

**COMPARATIVE STUDY OF MUDGA MODAK AND GODHUMA MODAK OF
KRUTANNA VARGA W.S.R. TO THEIR BRUHANA EFFECT IN ATIKARSHYA**

**A THESIS SUBMITTED TO,
TILAK MAHARASHTRA VIDYAPEETH, PUNE**

**FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY (Ph.D.)
IN AYURVED (SWASTHAVRITTA)
UNDER THE BOARD OF AYURVED STUDIES**



**SUBMITTED BY
DR. ROMA SURESH GANGAWANE
(Registration No. 056130078835)**

**UNDER THE GUIDANCE OF
PROF. DR. MEDHA SANJAY KULKARNI**

DEPARTMENT OF AYURVEDA

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CERTIFICATE OF THE SUPERVISOR

It is certified that work entitled “**Comparative Study of Mudga Modak and Godhuma Modak of Krutanna Varga w.s.r. to their Bruhana Effect in Atikarshya**” is an original research work done by **Dr. Roma Suresh Gangawane**, under my supervision for the degree of Doctor of Philosophy in Swasthavritta, to be awarded by Tilak Maharashtra Vidyapeeth, Pune. To best of my knowledge this thesis

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Prof. Dr. Medha Sanjay Kulkarni

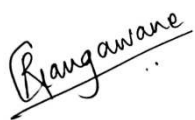
Tilak Maharashtra Vidyapeeth, Pune

UNDERTAKING

I, **Dr. Roma Suresh Gangawane** am the PhD Scholar of the Tilak Maharashtra Vidyapeeth in Swasthavritta subject. Thesis entitled '**Comparative Study of Mudga Modak and Godhuma Modak of Krutanna Varga w.s.r. to their Bruhana Effect in Atikarshya**' under the supervision of **Prof. Dr. Medha Sanjay Kulkarni**; solemnly affirm that the thesis submitted by me is my own work. I have not copied it from any source. I have gone through extensive review of literature of the related published / unpublished research works and the use of such references made has been acknowledged in my thesis. The title and the content of research are original. I understand that, in case of any complaint especially plagiarism, regarding my Ph.D. research from any party, I have to go through the enquiry procedure as decided by the Vidyapeeth at any point of time. I understand that, if my Ph.D. thesis (or part of it) is found duplicate at any point of time, my research degree will be withdrawn and in such circumstances, I will be solely responsible and liable for any consequences arises thereby. I will not hold the TMV, Pune responsible and liable in any case.

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Signature:



Address: D-25, Aniket Society – 1,
Bibwewadi Road,
Pune- 411037

PRN: 056130078835

Contact: +91 9822007403

E-mail: roma.gangawane@gmail.com

Date: 19.07.2022

Place: Pune

DECLARATION

I hereby declare that the thesis entitled '**Comparative Study of Mudga Modak and Godhuma Modak of Krutanna Varga w.s.r. to their Bruhana Effect in Atikarshya**' completed and written by me has not previously been formed as the basis for the award of any Degree or other similar title upon me of this or any other Vidyapeeth or examining body.



Signature of the Research Scholar

Dr. Roma Suresh Gangawane

Place: Pune

Date: 19.07.2022

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ABBREVIATIONS

• च.सं.	–	Charak Samhita
• सु.सं.	–	Sushrut Samhita
• अ.सं.	–	Ashtang Sangraha
• अ.हृ.	–	Ashtang Hruday
• भे.सं	–	Bhel Samhita
• का.सं	–	Kashyap Samhita
• हा.सं.	–	Harit Samhita
• यो.र.	–	Yog Ratnakar
• भा.प्र.	–	Bhav Prakash
• शा.सं.	–	Sharangadhar Samhita
• मा.नि.	–	Madhav Nidan
• भै.र.	–	Bhaishajya Ratnavali
• श.क.दृ.	–	Shabda Kalpa Druma
• सू	–	Sutra Sthana
• नि	–	Nidan Sthana
• वि	–	Viman Sthana
• चि	–	Chikitsa Sthana
• च. पा	–	Chakrapani Dutta
• CH	-	Charak
• SU	-	Sushrut
• A.H	-	Ashtang Hruday
• Ka.	-	Kashyap
• Sha.	-	Sharangadhar
• Su.	-	Sutra
• Vi.	-	Viman
• Chi.	-	Chikitsa
• Utt.	-	Uttara

INTRODUCTION:

With changing trends of today's era there are plenty of variations seen in the dietary habits. Increased consumption of fast food, instant preparations with low nutritive values, improper diet timings, lack of physical exercise etc. have triggered the increasing number of patients with malnourishment and weight issues. Results from 2007 – 2010 National Health and Nutrition Examination Survey (NHANES), using measured heights and weights indicate that an estimated 3.5% of adolescents aged 11-18 years, are underweight.¹

Good and proper nutrition is essential as adolescence is a critical period of growth and development. During adolescence, the need for most nutrients increases. It is very vital that the food choices are made carefully as the appetite is also likely to increase during this age.

Dietetics mentioned in *Ayurved* is rather unexplored area in many aspects. Many a time's food ingredients themselves become ingredients of medicine. So, dietary modifications play important role in management of the diseases.

पथ्यं पथोऽनपेतं यद्यच्चोक्तं मनसः प्रियम् ।

यच्चाप्रियमपथ्यं च नियतं तन्न लक्षयेत् ॥

- च.सू. २५।४५

Acharya Charak has rightly quoted in *Sutrasthan* that the body which is made up of *Dosha*, *Dhatu*, *Mala* along with conjugation of *Mana*, *Indriya* and *Aatma* whichever is beneficial i.e. *Hitkar Aahar Vihar* for the body is considered as *Pathya*.² So along with proper medications proper daily regime (*Aahar* and *Vihar*) is essential, which makes mind feel pleasant.

ATI KARSHYA AND UNDERWEIGHT:

In *Ayurved Samhitas* there are references available regarding the symptoms of *Atikarshya*. *Acharya Charak* explains the symptoms of *Atikarshya*³ –

शुष्कस्फिगुदग्रीवो धमनीजालसन्ततः त्वगस्थिशोषोऽतिकृशः स्थूलपर्वा नरो मतः॥ - च.सू. २१/१५

According to *Acharya Dalhana*

कार्श्यं मासंक्षयं।

- सु. सू. १५।१९

A person having lean and thin body but doesn't have any other complaints is *Krusha*.⁴ *Atikrusha* is much leaner and emaciated than *Krusha*. So symptoms of *Karshya* will appear more in *Atikarshya*.

The definition of underweight is - malnourished but doesn't have any feature of Marasmus and Kwashiorkor and his weight for age is 60-80% is underweight.⁵

Hence, *Atikarshya* is considered equal to Underweight in the current study.

NEED FOR THE PRESENT STUDY:

Many diseases are known to afflict human being; these include infectious, metabolic, genetic and nutritional deficiency disorder. Out of these nutritional deficiency diseases are the most common throughout the world. It is the most widespread health and nutritional problem in developing countries.

World Health Organization identifies malnutrition as the single most important risk factor of the disease.⁶ Hence, it is essential to introduce dietary changes in the patients instead of opting for medication. It can be more beneficial if introduced in young age. The ingredients selected for the present study are easily available, palatable and easily introduced or already a part of the daily diet.

SELECTION OF TOPIC:

सातत्यात्स्वादभावाद्वा पथ्यं द्वेष्यत्व मागतम्

कल्पनाविधिभिस्तैः प्रियत्वं गमयेत् पुनः॥

- च. चि. ३०।३३१

Continuous consumption of the similar kind of food develops *aruchi* in a patient. So it becomes essential and beneficial if *Pathya Aahar* is prepared in different ways using the same ingredients to increase its taste & palatability.⁷ The knowledge about the various recipes in *Krutanna Varga* and its therapeutic properties is scattered in our *Samhitas*. So there is a need to compile these topics together and popularize the concepts of *Krutanna Varga* in present era. The role of *Pathya Aahar* with respect to *Atikarshya* is not been studied. So the current study is planned so that simple day to day dietary changes can be beneficial easily consumable and affordable to the patients. Hence the current topic of “Comparative study of Mudga Modak and Godhuma Modak of Krutanna Varga w.s.r. to their Bruhana effect in Atikarshya” is planned.

According to Modern Science, *Mudga* and *Godhuma* are nearly equal in energy content. As in the current study there is assessment of the *Bruhana* effect of both the preparation, only the energy levels are considered. So, as per Parks PSM, nutritional profile of foods, page 685, 25th edition, Green Gram/100g (*Mudga*) = 348 Kcal and Whole Wheat/100g (*Godhuma*) = 346 Kcal Energy respectively.⁸

There are various references scattered in our *Samhitas* which describe *Mudga* and *Godhuma* as *swathyahitkar, pathyakara and nityasevaniya dravyas*.

AIM:

- To study the effect of *Mudga Modak* and *Godhuma Modak* in adolescent *Atikarshya*.

OBJECTIVES:

1. To study the concept of *Pathya Aahar* in *Ayurved* with special reference to *Krutanna Varga*.
2. To evaluate the effect of *Mudga Modak* and *Godhuma Modak* in the patients of *Atikarshya*.
3. To analyze the effectiveness of the above two *Krutanna Kalpanas*.

RESEARCH QUESTION:

Whether *Mudga Modak* and *Godhuma Modak* are equally effective as *Bruhana* in *Atikarshya*?

HYPOTHESIS:

H₀ - *Mudga Modak* and *Godhuma Modak* of *Krutanna Varga* are not equally effective as *Bruhana* in *Atikarshya*.

H₁ - *Mudga Modak* and *Godhuma Modak* of *Krutanna Varga* are are equally effective as *Bruhana* in *Atikarshya*.

REVIEW OF PREVIOUS WORK DONE:

So far no specific work has been done on the mentioned subject.

- 1) **Dr. K.S. Patel** – Brimhana effect of certain Ayurvedic drug compound in underweight child. (1985)
- 2) **Dr. Sharma Surendra** - A study of nutritional status in children based on Ayurvedic concept. (1986)
- 3) **Dr. Sharma Chamanlal** - Brimhana effect of certain indigenous drug in pediatric practice. (1987)
- 4) **Dr. Geeta Jatav** - Comparative study on the effect of Vidarikandadi Vati and Kshirabalataila basti in the management of Karshya in children. (2008)
- 5) **Dr. Nirali Joshi** - A Clinical Study on Brumhan Effect of Prinam Modak and Godhumadi Modak in the Management of Karshya. (2011)
- 6) **Dr. Patil Motilal** - Comparative study of Prinam modaka as a supplementary food and mid-day meal in Balawadi nutrition programme. (2016)

REVIEW OF LITERATURE

AYURVEDIC VIEW OF KARSHYA AND ATIKARSHYA

MEANING:

Derivation of the term 'Krusha' is done from the root of –⁹

* कृश तनु करणे + अच् प्रत्यय, तनु करणम् – कर्शिनी करणम् – श.क.द्रु . भाग क्र. २।१०८

As per *Shabdakalpadruma* - a person kept in short of food; becomes lean, thin and emaciated.

SYNONYMS:

As per *Vachaspatyam, Bruhat Sanskrutabhidhan* -¹⁰

* अल्पे च सूक्ष्मे च शुल्लक, तनु।

क्षाम, क्षत, कृश, क्षीण, पेलव, तलिन, तुन। - भाग क्र. ३।५५०

NIRUKTI:

* कार्श्य - कृशस्य भावः कार्श्यम् । - भाग क्र. ३।५५०

Karshya or *Krushata* is a *lakshana* of a subject who is emaciated or lean.¹¹

DEFINITIONS:

१) उपशोषित अल्प रस धातुजन्य मांसहानि शरीरं मांसक्षयो वा । - च.चि. ३०।२३५

Can be explained as a condition or disease in which the body of a subject becomes emaciated, having less quantity of *Rasa Dhatu* leading further to *Mamsahinata* or *Mamsakshaya*.¹²

२) कृश्यते इति कृशः । - श.क.द्रु . भाग क्र. २।१०८

It can be specified as - *Krusha* is state in which the subject becomes thin and lean.¹³

३) शरीरोपचयेत्यादि उपचयः स्थौल्यं, अपचयः कार्श्यं । - सु. सू. १५।३०

Karshya indicates *Dhatukshaya* as the chief occurrence; hence *Karshya* is referred as *Apatarpanatmaka* disease according to *Dalhana* in his commentary.¹⁴

REFERENCES OF KARSHYA:

There are references available regarding the disease *Karshya* in children but after a gross outlook of the *Samhitas*, we can say that *Karshya* has been described as a pre-stage of other diseases mentioned in many *Samhita*.

1. Charak Samhita:

* विसं वातसृष्टं कृशी भवति तत् पिबन। - च.चि. ३०।२३९

- Child become *Krusha* due to intake of *Vatadushta* milk.¹⁵
- There are 8 types of undesirable subjects (*Ashtaunindita*) from treatment point of view, *Atikrusha* is one of them. Precocious and low quantity than the required intake of food is chief cause in generating *Krushata*. *Tikta*, *Katu*, and *Kashay Rasa* are supposed to produce *Karshya*. *Krushangata* has been incorporated in the *Rasa Pradoshaja Vyadhi*.

2. Sushrut Samhita:

- *Acharya Dalhana* comments as ¹⁶ कार्श्यं मांसक्षयं। - सु. सू. १५।१९
- *Atikarshya* has been described with its *Nidan*, *Samprapti*, *Lakshana* and *Chikitsa*.
- In addition to above reference, the word *Krusha* has been used at many places under different contexts.

3. Ashtang Sangraha:

- *Atikrusha* along with *Atisthula* is described.¹⁷
- *Karshya* as an early symptom of *Parigabhika*.¹⁸ There is a description of *Balshosha* found in “*Kumarah shushyati*”.

4. Ashtang Hruday:

- There is no devoted separate paragraph for describing the symptomatology of *Krusha* though its treatment has been mentioned.

5. Kashyap Samhita:

- The reference of *Sandashi Jataharini* is associated with *Parigarbhika* and *Karshya* considered as an early symptom of *Parigarbhika*.¹⁹ *Karshya* as a symptom of *Kshudita* subject has been mentioned in *Ka. Bhojanakalpa*.²⁰ *Karshya* has been described as a pre-stage of *Kshiraja Phakka*.²¹ *Kshina Mamsa* has been described as a symptom of *Vyadhija Phakka*. *Acharya Kashyap* includes the condition *Karshya* as a disease caused by *Vata*.^{22,23}

6. Bhavaprakash:

- Separate chapter ‘*Karshyadhikar*’ for describing the etiology, symptoms, pathogenesis, prognosis and treatment of *Krusha* subject.²⁴

7. Madhav Nidan:

- Child becomes *Krusha* due to intake of *Vatadushta* milk.²⁵ This is an indirect reference of *Karshya* and other extreme form of malnutrition in children.

8. Yogaratnakar:

-Dedicated chapter for treatment of children suffering from *Karshya* in *Balroga Chikitsa Karshyadhikar*.²⁶

9. Sharangadhar:

- Description of *Karshya* under *Nanatmaja Vyadhi* of *Vata*, focusing the diseases caused exclusively by *Vata Dosha*.²⁷

CONCEPT OF KARSHYA AND ATIKARSHYA:

- *Acharya Charak* perceives that in cases where *lakshana* of disease manifest independently, then they are considered as a separate disease. Likewise when the *lakshana* appear as a part of disease then they are not called as an independent disease.
- If *Karshya* occurs later in childhood and persists for a longer period, then it may lead to *Atikarshya*.
- In the present study *Atikarshya* not a complication of any disease condition or has not a cause of any diseased condition has been taken into consideration.
- It may be said that a much leaner and emaciated subject having no other complaint perhaps be taken as *Atikarshya* (Underweight).

PROBABLE CLASSIFICATION OF NUTRITIONAL DEFICIENCY DISORDER OF CHILDREN IN AYURVED:

Nutritional deficiency disorder in children is classified into groups:

- 1) Normal to Mild Form - *Karshya*
- 2) Mild to Moderate Form – *Atikarshya*
- 3) Severe Form – *Parigarbhika - Bal shosha*

PROBABLE COMPARISON OF AYURVED AND MODERN VIEWS OF MALNUTRITION:

1. Atikarshya and Underweight: There are references available in *Ayurved Samhitas* regarding the symptomatology of *Atikarshya*.

According to *Acharya Dalhana* * कार्श्यं मांसक्षयं। - सु. सू. १५।१९

A person having lean and thin body but doesn't have any other complaints is *Krusha*. *Atikrusha* is much leaner and emaciated than *Krusha*. So symptoms of *Karshya* will appear more in *Atikarshya*.

The definition of underweight is - malnourished but doesn't have any feature of Marasmus and Kwashiorkor and his weight for age is 60-80% is underweight.²⁸

Hence, *Atikarshya* can be considered equal to Underweight to some extent.

2. Concept of Karshya and Atikarshya:

An outwardly lean and thin looking subject may be known as *Krusha*. To understand this precisely, the word like *Sthula*, *Atisthula*, *Krusha* and *Atikrusha* should be considered. According to *Acharya Sushrut*, the human body can be divided in to three groups based on its looking viz- *Sthula*, *Madhyam* and *Krusha*. There are some places in the body where generally fat deposits and these are – *Sphika* (hips), *Udar* (abdomen) and *Griva* (neck). Apparently a normal looking subject having more bulk of fat at these places may be considered as *Sthula*, on other hand when less fat is observed at these places, then termed as *Krusha* and subject with seemingly well-structured body having requisite amount of fat at the above places may be termed as *Madhyam*.

In this way *Sthula* and *Krusha* may be considered as abnormal. However they are prone to turn in to the stages of *Atisthula* and *Atikrusha* respectively, which are definitely diseased entities and *Ayurved* has included them under *Ashtaunindita Purusha* i.e. eight types of undesired subject.

By the explanation stated before, it may be said that a thin subject 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 *Atikrusha*.

While discussing about *Atikrusha Dalhana* he says –²⁹

* सोऽतिकृश इत्ययेन उपचय लक्षणेन बलाभावे दर्शिता । - सु. सू. १५।३३

Hence it can be stated that the word *Krusha* and *Atikrusha* show 2 degrees of malnutrition, i.e. moderate and severe respectively. The description of *Atikrusha* by *Sushrut* nearly equals to lack of nourishment 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 *Karshya* 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 *Karshya* occurs at early infancy it may lead to either *Balshosha* or *Parigarbhika*, if it occurs in later childhood or onward and persist for a longer period it may leads to *Atikarshya*.

NIDAN (ETIOLOGY OF KARSHYA): ^{29,30,31}

The etiological factors of *Karshya* can be broadly classified under three separate headings namely-

- 1) *Aaharaj* – (a) Qualitative (b) Quantitative
- 2) *Viharaj* – (a) *Sharirik* (b) *Mansik*
- 3) Others

Table No. 01 – Hetus for Karshya

AHARAJA		VIHARAJA		OTHERS
Qualitative	Quantitative	Sharirika	Mansika	
<i>Rukshaannapana</i>	<i>Alpashana</i>	<i>Kriyatiyoga</i>	<i>Ati shok</i>	<i>Vatika prakriti</i>
<i>Vatika annapana</i>	<i>Pramitashana</i>	<i>Ativyayam</i>	<i>Ati chinta</i>	<i>Nitya rogi</i>
<i>Kashaya, Katu, Tikta Rasa Sevan</i>	<i>Anashana</i>	<i>Mala mutradi nigras</i>	<i>Ati krodha</i>	<i>Grishma ritu</i>
	<i>Langhana</i>	<i>Ruksha udvaratana</i>	<i>Ati bhaya</i>	<i>Bhutabhighata</i>
	<i>Upavasa</i>	<i>Atiadyayana</i>		
		<i>Vata sevana</i>		
		<i>Atapa sevana</i>		

		<i>Kapha ati vartana</i>		
		<i>Shonita ati vartana</i>		
		<i>Mala ati vartana</i>		
		<i>Dukhashayya</i>		
		<i>Dukha asana</i>		
		<i>Bala Vata nigraha</i>		
		<i>Ati bhargamana</i>		

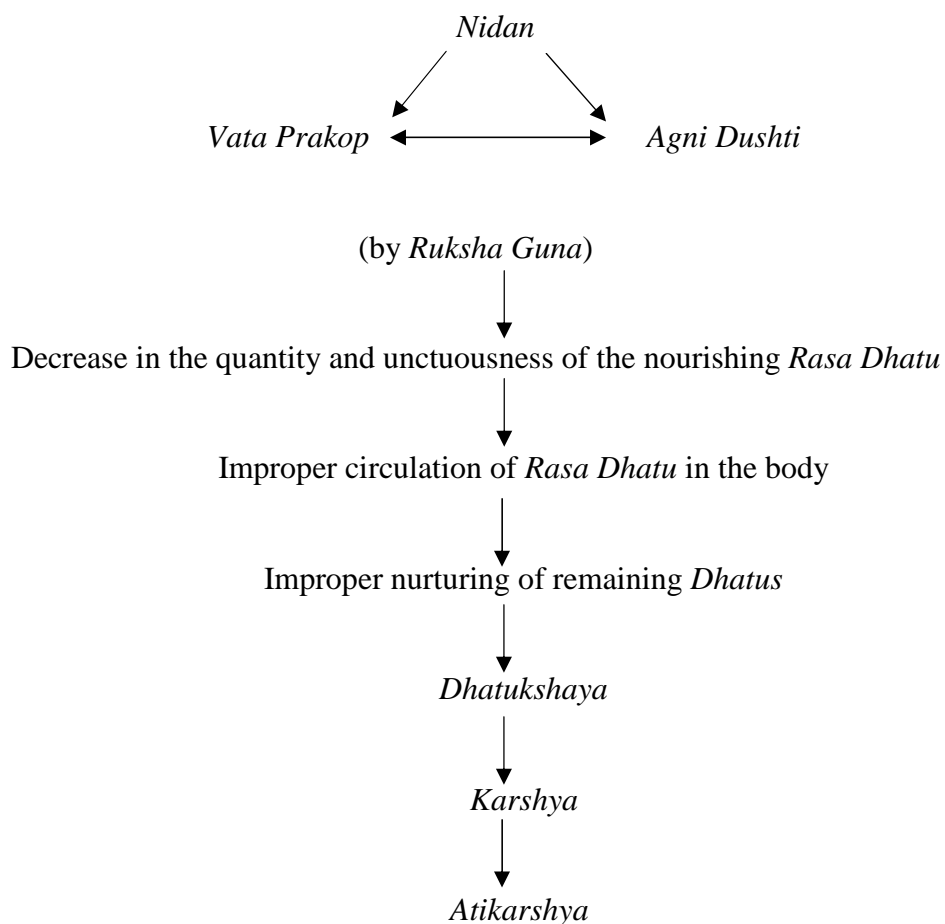
The above mentioned etiological factors cause *Vata Prakop* which leads to *Dhatukshya* specially *Mamsa* and *Meda Kshaya* and manifest the *Karshya*. From another i.e. *Aharaj* point of view, the dietetic factors like *Ruksha Annapaan* can be included in malnutrition where food is qualitatively less, and *Anashana*, *Alpashana* in under nutrition where food is quantitatively less.

In *Viharaj* factor, mainly excessive exhaustive procedures are described namely *Vata* and *Atapa Sevan*, *Ratrijagarana*, excessive exercise, etc. Along with this indulgence of hunger is also included. Here comparative to food intake, calories spent is more & thus occurs energy malnutrition. In calorie intake output ratio, output is more than the intake hence body tissues are degraded in order to get energy thus producing emaciation. Psychological factors lead to the disturbed mental condition hence hunger is decreased or proper food is not consumed, leads to emaciation. In *Vata Prakriti* subject, during the wear and tear phenomenon of body tear is more. *Vata* is responsible which is dominant in this condition. Thus *Krushata* is seen mainly in the nutritional deficient stages. Also certain diseases generalized effect on the health show *Krushata* in the form of sign and or symptoms or mostly in the convalescence stages or as a complication of disease. But in all these condition *Dhatukshaya* plays a crucial role. Though *Krushata* is found as a whole entity or a part of diseased condition (either sign or symptoms), for the present work *Atikrushata* not complicated by any diseased condition or not resulted in any diseased condition has been taken in to consideration.

SAMPRAPTI:

Due to the Ruksha Guna of *Vata* Dosha vitiation is seen in the etiological factors. The body factors viz. *Vata*, *Agni* and *Rasa* are correlated to each other. Vitiation of *Vata* leads to *Agni* dushti or *Agnidushti* may lead to *Vata* Prakop. At this stage either of them depreciates the quantity and unctuousness of the nourishing *Rasa* Dhatu, which hampers the bodily circulation of *Rasa* dhatu. The suitable nourishment of the remaining dhatus in the body is hindered, leading to *Dhatukshaya* and eventually manifest as *Karshya*. If this condition is ignored and persists for a longer duration it leads to *Atikarshya*.

SCHEMATIC REPRESENTATION OF SAMPRAPTI:



SAMPRAPTI GHATAK OF KARSHYA:

Dosha:

1. Vata

- *Vata Dosha* plays very important role in the pathogenesis of *Karshya*. *Sushrut* and *Vagbhat* have clearly mentioned *Krushata* is result of vitiation of *Vata dosha*.³²

* तस्य रौक्ष्यात् वातला रुक्षापचिताल्पशरीराः। - च.वि. ८।९८

It elucidates that *Vata dosha* is responsible for the *Apachita sharir* i.e. *Karshya* of the body. *Sharangadhar* enumerated *Karshya* as one of the *Nanatmaja* disease of *Vata* that means produced completely by *Vata Dosha*; which predominantly not only indicates the physical effects but also the mental debilities.³³

Vagbhat quotes the function of normal *Vata* as – * अक्षाणां पाटवेन च ।

Specifying that the *Vishaya Grahana* of *Indriya*, is performed by *Vata*. So when vitiated it is unable to function properly resulting to *Manovikaras*. As *Indriyas* take their *Indriyarthas* with the help of *Mana*; Charak also remarks *Vata* as³⁴ –

* नियन्ता प्रणेता च मनसः। - च.सू. १२।८

2. Pitta- Vitiated *Pachaka Pitta* is responsible for the pathogenesis of *Karshya*, as it leads to *Agnidushti* as an outcome of which the *Dhatu* are not produced properly leading to *Anuloma Kshaya*. Also *Agnidushti* may cause *Vata Prakop*, resulting *Krushata* of the body.

Dushya:

The *Dhatu* namely - *Rasa*, *Mamsa* and *Meda* are the main *Dushya* leading *Krushata*.

Acharya Sushrut quotes³⁵ - * रस निमित्तमेव स्थौल्य कार्श्यम् । - सु. सू. १५।३७

Agni dushti may lead to the formation of *Annavisha* in *Karshya*³⁶, leading to the inappropriate development of *Rasa dhatu* causing *Rasa Dhatukshaya*. Other *Dhatu* of the body are nurtured from the chief *Rasa dhatu*. *Krushata* is the main symptom seen after *Rasa Dushti*, due to *Anuloma Kshaya*, the other *Dhatu* are not well formed.³⁷

मांसेऽक्ष ग्लानि स्फिक शुष्कता ।

मेदसि स्वप्नं कट्टया प्लीहनौ वृद्धि कृशांगता ॥ - अ. ह. सू. ११।१८

Both *Mamsa* and *Meda Dhatu* are also responsible for *Karshya*.

Agni:

Jathragni Mandya is seen as result of *Agnidushti* in *Karshya*. Hence, *Acharya Charak* promotes management in form of *Laghu Santarpan* type of treatment for the *Bruhana*.

Koshtha:

Koshtha of *Krusha* subjects become *Krura*, as *Vata* is the main *Dosha* in pathogenesis of *Karshya*.

Udbhavasthana:

Pakwashaya can be considered as origin of *Karshya*; as the formation of *Dhatu* starts after the separation of *Aahar* by *Samana Vayu* in to *Sara* and *Kitta bhaga* in the *Pakwashaya*. If the separation is not done properly due to *Agni Dushti* and *Dosha Prakop*, nourishment of the *dhatu*s is stopped. Hence, probably the *Udbhavasthana* of this disease is said to be *Pakwashaya*.

Rogamarga:³⁸

Karshya is originated from *Koshtha* and manifests all over the body. Thus, it becomes a disease of *Aabhyantar Rogamarga*.

Srotas:

Annavaha, *Rasavaha*, *Mamsavaha* and *Medavaha srotas* affected due to their corresponding *Agni Dushti*, seen in *Karshya*.

RUPA OF KARSHYA:^{39,40,41,42}

The detailed description of clinical sign and symptoms is supported on the basis of symptomatology of *Atikarshya* (Ch. Su. 21/13-15). These can be broadly arranged in two separate headings:

- (1) *Pratyatmalakshana* (cardinal sign and symptoms)
- (2) *Samanyalakshana* (associated sign and symptoms)

TABLE NO. 02 – Lakshanas of Karshya

LAKSHANAS	CS	SS	AS	BP
<i>Pratyatma lakshanas</i>				
<i>Sushka Sphika</i>	+	-	+	+
<i>Sushka Udara</i>	+	-	+	+
<i>Sushka Griva</i>	+	-	+	+
<i>Dhamani Jala Darshana</i>	+	-	+	+
<i>Tvaga Asthi Shesha</i>	+	-	-	+
<i>Vata Roga Prayah</i>	-	+	+	-
<i>Sthula Parva</i>	+	-	+	+
<i>Samanya lakshanas</i>				
<i>Vyayam asahishnuta</i>	+	+	+	-
<i>Atisauhitya asahishnuta</i>	+	-	-	-
<i>Kashuta Nigraha asahishnuta</i>	+	+	+	-
<i>Pipasa Nigraha asahishnuta</i>	+	+	+	-
<i>Mahoushadha asahishnuta</i>	+	+	+	-
<i>Ati shita asahishnuta</i>	+	+	+	-
<i>Ati ushna asahishnuta</i>	+	+	+	-
<i>Maithuna asahishnuta</i>	+	-	-	-
<i>Kriyashu Alpa Prana</i>	-	+	+	-
<i>Rakta Pittaja Amaya</i>	-	-	+	-
<i>Sthula Anana</i>	-	-	-	+

- Wasting of buttock, abdomen & neck, calf muscles
- Due to this veins of the body become visible
- Only skin and bones are left to seen
- Head and joints relatively looks larger
- Wrinkles
- Body ache
- Whole body becomes thin

SADHASADHYATA OF KARSHYA:

* स्थौल्य कार्श्ये वरं कार्श्यम्। - च. सू. २१।१७

Acharya Charak has clarified *Krusha* that a subject is supposed to be easier to treat than *Sthula* subject.⁴³ *Bruhana Chikitsa* is usually implemented as line of treatment *Karshya*. It increases *Meda Dhatu* thus easier to treat and it is considered *Sukha Sadhya*. The *Krusha* afflicted with all complications with *Dosha* and *Dushya* involving all *Strotas*, *Margas* and is of longer duration is considered as *Asadhya* or incurable.

PRINCIPLES OF MANAGEMENT OF KARSHYA:

Karshya is a *Vata Pradhan Vyadhi*, mainly occurring due to *Dhatukshaya*. *Vata Upakrama* can be adopted as general line of treatment. All the *Acharya* have emphasized on *Bruhana Chikitsa* as specific line of treatment.

According to *Acharya Charak* *Bruhana Chikitsa* should be *Laghu Santarpan* in nature.⁴⁴ As in a *Krusha* patient *Agni*, *Sharirabala* and other related aspects are functioning poorly. The principle of management of *Karshya* should be in following manner:

- 1) *Nidan parivarjan*
- 2) *Sanshodhan*
- 3) *Sanshaman*
- 4) *Aahar*
- 5) *Aachar*

NIDAN PARIVARJAN:^{44,45}

Nidan Parivarjan can be considered first line of treatment in *Karshya*. The mentioned *Nidan* viz. *Ruksha*, *Vata Prakop Annapana*, *Alpa Bhojan*, *Kashay*, *Katu*, *Tikta Rasa sevan*, *Ati Vyavaya* etc. should be avoided, *Nidan Parivarjan* has two fold benefits. Being a prophylactic measure, further progression of disease can be ceased and the other aspect is in future relapse of the same disease can be prevented.

Acharya Sushrut described that proper implementation of *Sanshodhan*, *Sanshaman*, *Aahar* and *Aachar* are helpful in preventing, controlling as well as eradicating the *Karshya*.

Sanshodhan: ⁴⁵

Karshya is an *Apatarpanajanya vyadhi*, hence *Bruhana Chikitsa* is indicated. But *Mrudu Sanshodhan* can be advised to the *Krusha* patient. *Sanshodhan Chikitsa* is of two types -

i) *Bahir Parimarjan - Taila Abhyang, Snigdha Udvartan*

ii) *Antaha Parimarjan* - In the context of *Atikarshya Acharya Charak* quotes that *Doshavsechana* should be performed. *Acharya Sushrut* and *Vagbhat* recommended *Bruhana Basti* having *Mrudu, Snigdha*, etc. properties.

Sanshaman: ^{46, 47}

Sanshaman is a sort of conservative treatment. *Acharyas* here opine that *Rasayana, Vrishya, Balya, Bruhana, Jivaniya* type of *dravya* should be administered in *Karshya*.

(Ch. Su. 21/33)

Aahar: ^{48,49}

Aahar pertains to the different dietetic and nutritional regimens employed for the management of *Karshya*. Like *Mamsa, Dugdha, Guda, Ghruta* etc.

Vihar: ^{50,51}

This includes various preventive as well as rehabilitative measures effective for both mind and body. Like *Atimatra Awapna*, feeling of joy, peace of mind, abstinence of anxiety.

EMACIATION: ⁵²

१) सेवा रुक्षान्न पानानां लङ्घनं प्रमिताशनम् क्रियातियोगः शोकश्च वेगनिद्राविनिग्रहः ।

रुक्षस्योद्धर्तनं स्नानस्याभ्यासः प्रकृतिर्जरा। विकारानुशयः क्रोधः कुर्वन्त्यति कृशं नरम् ॥

- च.सू. २१/१०-११

प्रमितस्य स्तोकस्याशनं प्रमिताशनम्। क्रियातियोगः वमनाद्यति योगः ।

प्रकृतिः देहजनकं बीजं। अनुशयः अनुबन्धः॥ - च.पा.

Consumption of unctuous diet and drinks, fasting, intake of inadequate quantity of food, excess of elimination therapies (*Shodhan*), suppression of natural urges including urge for sleep, dry massage (*Udvartan*), bath, hereditary factors, long standing illness, old age and anger makes a person emaciated.

