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Research Article

# A COMPARATIVE STUDY TO ESTABLISH THE EFFECT OF *GO-GHRITA, PANCHATIKTA GHRITA* IN *ASTHIKSHAYA JANYA VATA VRIDDHI* W.S.R. TO OSTEOPENIA

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## ABSTRACT

Osteopenia (Low bone mass) is the most prevalent condition, and a major cause for Osteoporosis. This may lead to weak and fragile bones and increase the risk of fracture. Around 33.6 million individuals over the age 50 have low bone mass of the hip and thus are at risk of osteoporosis and other complications. In Ayurveda, it can be correlated with *Asthi kshaya* and it is a condition of degenerative changes in *Asthi* along with simultaneous vitiation of *Vata Dosha* residing in *Asthi Dhatu* occurs. Being a degenerative *Vata* disorder *Asthikshaya* (Osteopenia) demands a pioneer treatment of *Vata Dosha*. Ayurveda gives more weightage to treating this condition, with *Snigdh dravya chikitsa*. So, considering all these points the study entitled, "A Comparative Study to Establish the Effect of *Go-Ghrita*, *Panchatikta Ghrita* in *Asthikshaya Janya Vata Vriddhi* w.s.r. to Osteopenia".

## INTRODUCTION

A physician who thoroughly understands the anatomy and physiology of the human body, who can foresee the past, present, and future of disease, and who has studied Ayurveda in its entirety is considered capable of bringing happiness to the world. Ayurveda is a complete science of life that emphasizes maintaining balance among *Dosha*, *Dhatu*, *Agni*, *Mala*, *Atma*, *Mana*, and *Indriya*. Health, according to Ayurveda, is not merely the absence of disease but a state of physical, mental, and spiritual harmony. Among the fundamental components of the body, *Dosha*, *Dhatu*, and *Mala* are central to sustaining life, with *Dhatu* playing a key role in nourishment and structural maintenance (*Dharana* and *Poshana*).

Among the seven *Dhatus*, *Asthi Dhatu* provides support, stability, and shape to the body while nourishing *Majja Dhatu*. Any disturbance in *Dhatu Samya* leads to *Vikara* or disease. *Acharya Vagbhata* explains the concept of *Ashraya–Ashrayi Bhava*, highlighting the interrelationship between *Dosha* and *Dhatu*- *Vata* resides in *Asthi*, *Pitta* in *Rakta*, and *Kapha* in other *Dhatus* and *Malas*. When *Asthi Dhatu* decreases in quantity, quality, or function, it results in *Asthi Kshaya*. As *Asthi* is the *Ashraya Sthana* of *Vata*, an increase in *Vata Dosha* leads to depletion of bone density. Hence, factors causing *Vata Vriddhi* also contribute to *Asthi Kshaya*. *Acharya Sushruta* described its signs as *Asthi Shoola*, hair fall, brittle teeth and nails, and *Rukshata*.

In modern medicine, *Asthi Kshaya* can be correlated to osteopenia, a condition where bone mineral density is reduced but not severely enough to cause osteoporosis. It is a significant global health issue, especially among postmenopausal women, with around 50% of Indian adults showing low bone density. Ageing, hormonal changes, poor nutrition, sedentary habits, smoking, and vitamin D deficiency are major contributors. As *Vata* predominates in old age, *Asthi Kshaya* aligns with *Vata Vriddhi* disorders. Ayurveda advocates *Snigdha Dravya Chikitsa*- particularly *Go-Ghrita*- for such degenerative conditions. *Go-Ghrita* pacifies *Vata* and *Pitta*, nourishes *Dhatus*, and supports bone health. Considering these classical insights and modern correlations, the present study aims to evaluate the

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relationship between *Asthi Kshaya* and *Vata Vriddhi* through a comparative assessment of *Go-Ghrita* and *Panchtikta Ghrita* in *Asthi Kshaya Janya Vata Vriddhi*.

**Prevalence**

The overall prevalence of osteopenia and osteoporosis in India has been reported as 49.9% and 18.3% respectively. Region-wise, the prevalence of osteopenia was observed to be 51.3% in the East, 47.9% in the West, 55.6% in the North, and 47.4% in the South, while osteoporosis showed 18.4%, 16.3%, 16.4%, and 20.7% prevalence respectively. Females are slightly more affected than males, with rates of 19.4% and 17.3% respectively. Among postmenopausal women, the overall prevalence of osteoporosis is 33.1%, ranging from 16.9% in the North to 21.8% in the South. These figures highlight a significant public health burden, particularly among women above 50 years of age, and indicate the growing need for preventive and therapeutic strategies targeting bone health and *Asthi Kshaya* management.[8,9,10]

**Need of Study**

*Asthi* has prime importance in giving stability, shape, and structure to the body. Derangement in the Asthi and its nutrients will lead to *Asthigata rogas*.

