.9
15		3	1	2	1	16	16.4	15.4	15.5
16		2	0	1	0	13.6	14	14.5	14.6
17		1	0	3	1	17.9	18.8	15.4	15.9
18		2	1	3	1	12.6	13.4	14	14.4
19		2	0	2	0	20.1	21.3	15.7	16.2
20		1	0	2	1	14.8	15.5	14.8	15.1

1. Control Group B: Subjective & Objective Parameters

Sr. No.	OPD No.	Subjective Parameters				Objective Parameters			
		Kshudham andya		*Dhamani Jal Darshan*		Weight (Kgs)		Mid arm circumference (Cms)	
		BT	AT	BT	AT	BT	AT	BT	AT
1		3	2	1	0	14.6	15	14.9	15
2		1	1	2	0	17.7	18.1	15.4	15.6
3		2	1	2	1	11.8	12.7	14.3	14.6
4		1	0	3	1	16.3	16.6	15.3	15.3
5		3	1	1	0	13.4	13.8	14.8	14.9
6		3	2	2	1	12.8	13	14.2	14.2
7		2	1	3	1	14.7	15.3	14.5	14.7
8		3	1	2	1	21.6	22	16.3	16.3
9		2	1	1	0	16.1	16.8	15	15.3
10		2	1	1	0	20.3	20.9	16.2	16.4
11		2	1	1	0	12.2	12.5	14.1	14.1
12		3	2	2	1	13.6	14.5	14.7	14.9
13		1	1	3	2	23.7	24.5	16.7	16.8
14		3	1	1	1	14.5	15	14.8	14.9
15		1	0	1	0	13	13.6	14.4	14.6
16		1	0	2	1	12.4	13	14	14.2
17		2	1	2	1	18	18.2	15.2	15.2
18		2	1	3	2	21.5	22.1	16	16.1
19		1	0	1	0	16.4	16.9	15.1	15.3
20		2	1	2	1	23.6	24	16.6	16.6