- २) व्यायाममतिशौहित्यं क्षुत्पिपासामयौषधम्। कृशो न सहते तद्वत् अतिशीतोष्णमैथुनम् ।
प्लीहा कासः क्षयः श्वासो गुल्मोऽर्शास्युदराणि च ॥

कृशं प्रायोऽभिधावन्ति रोगाश्च ग्रहणी गताः। - च.सू. २१/१३-१४

Emaciated person cannot with stand physical exercise, intake of large quantities of food, hunger, thirst, diseases and drugs. These people also cannot bear excessive cold, dyspnoea, emaciation, abdominal tumour, piles, ascites and sprue.

FEATURES OF EMACIATION:

- ३) शुष्कस्फिगुदग्रीवो धमनीजालसन्ततः त्वगस्थिशोषोऽतिकृशः स्थूलपर्वा नरो मतः॥

- च.सू. २१/१५

In a person suffering from emaciation - buttocks, abdomen and neck are shrunken and wasted, veins can be easily seen through skin and the person appears to have only skin and bone.

PRINCIPLES OF TREATMENT: ⁵³

- ४) कृशानां बृंहणार्थं च लघु संतर्पणं च यत्॥ - च.सू. २१/२०

लाघवाद्गन्नि वृद्धिकरं, संतर्पणत्वाच्च पृष्टिकृत्॥

नवान्नादि गुर्वपि संतर्पणं कर्तव्यं। परं लाघवं गौरवं संस्कारादिना प्रकर्तव्यम् ॥ - च.पा.

Nourishing and light diet can be given to increase *Agni*; *Santarpak* food nourishes the body e.g. newly harvested rice. So, *Bruhana* can be probable mode of management in *Krushata*.

MANAGEMENT OF EMACIATION: ⁵⁴

- ५) स्वप्नो हर्षः सुखा शय्या निर्वृतिः शमः। चिन्ता व्यावाय व्यायाम विरामः प्रियदर्शनः॥

- च.सू. २१/२९

Regime for emaciated person – Proper sleep, being cheerful, having comfortable bed, intellectual and emotional satisfaction, peaceful mind, no concerns, sexual accomplishments, exercise and pleasant sights are conducive.

६) सततं व्याधितावेतावतिस्थूल कृशो नरो ।

सततं चोपचर्यो हि कर्शणैर्बृंहणैरपि ॥ - च.सू. २१/१६.

Atisthula (obese) and *Atikrusha* (emaciated) people are always affected with some disease. Hence in an *Atisthula* person *Karshan Chikitsa* is recommended whereas in *Atikrusha* person *Bruhana Chikitsa* is mentioned.

७) नवान्ननि नवं मद्यं ग्राम्यानूपौदका रसाः। संस्कृतानि च मांसानि दधि सर्पिः पयांसि च॥

- च.सू. २१/३०

Conducive Food - Newly harvested rice, newly prepared alcohol, flesh of marshy and aquatic animals, processed meat, curd, ghee, milk, sugar cane, black gram, wheat and products made of jaggery; are indicated in an emaciated person.

८) अचिन्तनाच्च कार्याणां ध्रुवं संतर्पणेनच । स्वप्नप्रसङ्गाच्च नरो वराह इव पुष्यति ॥

- च.सू. २१/३४

Intake of nourishing diet, freedom from anxiety and good sleep makes the man fat like a well-nourished pig.

९) बस्तयः स्निग्धमधुरस्तैलाभ्यङ्गश्च सर्वदा। शुक्लं वासो यथाकालं दोषाणामवसेचनम्॥

रसायनानां वृष्यानां योगानामुपसेवनं।हत्वाति कार्श्यमाधत्ते नृणामुपचयं परं॥

- च.सू. २१/३१-३२

Enema prepared of unctuous and sweet drugs, regular oil massage, bath, scents, garlands, use of white clothes, and elimination of dosha has in time and administration of rejuvenating and aphrodisiac drugs cure emaciation.

PATHYAPATHYA IN KARSHYA:

१) षष्टिकाञ्छालिमुद्गांश्च सैन्धवाम्लके यवान् ।

आन्तरीक्षं पयः सर्पिर्जाङ्गलं मधु चाभ्यसेत् ॥ - च.सू. ५/१२

Shashtika (paddy maturing in sixty days), *Shali* (rice), *Mudga* (green gram), *Saindhava* (salt), *Amalaka* (myrobalan), *Yava* (barley), *Antariksham* (rain water), *Paya* (milk), *Sarpi* (ghee) - prepared from milk of animals of desert like regions and *Madhu* (honey) should be used constantly.⁵⁶

२) लोहितशालयः शूकधान्यानां पथ्यतमत्वे श्रेष्ठतमा भवन्ति ;

मुद्गः शमीधान्यानाम् ॥ - च.सू. २५/३८ (हितकर आहार)

Hita tama Aahar Dravya – food material most suitable for health - *Lohita Shali* (red rice) best amongst *Shuka Dhanya* (cereals), *Mudga* (green gram) best amongst *Shami Dhanya Varga* (pulses) and *Gavya Sarpi* (cow's ghee).⁵⁷

३) अतः सर्वप्राणिनाममयमाहार्थं वर्ग उपदिश्यते;

तद्यथा - रक्तशालिषष्टिक कङ्कुक मुकुन्दक पाण्डुकपीतक प्रमोदककालकासनपुष्पक

कर्दमकशकुनातसुगन्धक कलमनीवार कोगेदेवोद्दालक श्यामाक गोधूम यव वैण हरिण कुरङ्ग

मृग मातृकाश्वदंष्ट्राकरालक्रकरकपोतलावतितिरि कपिञ्जल वर्तिरवर्तिका मुद्ग

वनमुद्गमकुष्ठकलाय मसूर मङ्गल्य चणक हरेण्वाढकीसतीनाश्चिल्लि वास्तुकसुनिषण्णक

जीवन्तीतण्डुलीयक मण्डूकपर्ण्यः, गव्यं घृतं, सैन्धवं, दाडिमामलकमित्येष वर्गः सर्व प्राणिनां

सामान्यतः पथ्यतमः ॥ - सु. सू. २०।५ (हिताहितीयमध्यायं)

Pathyatama Aahar - food material which are best suited for health – *Godhuma* (wheat), *Mudga* (green gram), *Gavya Ghrut* (cow's ghee) substances are amongst the best suited to all living beings.⁵⁸

४) मधुर शीतः स्निग्धो गुरु वृष्यो जीवनः संधानकरो।

बृंहणो बल्यः सरः शुक्रवर्धनो वातपित्तघ्नः॥ - च.सू. २७/२१ (गोधूम गुण)

Godhuma unites fractures, mitigates *Vata*, is sweet in taste, cold in potency, vitalizing, enhances strength, stoutening – gives a person healthy body, aphrodisiac, unctuous, bestows stability and *Guru* in nature.⁵⁹

५) बृंहणा वातपित्तघ्ना भक्ष्या बल्यास्तु समिता।

हृद्यां पथ्यतमास्तेषां लघवः फेनकादयः॥ - सु. सू. ४६।४०४ (अन्नपानविधीमध्यायं)

Eatables prepared from dough of wheat flour are stoutening, mitigates *Vata* and *Pitta* and bestow strength, good for heart and best suited for health; and are easily digestible.⁶⁰

६) स्वप्नो हर्षः सुखा शय्या मनसो निर्वृतिः शमः। चिन्ताव्यवायव्यायामविरामः प्रियदर्शनम्॥

नवान्नानि नवं मद्यं ग्राम्यानूपौदका रसाः। संस्कृतानि च मांसानि दधि सर्पिः पर्यासि च॥

इक्षवः शालयो माषा गोधूमा गुडवैकृतम् । बस्तयः स्निग्धमधुरास्तैलाभ्यङ्गश्च सर्वदा॥

स्निग्धमुद्वर्तनं स्नानं गन्धमाल्यनिषेवणम्। शुक्लं वासो यथाकालं देशणामवसेचनम्।

रसायनानां वृष्याणां योगानामुपसेवनम्। हत्वाऽतिकाश्यमाघत्ते नृणामुपचयं परम्॥

- च.सू.२१/२९-३३ (अष्टौनिन्दितीयमध्यायं)

Good sleep, joy, comfortable bed, free mind tranquility (calmness), avoidance of worry, copulation, physical activities, seeing the liked ones, use of freshly harvested grains as food, fresh wine, soup of meat of domestic, marshy and aquatic animals, meat processed in various ways, curd, ghee, milk, sugarcane, *Shali*, *Masha* and *Godhuma*, preparations of *Guda* (jaggery), enema which are unctuous and sweet, anointing oil always, unctuous (oily) massage and bath, putting on perfumes, use of rejuvenator and aphrodisiac recipes – these remove *Karshya* (emaciation) and bestow good growth to the person. Not worrying about his work (activities), consuming nourishing food always, and indulging in more of sleep, by these the person grows like boar. *Achintan* is the potent cause for stoutening, *Swapnaprasanga* means indulging in more sleep daily.⁶¹

BRUHANA REVIEW:

Bruhana is one of the significant therapeutic regimens highlighted in *Ayurved*. It has been given importance by *Acharya Charak* by enlisting it in the *Shadupakram*, the six vital treatments which are important to keep an individual in healthy state, as *Bruhana* helps in nurturing all the *Dhatus*.

MEANING:

The term *Bruhana* is a derivative from the root of “*Bruh*” which means to grow or to increase. From this root the word *Bruhana* is derived which means nourishment, growing strong and divulging stability to the body.

DEFINITION:

१) बृंहयन्ते वृद्धिनीयन्ते रसादि धातवः यत तत् बृंहणम् । - च.सू. २१।२९

It refers that *Bruhana* helps in nourishment and development of *Rasadi Dhatus*.⁶²

२) बृंहणं नाम तद यद शरीरांतर्गत रसादि धातुनां वृद्धाया देहस्य धातुकरं वृद्धिकरं च ।

Bruhana helps to increase the bulk of the body, by nurturing *Mamsa* and *Meda Dhatus*.⁶²

३) बृंहत्वं यद शरीरस्य जनयेद तत च बृंहण । - च.सू. २२।१०

Nourishment of the body refers to *Bruhana*.⁶³

४) बृंहणं यत बृंहत्वाय। बलं पुष्ट्युपलम्भश्च कार्श्यं दोषविवर्जनम् ॥

Bruhana helps to increase the bulk or major part of the body. This is according to both *Charak* and *Vagbhat*.^{64,65}

Bruhan Samayog – Balvrruddhi + Rasadi dhatu pushti + Karshya doshanasha

५) बृंहणं देह वृद्धिकर। - सु. सू. ४५।६३

Dalhana has supported meaning of *Bruhana* quoted by *Charak* and *Vagbhat*; he has specially emphasized here in the increase of *Mamsa* dhatu. *Hemadri*, in *Padarth Chandrika Teeka* states *Bruhana* strengthens the body by nourishing the *dhatus*.⁶⁶

- **SYNONYMS:** *Pushtikaraka*, *Mamsavardhaka* and *Santarpana*.

PROPERTIES OF BRUHANA DRAVYA:

Bhautik composition of *Bruhana Dravya* -

* बृहणं पृथ्वी अम्बु गुण भूयिष्ठं ।^{67,68,69}

Prithvi and *Aap mahabhutas* are predominant constituent of *Bruhana dravya*.

GUNA PANCHAKA:

Ayurved explains *dravya* and their properties in term of fivefold method labeled *Guna Panchak* i.e. *Rasa*, *Guna*, *Virya*, *Vipak* and *Prabhava*. In *Charak Samhita*, *Guna* of *Bruhana dravya* are enlisted which are in *Samvayi sambandha* with *dravya* and claimed of having no power to perform the action or karma independently.⁷⁰

Bruhana dravyas having the following *Gunas* -

- | | | | | |
|------------------|----------------------|-----------------|-------------------|----------------------------------|
| 1) <i>Guru</i> | 2) <i>Shita</i> | 3) <i>Mridu</i> | 4) <i>Snigdha</i> | 5) <i>Bahal</i> or <i>Sandra</i> |
| 6) <i>Sthula</i> | 7) <i>Pichchhila</i> | 8) <i>Manda</i> | 9) <i>Sthira</i> | 10) <i>Slakshana</i> |

PROBABLE PROPERTIES OF BRUHANA DRAVYA:

- **Rasa:** *Madhur*, *Amla* and *Lavan rasa* claimed of having *Bruhana* property, as per the evidences quoted by different *Acharya*. It is the quality that is perceived by the organ of tastes i.e. *Jivha*.

- **Virya:** It signifies that aspect of drug and diet by virtue of which, they manifest their action on the body. It is observed that *Bruhana dravya* possesses *Shita Virya*.

- **Vipak:** The effects of *Guna* which emerge dominantly at the end of digestion. Usually *Bruhana dravya* undergo *Madhur Vipak* because of the dominance of *Madhur rasa* at the end of metabolic transformation.

- **Prabhav:** It is the unexplainable entity that succeeds all the above things and which is the ultimate decisive factor that directs the fate of the action of the particular drug.

DIFFERENT REGIMENS INTENDED FOR BRUHANA CHIKITSA:^{71,72,73,74}

- **Aahar:** *Nava anna*, *Nava madya*, *Mamsa rasa*, *Mamsa*, *Dadhi*, *Ghruta*, *Kshira*, *Ikshu*, *Salidhanya*, *Udada*, *Godhuma*, *Yava*.

- **Vihar:** *Nidra*, *Sukha shayya*, *Nitya harsha*, *Snana*, *Brahamcharya*, *Manasika vishrama*, *Chinta Shokadi Vivarjanama*.

- **Anya:** *Nitya Abhyang, Snigdha, Madhur Basti, Rasayan and Vrushya Aushadha sevan.* Our Acharya have indicated *Bruhana Chikitsa* in both healthy and diseased condition. Some of them like *Bala, Vriddha* are the physiological conditions, where *Bruhana Chikitsa* is promoted. Due to excessive indulgence in *Karshyakara nidan*, or some disease pathological changes occur. Manifestation of sign and symptoms of *Karshya* take place where *Bruhana Chikitsa* is indicated as principle line of treatment. Some physiological and pathological conditions in which *Bruhana Chikitsa* is indicated as general line of treatment are enlisted in table as shown below.

INDICATION FOR BRUHANA CHIKITSA: ^{75,76,77,78}

Table no. 03 – Indications for Bruhana Chikitsa

PARTICULARS	CS	SS	AS	AH
Physiological				
<i>Bala</i>	+	+	+	+
<i>Vriddha</i>	+	-	+	+
<i>Garbhini</i>	+	+	+	+
<i>Sutika</i>	+	+	+	+
<i>Grishma Rutu</i>	+	-	+	+
<i>Vata prakruti</i>	-	-	+	+
Pathological				
<i>Krusha</i>	+	+	+	+
<i>Durbala</i>	+	-	+	+
<i>Kshina</i>	+	-	+	+
<i>Bheshaja karshita</i>	-	-	+	+
<i>Madya karshita</i>	+	+	+	+
<i>Stree karshita</i>	+	+	+	+
<i>Shoka karshita</i>	-	+	+	+
<i>Bhara karshita</i>	-	-	+	+
<i>Vyadhi karshita</i>	-	-	-	+
<i>Kshata kshina</i>	+	-	-	+
<i>Vrana shoshi</i>	-	+	-	-
<i>Urah kshata</i>	-	-	+	+
<i>Shosha, Arsha, Grahani roga Karshita</i>	+	+	-	-

Ample amount of nutrition is needed by *Bala*, *Sutika* and *Garbhini*. In a person having *Vata Prakruti*, *Krusha*, *Durbala* remains in vitiated stage due to which the body becomes more & more *Ruksha* resulting *Dhatukshayavastha*, so these people need *Bruhana*. In certain pathological conditions of the body like - *Bheshaja karshita*, *Kshata kshina* etc., *Vata* becomes vitiated resulting *Dhatukshaya* and *balhani*, which needs *Bruhana Chikitsa*. Children have maximum demand for more nutrition in the growing period to achieve faster rate of growth & development which can be achieved by *Bruhana Chikitsa*. *Acharya Vagbhat* classifies the treatment into two varieties viz. *Santarpan* and *Apatarpan*. *Santarpan* is needed to treat the *Apatarpanajanya Vyadhi*; *Karshya* is one of them.⁷⁹

CONTRAINDICATION FOR BRUHANA CHIKITSA: ^{80,81,82}

Bruhana Chikitsa is contraindicated in all the *Santarpan Vyadhi* and here *Langhan Chikitsa* is indicated. On this basis one can list out diseases or conditions where *Bruhana Chikitsa* is contraindicated. They are enlisted in table as shown below:

Table no. 04 - Contraindication for Bruhana Chikitsa

DISEASE/CONDITION	CS	AS	AH
<i>Prameha</i>	+	+	+
<i>Hridrog</i>	+	-	-
<i>Shopha</i>	+	-	-
<i>Pramilaka</i>	+	-	-
<i>Moha</i>	+	-	-
<i>Prameha pidika</i>	+	-	-
<i>Kushtha</i>	+	+	-
<i>Atisthaulya</i>	+	+	+
<i>Klaibya</i>	+	-	-
<i>Alasaka</i>	+	-	-
<i>Visuchika</i>	+	-	-
<i>Atisaar</i>	+	-	-
<i>Chhardi</i>	-	-	-
<i>Akshi rog</i>	-	+	+
<i>Kantha rog</i>	-	+	+
<i>Mutra kruchha</i>	+	-	-
<i>Pliha rog</i>	-	+	+

<i>Shiro rog</i>	-	+	+
<i>Vidradhi</i>	-	+	+
<i>Visarpa</i>	-	+	+
<i>Jwara</i>	+	+	+
<i>Amapradoshaja</i>	+	+	+
<i>Pandu</i>	+	-	-
<i>Kotha</i>	+	-	-
<i>Prabhuta Shleshma</i>	-	-	-
<i>Prabhuta Pitta</i>	-	-	-
<i>Prabhuta Rakta</i>	-	-	-
<i>Prabhuta Mala</i>	-	-	-
<i>Snehana Ayoga</i>	+	-	-
<i>Vidagdhajirna</i>	+	-	-
<i>Vishtabdhajirna</i>	+	-	-
<i>Amajirna</i>	+	-	-
<i>Rasasheshajirna</i>	+	-	-
<i>Twaka dosha</i>	+	-	-
<i>Kandu</i>	+	-	-
<i>Srotolepa</i>	+	-	-
<i>Indriyalepa</i>	+	-	-
<i>Tandra</i>	+	-	-
<i>Arochaka</i>	+	-	-
<i>Guru gastrata</i>	+	-	-
<i>Alasya</i>	+	-	-
<i>Hrulasa</i>	+	-	-
<i>Vibandha</i>	+	-	-
<i>Udgar</i>	+	-	-
<i>Bruhat sharir</i>	+	+	+
<i>Shishir Rutu</i>	+	+	+

After reviewing indication and contraindication for *Bruhana Chikitsa*, symptoms of *Samyak Bruhit lakshana* that are established by the *Bruhana Chikitsa* which is undertaken at proper level are described further.

SAMYAK BRUHIT LAKSHANA:

*बलं पृष्ट्युपलम्भश्च कार्श्यं दोष विवर्जन लक्षणे बृंहते । - च. सू. २२।३८

बृंहते स्याद बलं पृष्टिः तत साध्यामय संक्षय । - अ. ह. सू. १४।१६

According to *Acharya Charak*⁸² and *Vagbhat*⁸³ *Samyak Bruhit lakshanas* are:

- 1) *Bala Vridhi* (increase in body strength)
- 2) *Pushti Uplambha* (increase in plumpness of body)
- 3) *Karshya Roga Vivarjana* (disappearance of *Karshya*)
- 4) *Bruhana Sadhya Roga Sakshaya* (disappearance of the disease that are prone to *Bruhana Chikitsa*)

If administration of *Bruhana Chikitsa* is done in a proper way and in sufficient quantity, it leads to augmenting of body strength by increasing the musculature. According to *Acharya Sushrut* uninterrupted capacity to work, *Sarva chesta*, *Swapratighatah*, strong and well developed musculature. It is denoted by enhanced perception of various *indriya* and vitality of *Swara* and *Varna*.

*स्थिरोपचित मांसता स्वर वर्ण प्रसादो कारणानामात्य कार्य प्रतिपत्तिर्भवति ॥ - सु. सू. १५।२५

- *Upachaya* is seen, where in weak and emaciated muscle starts to develop in all their measure. So, beginning of body nourishment is second observation.⁸⁴
- In the present study using a simple measuring tape, some of the measurements like mid arm circumference, calf and chest circumference etc. were considered.
- Sign and symptoms of *Karshya* like *Dhamani jal darshana*, *Kshudha*, *daurbalya*, *kapola gata vasa*, etc. which can be observed, were reduced after administration of *Modak*.
- There are many *Apatarpanatmaka vyadhi* where *Bruhana* is the choice of treatment which are controlled and are cured after the administration of *Bruhana Chikitsa*.

ADOLESCENCE ACCORDING TO AYURVED:

In *Ayurved*, '*Balyavastha*' up to 16 years is considered as adolescent period as exact reference is not mentioned in any *Samhita*.

- According to *Sushrut* '*bala*' is up to one year.⁸⁵

Upto 1 year - '*ksheerapa*',

1-2 Years - '*ksheerannada*',

2-16 Years - '*annada*'

- *Acharya Kashyap*, has considered 1-16 years as '*kaumara*' stage.⁸⁶

- *Arogyakalpadruma* has taken *Balyavastha* up to 12 years of age.

- *Vagbhat* classified age of *Bala* as *Kshirad*, *Annad* and *Kshira annad*⁸⁷

- *Acharya Charak*, divided *Balyavastha* in two parts; first *Aparipakwadhatuna Avastha* up to 16 years, other *Samhita* have quoted 10-16 years as '*kaishora*' stage. Hence, last stage of '*Balyavastha*' can be taken as the period of adolescence an immature stage; as the gathering point of *Balya* and *Youvana*.⁸⁸ In this phase, full development is not there but maturation might have started.

Dhatus are in the developing stage, in *Balyavastha*, described as '*Vivardhamana*'- *Kapha* predominant and developing stage described by *Acharya Charak*. There is no direct reference mentioned in *Ayurved* of growth and development in adolescence. On the basis of development of *Dhatu*, changes seen in this stage can be described. *Pitta* may be related to hormonal secretions which takes place and mental faculties of *Dhatu Sarata* can be attributed to mental and social changes. According to *Ayurved Samhitas*, *Balya Avastha* is from birth up to 16 years of age. In accordance with *Ayurved Poshan* i.e. Nutrition influences growth before and after birth. When a child gets quality nutrition i.e. *Poshan*, growth in weight and height is noticed. *Rasa Dhatu* maintains *Aahar Poshan* in body. As *Rasa* is the first in production of *Dhatu* so it has a very much importance in next *Dhatu* development.

ADOLESCENCE:⁸⁹

Adolescence is described as the period in life when an individual is no longer a child, but not yet an adult. It spans the age group of 10 to 19 years.

The term Adolescence is derived from the Latin word, '*adolescere*'; meaning *to grow, to mature*. Developmentally, this amounts to 'achieving an identity'. About 23% of population in India constitutes of adolescents.

WHO/UN DEFINITIONS:

Adolescent - 10-19 years

Youth - 15-24 years

Young people - 10-24 years

Adolescence is a critical period as ample amount of biological and psychological changes are seen. It is a phase of life which is recently gained recognition as a distant phase of life with its own special needs. In this phase of development, many facades are involved; viz. the appearance of secondary sex characteristics (puberty) to sexual and reproductive maturity; there is a sense of adult identity, development of mental processes, there is a shift from total emotional and socio-economic dependence to relative independence.

Healthy development of adolescents is dependent upon several complex factors, their socioeconomic circumstances, the environment in which they live and grow, healthy and quality relationships with their families, communities and the opportunities for education and employment among others.

Salient attributes of Adolescence

1. Physical, psychological, emotional and social development
2. Rapid but uneven physical growth and development.
3. Onset of sexual activity and sexual maturity.
4. Desire for exploration and experimentation.
5. Development of adult mental processes and self-identity.
6. Change from dependence to relative independence.

STAGES OF ADOLESCENCE:

Though there is an overlap, three main stages of adolescence can be discerned:

1. Early Adolescence (10-13 years) : Characterized by a spurt of development of secondary sexual characteristics.
2. Mid Adolescence (14-16 years) : This stage is distinguished by the development of separate identity from parents, of new relationships with peer groups and the opposite sex and of experimentation.
3. Late Adolescence (17-19 years) : At this stage, adolescents have fully developed physical characteristics which are similar to adults and have formed a distant identity and have well-formed opinions and ideas.

CHANGES DURING ADOLESCENCE:

Table no. 05 - Changes during Adolescence

Girls		Boys	
Age range	Changes	Age range	Changes
9 to 11 years	Hormone activity starts. Breast budding may start. Ovaries enlarge.	9 to 12 years	Growth of scrotum and testes. Male hormone start to get active.
9 to 14 years	Growth of soft, thin, pubic hair begins. Breast growth is manifest.	11 to 14 years	Growth spurt at its peak. Pubic hair growth begins. Reproductive organ increases in size & length.
9 to 15 years	Breast growth continues. Pubic hair converts darker & coarser. The girl may get first menstruation in later part of the stage.	11 to 16 years	Under arm hair develops. There is a change in voice. Voice gets deeper. Facial hair grows.
10 to 16 years	Growth of Under arm hair is noticed. Pubic hair continues to develop.	14 to 18 years	Physical growth reaches almost to adult range. Facial hair and chest hair increase.
12 to 19 years	This is the final stage of becoming an adult. Breasts reach adult size. Menstruation cycle gets established ovulation occurs monthly.		

* Ref - http://www.iamj.in/posts/2018/images/upload/617_623.pdf

EMOTIONAL AND SOCIAL CHANGES:

1. Preoccupied with body image.
2. Want to establish a new identity.
3. Fantasy/ Day dreaming.
4. Rapid mood changes, emotional instability.
5. Attention seeking behavior.
6. Curious, inquisitive.
7. Full of energy, restless.
8. Self-exploration and evaluation.
9. Conflicts with family over control.
10. Peer group defines behavioral code.
11. Formation of new relationships.

UNDERWEIGHT IN ADOLESCENCE: ⁹⁰

- ICD-10-CMR63.6 code is used to indicate a diagnosis of Underweight.

Underweight status is characterized by depleted body fat and/or lean tissue stores. There are no specific guidelines on body mass index (BMI) for classifying underweight. The World Health Organization defines underweight as a BMI below the 5th percentile for age and gender.

An underweight person is the one whose body weight is considered too low to be healthy. A person suffering from underweight has BMI under 18.5 or a weight 15% to 20% below that normal for their age and height group.

CAUSES:

1. Genetics
2. Body metabolism
3. Drug use in some condition or misuse
4. Lack of nutrition (frequently due to hunger, poverty)
5. Eating disorders (both related to physical and mental)
6. Long standing illness

Underweight is a ailment associated with certain medical conditions, which includes anorexia, type 1 diabetes, hyperthyroidism, cancer, tuberculosis, etc. Patients suffering with liver disorders or gastrointestinal ailments may be unable to absorb nutrients adequately. Some individuals suffering from eating disorders can also be underweight due to lack of nutrition also because of over exercise.

PROBLEMS:

Underweight is probably seen as secondary or as a symptom of an underlying long term standing disease. Professional medical diagnosis is needed in unexplained weight loss.

Underweight can more over be essential causative condition. Low physical stamina and weak immune system is seen in severely underweight individuals, exposing them to infection. Immune and non-immune host defences are decreased in micronutrient deficiencies. Individuals suffering from underweight due to malnutrition are subjected to

special apprehensions, as the bulk caloric intake may not be sufficient, also the absorption of other vital nutrients, i.e. essential amino acids, vitamins and minerals.

Severely underweight women sufferers are as a consequence of an eating disorder, excessive strenuous work or exercise. Along with this the women may suffer from menstrual problems like -amenorrhea, probable complications during pregnancy and infertility.

Osteoporotic changes may be seen, even in youngsters who are underweight as it affects bone mineral density. There can be irreversible damage after incidence of first spontaneous fracture. Being underweight has been reported to increase mortality at rates comparable to that seen in morbidly obese people.

TREATMENT:

Diet-

Weight gain can be recommended in underweight individuals by increasing calorie intake. This may be done by eating an adequately high calorie diet in sufficient volume. By consumption of liquid nutritional supplements body weight can also be increased. Vitamin or mineral intake can also be recommended.

Exercise-

Underweight individual can gain weight by exercising. Muscle hypertrophy can be managed by increasing body mass. Muscle tone can be improved with weight lifting exercises and ultimately boosting weight gain and helps to increase bone mineral density. Exercise helps in enhancing the catabolic activity, which is outcome of anabolic over compensation via muscle hypertrophy leading to weight gain. This occurs due to enhanced storage of glycogen in muscles leading to increase in the muscle proteins. This also helps in stimulating an individual's appetite if they are not inclined to eat. Hence exercise acts as an Appetite Stimulant. Certain drugs may increase appetite either as their primary effect or as a side effect.

1. Mirtazapine or Amitriptyline (Antidepressant)
2. Chlorpromazine and Haloperidol (Antipsychotics)
3. Diphenhydramine, Promethazine or Cyproheptadine, and B-vitamin supplements (such as vitamin B12 and vitamin B-complex)
4. Orexigenic
5. Tetrahydrocannabinol (component of cannabis)

These increase in appetite as a side effect. In some regions where medicinal Cannabis approved, may be prescribed for severe appetite loss.

Underweight status is represented by depleted body fat and/or lean tissue stores. The status of underweight has been associated with higher rates of morbidity and mortality, to a lesser extent than obesity.

Underweight may be related to genetics, acute or chronic under nutrition. The person may suffer from scoliosis, intestinal problems, osteoporosis and emotional disorders. Increased susceptibility to infection, fatigue may be seen with a low BMI. Females may suffer from abnormal menstrual cycle and fertility issues. Amenorrhea in such conditions may reduce leptin levels, body fat, trigger emotional stress or anxiety. Underweight adolescents at risk for pregnancy complications like - premature delivery with low birth weight. Adolescents with chronic ailments affecting the absorption, metabolism or loss of nutrients may lose a significant amount of weight resulting from the catabolism of fat and muscle tissue.

MODERN REVIEW OF DISEASE

PEOPLE AT RISK: ⁹¹

Rapid period of growth is seen in children and adolescents if malnutrition affects it makes growth critical. Geriatric age group may develop malnutrition because ageing, illness and poor appetite. People living in underprivileged socioeconomic conditions which lack adequate sanitation, education are also at risk. The relationship between malnutrition and infection is cyclical—infection predispose one to malnutrition, and malnutrition, which impairs all immune defenses, predispose one to infection. The WHO identifies malnutrition as “the single most important risk factor for diseases”. Some researchers have identified malnourished children as being more likely to suffer episodes of infectious diseases, as well episodes of longer duration and greater severity, than other children.

NECESSARY NUTRIENTS: ⁹²

The WHO's department of Nutrition for Health and Development is responsible for formulating dietary and nutritional guidelines for international use. Adequate total nutrition includes the following nutrients: protein, energy (calories), vitamin A and carotene, vitamin D, vitamin E, vitamin K, thiamine, riboflavin, niacin, vitamin B6, pantothenic acid, biotin, folate, vitamin C, antioxidants, calcium, zinc, selenium, magnesium. Most important are protein and caloric/energy requirement needed to utilize protein. If these elements are inadequate, the result is a protein energy malnutrition, which affects one in every four children worldwide, with the highest concentration in Asia. Chronic deficiencies of protein and calories result in a condition called Marasmus, while a diet high in carbohydrates but low in protein causes a condition called Kwashiorkor.

DEFINITION: ⁹³

The world health organization defines malnutrition “as a range of pathological condition arising from a coincidental lack in varying proportion of protein and calories, occurring most frequently in infants and younger children, associated with infection”. The cellular imbalance between supply of nutrients and energy, and the body's demand - for them to ensure growth, maintenance and specific functions.

CLASSIFICATION OF MALNUTRITION: ⁹⁴

Protein energy Malnutrition is a generalized syndrome complex, and it is very difficult to classify it by using a single parameter. Classification is done as follows:

1. Clinical classification
2. Anthropometrical classification
3. Biochemical classification

1. Clinical classification - Clinical classification is based on relative contribution of protein or energy deficit.

a) Kwashiorkor – results from gross deficiency of proteins with an associated energy inadequacy.

b) Marasmus – is the result of gross deficiency of energy, though protein deficiency also accompanies.

c) Marasmic Kwashiorkor – Overlap of clinical picture of Kwashiorkor and Marasmus

d) Pre- Kwashiorkor- Affected children have poor nutritional status and certain features of Kwashiorkor but do not have edema.

e) Nutritional dwarfism – Prolonged PEM starting fairly early in life and going on over a number of years without developing kwashiorkor or Marasmus results in nutritional dwarfism

f) Underweight – The child is malnourished, but does not have any feature of Marasmus or kwashiorkor. Out of the expected weight for age, is 60-80% is noted.

g) Invisible PEM – This is not very evident. Toddlers who show breast addiction must be suspected to have invisible PEM.

2. Anthropometrical classification -There are many classifications based on anthropometrical measurements suggested by scientists. Among them some important and useful classification are proposed here. The general classification of PEM is done according to weight for age. Classification of chronic malnutrition is according to height for age; whereas acute malnutrition is classified according to weight for height. Classification according to weight for age: weight for age is the most commonly used parameter to classify nutritional status.

a) Gomez's classification - It was the first classification of PEM which initiated in 1956.

Grade I – 90 -75% of expected weight (Harvard standard)

Grade II – 75 -60% of expected weight

Grade III - <60% of expected weight

b) Bengoa's modification of Gomez classification – Any malnourished child with edema is considered in grade III irrespective of weight.

c) D. B. Jellife's classification –

Grade I – 81 -90% of expected weight (Harvard standard)

Grade II – 71 -80% of expected weight

Grade III – 61 -70% of expected weight

Grade IV – <61% of expected weight

d) Wellcome Trust classification–

Percentage of expected weight (Harvard standard)	Edema present	No Edema
60-80%	Kwashiorkor	Underweight
<60%	Marasmic Kwashiorkor	Marasmus

e) Indian Academy of Pediatrics 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

If the child has edema 'K' is placed in front of evaluated grade

3. Biochemical classification – The striking biochemical changes include lowering of serum protein specially the albumin fraction enzyme like esterase, amylase, lipase, cholinesterase, alkaline phosphates and lactic dehydrogenase, carrier proteins like transferrin, ceruplasmin and beta lipoprotein, essential amino acids, essential fatty acids, serum calcium, phosphorus, sodium, potassium, iron magnesium etc.