Around 33.6 million individuals over age 50 have low bone density of the hip and thus are at risk of osteoporosis, fractures and other complications. Hence it is one of the burning issues in the society. Treatments available in contemporary science for Low bone density are not devoid of adverse effects. Ayurveda has mentioned many herbal drugs helpful in combating bone loss, but are not scientifically evaluated. One such drug is *Go-Ghrita,* which is easily available and cost effective.

**AIMS AND OBJECTIVES**

1. To study if there is any relation between *Vata Vriddhi* and *Asthi Dhatu kshaya*.
2. To evaluate co-relation between *Lakshanas of Asthi Kshaya* and *Lakshanas* of *Vata Vriddhi* with osteopenia.
3. To compare and assess the *Go-Ghrita* and *Panchatikta Ghrita* in the management of *Asthi kshaya janya Vata Vriddhi*.

**Hypothesis**

**Null Hypothesis**

**H0:** Go-*Ghrita* and *Panchatikta Ghrita* are equally effective in the management of *Asthi Kashya janya Vata Vriddhi*.

**Alternative hypothesis**

**H1:** *Go-Ghrita* has more significant effect in the management of *Asthi kshaya janya Vata Vriddhi* than *Panchatikta Ghrita*.

**H2:** *Panchatikta Ghrita* has more significant effect in the management of *Asthi kshaya janyaVata Vriddhi* than *Go- Ghrita.*

**METHODOLOGY**

**Clinical Source**

Patients with *Vata Vriddhi* and *Asthi Kshaya* were selected randomly from the OPD of P.G. Department of *Kayachikitsa*, Shri Krishna Govt. Ayurvedic College and Hospital, Kurukshetra.

**Literary Source**

Information was collected from Ayurvedic classics, commentaries, modern texts, and related journals.

**Experimental Source**

Human clinical trial only; no animal experimentation was performed.

**Drug Source**

*Go-Ghrita* (Patanjali) and *Panchatikta Ghrita* (Dabur) were used for the study.

**Study Design**

Randomized Controlled and Open-Label Clinical Trial.

**Place of Study**

PG Department of *Kayachikitsa*, Shri Krishna Govt. Ayurvedic College and Hospital, Kurukshetra.

**Sample Size**

Total 60 patients of either sex, aged 30–60 years.

**Grouping**

- **Group A:** *Panchatikta Ghrita* 10ml OD with lukewarm water for 3 months (Control).
- **Group B:** *Go-Ghrita* 10ml OD with lukewarm water for 3 months (Intervention).

**CTRI Registration**

Registered under CTRI/2021/05/033381, dated 05/05/2021.

**Assessment Criteria**

1. Improvement in subjective and objective parameters of *Asthi Kshaya* and *Vata Vriddhi*.
2. Change in Bone Mineral Density (BMD) before and after treatment.

**Inclusion Criteria**

1. Patients of both sex age groups between 30 to 60 years were selected.
2. Patients having T-Score ranging from -1 to -2.5 (BMD).
3. Patients presenting with classical features of *Asthi Kshaya* and *Vata Vriddhi.*

**Exclusion Criteria**

1. Patient below 30 yrs of age and above 60 years.
2. Patients who are on hormonal therapy, avascular necrosis, carcinoma of bone.

3. Patients with the known case of metabolic disorders such as diabetes mellitus, hyper-parathyroidism, hyperthyroidism, thyrotoxicosis, Paget's disease, Cushing syndrome, renal, hepatic, cardiac, CNS and endocrinal disorders, gouty arthritis and hypertension.
4. Patients having T-Score below -2.5.
5. Woman who has achieved menopause but are in their one year's duration after cessation of their menses.

**Withdrawal Criteria**

1. During the course of clinical trial, if any serious condition or serious adverse effect develops which required urgent treatment.
2. Irregular follow up.
3. If patient wants to withdrawal from clinical trial.

**Duration of Treatment**

3 months continuous oral administration.

**Subjective Parameters**

**Dose and Timing**

10 ml once daily, taken ½ hour before meal with lukewarm water.

***Anupana***

*Ushnodaka* (lukewarm water).

**Ama Pachana**

*Trikatu Churna* 5 g BD before meals till *Nirama Lakshana* observed.