Sr. No.	Age (years)	Sex	Religion	Weight (In Kg.)							Mid Arm Circumference (In Cm.)							*Kshudha* Mandya							*Dhamani Jaldarshan*						
				0	15	30	45	60	75	90	0	15	30	45	60	75	90	0	15	30	45	60	75	90	0	15	30	45	60	75	90
1	6	M	Hi	17.3	17.4	17.6	17.9	18	18.2	18.3	15.6	15.6	15.7	15.7	15.8	15.8	15.9	3	3	3	3	2	2	1	2	2	2	2	1	1	0
2	3	F	Hi	11.8	11.9	12	12.2	12.3	12.5	12.6	14.5	14.5	14.5	14.6	14.6	14.7	14.8	2	2	2	2	1	1	0	3	3	3	2	2	1	1
3	4	F	Hi	13.5	13.5	13.6	13.7	13.8	14	14.1	14.9	14.9	14.9	14.9	14.9	15	15	1	1	1	1	0	0	0	1	1	1	1	0	0	0
4	5	M	Mu	16.2	16.3	16.4	16.5	16.6	16.7	16.8	15.2	15.2	15.3	15.3	15.4	15.5	15.6	2	2	2	2	1	1	1	3	3	3	2	2	0	0
5	7	M	Hi	18.1	18.1	18.3	18.4	18.5	18.6	18.6	15.7	15.7	15.8	15.9	16	16	16.1	2	2	2	1	1	0	0	2	2	2	1	1	1	0
6	5	F	Hi	14.8	14.9	14.9	15	15.1	15.2	15.3	15	15	15	15.1	15.2	15.3	15.3	3	3	3	2	2	1	1	1	1	1	1	0	0	0
7	5	F	Hi	16.4	16.5	16.6	16.7	16.8	16.9	17	14.9	14.9	15	15.1	15.1	15.2	15.3	3	3	2	2	2	1	1	2	2	2	2	1	1	1
8	9	M	Mu	23.5	23.7	23.8	24	24.1	24	25.2	17.2	17.2	17.2	17.3	17.3	17.3	17.4	2	2	2	1	1	1	1	3	3	3	2	2	1	1
9	4	F	Hi	12.8	12.9	13	13.1	13.3	13.4	13.7	14.8	14.9	14.9	15	15.1	15.2	15.3	3	3	3	2	2	1	0	2	2	2	1	1	1	0
10	4	F	Hi	13.5	13.6	13.7	13.8	13.9	14	14	14.7	14.8	14.8	14.9	14.9	15	15	1	1	1	1	1	0	0	3	3	3	2	2	1	1
11	8	F	Hi	21	21.3	21.6	21.8	22.3	22.4	22.6	16.6	16.6	16.7	16.7	16.7	16.8	16.9	3	3	2	2	1	1	1	2	2	2	2	1	1	1
12	3	M	Mu	12.3	12.3	12.4	12.5	12.5	12.6	12.7	14.3	14.3	14.3	14.4	14.4	14.4	14.5	2	2	2	2	2	1	1	1	1	1	1	0	0	0
13	4	F	Hi	14.5	15.6	15.7	15.8	15.8	15.9	15	15	15	15	15	15.1	15.2	15.2	3	3	3	3	2	1	1	2	2	2	1	1	1	1
14	3.5	F	Hi	12.7	12.7	12.8	12.9	13	13.1	13.2	14.7	14.7	14.7	14.7	14.8	14.8	14.9	1	1	1	1	1	1	1	1	1	1	1	0	0	0
15	5	F	Hi	16	16.1	16.2	16.2	16.3	16.4	16.4	15.4	15.5	15.5	15.5	15.5	15.5	15.5	3	3	2	2	2	1	1	2	2	2	2	1	1	1
16	4	M	Hi	13.6	13.6	13.7	13.8	13.9	13.9	14	14.5	14.5	14.5	14.5	14.5	14.6	14.6	2	2	2	1	1	0	0	1	1	1	1	1	0	0
17	6	M	Jain	17.9	17	17.2	17.4	17.9	18.5	18.8	15.4	15.5	15.6	15.6	15.8	15.9	15.9	1	1	1	1	0	0	0	3	3	3	3	2	2	1
18	3	M	Hi	12.6	12.7	12.9	13	13.1	13.2	13.4	14	14	14.2	14.2	14.3	14.3	14.4	2	2	2	1	1	1	1	3	3	3	2	2	1	1
19	8	F	Hi	20.1	20.2	20.5	20.5	20.8	21	21.3	15.7	15.7	15.7	15.8	15.9	16	16.2	2	2	2	1	1	0	0	2	2	1	1	1	0	0
20	5	F	Hi	14.8	14.9	15	15.1	15.2	15.4	15.5	14.8	14.9	15	15	15	15	15.1	1	1	1	1	0	0	0	2	2	2	1	1	1	1
1	5	F	Hi	14.6	14.6	14.6	14.7	14.8	14.9	15	14.9	14.9	14.9	14.9	14.9	15	15	3	3	3	3	2	2	2	1	1	1	1	0	0	0
2	6	M	Hi	17.7	17.8	17.8	17.9	17.9	18	18.1	15.4	15.5	15.5	15.5	15.5	15.6	15.6	1	1	1	1	1	1	1	2	2	2	2	1	1	0
3	3	F	Mu	11.8	11.8	11.9	12	12.4	12.7	12.7	14.3	14.3	14.4	14.4	14.5	14.6	14.6	2	2	2	2	1	1	1	2	2	2	2	1	1	1
4	6	F	Hi	16.3	16.3	16.4	16.4	16.5	16.5	16.6	15.3	15.3	15.3	15.3	15.3	15.3	15.3	1	1	1	1	1	0	0	3	3	3	3	2	2	1
5	4	M	Hi	13.4	13.4	13.4	13.5	13.6	13.7	13.8	14.8	14.8	14.8	14.8	14.8	14.8	14.9	3	3	3	3	2	2	1	1	1	1	1	0	0	0
6	4	M	Hi	12.8	12.8	12.8	12.9	12.9	13	13	14.2	14.2	14.2	14.2	14.2	14.2	14.2	3	3	3	2	2	2	2	2	2	2	2	2	1	1
7	5	F	Mu	14.7	14.7	14.8	14.9	15	15.2	15.3	14.5	14.6	14.6	14.6	14.7	14.7	14.7	2	2	2	2	2	1	1	3	3	3	2	2	1	1
8	8	F	Hi	21.6	21.6	21.6	21.7	21.8	21.9	22	16.3	16.3	16.3	16.3	16.3	16.3	16.3	3	3	3	1	1	1	1	2	2	2	2	1	1	1
9	4	M	Hi	16.1	16.1	16.2	16.4	16.6	16.7	16.8	15	15	15.1	15.1	15.2	15.2	15.3	2	2	2	2	1	1	1	1	1	1	1	0	0	0
10	8	F	Buddha	20.3	20.4	20.5	20.6	20.7	20.8	20.9	16.2	16.2	16.2	16.3	16.3	16.4	16.4	2	2	2	2	3	3	3	1	1	1	1	0	0	0
11	3	F	Hi	12.2	12.2	12.2	12.3	12.4	12.4	12.5	14.1	14.1	14.1	14.1	14.1	14.1	14.1	2	2	2	2	1	1	1	1	1	1	0	0	0	0
12	4	F	Hi	13.6	13.6	13.7	13.9	14	14.3	14.5	14.7	14.7	14.7	14.8	14.8	14.8	14.9	3	3	3	2	2	2	2	2	2	2	2	1	1	1
13	9	M	Hi	23.7	23.7	23.9	24	24.2	24.3	24.5	16.7	16.7	16.7	16.7	16.7	16.7	16.8	1	1	1	1	1	1	1	3	3	3	3	2	2	2
14	4	M	Mu	14.5	14.6	14.7	14.8	14.9	15	15	14.8	14.8	14.8	14.8	14.8	14.8	14.9	3	3	3	2	2	1	1	1	1	1	1	1	1	1
15	4	F	Mu	13	13.1	13.2	13.3	13.4	13.5	13.6	14.4	14.4	14.4	14.4	14.5	14.5	14.6	1	1	1	1	0	0	0	1	1	1	1	0	0	0
16	3	M	Hi	12.4	12.5	12.6	12.7	12.8	12.9	13	14	14	14	14	14.1	14.1	14.2	1	1	1	1	1	0	0	2	2	2	1	1	1	1
17	6	M	Hi	18	18	18	18	18.1	18.1	18.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	2	2	2	2	1	1	1	2	2	2	1	1	1	1
18	8	F	Hi	21.5	21.5	21.6	21.8	21.9	22	22.1	16	16	16	16	16	16	16.1	2	2	2	2	2	1	1	3	3	3	3	2	2	2
19	6	F	Hi	16.4	16.4	16.5	16.7	16.8	16.8	16.9	15.1	15.1	15.1	15.1	15.2	15.2	15.3	1	1	1	1	0	0	0	1	1	1	1	1	0	0
20	9	M	Hi	23.6	23.6	23.6	23.7	23.7	23.9	24	16.6	16.6	16.6	16.6	16.6	16.6	16.7	2	2	2	2	2	1	1	2	2	2	2	1	1	1