PREVALENCE: ⁹⁵

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 prevalence in the western hemisphere. In sub-Saharan Africa, 30% of children have PEM

MORTALITY/MORBIDITY:

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

Although death from malnutrition in the United States is rare, in developing countries, more than 50% of the 10 million deaths each year are either directly or indirectly secondary to malnutrition in children younger than 5 years.

LAB STUDIES:

The most helpful laboratory studies in assessing the nutritional status of a child are hematological studies and laboratory studies evaluating protein status. Hematological studies should include a complete blood count (CBC) with red blood cell indices and a peripheral smear, this helps in ruling out anemia from nutritional deficiencies such as iron, folate, and vitamin B-12 deficiencies. For measuring protein nutritional status, serum albumin, retinol binding protein, pre-albumin, transferrin, creatinine, and BUN levels are included. For short-term indicators of protein, status retinol-binding protein, pre-albumin, and transferrin determinations are much better than albumin. Practically, serum albumin is better measure of long-term malnutrition since it has longer half-life.

Diagnostic evaluation in children can be done additionally to focus on ascertaining the cause of malnutrition; especially who have a history of adequate food intake and signs/symptoms of malnutrition. Complete history and physical examination done and based on information laboratory studies can be advised.

Initial diagnostic studies include a CBC, sedimentation rate, serum electrolytes, and urinalysis and culture. Stool specimens should be obtained if the child has a history of abnormal stools or stooling patterns or if the family uses an unreliable or questionable source of water.

Additional studies may focus on thyroid functions or sweat chloride tests, particularly if height velocity is abnormal. Further diagnostic studies should be determined as dictated by the history and physical examination. For example, lab tests evaluating renal function, such

as phosphorus and calcium, should be obtained in the presence of renal symptoms. Children with suspected liver disease should have triglyceride and vitamin levels obtained, while zinc levels should be obtained in patients with chronic diarrhea. Celiac serology is a useful screening test and should be considered, especially if there is a family history of celiac disease or if other autoimmune diseases, such as type I diabetes mellitus, are present.

OTHER TESTS:

Practical nutritional assessment

1. Complete history, including a detailed dietary history
2. Growth measurements, including weight and length/height; head circumference in children younger than 3 years
3. Complete physical examination
4. Sensitive measures of nutritional status
5. Height-for-age or weight-for-height measurements greater than 2 standard deviations below the mean for age
6. Height-for-age or weight-for-height measurements more than 2 standard deviations less than the mean for age
7. Height-for-age measurements less than 95% of expected value
8. Weight-for-height measurements less than 90% of expected value
9. Less than 5 cm/y of growth in children older than 2 years
10. Body mass index (BMI) (although not established by the CDC as a criteria for failure to thrive)

CLINICAL MANIFESTATION OF MALNUTRITION:

(A) General sign and symptoms –

1. Fatigue and low energy
2. Dizziness
3. Dry and scaly skin
4. Poor immune function
5. Slowed reaction time and trouble paying attention
6. Underweight
7. Poor growth
8. Muscle weakness

- (B) Clinical sign & symptoms – poor weight gain, slowing linear growth, behavioral changes.
- (C) Physical sign and symptoms – decreased subcutaneous tissue at face, buttocks and legs.
- (D) Changes in oral cavity – cheilosis, angular stomatitis, papillary atrophy
- (E) Abdominal findings – abdominal distention secondary to poor abdominal muscle tone.
- (F) Skin changes – dry peeling skin with raw exposed
- (G) Nail changes – becomes fissured or ridged
- (H) Hair changes – becomes thin, sparse, brittle easy pulled out dull brown colour.

AETIOLOGY: ⁹⁶

- A) Primary – primarily due to dietary deficiency
- B) Secondary – as an effect of some other illnesses

A) 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.

1. Age – Marasmus is much more common in infants than older- Children Preschool children are at highest risk.
2. Birth weight - A low birth weight child requires more energy for catch up growth.

2) Dietary factors:

i) Breast feeding -

- a) Early cessation of breast feeding –
- b) Continuing breast feeding for long period
- c) Disturbed maternal child relationship
- d) Multiple gestations
- e) Lactation failure
- f) Poor health of mother

ii) Weaning –

- a) Starting very late
- b) Ignorance and excessive feeding of carbohydrate diet

iii) Faulty feeding and customs -

- a) Prejudice against colostrum
- b) Prolonged breast feeding without supplementation

3) Social factors:

1. Social customs,
2. Illiteracy,
3. Spacing between children <3 years,
4. Inequitable intra family distribution of food,
5. Female factor
6. Urbanization and industrialization -
7. Change in food habits
8. Slum-infection – Malnutrition
9. Non availability of certain foods

4) Economical factors:

1. Developing and under-developed nations
2. Low gross net production
3. Low per capita income

5) Commercial and Agricultural factors:

1. Advertisement promotion of artificial food
2. Draught / flood / fire / famine / war
3. Old fashioned method of cultivation

6) Political factors:

1. Defects in policy making and preventive strategies
2. Poor health care delivery system
3. Improper training in nutrition and maternal – child health care
4. Failure to reaching immunization, controlling malaria and other epidemic diseases

B) SECONDARY CAUSES -

1. Infection – Malnutrition – Infection cycle
2. Chronic vomiting – Achalasia cardia, Diaphragmatic hernia
3. Congenital diseases – Cleft palate, Micrognathia, hirschprungs disease
4. Serious organic diseases of – Heart, Brain and Kidney
5. Metabolic diseases – Diabetes, Galactosemia, Renal tubular acidosis

INFECTION – MALNUTRITION – INFECTION CYCLE:

A) Infection as a cause of Malnutrition:

1. Infection may affect PEM by various mechanism like-
2. Reduction of Intake
3. Increased excretion of nitrogen and negative nitrogen balance
4. Increased catabolism of protein
5. Increased cortisol
6. Parasitic infestation causing blood loss
7. Intrauterine infection leads to fetal under nutrition
8. Gastroenteritis leads to protein losing enteropathy

B) Infection as a result of Malnutrition:

1. Malnutrition may increase susceptibility to and severity of infections by destroying cell mediated immunity – Hence child is more prone to Tuberculosis, Viral diseases skin and mucosal infection by fungus.
2. Reduced humoral immunity - There is slight production of secretory IgA and these produced antibodies are functionally ineffective.

Hence, Malnutrition is result of complex interplay of interacting factors between individual, family and society.

PATHOPHYSIOLOGY:⁹⁷

Malnutrition practically affects every organ system of human body. Synthesis of body depends upon dietary protein which is essential to provide amino acids and other compounds that have multiple functional roles. Physiological and biochemical functions in the body depend upon energy. Metabolic functions in the body are assisted by micronutrients as components and cofactors in enzymatic processes. Due to substantial malnutrition in a child, physical growth, physiological functions, immunity and cognitive development is hampered.

Immune response changes correlate with poor outcomes the changes observed in children are - Loss of delayed hypersensitivity, fewer T lymphocytes, impaired lymphocyte response, impaired phagocytosis secondary to decreased complement and certain cytokines, and decreased secretory immunoglobulin A (IgA) are some changes that may occur. These immune changes influence children to severe and chronic infections, most commonly, infectious diarrhea, 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, including, a slower rate of growth of the brain, lower brain weight, thinner cerebral cortex, decreased number of neurons, insufficient myelination, and changes in the dendritic spines. More recently, neuro imaging studies have found severe alterations in the dendritic spine apparatus of cortical neurons in infants with severe protein-calorie malnutrition. 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. Other pathologic changes include fatty degeneration of the liver and heart, atrophy of the small bowel, and decreased intravascular volume leading to secondary hyper aldosteronism.

PATHOLOGY: ⁹⁸

Pathological changes can be presented in three stages -

Stage – I

In the first stage carbohydrate store in the body are depleted first. Low glucose level stimulates glucagon secretion by pancreas. As a result glycogen is converted to glucose (glycogenolysis) 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

Once glycogen stores are depleted the next stage of pathology occurs. During this time, 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 and a decrease in the PH of blood below normal. The body cannot neutralize the excess ketone bodies. Metabolic acidosis results in depression of CNS that may lead to ketosis. Metabolic acidosis is frequently associated with crash dieting, low carbohydrate diet, High protein diets and other foods.

During the 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 (Gluconeogenesis). Although this Glucose is used to maintain a fairly normal blood sugar level, muscles and other tissues use ketone bodies as an energy source. The length of second stage of starvation is primarily determined by the amount of stored fat in the body.

Stage – III

When fat reserves are depleted, the 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 protein stores are depleted to about ½ 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. Both adipose tissue and lean body mass are depleted.

MANAGEMENT OF MALNUTRITION: ⁹⁹

1. Nutritional status
2. Degree of hyper metabolism,
3. Expected duration of illness
4. And associated complications.

GOALS OF TREATMENT:

1. To minimize weight loss
2. To maintain body mass
3. To encourage body mass repletion

PRINCIPLES OF TREATMENT:

- 1. Treatment of complication** - by careful surveillance and prompt remedial action and by treating primary cause.
- 2. Initiation of feeding** - by all available means locally available and culturally acceptable.
- 3. Catch up growth and rehabilitation** – Patient is evaluated for the severity of PEM, presence or absence of systemic infection, other nutritional deficit such as vitamin deficiencies, anemia or electrolyte imbalance.
- 4. Follow up care** – To prevent further relapse

MEDICAL CARE: ¹⁰⁰

1. Evaluation of the child's nutritional status
2. Dietary intervention – dietitian
3. Determining adequate calorie intake.

Formula:

➤ **Kcal/kg = (RDA for age X ideal weight)/actual weight**

4. Micronutrient deficiencies to be addressed.
5. Oral caloric intake and supplementation with vitamin, iron, and folate supplements.
6. Increase protein intake
7. Monitoring weight gain

CONSULTATIONS:

Any child at risk for nutritional deficiency should be referred to a registered dietitian or other nutritional professional for a complete nutritional assessment and dietary counseling.

Counseling for family is needed for children with poor nutrition.

DIET:

Protein, energy, and other nutrient requirements fluctuate with age, sex, and physical activity levels. After careful assessment of nutritional status, initiate nutritional intervention with help of dietician. Sufferers of chronic malnutrition may need caloric intake in excess of 120 - 150 kcal/kg/d to achieve suitable weight gain. The diet must include adequate amounts of protein and other macronutrients. Micronutrient deficiencies are essential to be diagnosed for somatic growth and psychomotor development.

FURTHER OUTPATIENT CARE:

Monitoring and follow-up of patients for growth and determination of clinical signs and symptoms of malnutrition is necessary. Follow-up should be based on the severity and the patient's initial response to intervention. Minimal intervals between visits should give the patient sufficient time to show a change in the measured parameter. For example, an eight week interval is needed to document a change in height.

PREVENTION:

1. prenatal care and nutrition
2. Importance of breastfeeding to be emphasized.
3. Proper introduction of nutritious supplemental foods
4. Programs addressing micronutrient supplementation and fortification
5. Improvement in hygiene practices and sanitation (helps to decrease incidence of Malnutrition)

PROGNOSIS:

Chronic malnutrition hampers full growth potential causes cognitive deficits. So leads directly or indirectly to secondary malnutrition.

MIDDAY MEAL SCHEME: ¹⁰¹

Ref: https://en.wikipedia.org/wiki/Midday_Meal_Scheme

The Midday Meal Scheme is a school meal programme in India designed to better the nutritional standing of school-age children nationwide. The programme supplies free lunches on working days for children in primary and upper primary classes in government, government aided, local body, Education Guarantee Scheme, and alternate innovative education centres, Madarsa and Maqtabas supported under Sarva Shiksha Abhiyan, and National Child Labour Project schools run by the ministry of labour. Serving 120,000,000 children in over 1,265,000 schools and Education Guarantee Scheme centres, it is the largest of its kind in the world.

The programme has undergone many changes since its launch in 1995. The Midday Meal Scheme is covered by the National Food Security Act, 2013. The legal backing to the Indian school meal programme is akin to the legal backing provided in the US through the National School Lunch Act.

The government of India initiated the National Programme of Nutritional Support to Primary Education (NP-NSPE) on 15 August 1995. The objective of the scheme is to help improve the effectiveness of primary education by improving the nutritional status of primary school children. Initially, the scheme was implemented in 2,408 blocks of the country to provide food to students in classes one through five of government, government-aided and local body run schools. By 1997–98, the scheme had been implemented across the country. Under this programme, a cooked midday meal with 300 calories and 12 grams of protein is provided to all children enrolled in classes one to five. In October 2007, the scheme included students in upper primary classes of six to eight in 3,479 educationally backward blocks, and the name was changed from National Programme for Nutrition Support to Primary Education to National Programme of Mid-Day Meals in Schools. Though cooked food was to be provided, most states (apart from those already providing cooked food) chose to provide "dry rations" to students. "Dry rations" refers to the provision of uncooked 3 kg of wheat or rice to children with 80% attendance.

The nutritional guidelines for the minimum amount of food and calorie content per child per day are:

Table No. 06 -Entitlement norm per child per day under MDM

Sr. No.	Item	Primary (class one to five)	Upper primary (class six to eight)
1.	Calories	450	700
2.	Protein (in grams)	12	20
3.	Rice / wheat (in grams)	100	150
4.	Dal (in grams)	20	30
5.	Vegetables (in grams)	50	75
6.	Oil and fat (in grams)	5	7.5

In the case of micronutrients (vitamin A, iron, and folate) tablets and de-worming medicines, the student is entitled to receive the amount provided for in the school health programme of the National Rural Health Mission.

Numerous International voluntary and charity organizations have assisted, Viz. UNICEF, CARE, FAO, Church World Service, World Food Programme, etc.

RECOMMENDED DIETARY ALLOWANCES (RDA) IN ADOLESCENTS – 2010

Table No. 07 - Recommended dietary allowances (RDA) in adolescents - 2010

Sr. No.	Group	Age Group	Body Weight (Kg)	Net Energy (kcal/d)	Protein (g/d)
1	Boys	10-12 years	34.3	2,190	39.9
2	Girls	10-12 years	35.0	2,010	40.4
3	Boys	13-15 years	47.6	2,750	54.3
4	Girls	13-15 years	46.6	2,330	51.9
5	Boys	16-17 years	55.4	3,020	61.5
6	Girls	16-17 years	52.1	2,440	55.5

* Ref – Parks PSM 25th edition Pg. no 693

DRUG REVIEW

1. MUDGA: ¹⁰²

NIRUKTI AND UTPATTI:

* हर्षम् प्राप्नोति , मुद हर्षे ।भावप्रकाश निघण्टु - ९।४० धान्यवर्गः

As *Mudga* is light to digest, it is the one which brings joy, happiness.

SYNONYMS:

वासन्ताः कृष्णमद्गाश्च शारदा हरितस्था।मुद्गास्तु नामतः प्रोक्ताः सूषश्रेष्ठाः रसोत्तमाः॥

मुद्गः किलाटो माङ्गल्यो हरितः शारदोऽपि चापित्तप्रसेको वसुको माधवः प्रवरोऽसितः॥

-धन्वन्तरि निघण्टु

- *Vaasant, Pittaprasek, Vasuka, Maadhav, Shaarad, Kilaat, Mangalya*

PHARMACODYNAMICS ACCORDING TO AYURVED:

Rasa (Taste): *Kashay* (astringent), *Madhur* (sweet)

Guna (Properties): *Ruksha* (dry), *Laghu* (light for digestion),

Virya (potency): *Shita* (cold in potency)

Vipak (final taste after digestion of the drug): *Katu* (pungent)

Prabhav(specific effects): *Grahi* (absorbent), *Vishada* – clears the obstructed body channels, digestive and metabolic pathways

Doshaghnata: *Kaphapittahara* (pacifies Kapha and *Pitta* dosha), *alpavatakara* (aggravates *Vata*)

Karma: *Drushti prasadana* – good for eyes, improves quality of vision, *Jwaraghna* – relieves fever, *Varnya* – improves skin complexion, *Pushti bala prada* – nourishes and increases physical strength.

THERAPEUTIC BENEFITS:

Mudga is prescribed as a *Pathya Aahar* (favorable interventional diet) in various ailments, like - *Agnimandya* (Loss of appetite), *Amlapitta* (Hyperacidity), *Atisaar* (Diarrhea), *Pravahika* (Dysentery), *Arochak* (Anorexia), *Grahani* (Irritable Bowel Syndrome, tropical sprue), *Kamala* (Jaundice), *Sthaulya* (Obesity and Dyslipidaemia), *Prameha* (Urinary diseases and Diabetes), *Pratishyaya* (Rhinitis), *Chardi* (Emesis), *Shwasa* (Dyspnoea), *Kasa* (Cough), *Rajyakshma* (Phthisis), *Kustha* (Skin Diseases), *Sheetapitta* (Urticaria), *Arsha* (Haemorrhoids), *Bhagandara* (Fistula In Ano), *Ashmari* (Calculus), *Shitapitta* (Urticaria),

Shotha (Inflammatory conditions), *Bhagna* (Fracture), *Vidradhi* (Abscess), *Galganda* (Disease of Thyroid), *Arbuda* (Malignancies), *Pandu* (Anaemia), *Hridrog* (Cardiac Disorders), *Udara* (Ascites), *Madatyaya* (Alcohol related Diseases), *Murcha* (Altered Consciousness), *Apasmara* (Convulsion), *Unmada* (Psychiatric Disorders), *Pradara* (Menstrual Disturbances). These references are from *Bhaishajya Ratnavali*, *Yogaratanakar* and *Chakrapanidutta*.

The uniqueness of *Mudga* is its physiological effect; despite of *Madhur rasa*, *Laghu* and *Ruksha* properties it nourishes, promotes physical strength and builds tissues. This property is termed as ***Vichitra Pratyarabdha*** i.e. category of ingredients possessing distinctive property; a unity of contradictions, hence multiple action is noted.

TYPES, VARIETIES:

Two forms of green gram

Tusha (with husk) – *Guru* (heavy to digest)

Nishtusha (without husk) – *Laghu* (light to digest)

As per Ayurved, it has 5 sub varieties –

Shyama (Bluish black), *Harita* (green), *Peeta* (yellow), *Shweta* (white) and *Rakta* (red).

VERNACULAR NAMES:

Sanskrit: *Mudga*, *Vajibhojana*, *Rasottama*, *Bhuktiprada*, *Bhubala*;

English: Green gram, Golden gram

Hindi: Moong, Moong

Marathi: Hirve Moog

Bengali: Moong

Kannada: Hesaru

Telegu: Pilliperara

Malayalam: Cherupayaru

BOTANICAL NAME: *Vigna radiata* (L.) R. Wilczek

SYNONYMS: *Phasolus aureus* L., *Phasolus radiates* L.

FAMILY: Fabaceae, Leguminosae

MORPHOLOGY:

Vigna radiata is an annual vine growing up to 1-2 feet in height. Stem have fine, brownish hair. It has alternate and trifoliate leaves. Flowers are greenish yellow in colour. Fruit is pod in which green colour globular seeds are there.

CHEMICAL COMPOSITION/ NUTRITIONAL VALUES:

Green gram comprises of higher nutritional values. Among the nutrients, it is the rich source for carbohydrates (59.9) and protein (24.5). 100 g of it produces 348 kcal of energy and is a good source for minerals like potassium (1150 mg), sodium (27 mg), magnesium (112 mg), calcium (75 mg), phosphorus (405 mg), iron (3.9 mg). Carotene, thiamine (0.47 mg), niacin (2.4 mg), riboflavin (0.21 mg), ascorbic acid and folic acid are also present in green gram. It also contains essential amino acids such as arginine, lysine, phenylalanine, histidine, leucine, isoleucine, valine, tryptophan, cystine, methionine.

MACROSCOPIC:

Moong seeds are small, globular, about 0.4 cm long roughly square, smooth with white lateral hilum; usually green but sometimes yellowish-green; odour, not distinct; taste, slightly sweet.

MICROSCOPIC:

Seed coat shows a single layered, radially elongated, palisade-like cells, covered with a striated cuticle and supported internally by a single layered, thin walled bearer cells, followed by 4-6 layered, thin-walled, tangentially elongated, elliptical, parenchymatous cells; cotyledons consist of oval or polygonal, thin-walled, parenchymatous cells having round to oval, simple, starch grains measuring 8-33 μ in dia. and rarely, oil globules.

DOSE:

Dose is described as per the Ayurvedic Pharmacopoeia of India. Part 1 Volume 3. Page no. 123 – 50-100 g. for yusha

This is the reference of dose; in the same context, it is also mentioned that the dose of *Rasapradhanaaharadravya* as 4 *pala* and *Veeryapradhanaoushadha* as 1 *pala*, ½ *pala* and 1 *Karsha*. As *Aaharmatra* has been mentioned as 4 *pala*, the dose of *Mudga* has been fixed as 1 *Pala* which is incorporated along with the *Aahar* and administered once per day. Also *Charak* has described that *Aaharmatra* depend on *Agnibala*. Further, *Charak* has mentioned that *Mudga* is a *Laghudravya* which is *Vayu-agnibahala*, and are by nature stimulants of *Agni*. In the same context, it is said that though *Laghu Dravya*, excessive intake is not prescribed as it may hamper the *Agni*. Hence the dose of *Mudga* administered is kept as 1 *pala* (around 50gm) itself and the dose of *Aahar* which is taken along with *Mudga* is altered as per *Agni* of the person.

PHARMACOKINETICS:

The chief antioxidant constituents of Moong extracts in vivo are vitexin and isovitexin.

Moong extracts have a potent scavenging activity against pro-oxidant species, leading to inhibitory effect on low density lipoprotein oxidation. Vitexin isolated from Moong, products a significant effect in peripheral blood cells and lymphocyte blast-transformation function proving the radio protective, antioxidant and detoxifying properties.

Regular consumption of Moong may help to normalize the flora of enterobacteria, reducing absorption of toxic substances, decreasing the chance of hypercholesterolemia and coronary heart disease and avert cancer. Protein present in Moong isolates enhanced lipid profile through normalizing insulin sensitivity and particularly reduces plasma triglyceride level.

PHARMACOLOGY:

It has Antioxidant activity, detoxifying properties, radio protective action, cholesterol lowering effect, hypoglycemic activity.

SAFETY PROFILE AND TOXICITY:

Regular intake of Moong can help to decrease the absorption of toxic substances, regulate the enterobacterial flora and reduce the risk of hypercholesterolemia and coronary heart disease.

Moong is completely gluten free. It has low carbohydrate and high protein levels making it an ideal diet option for people with gluten intolerance.



2. GODHUMA: ¹⁰³

NIRUKTI:

* गुध्यति श्रेष्ठान् गुणान् , गुध् परिवेष्टने ।भावप्रकाश निघण्टु – ९।३५ धान्यवर्गः

It is considered as best amongst cereals.

SYNONYMS:

Yavanaka, Madhulika, Nistusa, Sumana, Badhudugdha, Svapupa, Mlecchabhojana, Ksiri, Rasala, Mandi Mukhi

PHARMACODYNAMICS ACCORDING TO AYURVED:

Rasa : *Madhur*

Guna: *Guru, Snigdha*

Virya : *Shita*

Vipak: *Madhur*

Prabhay: *Vrushya* (aphrodisiac, improves vigor), *Snigdha* (unctuous, oily), *Hima* (coolant) *Sara* (induces mobility, relieves constipation), *Jeevana* (enlivening), *Bruhana* (nourishing, improves weight), *Varnya* (improves skin tone and complexion), *Balya* (improves strength and immunity), *Ruchiprada* (enhances taste), *Sthairyakrut* (improves stability, strength), *Sandhana krut* (heals fractured bones and wounds), *Laghu* (light to digest), *Shukrala* (improves sperm and semen quality and quantity), *Pathya* (good for daily consumption).

Doshaghata: Balances *Vata* and *Pitta Dosh*.

Karma: *Vata Pitta Shamak* (balances *Vata* and *Pitta dosha*)

THERAPEUTIC BENEFITS:

Grahani (IBS, altering diarrhea), *Arsha* (hemorrhoids), *Udavarta* (bloating), *Angamarda* (malaise), *Anaha* (fullness due to bloating) and *Asthishool* (bone pain).

TYPES, VARIETIES:

There is reference of three types of *Godhuma*

Maha Godhuma – bigger in size, imported from west

Madhuli, Madhulika – smaller variety

Nisshuka/Nandimukhi – elongated, with blunt ends

VERNACULAR NAMES:

Sanskrit: Godhuma

English: Wheat

Hindi: Gehun

Marathi: Gahu

Bengali: Gom

Kannada: Godhi

Telegu: Godhumalu

Malayalam: Godhambu, Gotamp

BOTANICAL NAME: Triticum aestivum Linn.

SYNONYMS: Triticum sativum Lam., Triticum vulgare Vill.

FAMILY: Poaceae

MORPHOLOGY:

Wheat is an annual grass up to 1.2 m tall with hollow stem. Leaves are about 40 cms long, 1 - 2 cm broad flat. Long, slender, dorsally flattened and compressed, 2-5 floral spikelet's with tough closed rachis. The kernel (seed/grain) of wheat is a dry indehiscent fruit.

CHEMICAL COMPOSITION/ NUTRITIONAL VALUES:

Higher nutritional values are noticed in Wheat. Among the nutrients, it is the rich source for carbohydrates (71.2) and protein (12.6). 100 g of it produces 346 kcal of energy and is a good source for minerals like calcium (29 mg), iron (3.19 mg), magnesium (126 mg), phosphorus (288 mg), potassium (363 mg), sodium (2 mg) and Zinc (2.65 mg). Vitamins like Thiamine B1 (0.39 mg), niacin B3 (5.46 mg), Vit B6 (0.3 mg), Choline and Vit K are also present in Wheat. Wheat germ oil is rich in tocopherol Vit.E contain, total tocopherol 1897 mcg/g, alpha tocopherol 67%. The presence of ergosterol (proVit. D) has been reported. It also contains P-aminobenzoic acid, biotin, folic acid, inositol, nicotinic acid, pantothenic acid, riboflavin, thiamine, alpha-tocopherol, beta-tocopherol, alpha-beta-tocotrienols etc. Mainly - starch, sugar and fibers, essential amino acids like lysine, wheat endosperm contains gluten.

DOSE: 100-200 gms

SAFETY PROFILE AND TOXICITY:

People having gluten allergy/ incompatibility to gluten should resist intake of wheat and other food items prepared from wheat as it can cause diarrhea, bloating and increased intestinal movements. Spraying of glyphosate before harvest has shown to have some effect on our micro biome. It is an herbicide, which kills the wheat crop 1-2 weeks before the time of harvest, so that the wheat properly dries up, leading to early harvesting of wheat.

While making Wheat bread - wheat flour, water and yeast are left together for 10-12 hours overnight, helps to decrease the load of gluten in wheat helps the body to digest. But when the fermentation is accelerated to just 1 - 2 hours, higher amounts of gluten leftover in the wheat that could cause gluten intolerance. Body can process only limited amounts of gluten. Rest of the leftover gluten in the system may cause allergy.

3. ELA: ¹⁰⁴

SYNONYMS:

Chandra, Chandrabala, Dravidi, Tuttha, Triputa, Truti, Bahula, Korangi, Kapotavarna, Korangi, Upakunchika and Tutha.

PHARMACODYNAMICS ACCORDING TO AYURVED:

Rasa: *Katu, Madhur*

Guna: *Laghu, Ruksha*

Virya: *Shita*

Vipak: *Katu*

Prabhav: *Hrudya* (cardiac tonic), *Rochana* (enhances taste, relieves anorexia), *Deepana* (improves digestion strength)

Doshagnata: Balances *Kapha* and *Vata Dosha*

Karma: *Mutrakrichrahara* (Relieves dysuria, acts diuretic), *Arshahara* (piles, haemorrhoids), *Shwasahara* (chronic respiratory disorders), *Kasahara* (cough and cold), *Kshayahara* (tuberculosis), *Pumstvaghna* (excessive usage may harm fertility)

THERAPEUTIC BENEFITS:

Helps in reliving neuralgia, paralysis, constipation, bloating ailments due to aggravated *Vata Dosha*, relieves pain and burning sensation and it is useful to relieve vomiting sensation,

irritable bowel syndrome, gas build up in stomach. *Shwashara*, *Angamarda prashaman* and *Shirovirechanopag*.

TYPES, VARIETIES:

1. *Sukshma Ela* – *Elettaria cardamomum* - Lesser cardamom (small variety)
2. *Brihat Ela* - Greater cardamom - *Amomum subulatum* (Big variety)

Indian cardamoms are divided into:

1. Malbari Elaichi
2. Mysoori Elaichi

VERNACULAR NAMES:

Sanskrit: Sugandhiphala, Ela, Dravidi

English: Lesser Cardamon

Hindi: Choti Elaichi

Marathi: Velachi, Veldode

Bengali: Chot Elachi, Chot Elach

Kannada: Elakki

Telegu: Chinna Elakulu, Yelakkapalu

Malayalam: Elam

BOTANICAL NAME: *Elettaria Cardamomum* Maton

FAMILY: Scitamineace

MORPHOLOGY:

It is a pungent, aromatic, herbaceous, perennial plant, growing to about 2–4 m in height. The leaves are alternate, linear-lanceolate, 40–60 cm long. The flowers are white to lilac. The fruit is a three-sided yellow-green pod 1–2 cm long, containing 15-20 black and brown seeds.

CHEMICAL COMPOSITION/ NUTRITIONAL VALUES:

Borneol, p-cymene, Heptane, D- Limonene, Linalol, Menthone, Geraneol, Camphene, Methyl Heptenone, Myrcene, Nerylacetete, a- & B- Pinenes, saibenene, Nerol, a- & B- terpeneols, N- alkanes, Ascaridole, Camphor, Citral, Citronellal, Farnesol, Sitosterol, etc.

DOSE: Powder – 0.5 to 1 gm.

PHARMACOKINETICS:

It has an effect on Blood Pressure, Anti-oxidant activity, Anti-microbial activity, Liver protecting activity and Anti-ulcer activity.

SAFETY PROFILE AND TOXICITY:

Excess usage is not good for fertility.

4. PIPALLI: ¹⁰⁵

SYNONYMS:

Pippali, Kana, Vaidehi, Magadhi, Krushna, Chapala, Teekshna, Teekshna Tanddula, Kola, Ushna, Upakulya, Shoundi, Shaamahva, Krikara, Katubeeja, Korangi, Shyama, Dantaphala.

PHARMACODYNAMICS ACCORDING TO AYURVED:

Rasa: *Katu*

Guna: *Laghu, Tikshna*

Virya: *Ushna*

Vipak: *Madhur*

Prabhav: *Vrushya* (aphrodisiac), *Deepani* (improves digestion capacity), *Rasayani* (anti-ageing, rejuvenation), *Anushna* (not very hot), *Snigdha* (unctuous, oily), *Rechani* (causes purgation), *Pitta Avirodhini* (Does not increase Pitta to a large extent)

Doshaghnata: *Kapha Vataghni* – Balances *Kapha* and *Vata Dosha*

Karma: *Shwasahara* (useful in asthma, COPD and other respiratory diseases), *Kasahara* (relieves cough, cold), *Udarahara* (useful in ascites), *Kushtahara* (skin disorders), *Prameha* (diabetes), *Gulma* (abdominal tumor), *Arsha* (relieves piles, hemorrhoids)

Amanut (useful in indigestion, relieves *Ama*), *Kshayapaha* (relieves chronic lung disorders, tuberculosis)

TYPES, VARIETIES:

1. *Pippali* (Piper Longum)
2. *Gaja Pippali* (Piper chava)
3. *Saimhali* (Piper retrofractum)
4. *Vana Pippali* (Piper sylvaticum)

VERNACULAR NAMES:

Sanskrit: Pippali, Kana

English: Long Pepper

Hindi: Pipli

Marathi: Pimpli

Bengali: Peepul

Kannada: Hippali, Hipli

Telegu: Pippallu

Malayalam: Tippalu

BOTANICAL NAME: Piper Longum Linn.

FAMILY: Piperaceae

MORPHOLOGY:

Slender climber, cordate and ovate leaves, acute at apex, 7-nerved, membranous, dark green above pale and dull beneath. The flowers are distinctive, male and female; cylindrical pubescent rachis densely arranged. Long, fleshy red ripened fruit, turns black when dried.

CHEMICAL COMPOSITION/ NUTRITIONAL VALUES:

Essential oil mono and Sesquiterpenes, Caryophyllene, Piperine, Piperlogumine, Piperloguminine, Pipernonaline, Piperundecalidine, Pipericide, Sesamin, B-sitosterol four aristolactams (Cepharanone B, Aristolactum, Piperlactum A B), 4-5 dioxoaporphines, etc.

DOSE:

Powder: 0.5 – 1 gm

SAFETY PROFILE AND TOXICITY:

Long term use with improper dosing may cause toxicity.

5. SHARKARA: ¹⁰⁶

Sharkara is referred to crystallized rock sugar in Ayurved also known as *Sita*.

Synonyms:

Sita, Khanda Sharkara, Sharkara, Mishri

Gunakarma : *Madhura, Ruchya* (improves taste), *Asrahrut* (useful in haemorrhoids), *Dahahrut* (decreases burning sensation), *Susheeta* (natural coolant), *Shukra Karini* (aphrodisiac), nourishes all *Dhatu* (body tissues), *Chakshushya* (good for eyes), *Chardi* (antiemetic), *Kushta* (skin disorders), *Vrana* (ulcers, wounds), *Kapha Shwasa* (breathing difficulty with sputum collection), *Hikka* (hiccups), *Pittasra* (bleeding disorders) and *Doshanut* (natural detoxifier).

Doshaghnata – *Vatapittanuhrut* (Balances *Vata* and *Pitta Dosha*)

6. GO GHRUTA: ¹⁰⁷

शस्तं धीस्मृतिमेधाग्निबलायुः शुक्रचक्षुषाम्। बाल वृद्ध प्रजाकान्तिसौकुमार्यस्थिराथिनाम्॥

क्षतशीणपरीस्पर्शस्त्राग्निपित्तात्मनाम्। विपाके मधुरं शीतं वातपित्तविषापहम्॥

चक्षुष्यं बल्यमग्र्यञ्च गव्यं सर्पिगुणोत्तरम्॥ – अ.ह.सू. ५/३७-३९

Properties : *Madura rasa, Madhura paka, snighdha, Shita, vata-pitta-rakta vikara shaman, guru, kledakara, kaphakara.*

Functions : *Jeevaniya, Balya, Medhya, Vajikara, Aayu-sthapak, Sandhikara, Rasayana, Sadyashukrakara, Jaranashaka.*

Action : *Dosha-Dhatu-Mala-Srotasa-Kledakara, Vata-Pitta-Rakta vikara shamaka.*

Uses : *Jirna jwara* (Chronic fever), *Manasa roga* (improves mental health), *Grahani* (improves digestive system), *Pandu* (Anaemia), *Daha* (helps in pacifying burning sensation), *Hrudrog* (improves cardiac health), *Shoola* (subsides pain), *Udavarta* (relives abdominal bloating sensation), *Gulma* (tumours), *Garbhastrava, Yoniroga* (pacifies gynaecological ailments).



CONCEPT OF PATHYA AAHAR:

NIRUKTI:

Derivation of the term 'Pathya' is done from -

* पथ्यं - पथ् - पथिन् । - श.क.द्रु . भाग क्र . ३

As per *Shabdakalpadruma* it means a way, path, road, course to reach.¹⁰⁸

SYNONYMS:

चिकित्सादौ हितकारकम् । तत् पर्याय ।

करणम् २ हितम् ३ आत्मीयम् ४ आयुष्यम् ५ ॥ - इतिशब्दचंद्रिका

Beneficial in treatment since commencement is termed as *Pathya*. The synonyms are¹⁰⁹ -

1. *Karanam* - Instrument, mechanism
2. *Hitam* – beneficial for body
3. *Aatmiyam* - Close to atma
4. *Aayushyam* - helpful for body and promotes longevity

IMPORTANCE OF PATHYA AAHAR:

पथ्यं पथो ऽ नपेतं यद्यच्चोक्तं मनसः प्रियम्॥

यच्चाप्रियमपथ्यं च नियतं तन्न लक्षयेत्॥

- च.सू. २५/४५

- *Pathya* is derived from the word *Patha* – which means path. *Pathya* is defined as that factor which is conducive to the body and mind.
- *Pathya aahar* is such diet which is liked by the mind and has beneficial consequence over the body of an individual without causing any untoward effect.
- *Apathya aahar* is diet harmful to physical and mental wellbeing.¹¹⁰

हितकरमाहार विहारौषधादि । - च.सू. १/१००

- *Acharya Charak* says *Pathya* as synonym for *Bheshaj*, where as *Gangadhar* quotes in his commentary – पथि हितं पथ्यम् । पथोऽनपेतं पथ्यम् ॥
- This means one which is beneficial in *Pathya-marga Strotas* and which doesn't oppose principles mentioned in *Swasthavritta* is considered *Pathya*.¹¹¹

पथः शरीरमार्गात् स्रोतोररूपात् अनपेतम् अनपकारकमित्यर्थः यत्त पथ्यम् । – चक्रपाणि टिका

- The above *sutra* says the *dravya* which does not cause any harm to the *strotomaya sharir* is considered as *Pathya*. (*Chakrapani*)

IMPORTANCE OF PATHYA KALPANA: ¹¹²

काठिन्यादून भावाब्दा दोषोऽन्तः कुपितो महान् ।

पथ्यैर्मृद्वल्पतां नीतो मृदुदोषकरो भवेत् ॥ – च.चि. ३०/३२९

- When there is excessive *Sanchaya* of the *Doshas* in the body, with the help of the *Pathya aahar* and *Yogya Chikitsa* the *dosha* i.e. *mrudu dosha* become *alpapramanit*.
- So even if the patient has medications but does not consume *Pathya aahar – vihar*, there is no benefit seen in *Chikitsa*.
- Intensity of the excessive *Dosha* in a *gambhir vyadhi* can be reduced with regular consumption of *Pathya aahar*.

पथ्यमप्यश्नतस्तस्मोद्यो व्याधिरुपजायते ।

ज्ञात्वैवं वृद्धिमभ्यासमथवा तस्य कारयेत् ॥ – च.चि. ३०/३३०

- Even if while consuming *Pathya aahar* any *vyadhi* is caused, treating physician should understand its *dosha dushya sammurchana* and treat the *vyadhi* accordingly.
- But in the mean time, the patient should continue with *Pathya aahar vihar* regularly for longer period.

BENEFITS OF PATHYA AAHAR:

शरीरमुपचयबलवर्णसुखायुषायोजयति शरीरधातूनूर्जयति च । – च.सू. २८/३

- *Pathya* nourishes the body, provides strength, complexion and happiness. It promotes growth of tissue elements.¹¹³

वर्णःप्रसादःसौस्वर्यजीवितंप्रतिभासुखम् । – च.सू. २७/३४९

- Gives clarity of mind, promotes good voice, provides longevity, improves innovation skills, imparts nourishment and strength to body and improves intellect.¹¹⁴

मनसोऽर्थानुकूल्याद्धि तुष्टिं रुर्जारुचिबलम् ।

मुखोपभोगता च स्याद्व्याधेश्चातो बलक्षयः ॥ - च.चि. ३०/३३२

- When the food consumed is liked by the patient i.e. *Mansoarthanukula*, then it gives patient, *santosh* (satisfaction), *bala* (strength) and increases *ruchi* in *Anna* (palatability of the diet). These are the benefits of *Pathya* where the *vyadhi bala* decreases.¹¹⁵

PERCEPTION OF PATHYAPATHYA:

- *Pathya* means the wholesome food and following the regimen which does not adversely affect the body and mind. While those which adversely affect the body and mind are considered as *Apathya*.
- According to *Acharya Dalhana* and *Chakrapani*, without any internal medications, diseases can be treated through *Pathya palana* alone. It is one of the parts of *Chikitsa* as it helps in curing the disease while *Apathya sevan* are the causative factors of the disease.
- *Pathyapathya* differs from person to person. For a particular person, it depends on various factors such as *Matra, Kala, Kriya, Bhumi, Desha, Dosha*, etc. If a person follows *Pathya aahar-vihar* according to the rules and the occurrence of the disease, there is no need of internal medications. On the other hand, if a person is exposed to *Apathya aahar-vihar*, then the internal medications may not effective.

सातत्यात्स्वाव्दभावाव्दा पथ्यं द्वेष्यत्व मागतम् ।

कल्पनाविधिभिस्तैः प्रियत्वं गमयेत् पुनः ॥ - च.चि. ३०/३३१

- Continuous consumption of the similar kind of food develops *Aruchi* in the patient.
- So it becomes essential and beneficial if the *Pathya aahar* is prepared in different ways, using the same ingredients to increase its taste and palatability.
- So, different *Kalpana Vidhi* can be used to prepare the recipes mentioned in *Krutanna Varga* as per various *Samhitas*.¹¹⁶

AYURVEDIC REVIEW OF KRUTANNA VARGA:

Krutanna Varga is one among the *Aahar Vargas* that consists of cooked food preparations that are consumed in a daily basis and used as a part of treatment as *Sansarjana Krama* (Post therapeutic diet) in *Samhitas*. Concept of *Aahar* is found in *Vedas*. Earliest of treatise where *Krutanna Varga* was documented was in *Charak Samhita*, the number of preparations was gradually increased from *Samhita Kala* to that of *Nighantu Kala*. With respect to time there was a gradual increase in number of preparations and many of new processing techniques have been evolved. Many of the preparations mentioned in *Krutanna Varga* are utilized in the present era.

Aahar plays an important role in the treatment and prevention of the disease; comes under *Trayopasthamb* in *Ayurved*. Based on the source or method of intake of food, *Aahar* has been divided into various *Vargas*:¹¹⁷

-Total 12 *Varga* are described in *Charak Samhita*. They are – *shukadhanya*, *shamidhanya*, *mansa*, *shaka*, *phala*, *harit*, *madya*, *ambu*, *gorasa*, *ikshu*, ***krutanna*** and *ahara yogi varga*.

-In *Sushrut Samhita* liquid and solid are differentiated and mentioned in two different *adhyay*. In *Sushrut Samhita Sutrasthana* following *Varga* are mentioned – *jala*, *ksheer*, *dadhi*, *takra*, *ghrut*, *taila*, *madhu*, *ikshu*, *madya* and *mutra varga*. In *Sushrut Samhita Anapanavidhi adhyay* following *Varga* are mentioned – *shali*, *kudhanya*, *mansa*, *phala*, *shaka*, *pushpa*, *kanda*, *lavan*, ***krutanna***, *bhakshya* and *anupan varga*. Thus total 21 are described in these 2 *adhyay*.

-In *Ashtang Hruday Aahar* is classified into *drava* and *anna* and mentioned in *Dravadravyavidnyaniya* and *Annaswarupavidnyaneeya* respectively. They are – *shukadhanya*, *shimbidhanya*, *shaka*, *phala*, *jala*, *ksheer*, *ikshu*, *taila*, *madya* as well as *aoushadha varga*. Thus total 10 *Varga* are mentioned.

-In *Ashtang Sangraha Aahar Varga* are described in 2 separate *adhyay* – *Dravadravyavidnyaniya* and *Annaswarupavidnyaneeya*. Thus in *Ashtang Sangraha* total 11 *Varga* are described.

-References of *Krutanna Kalpanas* are also found in - *Bhavprakash*, *Yog Ratnakar*, *Madanapala Nighantu*, *Kaiyyadev Nighantu*, *Sharangdhar Samhita*, *Kshemakutuhalam*, etc. In *Madanapala Nighantu*, it is referred as *Dhanyakrutannadi varga*.

NIRUKTI:

१. कृ , कृत - to do a process¹¹⁸
२. अन्न - अन्नाद् भूतानि जायन्ते ; जातान्येन्नेन वर्धन्ते ।

अद्यतेऽति च भूतानि तस्मादन्नं तदुच्यते ॥- तैत्तिरीयोपनिषद्

Any living organism develops with proper intake of *Anna* (food).¹¹⁹

३. कृत + अन्न = कृतान्न
- अन्नस्य उपरी कृतः संस्कारः कृतान्नम् ।

संस्कृतमन्न । - सु.सू. ४६/३४०

Process done on food ingredients to make it palatable is *Krutanna*.¹²⁰

KRUTANNA VARGA PERSPECTIVE :

Aahar is explained as 'Mahabheshaj' by *Acharya Kashyap* and plays an important role in the treatment of the disease or prevention of disease. *Acharya Charak* has explained 'Ashtavidha aahar vidhi vishesha ayatana' and 'Aahar vidhi vidhan' for the ideal ways of administration of healthy food. This is so because *Ayurved* insists on ideal food to be consumed to attain and sustain good health. In *Ayurved*, *Krutanna Varga* is one such topic where recipes, combination, variations in methods of preparations with properties are explained.

CONCEPT OF AAHAR KALPANA IN KRUTANNA VARGA:

Use of *Kalpana* with consideration of other elements makes the *Dravya* suitable for human body. The *Aahar Vargas* like *Shuka Dhanya* (cereal grains), *Shami Dhanya* (legumes), *Mamsa* (meat) and *Shaka* (vegetables) cannot be used without applying *Aahar Kalpana*. So in *Ayurved* there is a special description of *Krutanna Varga* to explain the different *Kalpanas* (recipes) made by *Dravya* of other *Aahar Vargas*. In other words *Krutanna Varga* or *Aahar Kalpana* is applied aspect of described *Aahar Varga*. It consists of prepared foods, methods of preparing of different type of food recipes like - *Manda*, *Peya*, *Vilepi*, *Yusha*, *Yavagu*, etc. with method of preparation and properties. Due to *Sanskar* (process) and *Samyog* (combination of two or more substances) properties of the *dravya* are enhanced, the food preparation becomes palatable and easy to absorb in the body.¹²¹

There are different synonyms of Pathya kalpana found *under* the heading 'Pathya Kalpana,' 'Krutanna Varga' or 'Aaharayogi Kalpana.' *Krutanna Varga* is one among the *Aahar Vargas* that consists of cooked food preparations that are consumed in a daily basis and used as a part of treatment. The recipes are categorized as - *Aashita* (eatable), *Peeta* (drinkable), *Khadita* (chewable) and *Lidha* (lickable) are the main applied forms of these kalpanas. In a broad sense, *Aahar kalpanas* have classified under three categories -

1. *Kalpanas* prepared by *toya sannikarsha* – e.g. *panaka*, *tandulodaka*, etc.
2. *Kalpanas* prepared by *agni sannikarsha* – e.g. *parpata*, *yavaka*, etc.
3. *Kalpanas* prepared by *toya-agni sannikarsha* – e.g. *odana*, *yavagu*, etc.

Raw food material is converted into a complete different form from its original nature. This is done to make changes in its properties and make it suitable for its acceptance in the circulation in body. This is called as *Sanskar* (processing). *Ayurved* describes - '*sanskaro hi gunantaradhanama uchyate*' which means main aim of the *Sanskar* is to increase the properties of food material and make it acceptable inside the body.¹²²

Modern dietetics concept is based on dominance of basic constituents in the food which complete the daily fixed proportion of calories and nature of food is analysed by weighing the dominance of the basic contents of the food - Carbohydrates, Proteins and Fats.

Ayurved never emphasizes on specific quantity of diet, but advises to vary the quantity as per the appetite of the individual (strength of digestive capability) and nature of the food. Generally the patient is advised to have the food which will comprise *shadras* (all the six tastes) thus balancing the *Panchabhautika* constitution of the body. Guidelines are provided in *Samhitas* about the selection of diet in terms of *Aahar Kalpanas* depending upon the *Agni bala* of patient (*manda*, *tikshna*, *vishama*, *sama agni*), *koshta swarupa* (*krura*, *madhyama*, *mrudu koshta*) and *avastha* of the *vyadhi*. *Pathya* is suggested depending upon the properties of *dravya*, qualities of raw food, method of preparation and capacity of digestion of *rugna*. e. g. Pulses are considered as good source of proteins and suggest in more or less quantity in accordance with the calorie requirement. However, in *Ayurved*, *Masha* is considered as more difficult to digest as compare to *Mudga* and hence its suitable form is advised on the basis of digestive capacity.

Pathyakar Aahariya dravya are described disease-wise, but they cannot be consumed directly in raw form; when given in form of a delicious recipe it is liked and consumed whole heartedly.

In the current study concept of *Modak* (*Laddu*, sweet balls) mentioned in *Krutanna Kalpana* as *Pathya* in *Atikarshya* is elaborated. As the dose is perfectly adjusted, palatable and is liked by the subjects of the adolescent age group, this recipe was selected.

मोदक :

Referances of *Modak* are found in Vedic literatures and many texts in Ayurved under *Krutanna Kalpana*. Ref: www.wisdomlib.org/definition/modaka

1. *Valmiki-Ramayana Yuddhakhanda* 131.38 describes *Modak* a typical sweet ball.
2. *Yogashataka* of Pandit Vararuci mentions *Modak* or *Gutika* as formulated pills are the most common and can be used in majority conditions of diseases.
3. *Yogasarasangraha* by Vasudev quotes *Modak* is another name for *Gulika* i.e. powdered drugs are mixed with the syrup of jaggary, sugar or *Guggulu* or ground with water, milk or *Swaras*, made into balls and dried are known as *Gulika*.
4. *Padmapurana* 1.65 marks *Modak* to a type food-stuff used in the worship of Ganesh.
5. *Shivapurana* 1.16 says – sweets which when made of *Shalik* rice, forms a preferable constituent for a great offering
6. *Nilamatapurana* verse 698 recommends *Modak* as an offering for Lord Vinayak.
7. *Skandapurana* chapters 9,11, 214, etc. Workship of Lord Ganapati – *Tirtha, Naivedya Mahatmya*. Special reference in *Kedar Kand*.
8. *Markandeyapurana* mentioned under foods that are not to be stolen.
9. *Bramhandapurana* in *Anusanga-pada* quotes it under the race of *Priyavrata*.
10. *Dhanvantari Samhita* Chapter CCXVII - Various Recipes for the cure of sterility, virile impotency, etc.
11. Also references are found in – *Garudapurana, Brihaspati (Nitisara) Samhita* and *Devi Bhagavata Purana*.
12. In *Ayurved*, references of *Modak* are found in *Sushrut Samhita, Bhavprakash, Yogratnakar, Bhashajya Ratnavali, Kshemakutuhalam*, etc

SYNONYMS : *Modak, Ladduka, Laddu, Vataka, Vati, Gulika, Gutika, Bruhadgutika, Vatikta, Pindi* and *Varti*.

१) प्रकृतिमधुरसुकुमारानी मोदकखाद्यानी खाद्यन्ते । - स्वप्नवासवदत्त ४.३१

*Swapnavasavdutta describes Modak as a sweet ball.*¹²³

२) घृतप्लुते भोजनाभजाने पुरः स्पृतःपुराणघृतिबीम्बिता कृते ।

युवा निधार्योऽसि लड्डुकःद्वयं नखैरालिखाथा मामर्दा निर्दयांयम ॥ - नैषधीयचरितम् १६.१०३

*Naishadhiya Charitram refers Ladduka which is a common sweet even today.*¹²⁴

३) मोदयते इति मोदकः । मोदयति - मुद् णिच्ण्वुल् ।

*Modak literary means the effect of pleasing/delighting/ joy/ gladness; and the term applied is ball of sweet or ladduka in general, especially in case of food recipes belonging to sweet groups.*¹²⁵

४) मोदक वटकः पिण्डो तन्मात्रा चूर्णवन्मता ।

मोदकेषु द्विगुणितो गुडः सिता स्याच्चतुर्गुणा ॥

पक्केन वटकाः कार्या गुडेन सितयाथवा ।

परं हि वन्हिसंपर्काल्लघिमानं भजंतिते ॥ - वै. श. सिं.

*Modak which is also known as vataka, panda, should be given in quantity likewise of churna. For preparing Modak, Guda (jaggery) should be taken twice while sita (sugar) should be taken four times. After giving proper agni sanskar i.e. proper heating vataka, should be made out of it, becomes light to digest on giving agni sanskar.*¹²⁶

५) मोदक (पु.) बृहद्गुटिका (चक. ७.३६; र. १७.६७)

भक्ष्य लड्डुकः गुणाः बृंहणाः सुदुर्जराश्च - (सु.सु. ४६।३९५-३९६)

The properties of ladduka are Bruhana (body stoutening) and is heavy to digest.¹²⁷

६) दशमोत्सवके प्रोक्तः पक्वान्न स्योत्तमो विधिः ॥३१॥

अन्नमांसफलक्षीर कन्दमीना दिभिः कृताः । - क्षेमकुतुहलम् १/३१

Embodiment of *Kshemakuthalam* has a unique style and form of presentation. The work is described and assorted into twelve chapters signified as 'Utsava' (festive occasions or joyous elevations). Amongst which in the tenth chapter i.e. *Dashama Utsava*, covers the methods of preparing several kinds/forms of delicious eatable

recipes made of *anna* (cereals), *mamsa* (meat), *phala* (fruit), *kshira* (milk), *kanda* (tubers/bulbs) and *matsya* (fishes). They are labelled as *Pakvanna* i.e. prepared or processed food. Various types of *Phenika*, *Ladduka*, *Vataka*, *Modaka*, etc. are mentioned under the same.¹²⁸

७) बल्यो गुरुतरः शीतो मधुरो वातपित्तहा ।

कफशुक्रपदः स्निग्धो गोधूमन्तस्य लड्डुकः ॥२८॥

- क्षेमकुतुहलम् १०/२८

The medicinal properties of sweet balls made with the *godhumannasya laddukah* (wheat flour) are given below:¹²⁹

- i. *Balya* - Strengthening the whole body
- ii. *Gurutara* - Very heavy/ taking inordinate time for digestion
- iii. *Shital* - Cooling
- iv. *Madhur* - Sweet to taste
- v. Mitigating *Vata* and *Pitta*
- vi. *Shukraprada* - Enhancing the quality of semen
- vii. *Snigdha* – Unctuous

६) लड्डुका जगति ख्याताः कणिकाप्रभृतेरपि ॥२७॥

- क्षेमकुतुहलम् १०/२७

In the world, these are several varieties of *laddukas* (sweet balls) which are prepared of *kanika* (wheat flour) has become famous.

RESEARCH METHODOLOGY

AIM:

- To study the effect of *Mudga Modak* and *Godhuma Modak* in adolescent *Atikarshya*.

OBJECTIVES:

1. To study the concept of *Pathya Aahar* in Ayurved with special reference to *Krutanna Varga*.
2. To evaluate the effect of *Mudga Modak* and *Godhuma Modak* in the patients of *Atikarshya*.
3. To analyze the effectiveness of the above two *Krutanna Kalpanas*.

MATERIAL AND METHODS:

The present research topic entitled “Comparative Study of *Mudga Modak* and *Godhuma Modak* of *Krutanna Varga* w.s.r. to their *Bruhana* Effect in *Ati Karshya*” was planned with following research question and hypothesis –

RESEARCH QUESTION:

Whether *Mudga Modak* and *Godhuma Modak* are equally effective as *Bruhana* in *Atikarshya*?

HYPOTHESIS:

H₀ - *Mudga Modak* and *Godhuma Modak* of *Krutanna Varga* are not equally effective as *Bruhana* in *Atikarshya*.

H₁ - *Mudga Modak* and *Godhuma Modak* of *Krutanna Varga* are are equally effective as *Bruhana* in *Atikarshya*.

STUDY DESIGN:

The current study was a randomized controlled trial in the adolescent age group. **240 adolescent subjects** were screened irrespective of gender, religion having *Atikarshya* were selected for trials in four groups, after clearance of Institutional Ethical Committee (TMV).

LOCATION OF THE STUDY:

1. Manjula Shikshan Prasarak Sanstha, Radhakrushna School, Gokulnagar, Katraj-Kondhwa Road, Pune – 411048
2. Vasantdada Patil Pratishthan Pratibhatai Pawar School, Kondhwa Budruk, Pune – 411048

MATERIALS: Calibrated machines/instruments were used for the study.

1. Weighing machine (1-150kg)
2. Height recording scale (0-7 ft)
3. Measuring tape (5mt)
4. Hand Grip Dynamometer
5. Vernier Caliper

Active pharmaceutical ingredient-

Trial group - *Mudga Modak*

Control group - *Godhuma Modak* (details mentioned in further pages)

DRUG USED FOR THE STUDY:

1. Mudga
2. Godhuma
3. Ela
4. Pippali
5. Sharkara
6. Goghrot

COLLECTION OF RAW MATERIAL:

Green gram, wheat, sugar, cow's ghee, was procured from the local market with standards of FSSAI and AGMARK.

AUTHENTICATION:

The samples of raw material were subjected to authentication from Department of Botany, Savitribai Phule Pune University, Pune. Ref: Bot/061/15 Date: 08.10.2015.

The certificates are attached in the annexure.

INGREDIENTS FOR PREPARING A SINGLE MODAK:

MUDGA MODAK:

Green gram fine flour - 15 grams

Sugar - 15 grams

Cow's ghee - 15grams

Ela and Pippali as Prakshep Dravya

(0.5gm)

GODHUMA MODAK:

Fine flour of wheat - 15 grams







Sugar - 15 grams







cow's ghee - 15grams

Ela and Pippali as Prakshep Dravya





(0.5gm)

SOP OF MUDGA MODAK:

	1. Take the 500 grams floured moong in a vessel.
	2. Add approximately 500 ml of water and form a batter.
	3. Heat 500 grams of cow's ghee in a wok (kadhai).
	4. Take a clean sieve (motichoor jhara) and start pour the liquefied flour batter.
	5. Remove the fried daanas from the kadhai.
	6. Take 500 grams of sugar in a Kadhai

	<p>7. Make sugar syrup by adding sugar to water and heating till one string consistency.</p>
	<p>8. Add the daanas to the hot sugar syrup.</p>
	<p>9. Allow the daanas to soak up the syrup and then remove the mixture in a vessel for cooling.</p>
	<p>10. After cooling prakshep dravya Ela and Pippali is added in powdered form.</p>
	<p>11. Modak was prepared by hand and weighed accurately i.e. 30 grams each.</p>
	<p>12. Batch wise packing of final product.</p>

SOP OF GODHUMA MODAK:

	<p>1. Heat 500 grams ghee in a kadhai and then add 500 grams wheat flour.</p>
	<p>2. Keep roasting on low flame till the colour of mass becomes golden brown.</p>
	<p>3. Make sugar syrup by adding 500 grams sugar to water and heat till one-two string consistency (khandapak). Mix the ghee fried wheat flour. The prakshep dravya Ela and Pippali are added at this stage.</p>
	<p>4. Roll them between palms into Modak weighing 30 grams each.</p>

SOP MUDGA MODAK AS PER BHAVPRAKASH: ¹³⁰

मुद्गानां धूमासीं सम्यग्लयेन्निर्मलाम्बुना। कटाहस्य घृतस्योर्ध्वं झर्झरं स्थापयेत्तः॥
धूमसीन्तुद्रवीभूतां प्रक्षिपेज्झर्झरोपरि। पतन्ति बिन्दवस्तस्मात्तान्सुपक्वान्समुधरेत्॥
सितापाकेन संयोज्य कुर्याद्धस्तेन मोदकान्। लघुर्ग्राही त्रिदोषघ्नः स्वादुः शीतो रुचिप्रदः॥
चक्षुष्यो ज्वराद्बल्यस्तर्पणो मुद्गमोदकः॥ - भा.प्र. कृतान्नवर्ग १२।१२७-१३०

1. Good quality Mudga (Moong - green gram – *Phaseolus aureus*) was taken from market as per the FSSAI standards and authenticated.
2. Roasted the cleaned green gram and grounded it in powdered form into fine flour.
3. Take the floured moong add water and form a batter.
4. Heat cow's ghee in a wok (kadhai) to approximately 170 degrees Celsius.
5. Take a clean sieve (motichoor jhara) and start pour the liquefied flour batter little by little.
6. Hit the jhaara on the kadhai and droplets of batter will pour down in the hot ghee to form daana.
7. With a fine jhaara remove the fried daanas from the ghee.
8. Keep the daanas for straining ghee.
9. Make sugar syrup by adding sugar to water and heating till one string consistency.
10. Add the daanas to the hot sugar syrup.
11. Allow the daanas to soak up the syrup and then remove the mixture in a vessel for cooling.
12. After cooling prakshep dravya Ela and Pippali is added in powdered form.
13. After 1 hour *Modak* was prepared by hand and weighed accurately i.e. 30 grams each.

SOP GODHUMA MODAK AS PER KSHEMAKUTUHALAM: ¹³¹

ईषद् घृतेन संमिश्रा कणिका भर्जितामनाक्। खण्डपाके विनिक्षिप्त मर्दयेद्दृढपाणिना॥
ततस्तया विनिर्मायं यावदिष्टप्रमाणकम्॥ - क्षेमकुतुहलम् पक्वान्न १०।२०-२१

1. Good quality Godhuma (wheat – *Triticum aestivum*) was taken from market as per the FSSAI standards, cleaned and grounded in powdered form to make wheat flour.
2. Wheat flour was sifted twice to remove extraneous matter.
3. Ghee is taken heated and filtered to remove extraneous matter.
4. Heat the ghee in a wok (kadhai) and then add wheat flour.

5. Keep roasting on low flame till the colour of mass becomes golden brown.
6. Allow the mixture to cool down for some time.
7. In a separate stainless steel vessel, take required sugar, add water and heat it.
8. While heating, take the semisolid mix between thumb and index finger, when 1-2 threads form between the two fingers of sugar syrup (khandapak), then stop heating.
9. Mix the ghee fried wheat flour with khandapak.
10. The prakshep dravya Ela and Pippali are added at this stage.
11. Roll them between palms into *Modak* weighing 30 grams each.

QUANTITY OF MODAK:

Raw materials were purchased at once from the local market and samples of each were authenticated. As per the calculation of 60 subjects in each group, given 30grams of *Modak* for period of seven days. So totally 420 *Modak* were prepared in a batch weighing 12.6 kg in 7days. Each batch was prepared and administered as per SOP every seven days for three months.

CONTENTS OF INTERVENTION:

Standardization of *Mudga Modak* and *Godhuma Modak* was done as per norms¹¹⁷ mentioned in - Ref: www.ncbi.nlm.nih.gov from Department of Botany, Savitribai Phule Pune University, Pune. Ref: Bot/077/15 Date: 19.11.2015 (certificates in the Annexure)

METHODS FOLLOWED FOR CLINICAL STUDY:

- Various schools were approached in Pune area.
- Two schools were selected and were given Permission letters from Head, Department of Ayurved, TMV to conduct the study. (Annexure)
- The study design was explained to the school officials including the teaching and non-teaching staff of the schools.

ACTIVITIES PERFORMED ON SCREENING VISIT:

- Health Check-up camp was organized in schools with prior written permissions.
- All students in the study age group were screened and those who fulfilled the parameters of Inclusion Criteria were included in the study.
- Deworming charts and records in schools were checked and noted.

- Parent meeting was called. With the help of power point presentation, the study was explained in detail to the parents and class teachers. The session emphasized on the study groups, benefits and maintaining daily diet of subject.
- Each and every possible effort was taken to answer study related queries.
- Parents' attendance was also recorded.
- The parents who were willing for participation were called on next day with their ward for participation eligibility screening.

ACTIVITIES PERFORMED ON BASELINE VISIT DAY 1:

- Signatures on written informed consent were obtained from the class teacher and parent of subjects to be included in the study.
- During Informed consent process, the parents were given enough time to read the Informed Consent Form which was printed in the languages best understood by them.
- They were given freedom to ask the questions and all questions were answered up to their satisfaction.
- Daily Diet was explained to the parent and was asked to follow the provided diet chart. The parent and class teacher were instructed to keep a watch on the maintenance of daily diet dairy.
- After signing Consent by the parent detailed physical and systemic examination was performed related to the assessment criteria.
- Past and present illness, medicinal history was taken to rule out any existing disease. The screening phase was designed to confirm that the subject fulfils all inclusion criteria and don't meet exclusion criteria.
- The assessment parameters evaluation was done in special case Performa designed for the study.
- Their class teachers were contacted to get information about the subjects. According to simple randomization method, the subjects were included in respective groups.
- Trial group i.e. *Mudga Modak* was dispensed to subjects in group A.
- *Mudga Modak* was dispensed in Poly-propylene packing material sealed and duly labeled packet, for proper administration and improvising safety as it is a food item.
- To ensure its proper management and supervision, the class teacher were handed over the *Mudga Modak* and asked to dispense it every day in morning with breakfast, as the school timings of the students was from 7 am. On Sundays and national holidays

the teachers handed over the packets to students to make certain that the *Mudga Modak* was consumed.

- The subjects in group A were advised to follow the diet chart provided to the parent. Daily Diet Dairy was maintained by the subjects, which was checked during the follow up.
- Similar protocol was followed in the Control group i.e. *Godhuma Modak* dispensed to subjects in group B.
- Group C with Mid-day meal and common meal were asked to follow the diet chart.
- Group D was told to follow regular meal as it was an observational group.
- The subjects, their parents and class teachers of Group A and Group B were provided with contact details and they were instructed to contact in emergency situation if any.

DAY 7:

Fresh batch of *Modak* for group A and Group B was prepared and dispensed in the school weekly for period of 3 months and subjects and proper dispense of *Modak* was observed.

ACTIVITIES PERFORMED ON FOLLOW UP VISIT I (30TH DAY):

- Detailed physical and systemic examination was performed.
- Subject's medical history if any was noted.
- The assessment parameters evaluation was noted in special case Performa.
- Their teachers were contacted to get additional information if any.
- Daily diet dairy maintained by the subject was checked during the follow up.
- Mid-day Meal records in the school were checked.

ACTIVITIES PERFORMED ON VISIT II (60TH DAY):

- Detailed physical and systemic examination was performed.
- Subject's medical history if any was noted.
- The assessment parameters evaluation was noted in special case Performa.
- Their teachers were contacted to get additional information if any.
- Daily diet dairy maintained by the subject was checked during the follow up.
- Mid-day Meal records in the school were checked.

ACTIVITIES PERFORMED ON VISIT III (90TH DAY):

- Detailed physical and systemic examination was performed.
- Subject's medical history if any was noted.
- The assessment parameters evaluation was noted in special case Performa.
- Their teachers were contacted to get additional information if any.
- Daily diet dairy maintained by the subject was checked during the follow up.
- Mid-day Meal records in the school were checked.
- The study in the school was concluded.

TOTAL DURATION OF STUDY: 3 months.

STUDY INTERVENTION: *Mudga Modak* and *Godhuma Modak*

DOSE OF ADMINISTRATION:

1. *Mudga Modak* – one *Modak* weighing 30 grams per day.
2. *Godhuma Modak* – one *Modak* weighing 30 grams per day.

ROUTE OF ADMINISTRATION: Orally.

PERIOD OF ADMINISTRATION:

Mudga Modak and *Godhuma Modak* depending upon the group, was administered for 3 months, daily.

TIME OF ADMINISTRATION: Morning with breakfast.

SAFETY PRECAUTIONS ON DISPENSING OF THE MODAK:

Poly-propylene with ziplock was used as packing material for *Modak*, for proper administration and improvising safety as it is a food item used.

DIET & RESTRICTIONS:

Diet was advised to the groups A, B & C in form of diet charts given to parents. Subjects in group D were advised to take the normal diet to which they have been accustomed.

STUDY GROUPS:

Groupings were done by Simple Randomization Method – Lottery Method.

In the Study trial these subjects were randomly allocated into 4 groups -

GROUP A – 60 Subjects - *Mudga Modak* + having a common meal + mid-day meal

GROUP B – 60 Subjects - *Godhuma Modak* + having a common meal + mid-day meal

GROUP C – 60 Subjects - having a common meal + mid-day meal

GROUP D – 60 Subjects - having a regular meal (meal on daily basis)

According to www.nap.edu Recommended Daily Allowance Calorie content intake for the adolescents its 2,200 – 3,000 Kcal / day was advised. So the common meal which is consumed daily was advised in the first three groups in form of diet chart. (Refer Annexure)

SAMPLE SIZE CALCULATION:

The adolescents with chief complaint of - poor weight gain, poor growth; lean and thin body and complaints of *Daurbalya* were selected, after taking a complete history emphasizing on milestones and dietetic history. Subjects were then enrolled for current study. Amongst these,

$$n = \frac{Z^2 P (1-P)}{d^2}$$

n = sample size

Z = Standard normal variable = 1.96 (for 5%)

P = Prevalence Rate = 3.5% = 3.5/100 = 0.035

d = permissible error Adolescent in the age group of 11 to 18 years i.e. the adolescent age were selected by simple randomization for the present study.

As per the results from 2007 – 2010 National Health and Nutrition Examination Survey (NHANES) the prevalence rate estimated 3.5% of adolescents aged 11-18 years, are underweight. So, as per the formula –

$$n = \frac{(1.96)^2 (0.035) * (1-0.035)}{(0.05)^2}$$

$$n = \frac{(1.96)^2 (0.035) * (0.965)}{(0.05)^2}$$

$$n = 51.9$$

$$n \approx 52 \text{ (minimum)}$$

So, the minimum sample size as per the prevalence rate is 52, 60 subjects for each group were included, hence totally 240 subjects for the study were planned.

SAMPLE SIZE:

240 subjects - Purposive sampling method used for the adolescent age group.

FOLLOW – UP:

Day 0 - Visit 1

Day 30- Visit 2 - First follow up after 1st Month,

Day 60- Visit 3 -Second follow up after 2nd Month

Day 90- Visit 4 - Third follow up after 3rd Month.

Weekly visit was done to school to provide fresh batch of *Modak*.

INCLUSION:

1. Subjects in the age group of 11 to 18 years.
2. Either gender.
3. Subjects with fulfilling the description of *Atikarshya* described in our text like –
 - *Shushka Sphika*,
 - *Shushka Udar*,
 - *Shushka Griva*,
 - *Dhamanijaladarshana* etc. Ref – च.सू. २१/१५
4. Adolescent subjects fulfilling the criteria given by National Center for Health Statistics were selected for the present study.

EXCLUSION:

1. Subjects with history of any major illness like – tuberculosis, carcinoma, immune deficiency disorders, etc.
2. Subjects with weight more than normal weight for age.
3. Subjects less than 60% of normal weight for age.
4. Subject having *Agnimandya* and *Samata*.

WITHDRAWAL CRITERIA:

1. If subject develops any adverse effect owing to use of intervention.
2. Any other serious condition or any adverse event which requires urgent treatment occurs.
3. If subject refuses to continue to be part of study and wish to be withdrawn.

CRITERIA OF ASSESSMENT:

A. SUBJECTIVE TYPE:

- The assessment is based on improvement in the cardinal sign and symptoms mentioned in classical texts of *Ayurved*.
- Subjective parameters were used for assessment with help of following scoring pattern.¹³²
- The activities of adolescent were taken into consideration for the assessment.

Table no. 08 – List of Subjective Criteria

Sr. No.	SUBJECTIVE CRITERIA	OBSERVATION
1.	<i>Daurbalya</i> (Diability)	Present/Absent
2.	<i>Kshudha</i> (Hunger)	Present/Absent
3.	<i>Dhamani Jala Darshana</i> (Visibility Of Veins)	Present/Absent
4.	<i>Nidra</i> (Sleep)	Present/Absent
5.	<i>Kapola Gata Vasa</i> (Buccal pad of fat)	Present/Absent

1. DAURBALYA-

	SCORE
Dull	3
Moderately active	2
Active	1
Very active	0

2. KSHUDHA

Adolescent does not take food considerably even by force -	3
Adolescent does not ask but takes food considerably by request -	2
Adolescent asks food but does not take adequately -	1
Adolescent himself asks food and consumes adequately –	0

3. DHAMANI JALA DARSHANA

Prominently seen -	3
Visible -	2
Visible and prominent on pressure -	1
Not visible easily even after pressure –	0

4. NIDRA

Insomnia -	3
Disturbed -	2
Short but sound -	1
Long and sound –	0

5. KAPOLA GATA VASA

Cheeks inside with zygomatic bones prominent -	3
Cheeks inside -	2
On surface level -	1
Cheeks averted -	0

B. OBJECTIVE TYPE:

Including various Anthropometric measures like height, weight, chest circumference, head circumference, mid arm circumference was carried out.

PHYSICAL AND ANTHROPOMETRICAL MEASUREMENTS:

a) Weight in kg (Wt.)

The weight of the adolescent was recorded accurately on a digital weighing scale. As per Indian Association of Pediatrics ideal weight in boys' age group 11-18 years is 35.3 to 68.9 kg and in Girls 37 to 56.6 kg.

b) Height in cm (Ht)

The adolescent was made to stand upright. Heels slightly separated and the weight was borne evenly on both feet. Heels, buttocks and back were brought in contact with vertical surface of wall. The head was positioned in such a way that the adolescent looked directly forward with the Frankfurt plane (the line joining the floor of external auditory meatus to the lower margin of orbit) and the bicauricular plane being horizontal. The head piece was kept firmly over the vertex, to compress the hair. The dimensions of the height were then recorded accordingly. As per IAP ideal Height in boys age group 11-18 years is 143.3 to 176.8 cms and in Girls 144.8 to 163.7 cms.

Exhibit 3-1. SP position for standing height

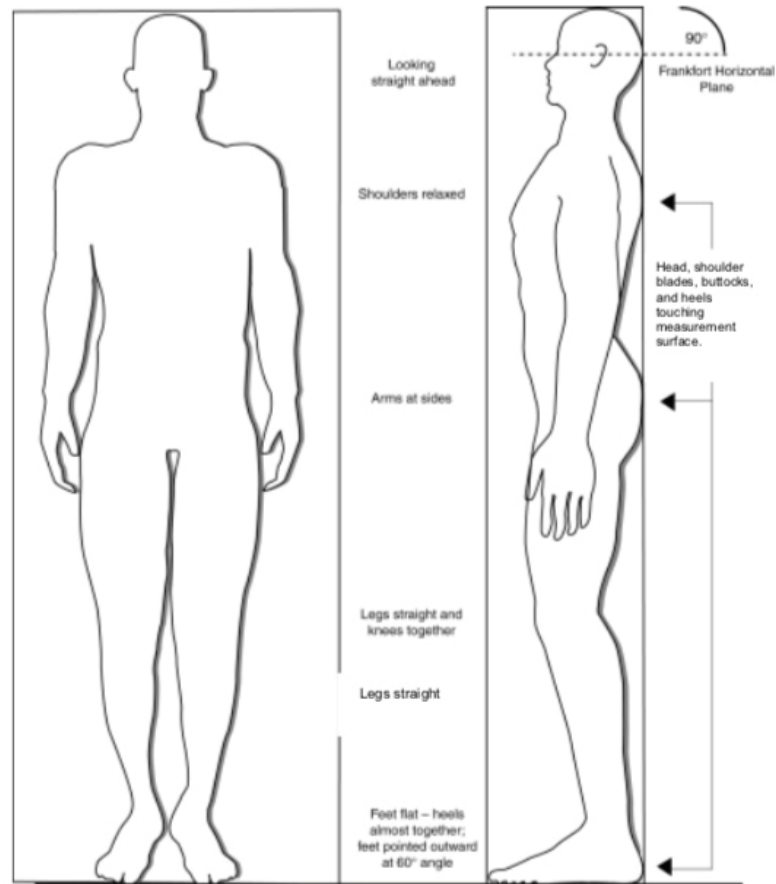


Fig No. 1 – Height Measurement

c) BMI

BMI = wt. in kg/ht in (m²) (Quetelet's index). As per IAP ideal BMI in boys age group 11-18 years is 17.2 to 21.9 and in Girls 17.5 to 21.3.

d) Mid arm circumference (MAC)

The adolescent stood upright, shoulders relaxed, and the arms hanging loosely. It was assessed by measuring tape at a midpoint between acromion & olecranon process, in centimeters. As per IAP ideal Mid arm circumference in boys age group 11-18 years is 13.5 to 27.2 cms and in Girls 13.5 to 20.6 cms.

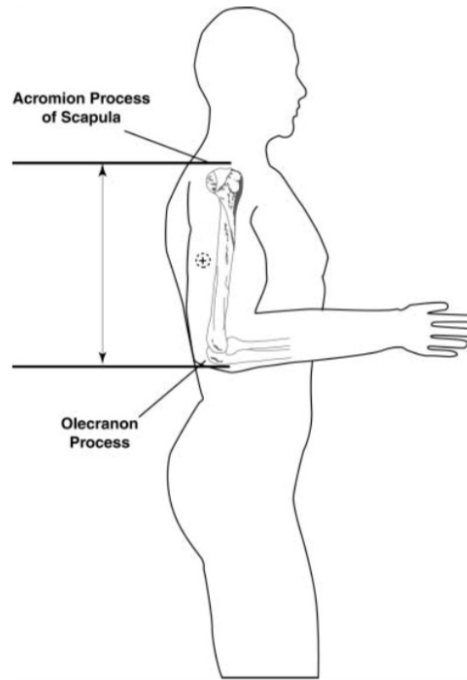


Fig No. 2 – Measurement of Mid arm circumference

e) Chest circumference (CC)

The chest circumference was measured at the level of the nipples, midway between inspiration and expiration, while the adolescent will be in recumbent position. It was recorded with the help of the measuring tape. Ideal Chest circumference in age group 11-18 years is 48.5 to 78 cms.

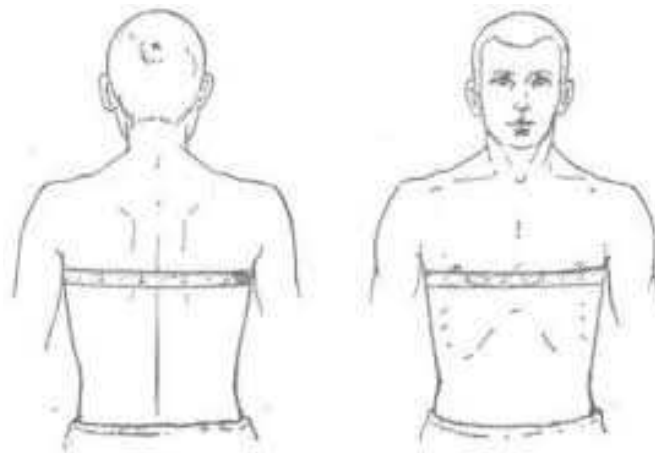


Fig No. 3 – Measurement of Chest circumference

f) Head circumference (HC)

The maximum circumference of the head from the occipital protuberance to the supraorbital edges on the forehead was recorded. It was documented with the help of the measuring tape. As per IAP ideal Head Circumference in boys age group 11-18 years is 53.1 to 55 cms and in Girls 52.7 to 54.3 cms.

Exhibit 3-14. Insertion tape position for head circumference

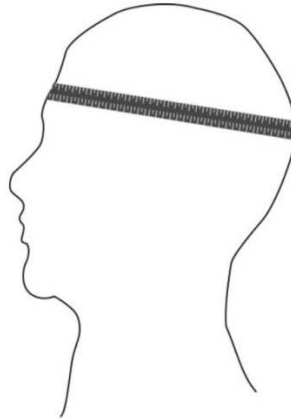


Fig No. 4 – Measurement of Head circumference

g) Mid-Thigh circumference (MTC)

The adolescent stood with most of the weight on the left leg with the right leg forward, knee slightly flexed, and soles of both feet flat on the floor. By standing on the right side and placing the measuring tape around the mid-thigh at the point that is inguinal crease and proximal border of patella. It was done by resting the tape firmly on the skin but without compressing it, the mid-thigh circumference was recorded in cm. As per IAP ideal Mid-Thigh circumference in adolescent age group 11-18 years is 62 to 72 cms.

Exhibit 3-6. Measuring tape position for thigh circumference



Fig No. 5.a – Measurement of Mid-Thigh circumference

Exhibit 3-2. SP position for upper leg length location and upper leg midpoint

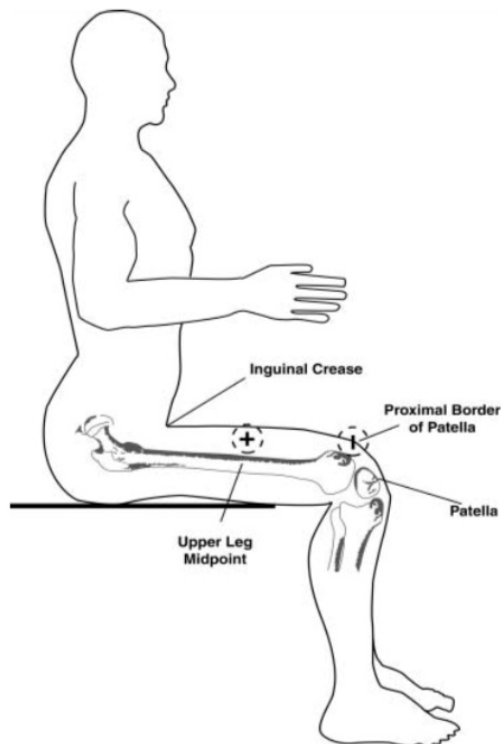


Fig No. 5.b –Measurement of Mid-Thigh circumference

h) Mid-calf circumference (MCC)

The adolescent was made to take a seat. To trace the maximum circumference, the measuring tape was located around the calf. Then it was moved up and down in a plane perpendicular to the long axis of the calf. By holding the zero end of the tape below the measurement value, the mid-calf circumference was documented. As per IAP ideal Mid-calf circumference in adolescent age group 11-18 years is 28 to 38 cms.

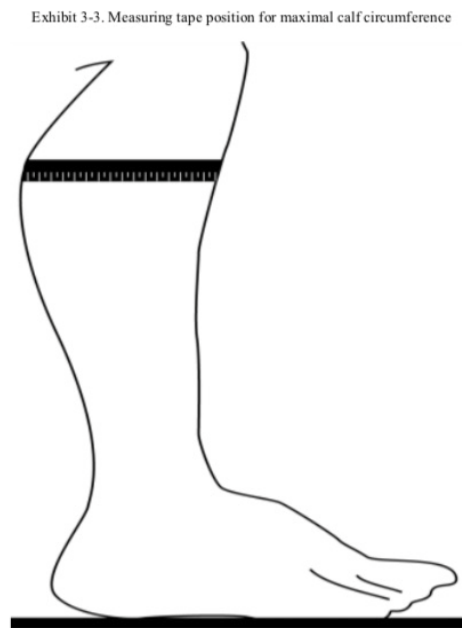


Fig No. 6 – Measurement of Mid-calf circumference

i) Waist circumference (WC)

Waist or abdominal circumference was measured at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest, using a stretch resistant measuring tape, as mentioned in WHO data gathering protocol. The ideal waist circumference in age group 11-18 years is 34.1 to 54.6 cms.

j) Hip circumference (HC)

Largest circumference at the posterior extension of buttocks, it was measured with help of measuring tape. The ideal hip circumference in age group 11-18 years is 41.4 to 66.3 cms.

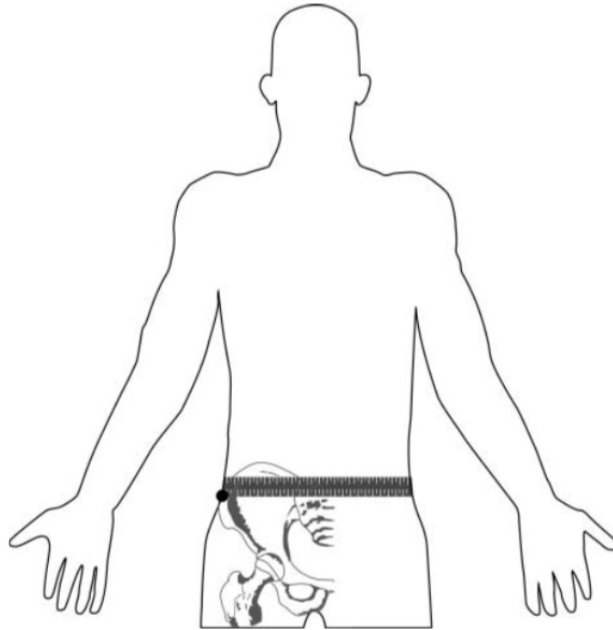


Fig No. 7 – Measurement of Waist circumference

k) Hand Grip Dynamometer

Hand Grip Dynamometer is the instrument used for measuring the maximum isometric strength of the hand and forearm muscles. It helps in tracking the improvements of strength.

Hand grip strength was measured with the dominant working hand of the subject; in which the adolescent was asked to squeeze the dynamometer as hard as possible. The display pointing towards the examiner findings were noted. The average of three tests was calculated and used in further analysis.



Fig No. 8 – Hand Grip Dynamometer

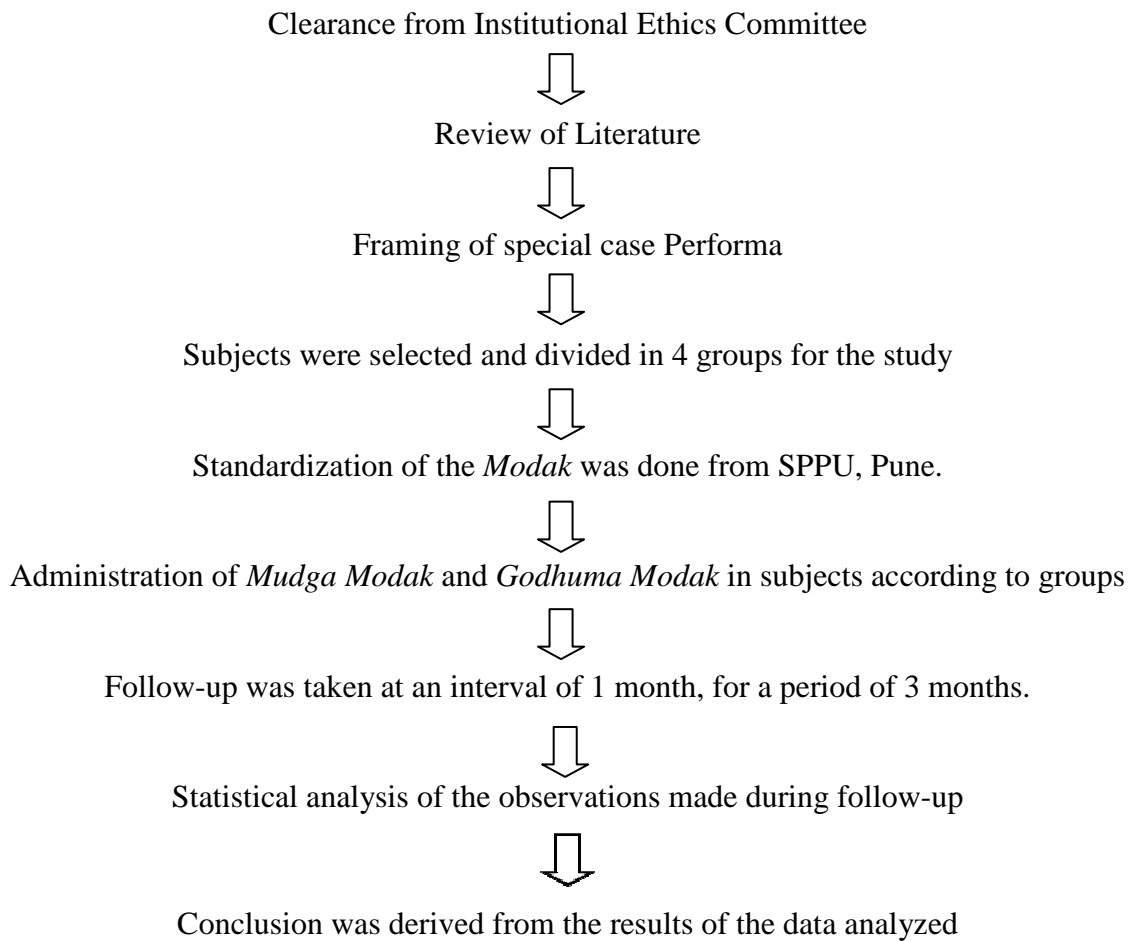
1) Sthula Parva:

Measurements were done with the use of the Vernier caliper.



Fig No. 9 – Vernier caliper

ACTUAL PLAN OF WORK:



ANALYSIS AND INTERPRETATION

OBSEVATIONS AND RESULTS

The data generated during the study was grouped under two headings for convenience of statistical analysis.

1. Analysis of demographic data of subjects included in study.
 2. Analysis of assessment parameters
- Subjective criteria - Since observations are on ordinals scale (gradations), Wilcoxon Signed Rank Test is used to test efficacy in Group A, Group B, Group C & Group D
 - For comparison among four groups in Subjective criteria, Kruskall Wallis H Test is used.
 - Objective criteria - observations are quantitative and sample size is greater than 30, Z-Test is used to test efficacy in Group A, Group B, Group C and Group D.
 - For comparison both before & after, among four groups, ANOVA test is used.

ANALYSIS OF DEMOGRAPHIC DATA OF SUBJECTS:

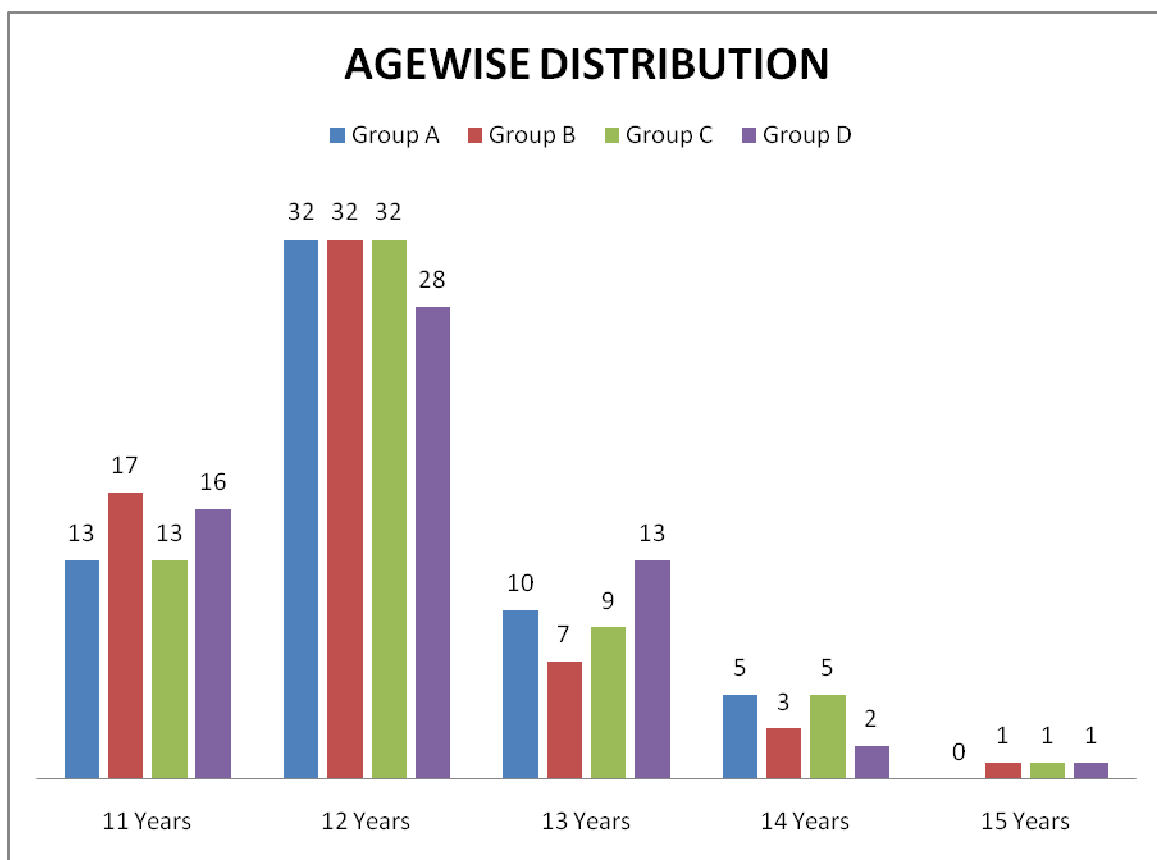
After obtaining informed consent and baseline screening total 240 subjects were included in the four groups. In each group 60 subjects were included. For analysis of demographic data all subjects included in study were considered.

1. AGE WISE DISTRIBUTION :

According to the inclusion criteria subjects between age group of 11 to 15 years were included in the study. Out 240 subjects included maximum (51.66 %) were of 12 years, while minimum (1.25 %) subjects belonged to 15 years of age. Out of remaining subjects 24.58 % belonged to 11 years, 16.25 % belonged to 13 years and 6.25 % belonged to 14 years of age.

Table No. 09 Age Wise Distribution of Subjects

S.No	AgeGroup	Group A		Group B		Group C		Group D		Total	
	In Years	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
1.	11	13	21.66	17	28.33	13	21.66	16	26.66	59	24.58
2.	12	32	53.33	32	53.33	32	53.33	28	46.66	124	51.66
3.	13	10	16.66	7	11.66	9	15	13	21.66	39	16.25
4.	14	5	8.33	3	5	5	8.33	2	3.33	15	6.25
5.	15	0	0	1	1.66	1	1.66	1	1.66	3	1.25
	Total	60	100	60	100	60	100	60	100	240	100



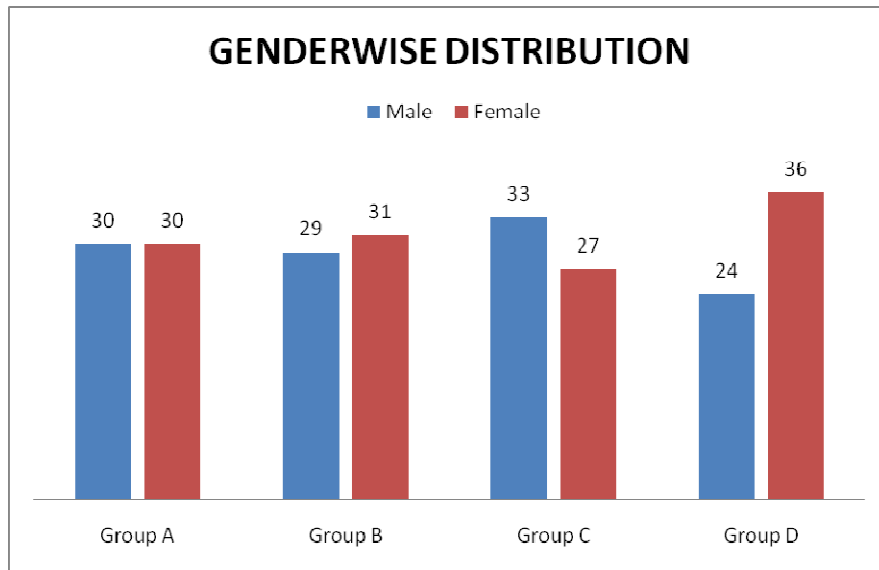
Graph No. 1 Age Wise Distribution of Subjects

2. GENDER WISE DISTRIBUTION :

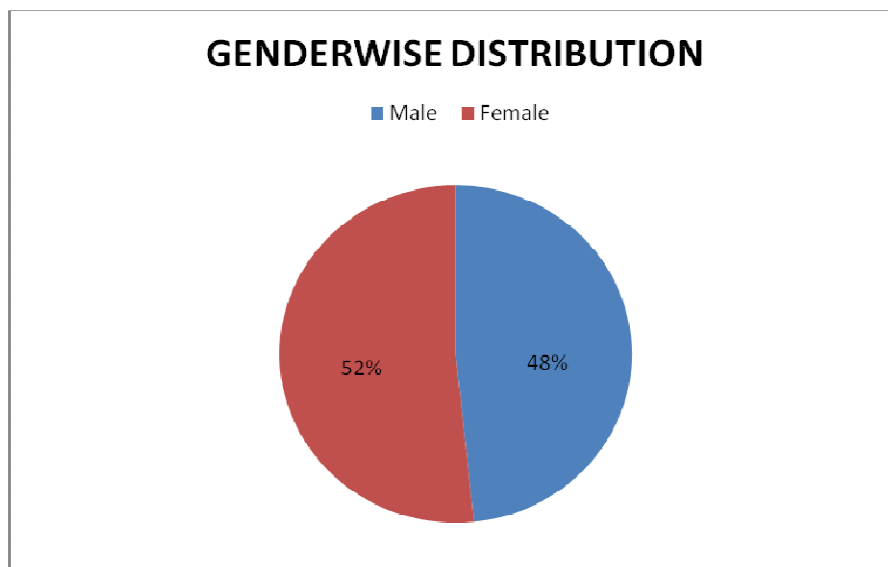
Gender wise distribution showed that 48.33% subjects were male while 51.66% subjects were female. It indicates that nearly equal numbers of male and female subjects were included in the study and there was no bias in inclusion as far as gender is concerned.

Table No. 10 Gender Wise Distribution of Subjects

Gender	Group A		Group B		Group C		Group D		Total	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Male	30	50	29	48.33	33	55	24	40	116	48.33
Female	30	50	31	51.66	27	45	36	60	124	51.66
Total	60	100	60	100	60	100	60	100	240	100



Graph No. 2 Gender Wise Distribution of Subjects



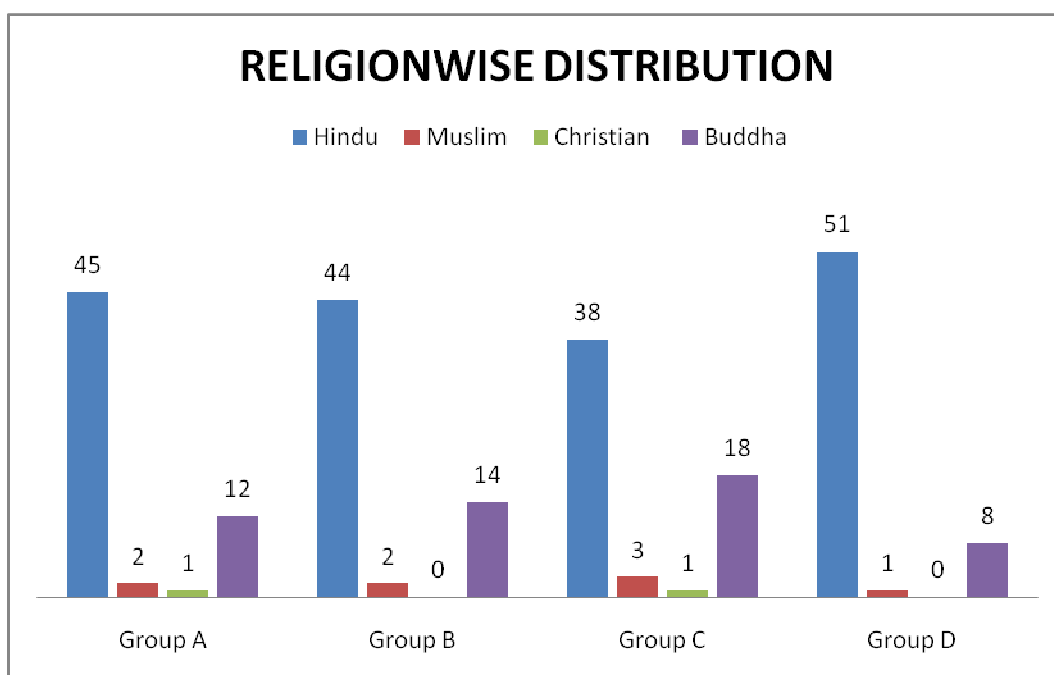
Graph No. 3 Gender Wise Distribution of Subjects

3. RELIGION WISE DISTRIBUTION :

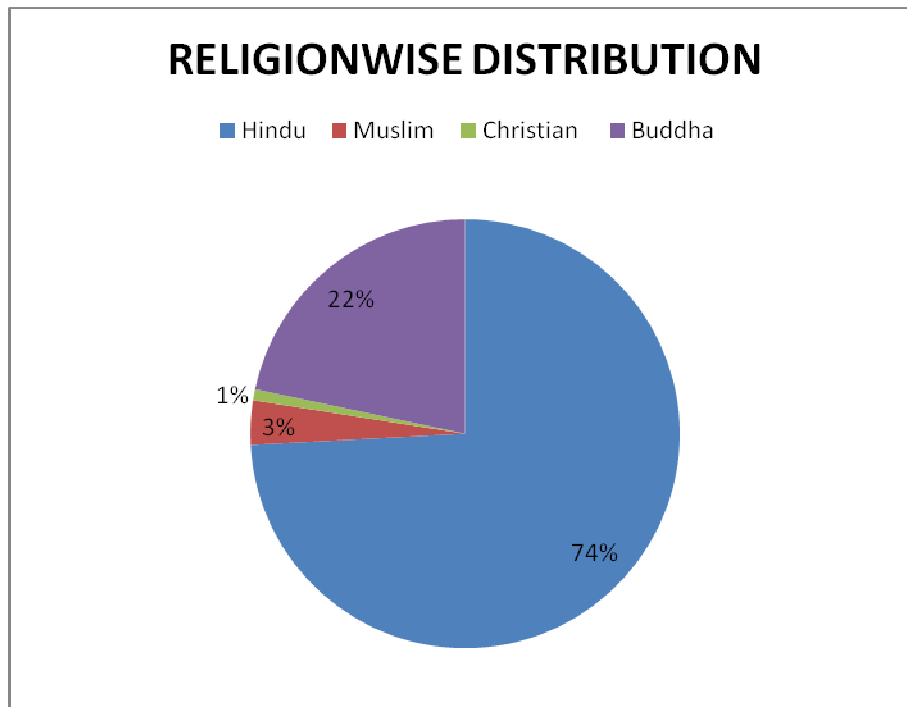
It was observed in the study that 74.16 % subjects were Hindu, 3.33 % were Muslims, 0.83% were Christians while 9.62 % were followers of Buddhism.

Table No. 11 Religion Wise Distribution of Subjects

Religion	Group A		Group B		Group C		Group D		Total	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Hindu	45	75	44	73.33	38	63.33	51	85	178	74.16
Muslim	2	3.33	2	3.33	3	5	1	1.667	8	3.33
Christian	1	1.66	0	0	1	1.667	0	0	2	0.83
Buddha	12	20	14	23.33	18	30	8	13.333	52	21.66
Total	60	100	60	100	60	100	60	100	240	100



Graph No. 4 Religion Wise Distribution of Subjects



Graph No. 5 Religion Wise Distribution of Subjects

4. FINANCIAL STATUS WISE DISTRIBUTION:

Financial status of the parents of subjects included in the study revealed that families belonged to lower financial status. None of subject was from families of middle class or higher classes of society.

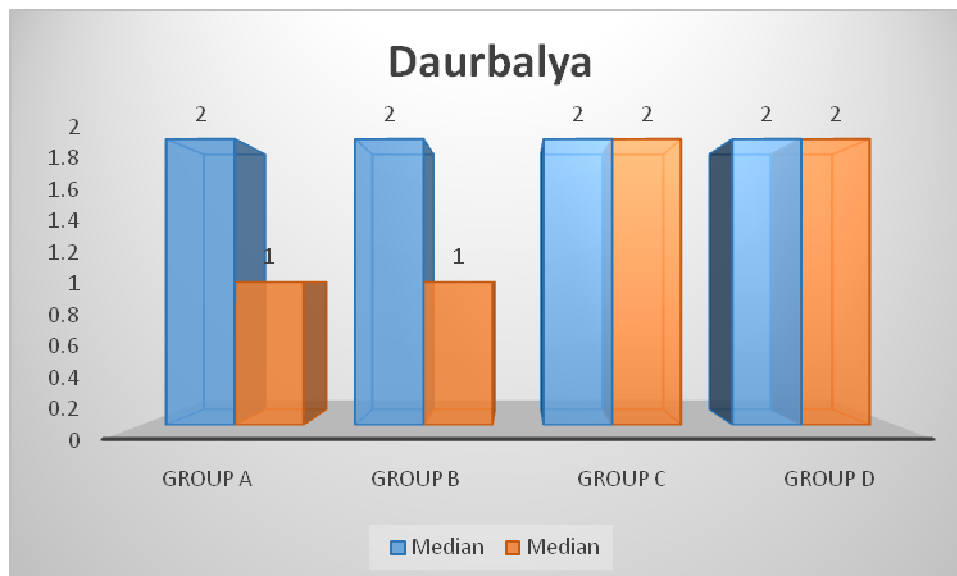
ANALYSIS AND INTERPRETATION

SUBJECTIVE CRITERIA:

Table no. 12 – Effects on Daurbalya

DAURBALYA	Median		Wilcoxon Signed Rank W	P-Value	% Effect	Result
	BT	AT				
Group A	2	1	-6.044 ^a	0.000	33.6	Sig
Group B	2	1	-6.688 ^a	0.000	46.9	Sig
Group C	2	2	-2.236 ^a	0.025	4.0	Sig
Group D	2	2	-1.342 ^a	0.180	2.5	NS

Since observations are on ordinals scale (gradations), **Wilcoxon Signed Rank Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed Group A, Group B and Group C are significant while effect observed in Group D is not significant.

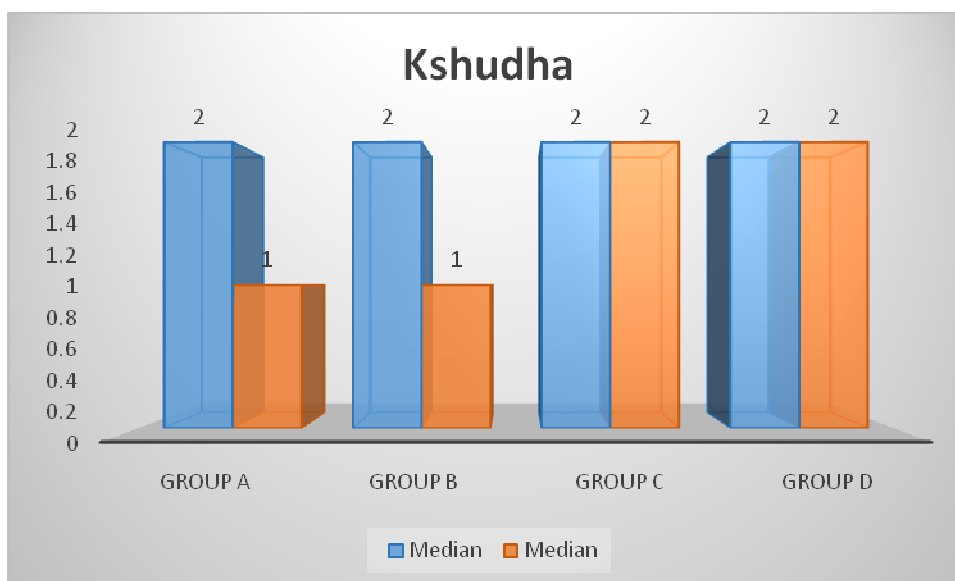


Graph No. 6 - Effects on daurbalya

Table no. 13 – Effects on kshudha

KSHUDHA	Median		Wilcoxon Signed Rank W	P-Value	% Effect	Result
	BT	AT				
Group A	2	1	-6.137 ^a	0.000	56.6	Sig
Group B	2	1	-6.333 ^a	0.000	58.1	Sig
Group C	2	2	-2.828 ^a	0.005	7.0	Sig
Group D	2	2	-1.732 ^a	0.083	2.5	NS

Since observations are on ordinals scale (gradations), **Wilcoxon Signed Rank Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed Group A, Group B and Group C are significant while effect observed in Group D is not significant.

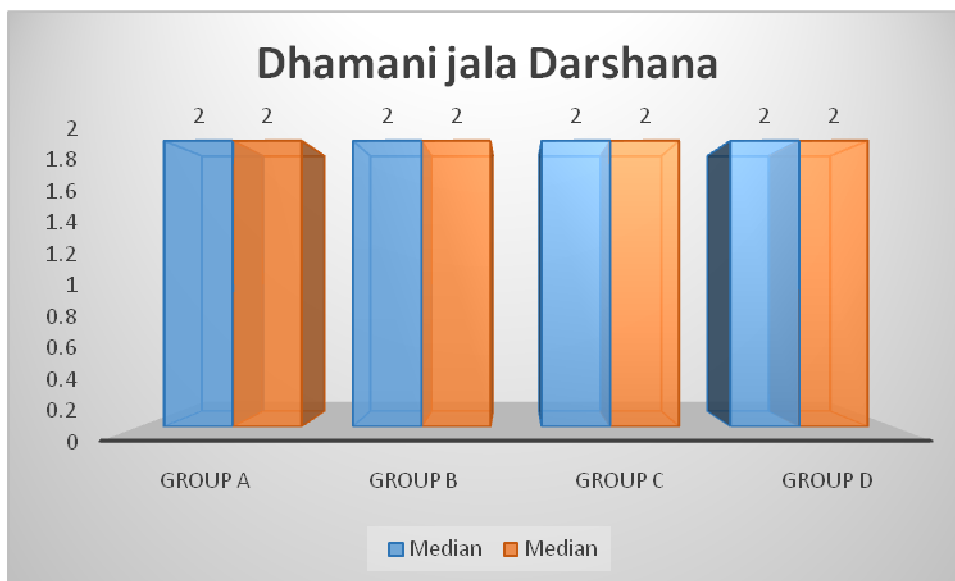


Graph No. 7 - Effects on kshudha

Table no. 14 – Effects on dhamani jala darshana

DHAMANI JALA DARSHANA	Median		Wilcoxon Signed Rank W	P-Value	% Effect	Result
	BT	AT				
Group A	2	2	-2.828 ^a	0.005	7.8	Sig
Group B	2	2	-3.441 ^a	0.001	14.4	Sig
Group C	2	2	-2.236 ^a	0.025	5.1	Sig
Group D	2	2	.000 ^b	1.000	0.0	NS

Since observations are on ordinals scale (gradations), **Wilcoxon Signed Rank Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A, Group B and Group C are significant while effect observed in Group D is not significant.

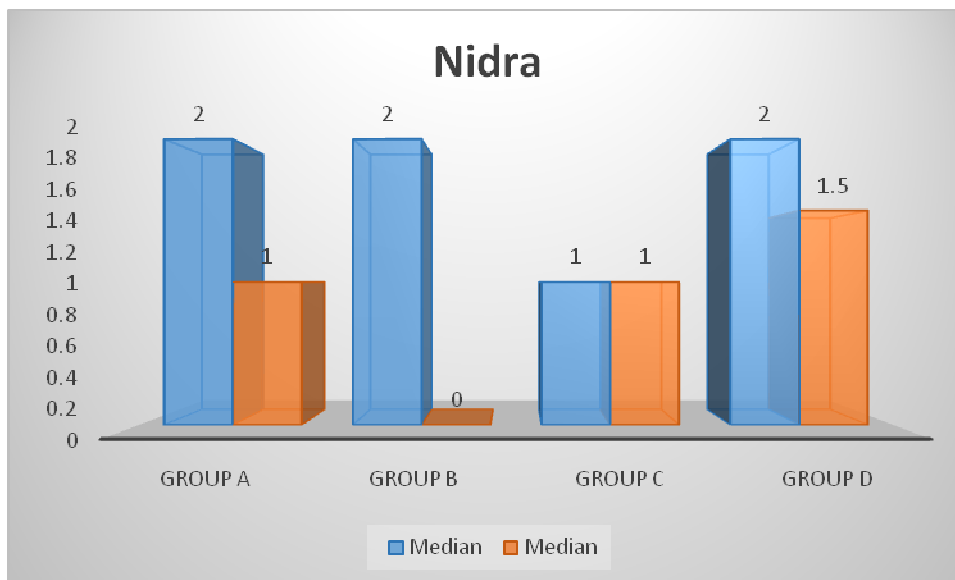


Graph No. 8 - Effects on dhamani jala darshana

Table no. 15 – Effects on nidra

NIDRA	Median		Wilcoxon Signed Rank W	P-Value	% Effect	Result
	BT	AT				
Group A	2	1	-3.642 ^a	0.000	29.2	Sig
Group B	2	0	-5.374 ^a	0.000	58.8	Sig
Group C	1	1	-1.000 ^a	0.317	2.9	NS
Group D	2	1.5	-1.732 ^a	0.083	4.1	NS

Since observations are on ordinals scale (gradations), **Wilcoxon Signed Rank Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A and Group B are significant while effect observed in Group C and Group D is not significant.

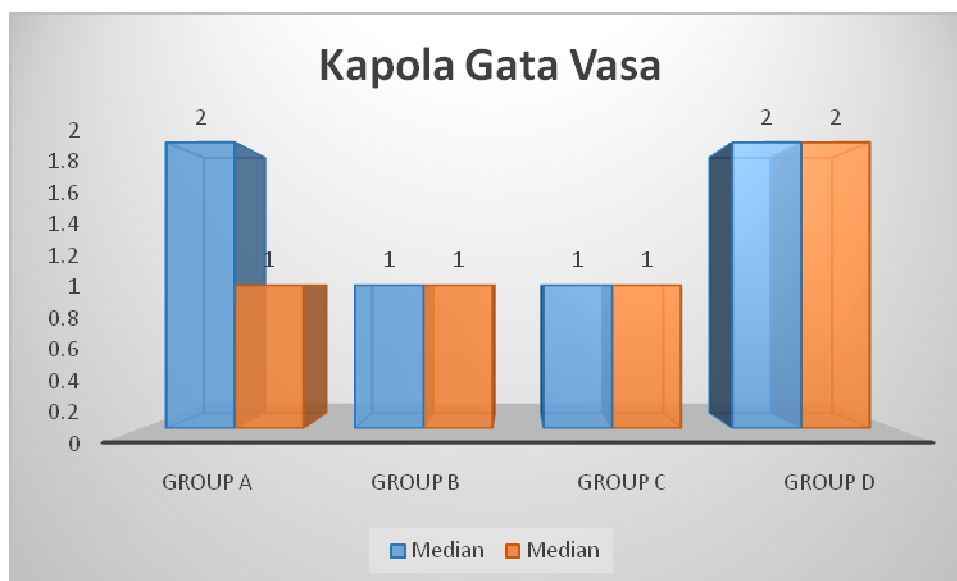


Graph No. 9 - Effects on nidra

Table no. 16 – Effects on kapola gata vasa

KAPOLA GATA VASA	Median		Wilcoxon Signed Rank W	P-Value	% Effect	Result
	BT	AT				
Group A	2	1	-2.236 ^a	0.025	5.3	Sig
Group B	1	1	-2.449 ^a	0.014	6.5	Sig
Group C	1	1	.000 ^b	1.000	0.0	NS
Group D	2	2	.000 ^b	1.000	0.0	NS

Since observations are on ordinals scale (gradations), **Wilcoxon Signed Rank Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A and Group B are significant while effect observed in Group C and Group D is not significant.



Graph No. 10 - Effects on kapola gata vasa

COMPARISON AMONGST THE FOUR GROUPS FOR SUBJECTIVE CRITERIA:

Table no. 17 – comparison amongst the four groups for subjective criteria

Criteria	Group	N	Mean Rank	Sum of Ranks	Kruskal Wallis Test	P-Value
DAURBALYA	Group A	60	147.73	8863.50	117.861	0.000
	Group B	60	175.43	10525.50		
	Group C	60	80.96	4857.50		
	Group D	60	77.89	4673.50		
	Total	240				
KSHUDHA	Group A	60	164.65	9879.00	121.031	0.000
	Group B	60	164.83	9890.00		
	Group C	60	80.47	4828.00		
	Group D	60	72.05	4323.00		
	Total	240				
DHAMANI JALA DARSHANA	Group A	60	122.87	7372.00	16.281	0.001
	Group B	60	135.22	8113.00		
	Group C	60	116.92	7015.00		
	Group D	60	107.00	6420.00		
	Total	240				
NIDRA	Group A	60	126.75	7605.00	60.783	0.000
	Group B	60	163.71	9822.50		
	Group C	60	95.04	5702.50		
	Group D	60	96.50	5790.00		
	Total	240				
KAPOLA GATA VASA	Group A	60	125.00	7500.00	11.670	0.009
	Group B	60	127.00	7620.00		
	Group C	60	115.00	6900.00		
	Group D	60	115.00	6900.00		
	Total	240				

For comparison among four groups, **Kruskall Wallis H Test** is used. From above table it can be observed that P-Values for all parameters are less than 0.05. Hence it can be concluded that there is significant difference among all four groups.

Further it can be can observe that mean rank for Group B is greater, hence it can be concluded that effect observed in Group B is more than other groups.

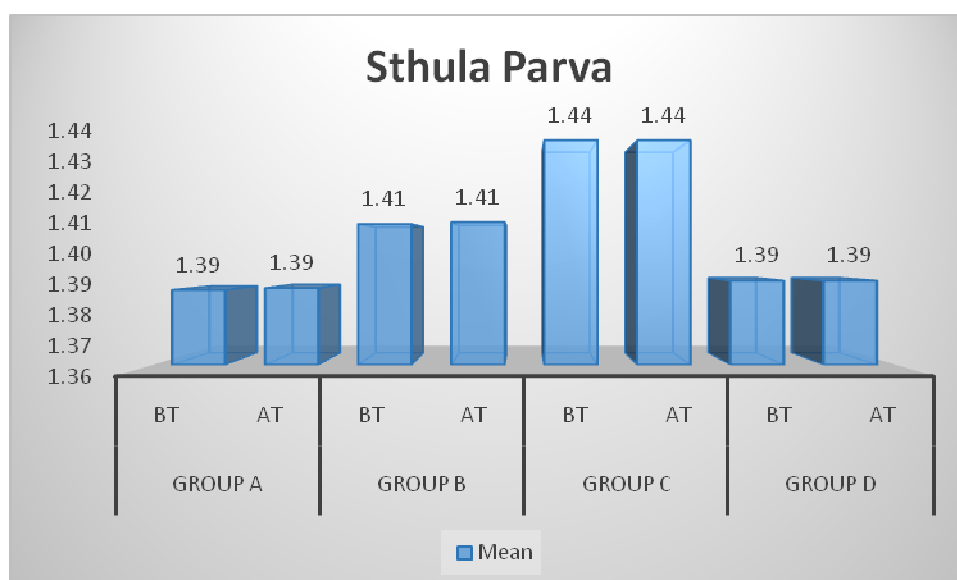
OBJECTIVE CRITERIA:

1. STHULA PARVA:

Table no. 18 – Effects on Sthula parva

STHULA PARVA		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	1.39	60	0.07	0.01	-2.053	0.045	0.05	Sig
	AT	1.39	60	0.07	0.01				
Group B	BT	1.41	60	0.09	0.01	-2.053	0.045	0.05	Sig
	AT	1.41	60	0.09	0.01				
Group C	BT	1.44	60	0.11	0.01	0.000	1.000	0.00	NS
	AT	1.44	60	0.11	0.01				
Group D	BT	1.39	60	0.09	0.01	0.000	1.000	0.00	NS
	AT	1.39	60	0.09	0.01				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A and Group B are significant while effect observed in Group C and Group D is not significant.



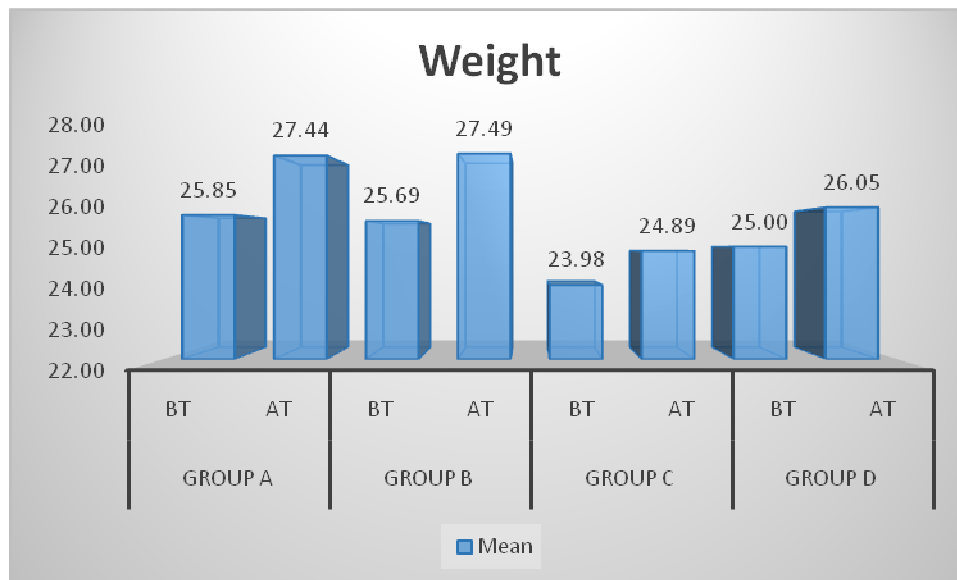
Graph No. 11 - Effects on Sthula parva

2. WEIGHT:

Table no. 19 – Effects on weight

WEIGHT		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	25.85	60	3.66	0.47	-31.770	0.000	6.14	Sig
	AT	27.44	60	3.65	0.47				
Group B	BT	25.69	60	5.30	0.68	-10.280	0.000	7.00	Sig
	AT	27.49	60	5.13	0.66				
Group C	BT	23.98	60	4.04	0.52	-16.285	0.000	3.80	Sig
	AT	24.89	60	3.93	0.51				
Group D	BT	25.00	60	4.26	0.55	-5.059	0.000	4.19	Sig
	AT	26.05	60	4.62	0.60				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A, Group B, Group C and Group D are significant.



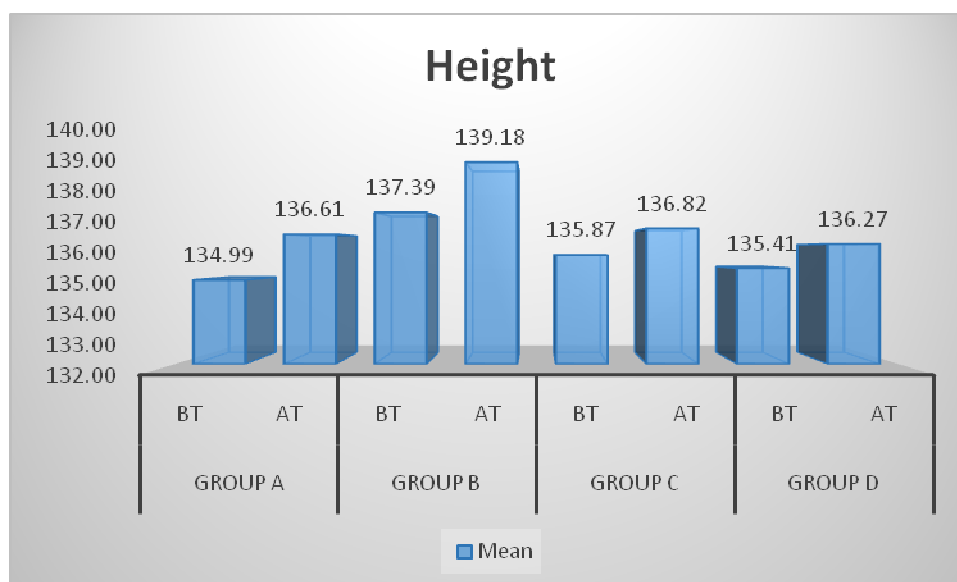
Graph No. 12 - Effects on Weight

3. HEIGHT:

Table no. 20 – Effects on height

HEIGHT		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	134.99	60	7.46	0.96	-27.009	0.000	1.20	Sig
	AT	136.61	60	7.61	0.98				
Group B	BT	137.39	60	10.15	1.31	-28.879	0.000	1.30	Sig
	AT	139.18	60	10.25	1.32				
Group C	BT	135.87	60	8.50	1.10	-18.052	0.000	0.70	Sig
	AT	136.82	60	8.48	1.09				
Group D	BT	135.41	60	8.10	1.05	-16.938	0.000	0.64	Sig
	AT	136.27	60	8.06	1.04				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A, Group B, Group C and Group D are significant.



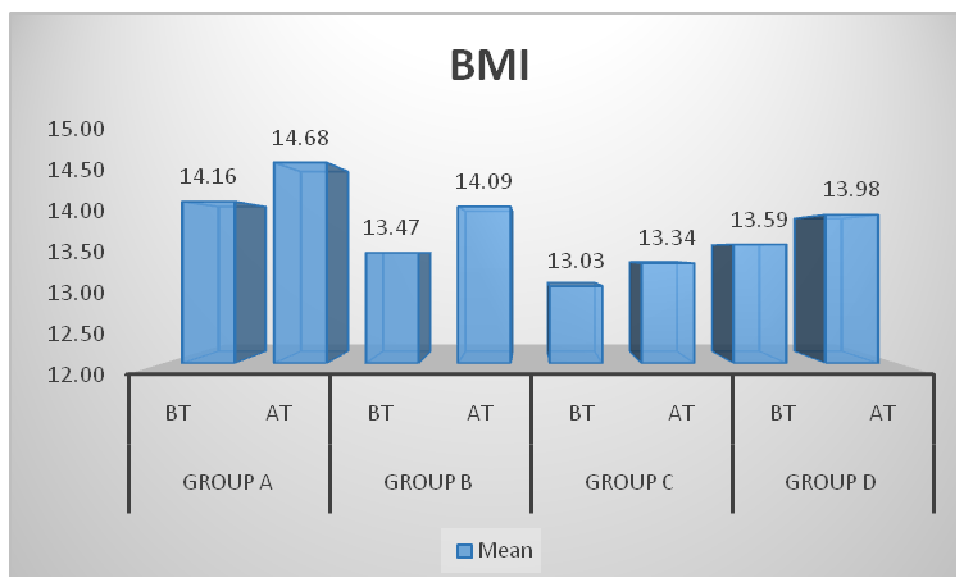
Graph No. 95 - Effects on Height

4. BODY MASS INDEX:

Table no. 21 – Effects on BMI

BMI		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	14.16	60	1.35	0.17	-15.130	0.000	3.69	Sig
	AT	14.68	60	1.30	0.17				
Group B	BT	13.47	60	1.50	0.19	-8.014	0.000	4.57	Sig
	AT	14.09	60	1.45	0.19				
Group C	BT	13.03	60	2.04	0.26	-9.733	0.000	2.36	Sig
	AT	13.34	60	1.96	0.25				
Group D	BT	13.59	60	1.50	0.19	-3.652	0.001	2.91	Sig
	AT	13.98	60	1.73	0.22				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A, Group B, Group C and Group D are significant.



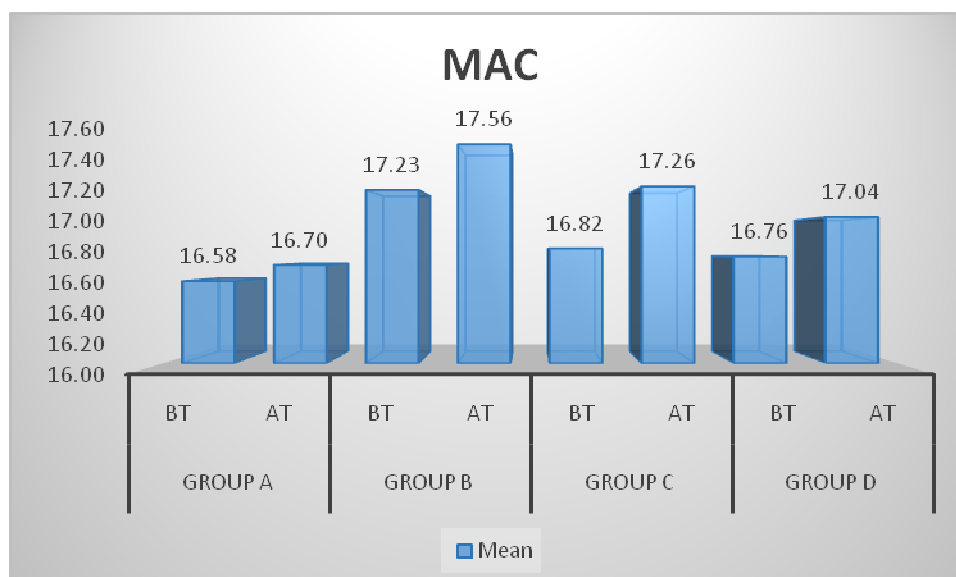
Graph No. 14 - Effects on BMI

5. MID ARM CIRCUMFERENCE (MAC):

Table no. 22 – Effects on mid arm circumference (MAC)

MAC		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	16.58	60	1.60	0.21	-2.504	0.015	0.70	Sig
	AT	16.70	60	1.67	0.22				
Group B	BT	17.23	60	1.23	0.16	-7.952	0.000	1.89	Sig
	AT	17.56	60	1.21	0.16				
Group C	BT	16.82	60	1.22	0.16	-12.325	0.000	2.63	Sig
	AT	17.26	60	1.25	0.16				
Group D	BT	16.76	60	1.36	0.18	-5.721	0.000	1.69	Sig
	AT	17.04	60	1.44	0.19				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A, Group B, Group C and Group D are significant.



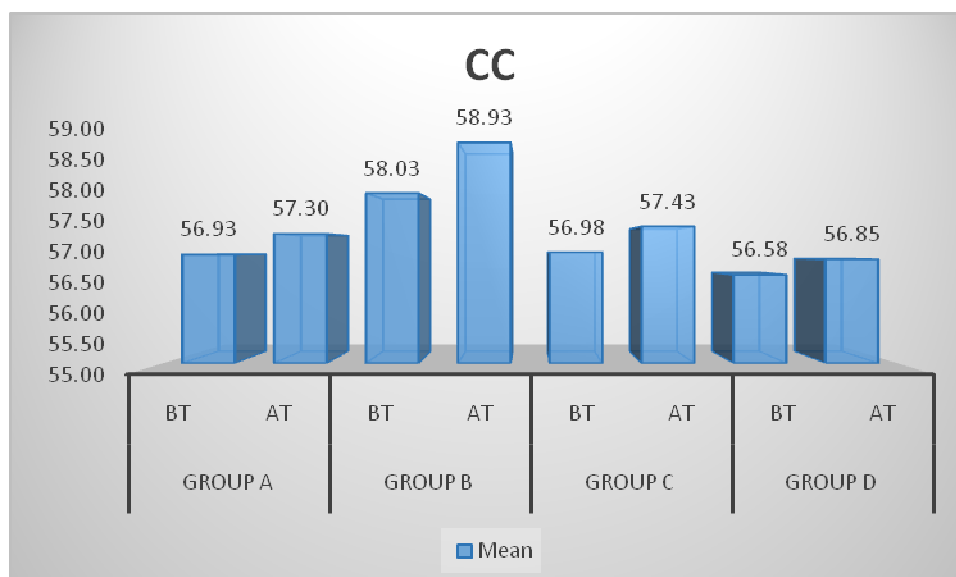
Graph No. 15 - Effects on mid arm circumference (MAC)

6. CHEST CIRCUMFERENCE (CC):

Table no. 23 – Effects on chest circumference (CC)

CC		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	56.93	60	4.58	0.59	-3.718	0.000	0.64	Sig
	AT	57.30	60	4.59	0.59				
Group B	BT	58.03	60	5.45	0.70	-15.860	0.000	1.55	Sig
	AT	58.93	60	5.36	0.69				
Group C	BT	56.98	60	4.93	0.64	-9.274	0.000	0.80	Sig
	AT	57.43	60	4.93	0.64				
Group D	BT	56.58	60	5.36	0.69	-5.250	0.000	0.49	Sig
	AT	56.85	60	5.41	0.70				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A, Group B, Group C and Group D are significant.



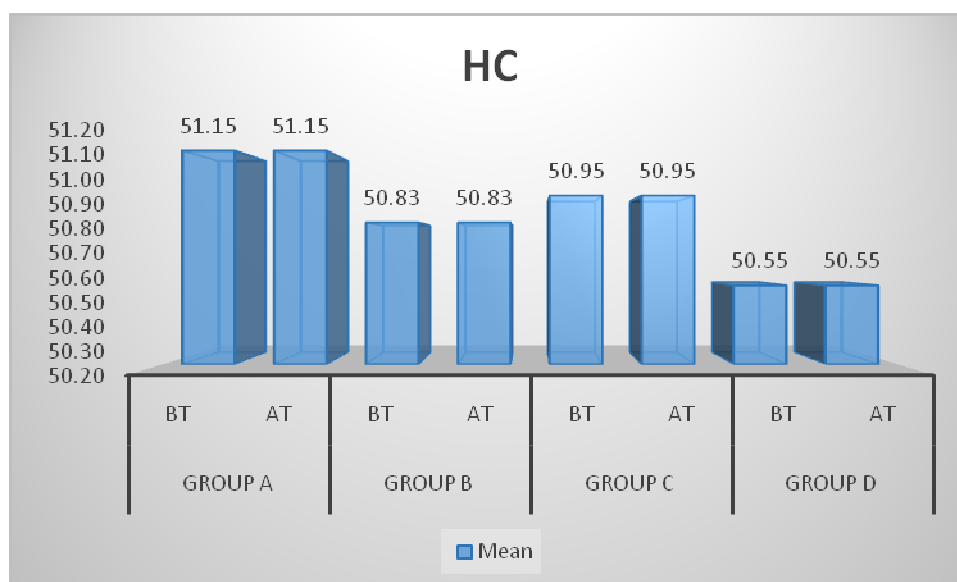
Graph No. 16 - Effects on chest circumference (CC)

7. HEAD CIRCUMFERENCE (HC):

Table no. 24 – Effects on head circumference (HC)

HC		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	51.15	60	1.42	0.18	0.000	1.000	0.00	NS
	AT	51.15	60	1.42	0.18				
Group B	BT	50.83	60	1.96	0.25	0.000	1.000	0.00	NS
	AT	50.83	60	1.96	0.25				
Group C	BT	50.95	60	1.68	0.22	0.000	1.000	0.00	NS
	AT	50.95	60	1.68	0.22				
Group D	BT	50.55	60	1.50	0.19	0.000	1.000	0.00	NS
	AT	50.55	60	1.50	0.19				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A, Group B, Group C and Group D are not significant.



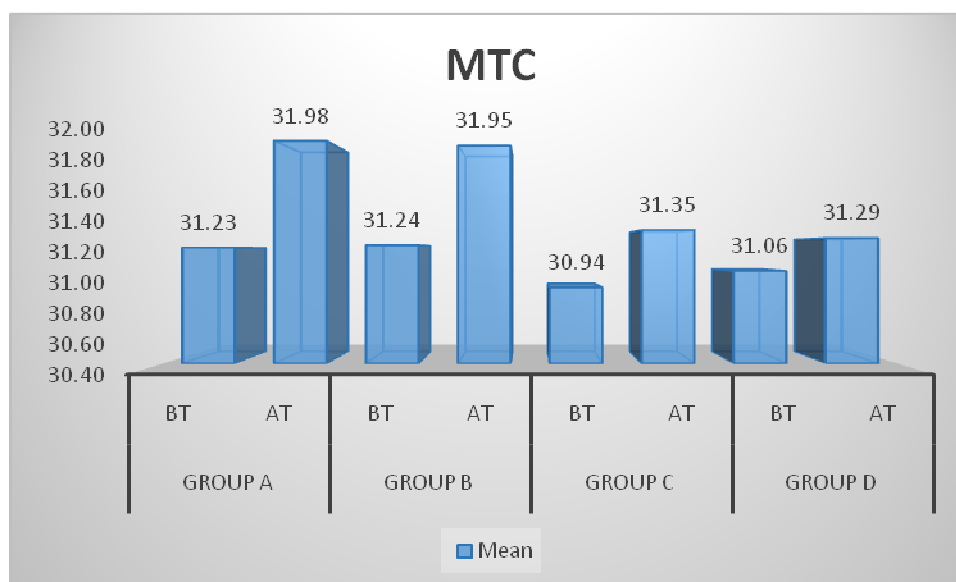
Graph No. 17 - Effects on head circumference (CC)

8. MID THIGH CIRCUMFERENCE (MTC):

Table no. 25 – Effects on mid thigh circumference (MTC)

MTC		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	31.23	60	4.53	0.58	-1.576	0.120	2.43	NS
	AT	31.98	60	2.67	0.34				
Group B	BT	31.24	60	2.75	0.36	-4.150	0.000	2.27	Sig
	AT	31.95	60	2.73	0.35				
Group C	BT	30.94	60	2.85	0.37	-8.215	0.000	1.32	Sig
	AT	31.35	60	2.85	0.37				
Group D	BT	31.06	60	2.77	0.36	-4.698	0.000	0.75	Sig
	AT	31.29	60	2.79	0.36				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group B, Group C and Group D are significant.



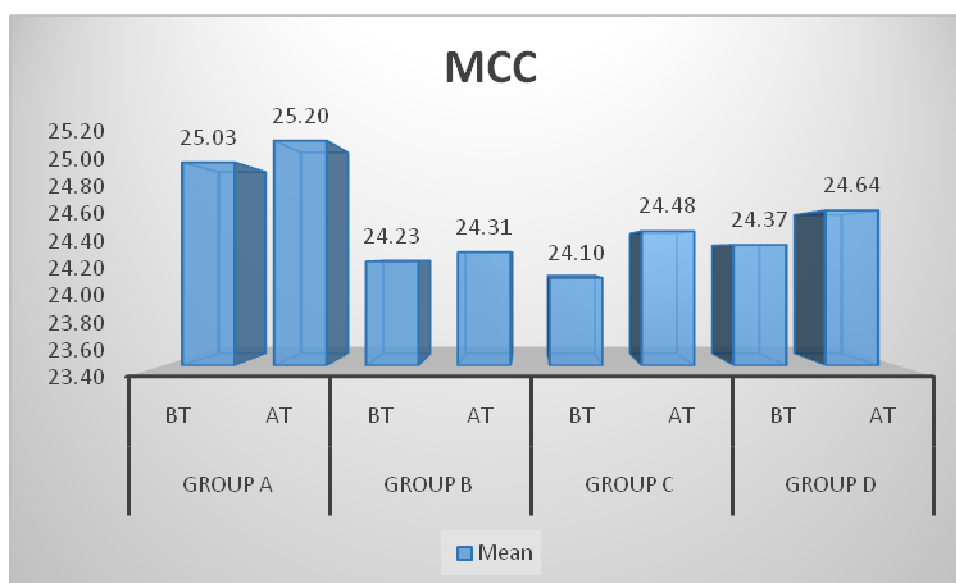
Graph No. 18 - Effects on mid thigh circumference (MTC)

9. MID CALF CIRCUMFERENCE (MCC):

Table no. 26 – Effects on mid calf circumference (MCC)

MCC		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	25.03	60	1.96	0.25	-3.960	0.000	0.70	Sig
	AT	25.20	60	1.94	0.25				
Group B	BT	24.23	60	1.63	0.21	-3.227	0.002	0.31	Sig
	AT	24.31	60	1.61	0.21				
Group C	BT	24.10	60	1.78	0.23	-7.982	0.000	1.56	Sig
	AT	24.48	60	1.81	0.23				
Group D	BT	24.37	60	1.78	0.23	-5.709	0.000	1.13	Sig
	AT	24.64	60	1.75	0.23				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A, Group B, Group C and Group D are significant.



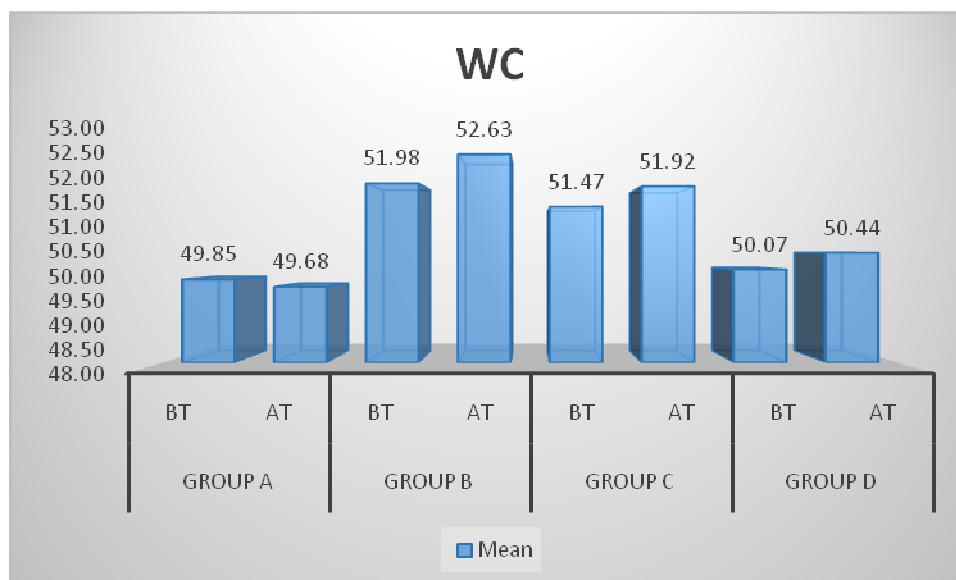
Graph No. 19 - Effects on mid calf circumference (MCC)

10. WAIST CIRCUMFERENCE (WC):

Table no. 27 – Effects on waist circumference (WC)

WC		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	49.85	60	5.47	0.71	0.221	0.826	0.33	NS
	AT	49.68	60	7.99	1.03				
Group B	BT	51.98	60	4.19	0.54	-12.357	0.000	1.23	Sig
	AT	52.63	60	4.10	0.53				
Group C	BT	51.47	60	4.42	0.57	-8.128	0.000	0.87	Sig
	AT	51.92	60	4.37	0.56				
Group D	BT	50.07	60	4.94	0.64	-8.548	0.000	0.75	Sig
	AT	50.44	60	4.97	0.64				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group B, Group C and Group D are significant.



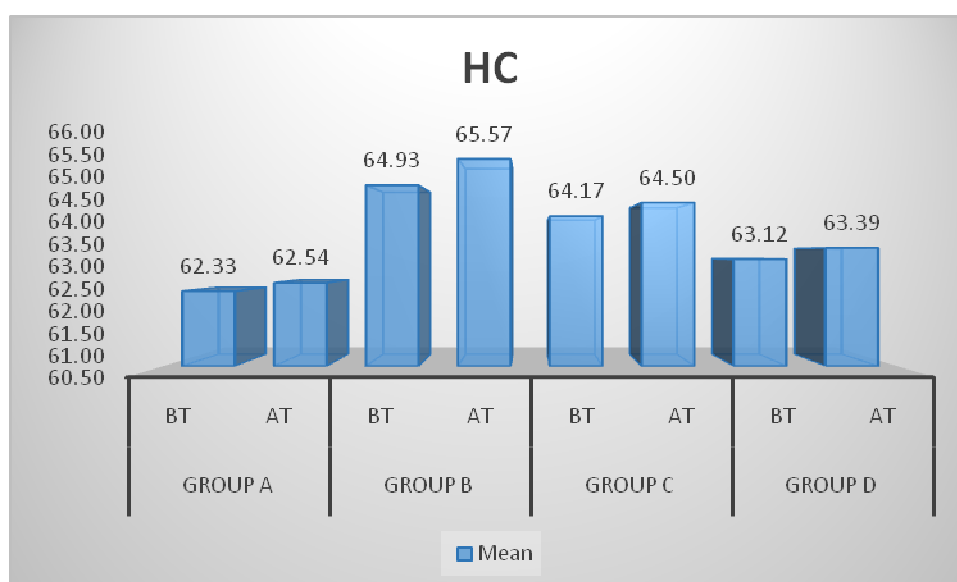
Graph No. 20 - Effects on waist circumference (WC)

11. HIP CIRCUMFERENCE (HC):

Table no. 28 – Effects on hip circumference (HC)

HC		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	62.33	60	5.84	0.75	-2.833	0.006	0.33	Sig
	AT	62.54	60	5.93	0.76				
Group B	BT	64.93	60	4.89	0.63	-12.357	0.000	0.99	Sig
	AT	65.57	60	4.86	0.63				
Group C	BT	64.17	60	4.93	0.64	-5.765	0.000	0.52	Sig
	AT	64.50	60	4.98	0.64				
Group D	BT	63.12	60	5.27	0.68	-4.589	0.000	0.44	Sig
	AT	63.39	60	5.27	0.68				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A, Group B, Group C and Group D are significant.



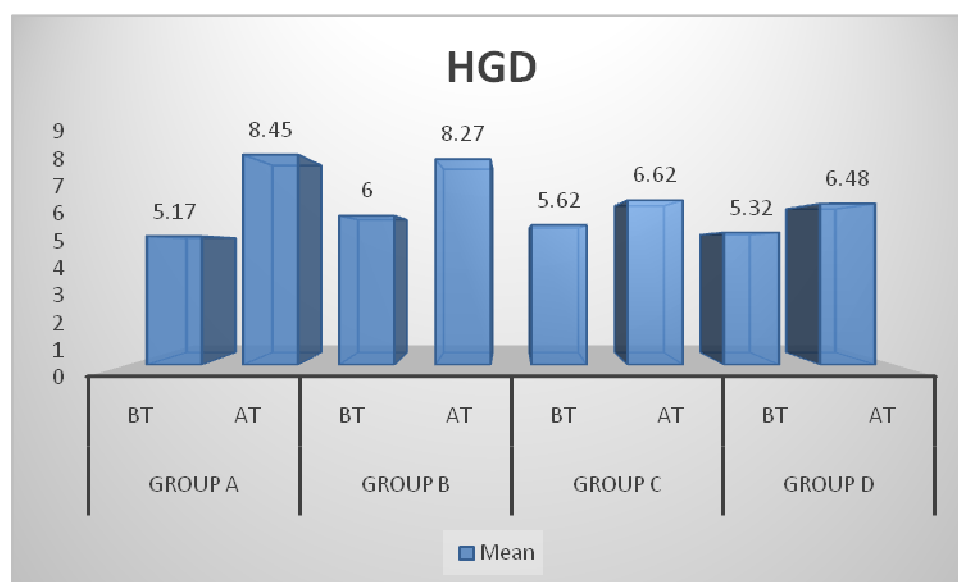
Graph No. 21 - Effects on hip circumference (HC)

12. HAND GRIP DYNAMOMETER(HGD):

Table no. 29 – Effects on hand grip dynamometer (HGD)

HGD		Mean	N	SD	SE	Z-Value	P-Value	% Effect	Result
Group A	BT	5.17	60	3.74	0.48	-19.715	0.000	63.55	Sig
	AT	8.45	60	3.50	0.45				
Group B	BT	6.00	60	3.18	0.41	-9.140	0.000	37.78	Sig
	AT	8.27	60	3.15	0.41				
Group C	BT	5.62	60	3.19	0.41	-8.251	0.000	17.80	Sig
	AT	6.62	60	2.89	0.37				
Group D	BT	5.32	60	3.16	0.41	-9.248	0.000	21.94	Sig
	AT	6.48	60	2.95	0.38				

Since observations are quantitative and sample size is greater than 30, **Z-Test** is used to test efficacy in Group A, Group B, Group C and Group D. From above table it can be observed that, effect observed in Group A, Group B, Group C and Group D are significant.



Graph No. 22 - Effects on hand grip dynamometer (HGD)

COMPARISON AMONGST THE FOUR GROUPS FOR OBJECTIVE CRITERIA:

Table no. 30 – Comparison amongst the four groups for objective criteria

Criteria	Group	N	Mean Diff	SD	SE	F-Value	P-Value
STHULA PARVA	Group A	60	0.00	0.00	0.00	2.810	0.402
	Group B	60	0.00	0.00	0.00		
	Group C	60	0.00	0.00	0.00		
	Group D	60	0.00	0.00	0.00		
	Total	240	0.00	0.00	0.00		
WEIGHT	Group A	60	1.59	0.39	0.05	18.066	0.000
	Group B	60	2.07	0.87	0.11		
	Group C	60	0.94	0.36	0.05		
	Group D	60	1.07	1.59	0.21		
	Total	240	1.42	1.04	0.07		
HEIGHT	Group A	60	1.62	0.47	0.06	68.441	0.000
	Group B	60	1.79	0.48	0.06		
	Group C	60	0.95	0.41	0.05		
	Group D	60	0.86	0.39	0.05		
	Total	240	1.30	0.59	0.04		
BMI	Group A	60	0.53	0.26	0.03	7.013	0.000
	Group B	60	0.74	0.44	0.06		
	Group C	60	0.35	0.18	0.02		
	Group D	60	0.42	0.83	0.11		
	Total	240	0.51	0.51	0.03		
MAC	Group A	60	0.23	0.30	0.04	5.342	0.001
	Group B	60	0.36	0.28	0.04		
	Group C	60	0.44	0.28	0.04		
	Group D	60	0.37	0.30	0.04		
	Total	240	0.35	0.30	0.02		
CC	Group A	60	0.48	0.69	0.09	15.145	0.000
	Group B	60	0.90	0.44	0.06		
	Group C	60	0.48	0.36	0.05		
	Group D	60	0.34	0.35	0.05		
	Total	240	0.55	0.52	0.03		
HC	Group A	60	0.00	0.00	0.00	NA	NA
	Group B	60	0.00	0.00	0.00		
	Group C	60	0.00	0.00	0.00		
	Group D	60	0.00	0.00	0.00		
	Total	240	0.00	0.00	0.00		

MTC	Group A	60	0.79	3.72	0.48	0.926	0.429
	Group B	60	0.71	1.32	0.17		
	Group C	60	0.41	0.39	0.05		
	Group D	60	0.27	0.36	0.05		
	Total	240	0.54	1.99	0.13		
MCC	Group A	60	0.26	0.28	0.04	12.258	0.000
	Group B	60	0.08	0.18	0.02		
	Group C	60	0.39	0.35	0.04		
	Group D	60	0.31	0.35	0.04		
	Total	240	0.26	0.32	0.02		
WC	Group A	60	1.45	5.67	0.73	1.750	0.157
	Group B	60	0.64	0.40	0.05		
	Group C	60	0.48	0.39	0.05		
	Group D	60	0.38	0.34	0.04		
	Total	240	0.74	2.87	0.19		
HC	Group A	60	0.41	0.45	0.06	6.150	0.000
	Group B	60	0.64	0.40	0.05		
	Group C	60	0.40	0.39	0.05		
	Group D	60	0.34	0.42	0.05		
	Total	240	0.45	0.43	0.03		
HGD	Group A	60	3.28	1.29	0.17	50.346	0.000
	Group B	60	2.57	1.49	0.19		
	Group C	60	1.10	0.82	0.11		
	Group D	60	1.20	0.94	0.12		
	Total	240	2.04	1.48	0.10		

For comparison among four groups, **ANOVA test** is used. From above table it can be observed that P-Values for all parameters are less than 0.05. Hence it can be concluded that there is significant difference among all four groups.

Further it can be observed that mean difference for Group B is greater, hence it can be concluded that effect observed in Group B is more than other groups.

DISCUSSION:

- In this randomized controlled trial totally 240 subjects were enrolled. The *Modak* was administered in the first two groups (A&B) of the study, early in the morning. The parents, teaching and non-teaching staff of the schools were guided and told about the study, the proceedings of the project were done efficiently.
- Follow up was taken on 30th, 60th and 90th day.
- Health Check-up camps were conducted in schools with prior written permissions.
- All students in the study age group were screened and those who fulfilled the parameters of Inclusion Criteria were included in the study.
- The school staff and the parents were explained about the study procedure in detail and informed consent was signed from the parent and class teacher and counseling was done regarding diet.
- Diet charts were given. As the subjects had lunch in the mid-day meal scheme there was no variability in the diet. Assessment criteria were documented before during and after the study.
- Results were analyzed statistically.

Total study is discussed in to various sections –

1) Discussion on Selection of Topic:

Why underweight Adolescence age group selected for the study?

The term adolescence has been defined as including those aged between 10 and 19 years and youth as those between 15 and 24; young people is a term that covers both the age groups i.e. those between the ages of 10 and 24. Adolescence is the period of physical, psychological and social growth from childhood to adulthood. The development that takes place in adolescence is generally uneven, in that the physical maturity may well be achieved in advance of psychological or social maturity; in most societies, in fact, reproductive capability is now established at an earlier age than the past.

The significance of the fitness of youth has begun to obtain growing recognition, specifically in developing countries where in 4 out of 5 of the world's young population, more than half are under the age of 25. These young men and women are, or will become, the parents of the next generation. They must be given every opportunity to develop to their full potential as healthy individuals. So as this age group builds a healthy nation, this group is focused.

2) Discussion on Atikarshya and underweight:

Karshya is an *Apatarpana Janya Swatantra Vyadhi*. An apparently lean and thin looking person may be known as *Krusha*. *Aahar Dosha* is the main predisposing factor for this disorder and *Alpashana* and *Vishamashana* (inappropriate intake habits) are specially results in the development of *Karshya*. *Karshya* – can be a normal phenomenon or it can also manifest along with other diseases as symptom or complication. *Atikrusha* is much leaner and emaciated than *Krusha*. So symptoms of *Karshya* will appear more in *Atikarshya*. In the present study *Atikarshya* not complicated by any diseased condition or not resulted in any diseased condition has been taken in to consideration.

Detailed information about *Karshyadhikar* is given in *Bhavprakash* but *Chikitsa* of *Karshya* in children is explained by *Yog Ratnakar* only. Other referances related to *Atikarsya* are found scattered in *Samhitas*.

As *Krushata* is a pre-stage it is to be treated with proper care and attention which otherwise leads to *Balshosha*, *Parigarbhika* or *Atikarshya*. *Karshya* and *Atikarshya* are condition's which may occur at any time. Underweight is correlated with *Atikarshya* in present study.

3) Discussion on selection of Mudga and Godhuma for the study:

- As seen in the literary review of the study, references of *Mudga* and *Godhuma* are found in various texts of *Ayurved* as one of the *Hitkar* and *Nityasevaniyadrayas*, which are *Satmya* for the body. These *dravyas* are emphasized on inclusion of *Pathyakar* and *Matravat Aahar*, and its probable role in *Atikarshya* and weight gain parameters is due to its *Bruhana* effect on the body. Pharmacotherapies like *Bruhana* have been advocated in *Ayurved* for the patients of *Karshya*. In Modern science, pediatrics diet management and restoration of the different deficiencies have been advised patients of underweight.

In case of management of *Atikarshya*, *Acharya Charak* has rightly advised administration of *Bruhana* therapy as per the requirements. *Bruhana* refers to the phenomenon of healthy growth of *Dhatas*, particularly *Kapha*, *Mamsa* and *Meda* leading to proper development and enhancement of different parts of the body. Phenomenon of *Bruhana* can be understood by means of *Aahar* and *Aushadha*. Being *Viryapradhan Bruhana Aahar* gives quicker results in weight gain due to its daily consumption.⁶² *Bruhana Dravya* mainly comprises of *Parthiva* and *Aapyabhavas* and should be cautiously used in managment in an emaciated person, as *Sharirbala* and *Agnibala* are reduced. Hence, *Prakshepadravya* are added to enhance digestion. Probable mode of action of *Bruhana Aahar Dravya* can be assessed on the ground

of its *Gunapanchaka*. It is found that *Mudga* and *Godhuma* have predominance of *Guru*, *Snigdha*, *Shita* and *Manda Guna*, *Madhur Rasa* and *Madhur Vipak* causing *Bruhana* effect. The individual component of *Mudga* and *Godhuma Modak* are been clinically evaluated.

4) Discussion on sample size in the study:

As per the formula sample size for the study is calculated with Standard normal variable along with permissible error and the sample size was calculated.

$$n = \frac{Z^2 P(1-P)}{d^2}$$

n = sample size

Z = Standard normal variable = 1.96 (for 5%)

P = Prevalence Rate = 3.5% = 3.5/100 = 0.035

d = permissible error Adolescent in the age group of 11 to 18 years i.e. the adolescent age were selected by simple randomization for the present study.

As per the results from 2007 – 2010 National Health and Nutrition Examination Survey (NHANES) the prevalence rate estimated 3.5% of adolescents aged 11-18 years, are underweight. So, as per the formula –

$$n = \frac{(1.96)^2 (0.035) * (1-0.035)}{(0.05)^2}$$

$$n = \frac{(1.96)^2 (0.035) * (0.965)}{(0.05)^2}$$

$$n = 51.9$$

$$n \approx 52 \text{ (minimum)}$$

So, the minimum sample size as per the prevalence rate is 52, 60 subjects for each group were included, hence totally 240 subjects for the study were planned. Sample size deliberately increased to evaluate and prove the action of the selected *Dravya*.

Group allocation of the subjects was done by Simple randomization method – Lottery method.

5) Discussion on Pathya Kalpanas and Krutanna Varga:

Ayurved Samhitas have explained different *Aahar Kalpana as Pathya Kalpanas* and *Krutanna Varga* like *Manda*, *Peya*, *Vilepi*, *Yavagu*, *Yusha*, etc. These are important in the field of health with respect to prevention, where different *dravya* are used for maintaining and sustaining the living body. In therapeutics many *Pathya kalpanas* are described as a

vehicle for *Shodhan* and *Shaman* formulations. But still these therapeutic measures remain neglected because of reluctant approach towards unfamiliar methodology of these *Pathya kalpanas*. Current study aims to review the detail concept of *Pathya Kalpana* in order to explore the scientific approach towards ancient dietary regimen to ensure the healthy life.¹³³

Importance of Krutanna Kalpanas:

Krutanna kalpanas are used by healthy individuals as well as to treat the different diseases according to the state of disease and capacity to digest the food in that disease. The mechanism of these *Aahar kalpanas* is based on *Agni* and condition of vitiated *Doshas*. They help to restore the normal functioning of *Agni* so as to digest the food properly and give required nutrition to tissues of body – by nourishing all the *Dhatu* and *Srotas* leading to complete sustenance of body. It reduces the possibility of formation of *Aama* which is often triggered in case of derangement of *Agni*, by detoxifying the body in process of eliminating vitiated *Doshas*. When food items are enhanced with herbs having medicinal property which are tasty, then diseased person consumes it with interest as the recipe becomes more palatable due to use of combination of ingredients of various *Aahar Varga*. This helps in formation of *Prakrut Aahar Rasa* leading to *Dhatuposhana* and normal functioning of body system.

Concept of *Pathya* varies with the individual. Even it changes in the same person according to age, *Dosha Avastha*, *Vyadhi Avastha*, *Koshtha Swarupa*, *Sharirika* and *Manasika Bala*, *Agni Bala*, *Prakruti*, habitat, occupation, etc. All these factors should be considered while planning *Pathya* for a person. The concepts *Pathya and Krutanna kalpanas* have remained abandoned. Suitable raw material can be used to make an appropriate *Aahar Kalpana* in accordance with the diseased condition as well as digestive capacity of patient. These should be used in the form of *Anupana* or as a complete diet solution. These can be used as a supplementary diet in a healthy person also. Considering all these benefits, it can be incorporated in daily diet regimen. Current study would help to refresh the concept of *Pathya and Krutanna kalpanas* and encourage their use in response with the treatment protocol as well as daily dietary regimen.

6) Discussion on Sanskar in Krutanna Varga Aahar Kalpana:

Concept of *Samasiddhika* and *Naimittika Guna* is important to understand the concept of *Sanskar* as the modification of attributes takes place at the level of *Naimittika Guna*. Therefore, when the comparison made between the properties of raw substance and processed preparations mentioned in *Krutanna Varga*, some of their *Samsiddhika Guna* (inherent

qualities) had not changed. However, *Sanskar* is essential to make the substance palatable, bio available and therapeutically useful. Ingredients of *Aahar Varga* are available in raw form. With help of *Sanskar*, can be easily absorbed and assimilated in the body. Individually each *Sanskar* explained in *Ayurved* and needs to be established through objective parameters and thereby that become scientific. In current study effort has been made to prove the same.¹¹⁷

7) Discussion on dose of each *Modak*:

- There is no clear reference of dose, quantity, size or amount of *Modak* in classical texts of *Ayurved*. Dose of each *Modak* was calculated according to the energy requirement and body weight which was decided to be 30 grams each daily.

वीर्यप्रधानौषधीद्रव्यं रसप्रधानआहारद्रव्यं ॥ - च. सू. २।१७ (चक्रपाण्डिका)

This is the reference of dose; in the same context, it is also mentioned that the dose of *rasapradhanaaharadravya* as 4 *pala* and *veeryapradhanaoushadha* as 1 *pala*, ½ *pala* and 1 *karsha*. *Charakachaya* has mentioned that *Mudga* is a *Laghudravya* which is *vayu-agnibahala*, and are by nature stimulants of *Agni*. In the same context, it is said that though *Laghu dravya*, excessive intake is not prescribed as it may hamper the *Agni*. Hence the dose of *Mudga* administered and the *Aahar* which is taken along with *Mudga* is altered as per *Agni* of the person. Hence in the current study, considering the adolescent age group and total consumption of diet the dose decided was 15 grams for *Moong* and *Godhuma* respectively.¹³⁴

8) Discussion on various references of *Modak* in texts and the SOP used in the study:

- Dosage was calculated as per the age, weight and palatability. As the *Modak* are from *Pakwanna* category of *Krutanna varga*, its use was to be made wisely. So quantity of 30 grams was decided for each *Modak* daily.

- *Granthokta* way was adopted for the preparation of both the *Modaks* and in practical way of preparation of *Modak prakshep dravya* was added i.e. *Ela* and *Pippali*. The use of *prakshep dravya* was mainly done in order to enhance the taste of *Modaks*, increase the palatability and digestion. *Ela* is a *Sugandhi dravya*, *Vatashamak* and promotes *Agnibala Vruddhi* (improves digestion capacity). *Pippali* used acted as *Kaphaghna*, *krumighna* and boosted digestion.

9) Discussion on Standardization of the Modaks:

As per the guidelines mentioned in www.ncbi.nlm.nih.gov the standardization of both the Modaks was done.¹³⁵ The organoleptic characters viz. colour, smell, taste, and palatability; physical attributes like – shape, size, diameter, weight and texture (brittleness) were noted and nutritive values were analyzed. Findings of sensory attributes of both *Modak* were evaluated on the characteristics using a 5 point scoring method on basis of Appearance, colour, texture, taste and odour microbiological testing using pour plating method. From the observations noted it was concluded that both *Mudga Modak* and *Godhuma Modak* had a good shelf life of nearly 30 days. (Annexure)

10) Discussion on safety precautions on dispensing of the Modak:

Poly-propylene was used as packing material for *Modak*. It is a linear polymer containing little or no unsaturation. It has high tensile strength and chemical inertness. It has good resistance to sunlight, air, relative humidity. Hence for proper administration and improvising safety as it is a food item it was used.

11) Discussion on Probable mode of action of Mudga Modak:

Green gram in *Mudga Modak* is characterized by possessing a distinctive property termed - *Vichitra pratyarabdha*. A dravya is known for its action at various levels based on its characteristics; for example milk has *Madhur rasa*, *Guru Guna* (taking longer time to digest), *Sheeta Virya* (consuming energy while digestion), *Madhur Vipak* (Post digestive effect being anabolic) and *Bruhana* (nourishing). But *Mudga* being *Madhur rasa* - possesses *Laghu Guna* (takes lesser time for digestion) *Katu Vipak* (Catabolic post digestive effect) yet is nourishing and bulk promoting. These paradoxes make *Mudga* most compatible food substance, efficient tissue builder and nourisher and a dravya with multifaceted action.

Mudga Modak is *Swadu* (sweet), *Shita*, *Laghu*, *Graahi* (absorptive), *Tridoshanasak*, *Ruchi-prada* (enhances taste), *Chakshushya* (intervention good for health of eyes and eye sight), *Jwarahar*, *Tarpan* (satiating)¹³⁶

The *Madhur Rasa* and *Madhur Vipak* of *Modak* make it *Vata Shamaka*. This property mainly helps in clearance of channels and improves the circulation of *Dhatu*s and indirectly helps in nourishment of *Dhatu*s means responsible for *Uttarottar Dhatu Poshana*. *Vatanulomaka* property present in *Go Ghruta* helps in balance and maintenance of *Agni* and ultimately causes *Samyaka Aaharpaka*. *Balya* and *Vrishya* property helps in triglyceride synthesis which is *Dehavridhikara Bhava*. On the other hand *Guru*, *Snigdha*, *Shita*, and *Mrudu Gunas* are

directly responsible for *Bruhana* effect in body. *Rasayana* property improves general health and immunity. *Jivaniya* property maintains equilibrium of *Dosha*, *Dhatu* and *Mala*. Essential component present in *Mudga* helps in body building.

12) Discussion on Probable mode of action of Godhuma Modak:

Godhuma Modak is a recipe tends to aggravate *kapha* in body. It is *Madhur rasatmak*, *Guru*, *Snigdha*, *Shita viryatmak* and *Madhur vipaki*. These properties make it difficult to digest, although roasting the wheat flour in ghee can enhance its digestibility. It may help in balancing *Vata* and *Pitta Dosha*. As it was given in small portion daily, good results were seen without overloading the digestive system. Because of the *Jeevaniya* and *Bruhaniya Guna* it acts in nourishing and promotes weight gain. It helps in improving strength and immunity as it is *Balya* in nature. Its regular consumption improves stability, strength as it is *Sthairyakrut* in nature. It is considered as *Pathya* - good for daily consumption.^{137,138}

13) Discussion on mode of action of Green gram:

Green Gram i.e. Moong is consumed as a diet and has a vital role in human nutrition, as has ample active compounds and is a rich source of protein (20.97–32.6%) and. The protein identified in Moong staple food in India and is an effectively excellent source of amino acids, and the essential amino acids in particular, in which many kinds of cereals are deficient. It helps to overcome daily needs for protein and provides sufficient bioavailability. The rich nutrients of the Moong bean, such as minerals, iron, dietary fiber, and significant amounts of bioactive phytochemicals also make it a good alternative function food. Furthermore, the polyphenols, polysaccharides, and polypeptides contained in the Moong bean all exert antioxidant activity, which can contribute to disease prevention.¹³⁶ Moong contain a type of soluble fiber called pectin, which helps to keep bowels regular by speeding up the movement of food through gut. Resistant starch works similarly to soluble fiber, as it helps nourish healthy gut bacteria. The bacteria then digest it and turn it into short-chain fatty acids — butyrate, in particular as it promotes in improvising digestive health. It nourishes colon cells and boosts gut's immune defenses and even lower your colon cancer risk. The carbohydrates in Moong are easier to digest than those found in other legumes. Therefore, Moong is less likely to cause flatulence compared to other types of legumes.^{142, 143}

14) **Discussion on mode of action of wheat:** ^{139,140}

Wheat promotes satiety, prolongs gastric emptying time, and slows down nutrient absorption, thereby assisting in weight maintenance. It also provides positive health effects for the gastrointestinal tract by decreasing gut transit time, increasing digesta viscosity in the small intestine, and increasing stool bulk and short-chain fatty acid production in the colon. Most of the minerals in wheat found help to bind to total fibre or fibre components such as hemicelluloses, cellulose, and lignin. Intake of minerals macro-minerals (Ca, Mg, K, and P) and micro-minerals (Cu, Fe, Mn, and Zn), in wheat flour activates enzymes performing metabolic functions of human body process, helps in body building. It is important source of bioactive phytochemicals alk(en)ylresorcinols (ARs), benzoxazinoids (BXs), phytosteroids, sphingolipids, lignans, flavonoids, phenolic acids, fatty acids and glycolipids, tocopherols, carotenoids, and other minor components. Wheat has action on aging as well as antimicrobial and shows neuro-protective effect (protection of nerve cells from oxidative injury and neurotoxicity) incorporation of anthocyanin-rich foods in the human diet may help boost overall health. A significant concentration of all these nutrients and so should be part of the human diet to improve health and wellness. It helps in the normal functioning of the brain by reducing age-related neurodegeneration and cognitive decline. Carotenoids as plant pigments are a vital dietary source of vitamin A, which is beneficial for healthy vision, skin, bones and other tissues in the body. Lutein and zeaxanthin have benefits of maintaining good eye health and enhanced immune response.

15) **Discussion on analysis of demographic data of subjects:**

After obtaining informed consent and baseline screening total 240 subjects were included in the four groups. In each group 60 subjects were included. For analysis of demographic data all subjects included in study were considered. Following data was obtained –

1. Age wise distribution - According to the inclusion criteria subjects between age group of 11 to 15 years were included in the study. Out 240 subjects included maximum (51.66 %) were of 12 years, while minimum (1.25 %) subjects belonged to 15 years of age. Out of remaining subjects 24.58 % belonged to 11 years, 16.25 % belonged to 13 years and 6.25 % belonged to 14 years of age.

2. Gender wise distribution - 48.33% subjects were male while 51.66% subjects were female. It indicates that nearly equal numbers of male and female subjects were included in the study and there was no bias in inclusion as far as gender is concerned.

3. Religion wise distribution - It was observed in the study that 74.16 % subjects were Hindu, 3.33 % were Muslims, 0.83% were Christians while 9.62 % were followers of Buddhism.

4. Financial status wise distribution - Parents of subjects included in the study revealed that families belonged to lower financial status. None of subject was from families of middle class or higher classes of society.

16) Discussion on Statistical Analysis:

1. Daurbalya - Out of the four groups two groups A and B show statistically significant improvement in *bala*. The effect of group A is 33.6 while B is 46.9, the P values for both groups is 0.000 which proves that the treatment is successful to reduce *Daurbalya*. The subjects from group B show more effect than group A, as *Mudga* has more proteins and *Godhuma* has more carbohydrates in content.

2. Kshudha - Group A and Group B show statistically higher significant effect which means both these treatments are effective with regards to *kshudha*. There is negligible difference seen in both the groups so both can be considered equally effective. *Laghu*, *Vishada* properties of *Mudga* and *Deepan*, *Pachan* properties of *Godhuma* have caused these effects. In addition *Go Ghruta* and *prakshep dravya* have played supplementary roles of *Deepan Pachan*. The P values are 0.000 which indicate high significance of the data in these groups.

3. Dhamani Jala Darshana - The groups A and B have shown high significance which means the treatment is effective. Group A shows P value of 0.005 while group B shows P value of 0.001, which means group B shows more effect than group A. this may be because *Mudga* has more protein content which improves muscular mass while *Godhuma* has more carbohydrate content which increases subcutaneous fat.

4. Nidra - Group A and B show highly statistically significant effect as the P values are 0.000. The effect seen in group B is more than in group A which may be due to property of *Godhuma* which satisfies the appetite by filling the stomach, which results in good quality of sleep as compared to *Mudga*.

5. Kapola Gata Vasa - Group A and Group B show significant improvement which means the treatment is effective there is negligible difference between both the groups so it can be concluded that both the treatments are equally effective.

6. Sthula Parva - The observation show statistically significant effects in group A and group B. The percent effects in both the groups are the same. So, it can be concluded that both the treatments have same effect.
7. Weight - Statistically significant changes in weight is seen in all the groups. Group A and Group B show higher improvement indicating that both the treatments are effective. Percent effective changes in Group A and Group B are nearly same.
8. Height - The changes in height in all the groups are statistically significant. Group A and group B show more improvement than other two groups. This shows that the treatment is more effective. Group A and Group B show nearly same effect with respect to height.
9. BMI - The changes in BMI in all the groups are statistically significant. Group A and group B show more improvement than other two groups. This shows that the treatment is more effective. Group A and Group B show nearly same effect with respect to BMI.
10. Mid Arm Circumference (MAC) - The changes in MAC in all the groups are statistically significant. Group A and group B show more improvement than other two groups. This shows that minimal growth is seen in group A which indicates that *Mudga* promotes muscular lean growth.
11. Chest Circumference (CC) - The changes in CC in all the groups are statistically significant. Group B shows more improvement than other groups. This shows that minimal growth is seen in group A which indicates that *Mudga* promotes muscular lean growth.
12. Head Circumference (HC) - There is no difference in effect in all the groups.
13. Mid-Thigh Circumference (MTC) -The changes in MTC in all the groups are statistically significant. Group A and Group B shows more improvement than other groups. This shows that the treatment is effective. Both the groups show nearly same effect.
14. Mid-Calf Circumference (MCC) - The changes in MCC in all the groups are statistically significant. Group A and Group B shows less improvement than other groups.
15. Waist Circumference (WC) – The changes in WC in all the groups except Group A are statistically significant. Group A shows less effect than other groups.
16. Hip Circumference (HC) - The changes in HC in all the groups are statistically significant. Group A shows less effect than the other groups and is less significant statistically than the other groups.
17. Hand Grip Dynamometer (HGD) - The changes in HGD in all the groups are statistically significant. Group A shows more effect than the other groups and is highly significant statistically than the other groups. This might be due to the improvement in muscle strength.

- Proteins consist of Amino acids which are strung together in complex formations. Because proteins are complex molecules, the body takes longer to break them down. As a result they are much slower and long lasting source of energy than carbohydrates.
- Though both *Modaks* are statistically significant in improving the symptoms, *Godhuma Modak* is marginally more effective in majority of the criteria listed in the study.

17) Discussion on Findings:

1. Adolescents are more prone to *Atikarshya* due to unhealthy food habits, absence of personal attention, exposure to sunlight and physical strain while playing.
2. Low socioeconomic and lower middle class people cannot afford nutritious food and they are additionally prone to malnutrition. Bad food habits and lack of nourishment cause disturbance in physiological and psychological aspect of children leading to *Karshya*, with ignorance further leads to *Atikarshya*.
3. *Doshbalapravrita* is mainly accountable for disease. As it was seen that growth and development was hampered due to etiological factors.
4. In the current study, *Nidan sevan* and *Srotodushti* substantiate theoretical observation made in *Samhitas* are relevant in the present era.
5. Mental alertness and physical activities of children in A & B group were improved which further implies the importance of nutrition in the cognitive process.
6. It was observed in Group A & B were less prone to illness or disease compared to group C & D. from this it can be predicted, that good nutrition leads to immunity building process.
7. It was observed that the subjects were ready to accept the *Modak* into their daily diet. Due to which we can include it in the National Nutritional programmes in possibly all age groups.
8. Ingredients are part of daily diet and easily available, hence it can be a cost effective alternative for nutrition in adolescents.
9. All the parameters in the subjective criteria of Group A & B were found to be improved than Group C & D.
10. Intolerance to gluten or allergy is observed sometimes which is present in *Godhuma* (wheat). Even now-a-days people prefer gluten free food so in such conditions, use of *Mudga* can be recommended in diet as it is easy to digest and nutritional values are not compromised.

SUMMARY:

The present study entitled – ‘Comparative Study of Mudga Modak and Godhuma Modak of Krutanna Varga w.s.r. to their Bruhana Effect in Atikarshya’ is presented in two main sections – conceptual and interventional.

Conceptual study was done using available literature like Brihatrayi with various commentaries, encyclopaedias like Shabdakalpadruma, Vachaspatyama, contemporary modern texts, reputed journals, research articles, web sources and related works from different Universities, which were further reviewed and documented for the study.

Study intervention: Trial group - *Mudga Modak*
Control group - *Godhuma Modak*

Dosage: depending upon the group 30 grams per day orally Morning with breakfast, daily.

Duration of Therapy: 3 months

Sample size – 240

Study Groups:

GROUP A – 60 Subjects - *Mudga Modak* + having a common meal + mid-day meal

GROUP B – 60 Subjects - *Godhuma Modak* + having a common meal + mid-day meal

GROUP C – 60 Subjects - having a common meal + mid-day meal

GROUP D – 60 Subjects - having a regular meal

Assessment Parameters:

Subjective Criteria – Daurbalya, Kshudha, Dhamani Jala Darshana, Sthula Parva, Nidra and Kapola Gata Vasa.

Objective Criteria – Weight , Height, BMI, Mid arm circumference, Chest circumference, Head circumference, Mid-Thigh circumference, Mid-calf circumference, Waist circumference, Hip circumference and Hand Grip Dynamometer

Statistical Analysis:

Subjective criteria - Since observations are on ordinals scale (gradations), Wilcoxon Signed Rank Test is used to test efficacy in Group A, Group B, Group C & Group D. For comparison among four groups in Subjective criteria, Kruskall Wallis H Test is used.

Objective criteria - observations are quantitative and sample size is greater than 30, Z-Test is used to test efficacy in Group A, Group B, Group C and Group D.

For comparison in both i.e. before & after, amongst four groups, ANOVA test is used.

CONCLUSION:

1. The concept of *Pathya Aahar* in Ayurved with special reference to Modak - recipe of *Krutanna Varga* used in *Atikarshya* was elaborated.
2. The effect of *Mudga Modak* and *Godhuma Modak* as *Bruhana* in *Atikarshya* amongst adolescent was studied and evaluated.
3. The effectiveness of *Mudga Modak* and *Godhuma Modak as Krutanna kalpanas* were analyzed in *Atikarshya* and it was found that *Godhuma* increased the bulkiness in subjects while *Mudga* increased muscular leanness and Group A showed more Energy (*Bala*) than Group B which was observed in effects of Hand Grip Dynamometer.

LIMITATION AND SCOPE OF STUDY:

Limitations:

1. *Aahar* is considered as *Mahabheshaj* i.e. best medicine, but as it is not accepted globally, scientific scope for generating evidence as functional food is lagged behind.
2. Until various recipes mentioned under *Krutanna Varga* in *Ayurved* as *Pathya Aahar Kalpana* get recognition from Government to be included in National Nutritional Programmes, study in large population is not possible.
3. Lack of previous research studies on recipes mentioned in *Krutanna Varga*.

Future Scope of Study:

1. Therapeutic effects can be studied considering *Modak* of *Krutanna Kalpana* as Nutraceutical product or functional food with potential nutritional and safety profile.
2. Sophisticated instrumentation facility is available now a days from which we can derive more informative contents like nutritional profile of *Krutanna Vargas*.
3. This study is a good example of low economic value high nutrition recipe, so studies can be carried out on large scale basis.
4. Many references of recipes of *Pathya Aahar* are mentioned in *Krutanna Varga* included in our *Samhitas*. Considering this as base, many studies can be carried out.
5. Dose of the *Modak* can be modified and effect can be studied.
6. Introducing the study in child diet i.e. *Annadaawastha* – age group above 3 years, Geriatric age group, Pregnant and Nursing mothers.

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लिखित संमती पत्रक

रुग्ण क्र.

वय:

रुग्ण नाम:

लिंग:

**“COMPARATIVE STUDY OF MUDGA MODAK AND GODHUMA MODAK OF KRUTANNA
VARGA W.S.R. TO THEIR BRUHANA EFFECT IN ATIKARSHYA”**

१] मी या पत्रकाद्वारे असे नमुद करतो/करते कि, मी दिनांक _____ रोजी या प्रक्रियेसंदर्भातील सर्व माहिती दिली असून त्याबद्दल उपस्थित झालेल्या सर्व शंकांचे निरसन करण्यासाठी प्रश्न विचारण्याची संधी मला मिळाली आहे. त्यामुळे सर्व मुद्दे मला समजले असून शंकांनिरसन पूर्ण झाले आहे.

२] तसेच माझ्या पाल्याला देण्यात येणाऱ्या मूगाचे लाडू / गव्हाचे लाडू विषयी सर्व माहिती मला देण्यात आली असून ते आहारात देण्यास मी स्वखुशीने तयार आहे.

३] तसेच मी हे देखील जाणून आहे की ह्या प्रक्रियेमधला माझा व माझ्या पाल्याचा सहभाग कोणत्याही क्षणी रद्द करू शकतो/शकते. त्याकरिता मला कोणतेही कारण देण्याची गरज नाही व त्यामुळे माझी कोणतीही वैद्यकीय सेवा किंवा कायदेशीर न्यायविषयक अधिकार यांचे हनन होणार नाही.

४] मला अभ्यासक, अभ्यासकाठी काम करणारे इतर लोक व परीक्षक ह्या लोकांना, माझे संबंधित नोंदी पहाण्यासाठी माझी संमती घेण्याची आवश्यकता नसेल. मी प्रक्रियेमधून माझा व माझ्या पाल्याचा सहभाग काढून घेतल्यानंतर देखील या प्रबंधासाठी किंवा इतर संबंधित अभ्यासासाठी माझ्याशी संबंधित नोंदी माझ्या संमती शिवाय पडताळल्या जाऊ शकतात याची मला जाणीव असून माझी पूर्ण संमती आहे.

५] तसेच मला याची कल्पना आहे कि, माझी व माझ्या पाल्याची ओळख पूर्णता गोपनीय राखली जाईल. माझ्या नोंदी इतर कोणत्याही अभ्यासविषयक कामासाठी किंवा प्रकाशनास देताना माझी ओळख पूर्णतः गोपनीय राखली जाईल. या नोंदी कोणत्याही शास्त्रीय दृष्टिकोणातून वापरण्यात मी अडवणूक करणार नाही.

वरील सर्व गोष्टी मला समजल्या असून मी स्वखुशीने संमती देत आहे.

पालकाची सही

साक्षात्किताची सही व नाव

शोध प्रबंधकाची सही

“COMPARATIVE STUDY OF MUDGA MODAK AND GODHUMA MODAK OF KRUTANNA VARGA

W.S.R. TO THEIR BRUHANA EFFECT IN ATIKARSHYA”

CASE RECORD FORM

STUDY GROUP:

Sr. No.:

DATE:

NAME OF PATIENT: _____

ADDRESS: _____

AGE: ____Yrs

SEX: Male / Female

EDUCATION:

RELIGION:

PRADHAN VEDANA

HISTORY OF PAST ILLNESS

H/O SURGICAL ILLNESS (If Any)

FAMILY HISTORY

PERSONAL HISTORY

Aahar:

Vihar:

Sleep: Day ____ hrs Night ____ hrs Disturbed / Sound

Anidra / Atinidra / Alpa / Samyak

Bowel: Regular / Constipated / Others

Exercise: Jogging / Walking / Games / Others / No Exercise.

Agni: Sama / Manda / Vishama / Tikshna

Menstrual History: (Female Subjects)

Menarche Age

Regular / Irregular

PRESENTLY TAKING TREATMENT (If Any)

PRAKRITI VINISHCHAYA

1. Sharirik - Vatapittaj/Vatakaphaj/Pittavataj/Pittakaphaj/Kaphapittaj/Kaphavataj.
2. Manasik - Satvika / Rajasik / Tamasik.

ASHTAVIDHA PARIKSHANA

1. NADI - _____ / min
2. MALA - Drava/Ghana/Snigdha/Ruksha/Grathit/Saama/Niraam
3. MUTRA - Daha / Vedana / Alpa / Madhyama / Bahupramana
4. JIVHA - Sama / Nirama
5. SHABDA - Ksheena / Gadgad / Aspashtha / Khara
6. SPARSHA - Sheeta / Ushna / Ruksha/ Snighdha / Khara
7. DRUKA - Dirgha / Rhaswa /Sthir / Satej / Chanchal
8. AKRITI - Krusha, Madhyam, Sthula

CRITERIA OF ASSESSMENT:

A. SUBJECTIVE TYPE:

No.	Symptoms	Score	Before T/t	Day 01	Day 30	Day 60	Day 90	After T/t
01.	DAURBALYA – a. Dull b. Moderately active c. Active d. Very Active	3 2 1 0						
02.	KSHUDHA (Hunger) – a. Adolescent does not take food considerably even by force b. Adolescent does not ask but takes food considerably by request c. Adolescent asks food but does not take adequately d. Adolescent himself asks food & consumes adequately	3 2 1 0						
03.	DHAMANI JALA DARSHANA a. Prominent b. Visible c. Visible and prominent on pressure d. Not visible easily even after pressure	3 2 1 0						

04.	NIDRA (Sleep)							
	a. Insomnia	3						
	b. Disturbed	2						
	c. Short but sound	1						
	d. Long and sound	0						
05.	KAPOLA GATA VASA (Buccal pad of fat)							
	a. Cheeks inside with zygomatic bones prominent	3						
	b. Cheeks inside	2						
	c. On surface level	1						
	d. Cheeks averted	0						

B. OBJECTIVE TYPE: PHYSICAL AND ANTHROPOMETRICAL MEASUREMENTS

No.	PARAMETERS	Before T/t	Day 01	Day 30	Day 60	Day 90	After T/t
01.	Sthula Parva						
02.	Weight in kg (Wt)						
03.	Height in cm (Ht)						
04.	BMI						
05.	Mid arm circumference (MAC)						
06.	Chest circumference (CC)						
07.	Head circumference (HC)						
08.	Mid-Thigh circumference (MTC)						
09.	Mid-calf circumference (MCC)						
10.	Waist circumference (WC)						
11.	Hip circumference (HC)						
12.	Hand Grip Dynamometer						

NOTES:

Sign of PhD Scholar

Sign of PhD Guide

“COMPARATIVE STUDY OF MUDGA MODAK AND GODHUMA MODAK OF KRUTANNA VARGAW.S.R. TO THEIR BRUHANA EFFECT IN ATIKARSHYA”

रुग्ण क्र. _____

Group: _____

Date: _____

रुग्णनाम: _____

वय: _____ लिंग: M / F

प्रकारनाव	पथ्य	अपथ्य
धान्य	गहू , तांदूळ , ज्वारी , नाचणी	नवीनधान्य , बाजरी
कडधान्य	मूग , मसुर , मटकी , चवळी	वाल , छोले , हरबरा , कुळीथ , वाटाणा , राजमा , मेथ्या , उडीद , तीळ
भाज्या	कोहळा , दुधीभोपळा , लालभोपळा , तोंडली , दोडका , पडवळ , केळफूल , भेंडी , कोबी , घोसावळी , छोटेवांगे , चवळीच्याशेंगा , फरसबी , श्रावणीघेवडा	सिमलामिरची , डब्बूमिरची , गवार , फ्लॉवर , शेवगा , टोमॅटो , हिरव्या / लालमिर्ची .
पालेभाज्या	पालक , चवळाई , माठ , लालमाठ , चाकवत	शेपू , अंबाडी , मेथी , आळू , करडई , मुळ्याचीपानं , आंबटचुका
कंद	बीटरूट , गाजर , कांदा , आले	बटाटा , रताळी , सुरण , मुळा , लसूण
फळे	डाळिंब , सफरचंद , शहाळं , अंजीर , आवळा , केळी , सिताफळ , कलिंगड , द्राक्षं , खरबूज , नाशपति , जाम्भूळ , फणस	संत्री , मोसंबी , पेरु , अननस , स्ट्रॉबेरी , पपई
द्रव्य	गाईचेदुध , ताजेगोडताक , ताजेलोणी , तूप.	शेळीचेदुध , दही , ताक , लस्सी , मिल्कशेक , कोल्डीक्स / शीतपेय
तेल	सूर्यफूल	शेंगदाणा , करडई , मोहरी
चटणी	आवळा , दुधीच्यासालीची , दोडक्याच्याशिरांची	खरडा , शेंगदाणा , खोबरे+लसूण , जवस , तीळ
ड्रायफ्रुट	काळ्यामनुका , अंजीर , खजूर , बदाम , अक्रोड	काजू , जरदाळू
मांसाहार	कमी मसाले घातलेले चिकन , शक्यतो सूप , अंडी	खारवलेलेमासे , प्रॉन्स ,इ.
उपवासासाठी	राजगिन्याच्या लाह्या / लाडू / वडी + दुध , शिंगाच्याची खीर , ओल्यानारळाचीवडी.	भगर , साबुदाणाखिचडी / वडे
इतर	शिरा , खीर , रसमलाई	हॉटेलिंग , शिळेअन्न , फ्रूटसॅलेड , शिकरण , दूध + मासे , वनस्पती तूपातील व डीप-फ्राय पदार्थ , बनपाव , खारी , सँडविच , केक , पीझझा , बर्गर , क्रीमरोल , चायनीज , चाट (भेळ , पाणीपुरी , इ.) , आंबवलेले पदार्थ (इडली , डोसा , ढोकळा , इ.) , लोणचे , पापड

NAME	PATHYA	APATHYA
GRAINS	Wheat, rice, Indian Millet, Ragi	New grains, Bajra
CEREALS & PULSES	Green gram, Red gram, Black eyed beans, Cow Peas	Field Beans, Chole, Bengal Gram, Horse Gram, Dry Peas, Kidney beans, Fenugreek Seeds, Black Gram, Sesame.
VEGETABLES	Ash Gourd, Bottle Gourd, Red Pumpkin, Kovai, Ridge Gourd, Snake Gourd, Plantain Flower, Lady Finger, Cabbage, Ghosavale, Green Small Brinjal, Cow Peas, French Beans, Indian Salmon	Capsicum, Bell Pepper, Cluster Beans, Cauliflower, Drumsticks, Tomatoes, Green / red Chillies, etc
GREEN LEAFY VEGETABLES	Spinach, Cow Peas Leaves, Amaranthus, Red Amaranthus, Chakvat	Dill (Shepu), Gogu, Fenugreek, Colocassia, Kardai, Radish Leaves, AmbatChuka
ROOTS & TUBERS	Beet Root, Carrot, Onions, Ginger.	Potato, Sweet Potato, Yam, Radish, Garlic.
FRUITS	Pomegranate, Apple, Coconut, Figs, Indian Goose Berry, Banana, Custard Apple, Jack Fruit, Watermelon, Grapes, Musk Melon, Pear	Orange, Sweet Lime, Guava, Pineapple, Strawberry, Papaya
DRAVYA	Cow's Milk, Freshly prepared Sweet Buttermilk, Fresh Butter, Clarified Butter (Ghee)	Goats Milk, Yogurt, Stored Butter Milk, Lassi, Milk Shake, Cold Drinks
OILS	Sunflower	Groundnut, Safflower, Cottonseed, Mustard oil
CHUTNEYS	Amla, Skin of Bottle Gourd, Ridge Gourd, Fibers	Chillies, Groundnut, Desiccated Coconut + Garlic, linseed, Sesame
DRY FRUITS	Raisins/Black Currents, Dry Figs, Dates, Almonds, Apricots.	Cashew nuts, Walnut
NON-VEG	Chicken prepared with less amount of Oil & Spices, preferably Soups and eggs.	Sun Dried, Salted Fish, Prawns, etc.
FAST ITEMS	Rajgira Laddu / Vadi + Milk Dry Water Chestnut Flour Kheer, Fresh Coconut Vadi.	French Millet, Sago (Khichadi/vada/Chivda)
OTHERS	Sheera, Kheer (Vermicelli/rice), Rasmalai	Hotelling, Stale Food, Fruit Salad, Banana+Milk, Milk+Fish, Deep-Fried Items esp. prepared in Vanaspati Ghee, Bread, Bakery Items, Sandwich, cakes, Pizza, Burgers, Cream Rolls, Chinese, Chaat Items, Fermented Food, Preserved Food

॥ पुष्यं पुष्यं विचिन्वीत मूलच्छेद न कारयेत् ॥

Dr. S. S. Deokule

Prof. & Head

वनस्पतिशास्त्र विभाग

Department of Botany

पुणे विद्यापीठ

University of Pune

गणेशखिंड, पुणे-४११००७ (भारत)

Ganeshkhind, Pune-411007 (India)

सं.क्र. : वनस्पतिशास्त्र/

Ref.No. : Bot/ 061/15

पुणे विद्यापीठ
University of Pune



दूरभाष : ०२०-२५६०१४३९, २५६०१४३८

Phone: 020-25601439, 25601438

फॅक्स : ०२०-२५६९०४९८

Fax : 020-25690498

ई-मेल :@unipune.ernet.in

E-mail :@unipune.ernet.in

दिनांक :

Date : 08.10.2015

AUTHENTIC CERTIFICATE

This is to certify that **Dr. Roma Suresh Gangawane** of Tilak Maharashtra Vidyapith, Pune. She has selected research topic of his Ph.D. degree (Swasthavritta) which is as given below-

“COMPARITIVE STUDY OF MUDGA MODAK AND GODHUMA MODAK OF KRUTANNA VARGA WITH SPECIAL REFERENCE TO THEIR BRUHANA EFFECT IN ATIKARSHYA”

Under this study the specimen which he has been submitted to me for the authentication were identified & confirmed as:

Drug Name	Botanical Name	Name of Family	Plant part used
Mudga	<i>Vigna radiata</i> (L.) R. Wilczek	Fabaceae	Seeds
Godhuma	<i>Triticum aestivum</i> L.	Poaceae	Seeds
Ela	<i>Elettaria cardamomum</i> (L.) Maton	Zingiberaceae	Seeds
Pipli	<i>Piper longum</i> L.	Piperaceae	Seeds
Go Ghrita	-----As it is-----		
Canesugar	-----As it is-----		

The sample which was submitted in an organ form and as it is. These are identified as above. This is for information & necessary action.

The authentications of the sample were done by confirmation botanical parameters and Physico-chemical tests.



S. S. Deokule

Dr. S. S. Deokule
Professor & Head
Department of Botany
University of Pune,
PUNE-411 007.

॥ पुष्यं पुष्यं विचिन्वीत मूलच्छेद न कारयेत् ॥

Dr. S. S. Deokule
Prof. & Head
वनस्पतिशास्त्र विभाग
Department of Botany
पुणे विद्यापीठ
University of Pune
गणेशखिंड, पुणे-४११००७ (भारत)
Ganeshkhind, Pune-411007 (India)

सं.क्र. : वनस्पतिशास्त्र/
Ref.No. : Bot/ 077 /15

पुणे विद्यापीठ
University of Pune



दूरभाष : ०२०-२५६०१४३९, २५६०१४३८
Phone : 020-25601439, 25601438
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Fax : 020-25690498
ई-मेल :@unipune.ernet.in
E-mail :@unipune.ernet.in

दिनांक :
Date : 19.11.2015

CERTIFICATE

This is to certify that **Dr. Roma Suresh Gangawane** of Tilak Maharashtra Vidyapith, Pune. She has selected research topic of Ph.D. degree (Swasthavritta) which is as given below-

“COMPARATIVE STUDY OF MUDGA MODAK AND GODHUMA MODAK OF KRUTANNA VARGA W.S.R. TO THEIR BRUHANA EFFECT IN ATIKARSHYA”

Under this study two specimen submitted for the nutritive values.

Sr. No.	Characters	Mudga Modak	Godhuma Modak
1.	colour	chrome yellowish	greyish brown
2.	smell	aromatic, sweet smell	aromatic, sweet smell
3.	taste	sweet	sweet
4.	palatability	little bit heavy	easy for digestion
5.	shape	round	round
6.	size, diameter	4.45 – 4.6 cms	4.45 – 4.6 cms
7.	weight	30 grams	30 grams
8.	texture	easily breakable by teeth (brittle)	easily breakable by teeth (smooth)
Nutritive Values -			
1.	Total Proteins	48%	24%
2.	Total Carbohydrates	21%	18%
3.	Energy	104.4 Cal	103.65 Cal
4.	Fat	1.2%	1.5%



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॥ पुषं पुषं विधिन्वीत मूलर्षेद न कारवेत् ॥

Dr. S. S. Deokule
Prof. & Head
वनस्पतिशास्त्र विभाग
Department of Botany
पुणे विद्यापीठ
University of Pune
गणेशखिंड, पुणे-४११००७ (भारत)
Ganeshkhind, Pune-411007 (India)

सं.क्र. : वनस्पतिशास्त्र/

Ref.No. : Bot/078/15

पुणे विद्यापीठ
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“COMPARATIVE STUDY OF MUDGA MODAK AND GODHUMA MODAK OF KRUTANNA VARGA W.S.R. TO THEIR BRUHANA EFFECT IN ATI KARSHYA”

Under this study the two specimen submitted for the Microbiological testing to check its shelf life. Both the samples kept over 3 weeks using serial dilution (dilution factor: – 10-2) using pour plating method by adding Nutrient Agar.

Sr. No.	Duration	Findings in Mudga Modak	Findings in Godhuma Modak
1	7th Day	3-4 colonies	3-4 colonies
2	14th Day	6-7 colonies	5-6 colonies
3	21st Day	8-9 colonies	7-8 colonies
4	28th Day	9-10 colonies	8-9 colonies

The results checked by Total Plate Count of the microbial colonies.

From the observations noted below it can be concluded that both samples had a good shelf life of one month.



S. S. Deokule
Dr. S. S. Deokule
Professor & Head
Department of Botany
University of Pune,
PUNE-411 007.



टिळक महाराष्ट्र विद्यापीठ Tilak Maharashtra Vidyapeeth

(Declared as Deemed University under section 3 of UGC Act 1956 vide
Notification No.F-9-19/85-U-3 dated 24 April 1987 by the Government of India).
Vidyapeeth Bhavan, Mukundnagar, Gultekdi, Pune-411037.

Tel: 91-020-24261856, 24403000
E-mail : registrar@tmv.edu.in

Fax: 91-020-24266068, 24403100
Website: www.tmv.edu.in

Ref No:Ayu/15/ 180

Date: 30th December 2015

To

The Head Master,
Radhakrishna Prathmik
Va Madhyamik Vidyalaya,
Katraj-Kondava Road,
Gokul nagar,
Pune.

Sub: Help for fulfillment of Ph.D. study

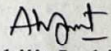
Dear Sir,


Vd. Roma Gangawane is our bonafied Ph.D. student. Her research involves the nutritional study of Secondary School children.

Hence we request you to allow her to carry out part of the study in your School.

Thanking you.

With Regards,


Dr. Abhijit Joshi
Department Head


मुख्याध्यापिका
सौधाकृष्ण प्राथमिक विद्यालय
गोकुळनगर, कात्राज, कोंढवा रोड
पुणे-४१



टिळक महाराष्ट्र विद्यापीठ Tilak Maharashtra Vidyapeeth

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Tel: 91-020-24261856, 24403000
E-mail : registrar@tmv.edu.in

Fax: 91-020-24266068, 24403100
Website: www.tmv.edu.in

Ref No:Ayu/15/ 180

Date: 30th December 2015

To,

The Head Master,
Smt.Pratibhataee Pawar Vidyalaya,
Katraj Kondwa Road,
Pune.

Sub: Help for fulfillment of Ph.D. study

Dear Sir,

Vd. Roma Gangawane is our bonafied Ph.D. student. Her research involves the nutritional study of Secondary School children.

Hence we request you to allow her to carry out part of the study in your School.

Thanking you.

With Regards,

Abhit
Dr. Abhijit Joshi
Department Head

Received
12/30/15
प्राचार्य
प्रतिभाताई पवार माध्यमिक व
उच्च माध्यमिक विद्यालय
कोंढवा बु॥ पुणे - ४११ ०४८



॥ विद्या विनयेन शोभते ॥

मंजुळा शिक्षण प्रसारक संस्था
राधाकृष्ण पूर्वप्राथमिक/प्राथमिक विद्यालय

गोकुळनगर, परदेशी एन्टरप्राईजेस प्रोजेक्ट, कात्रज-कोंढवा रोड, पुणे - ४११ ०४६ फोन:- ९८५०९८३६४० / ९८५०३०३७०८,
रजि. नं. व्हीएलएस / १००४ (३६०/२००४) प्राप्ति - ३

श्री. बबनराव मोहनराव परदेशी
(अध्यक्ष)

श्री. दिलीप बबनराव परदेशी
(सचिव)

जावक क्र. :- 622/16

दिनांक :- 11/11/2016

पुती,
डिस्क महाराष्ट्र विद्यापीठ
मुकुंदनगर, कुलुटेकडी
पुणे.

विषय:- PHD च्या विद्यार्थ्यांना शाळेमध्ये प्रकल्पासाठी परवानगी
दिल्या बाबत.

महोदय,

वरील विषयानुसार आपणांस कळविण्यात येते की आपल्या
विद्यापीठाचे PHD चे विद्यार्थी आमच्या विद्यालयामध्ये PHD चा
प्रोजेक्ट करण्यासंदर्भात शाळेत परवानगी मागल्यासाठी आले असता
त्यांना त्यांच्या प्रकल्पासाठी शाळेच्या यतीने परवानगी
देण्यात येत आहे.

तरी त्यांनी त्यांचा प्रकल्प योग्यरित्या
शाळेचे नियम पाळून करावे. योग्यरित्या अंमलबजावणी
करावी.

PHD प्रकल्प विद्यार्थ्यांची नावे.

① रोमा सुरेश त्रंगावणे. डिस्क महाराष्ट्र विद्यापीठ.

आपला विद्वांस

Headmaster
Radhakrishna Prathamik Vidyalaya
Gokul Nagar, Katraj-Kondhwa Rd
Kondhwa, Pune-48

रजि. क्र. महाराष्ट्र-६९२६-९३ पुणे

वसंतदादा पाटील प्रतिष्ठानचे

स्थापना : १९९३

प्रतिभाताई पवार माध्यमिक व उच्च माध्यमिक विद्यालय

कोंढवा बुद्रुक, पुणे - ४११ ०४८. फोन : २६९३३४३५

एस.एस.एस./१०९३/३४५० मा. शि.

एच.एस.सी./१७०१/(३२६/०१)उ.मा.शि-१ कला

एच.एस.सी./१७०३/(१८/०३)उ.मा.शि-१ वाणिज्य

एच.एस.सी./१०१०/(४४६/१०)उ.मा.शि-१ विज्ञान

परीक्षा परिषद - २१५१०५७

(SSC) इंडेक्स क्र. : ११-०५-०६६

(HSC) इंडेक्स क्र. : J११-१५-०३८



जावक क्र. : पी.पी.एच.

दिनांक : २७/०१/२०१६.

टिळक महाराष्ट्र विद्यापीठ,
मुकुंदनगर, गुलटेकडी,
पुणे.


विषय :- PHD च्या विद्यार्थ्यांना शोळमध्ये प्रकल्पासाठी परवानगी
दिल्या जाणून.

महोदय,
वरील विषयात अनुसदन सापणाने कळवण्यात येते की, आपल्या
विद्यापीठाचे PHD चे विद्यार्थी आपल्या विद्यालयामध्ये PHD चा
प्रोजेक्ट करण्यासंदर्भात शोळेत परवानगी मागण्यासाठी आले असता
त्यांना त्यांच्या प्रकल्पासाठी शोळेच्या वतीने परवानगी देण्यात
येत आहे.

तरी त्यांची त्यांचा प्रकल्प योग्यरित्या शोळेचे
नियम पाळून करावा. योग्यरित्या संमलज जावणी करावी.

PHD च्या प्रकल्प विद्यार्थ्यांची नावे.

① रोमा सुरेश गंगावणे. टिळक महाराष्ट्र विद्यापीठ.


प्राचार्य
प्रतिभाताई पवार माध्यमिक व
उच्च माध्यमिक विद्यालय
कोंढवा बु॥ पुणे - ४११ ०४८



॥ विद्या विनयेन शोभते ॥

“मंजुळा शिक्षण प्रसारक संस्थेचे”

राधाकृष्ण प्राथमिक विद्यालय

गोकुळनगर, परदेशी एंटरप्राजयेस शेजारी, कात्रज-कोंढवा रोड, पुणे - ४११०४६.

मो. : ९४०४००७८५३ / ९७६३३८६९९७

रजि. नं. वि.एल.एस./१००४ (२६०/२००४) प्राशि - ३

श्री. बबनराव मोहनराव परदेशी
(अध्यक्ष)

श्री. दिलीप बबनराव परदेशी
(सचिव)

जावक क्रं. 199/017

दिनांक : 11/04/017

प्रति,

विभाग प्रमुख,
आयुर्वेद विभाग,
टिळक महाराष्ट्र विद्यापीठ
पुणे- 411037

विषय:- Ph.D study यशस्वीरीत्या पूर्ण केल्याबाबत....

महोदय,
दि 30 डिसेंबर 2015 रोजी आपण दिलेल्या पत्रानुसार (Ref.No-Ayu/15/180)
वेद विभागा बंगळूर येथील आमच्या महाविद्यालयातील 350 विद्यार्थी व
340 विद्यार्थीनींची आरोग्य तपासणी करून त्यांच्या शोध प्रबंधासाठी
150 विद्यार्थ्यांची निवड केली. शोध प्रबंधाचे नाव "Comparative study of
mudga and Godhuma Madak of Krutannya Varga w.s.r their
Brahma effect in Ati Karshya"

विद्यालयाच्या व निवड केलिल्या विद्यार्थ्यांच्या पालकांच्या लिखित
संमतीनंतर दि. 1 जाने 2016 ते 10 एप्रिल 2016 या कालावधीत पोस्ट
लाइ (प्रोएक) देऊन त्यांच्या शोध प्रबंधानुसार study यशस्वीरीत्या पूर्ण
केला

For
मुख्याध्यापिका

राधाकृष्ण प्राथमिक विद्यालय
गोकुळनगर, कात्रज, कोंढवा रोड
पुणे.४८

रजि. क्र. महाराष्ट्र-६९२६-९३ पुणे

वसंतदादा पाटील प्रतिष्ठानचे

स्थापना : १९९३

प्रतिभाताई पवार माध्यमिक व उच्च माध्यमिक विद्यालय

कोंढवा बुद्रुक, पुणे - ४११ ०४८. फोन : २६९३३४३५

एस.एस.एस./१०९३/३४५० मा. शि.

एच.एस.सी./१७०१/(३२६/०१)उ.मा.शि-१ कला

एच.एस.सी./१७०३/(१८/०३)उ.मा.शि-१ वाणिज्य

एच.एस.सी./१०१०/(४४६/१०)उ.मा.शि-१ विज्ञान

परीक्षा परिषद - २१५१०५७

(SSC) इंडेक्स क्र. : ११-०५-०६६

(HSC) इंडेक्स क्र. : J११-१५-०३८



जायफळ क्र. : पी.पी.एच

१०१६

दिनांक : 13 | 04 | 2016

विभाग प्रमुख
आयुर्वेद विभाग
टिळक महाराष्ट्र विद्यापीठ,
पुणे - ४११०३७

विषय :- Ph.D. Study यशस्वीरीत्या पूर्ण केल्याबाबत..

महोदय,

दि. ३० डिसेंबर २०१५ रोजी आपण दिलेल्या पत्रानुसार (Ref No. Ayp/15/180) वैद्य शेमा गंगावणे यांनी आमच्या महाविद्यालयातील ४२५ विद्यार्थी व ३७० विद्यार्थीनींची आरोग्य तपासणी करून त्यांच्या शोधप्रबंधासाठी १५० विद्यार्थ्यांची निवड केली. विद्यालयाच्या व निवड केलेल्या विद्यार्थ्यांच्या पालकांच्या लिखित संमतीनंतर दि. ५ जानेवारी २०१६ ते १२ एप्रिल २०१६ या कालावधीत त्यांच्या शोध प्रबंधानुसार study यशस्वीरीत्या पूर्ण केला.


प्राचार्य

प्रतिभाताई पवार माध्यमिक व
उच्च माध्यमिक विद्यालय
कोंढवा बु॥ पुणे - ४११ ०४८