***Pathya-Apathya***

Suitable *Ahara* and *Vihara* advised for bone nourishment and *Vata Shamana*.

**Investigation**

Bone Mineral Density (BMD) measured by PDXA using a standard bone densitometer (Zandu Pharmaceutical Co., Haryana).

**Follow-up**

Conducted on the 1st, 8th, 15th, 22nd, 30th, and 90th days.

**Table 1**: **Assessment of *Asthi Kshaya***

| S.No. | Assessment of *Asthi Kshaya* | BT | AT |
|---|---|---|---|
| 1 | *Asthi shoola* - Do you feel pain in bones? | | |
| 2 | *Nakha vikara* and *Patana* – Do you have brittle nails? | | |
| 3 | *Kesh Vikara* and *Patana* – Do you have hair fall? | | |
| 4 | *Danta Vikara* and *Patana* - Do you have brittle teeth/cracks in teeth? | | |
| 5 | *Loma Vikara* – Do you have small hair fall? | | |
| 6 | *Smasru vikara* and *Patana*- Did your beard and mustaches fall? | | |
| 7 | *Sandhi Saithilya*- Do you have looseness of joints? | | |
| 8 | *Ruksata* – Is your body dry? | | |
| 9 | *Asthi toda* – Do you feel pricking type of pains in bones? | | |
| 10 | *Srama* – Do you feel tired/ tiredness without work? | | |

**Table 2: Assessment of *Vata Vriddhi***

| S.No | *Vata Vriddhi Sharirika Lakshanas* Assessment Question | BT | AT |
|---|---|---|---|
| 1. | *Karshya* - Has there been decrease in weight? | | |
| 2. | *Karshnya* – Do you feel your complexion has changed blackish? | | |
| 3. | *Ushna kamita* – Do you feel like taking warm food/drinks/ staying warm? | | |
| 4. | *Shakrit graha*- Do you feel constipated? | | |
| 5. | *Gadhavarchastwam* – Do you feel your stool has become hard? | | |
| 6. | *Aanaha* – Do you feel difficulty in passing stool, urine? | | |
| 7. | *Aatopa* – Do you feel gurgling of intestine? | | |
| 8. | *Adhmana* – Do you feel distension of abdomen? | | |
| 9. | *Kampa*- Do you have tremors? | | |
| 10. | *Gatrsphurana* – Do you feel flickering in any part of body? | | |
| 11. | *Alpabaltwam* – Do you feel there is decrease in your strength? | | |
| 12. | *Nidranasha* – Do you have complete loss of sleep? | | |

| | | | |
|---|---|---|---|
| 13. | *Indriyabhramsa* – Do you feel there is decline in sense of vision/ hearing / smell /taste /touch? | | |
| 14. | *Pralapa* – Is there irrelevant talking? | | |
| 15. | *Bhrama* – Do you feel dizzy? | | |
| 16. | *Vakparushya* – Is there hoarsens of voice? | | |
| 17. | *Asthi sula* – Do you feel pain in bones? | | |
| 18. | *Deenta* – Is your low liness life? | | |
| | ***Vata Vriddhi Manasika Lakshanas* Assessment Question** | | |
| 19. | *Dinya* – Do you feel depressed? | | |
| 20. | *Bhaya* – Have you been feeling more scared recently? | | |
| 21. | *Shoka* – Do you feel more sorrow recently? | | |

**Objective Parameters**

(i) BMD: Bone mineral density Test (T-score)

Osteopenia = T- score between -1 to -2.5

| **Objective parameters** | **BT** | **AT** |
|---|---|---|
| **B.M.D** | | |

Bone Mineral Density (T-Score): WHO Criteria

Normal 'T' score greater than -1

Osteopenia, 'T' score between -1 to -2.5

Osteoporosis 'T' score less than or equal to -2.5

Severe Osteoporosis 'T' score less than -2.5 with fracture.

**The Result was Categorized as**

$$\text{Percentage of increase/decrease of } Dosha/Dhatu = \frac{\text{Increase/decrease symptoms presents of } Dosha/Dhathu}{\text{Total symptoms of increase and decrease of } Dosha/Dhatu} \times \mathbf{100}$$

- Marked relief - Above 75% improvement
- Moderate relief - 50-75% improvement
- Mild Relief - 25-50% improvement
- No Relief- Below 25%improvement

**Statistical Analysis**

**RESULTS**

**Table 3: Effect of therapy on Subjective Parameters of *Asthikshaya* in group A**

| ***Asthi Kshaya* Group A** | **Mean** | | **SD** | | **SE** | | **Wilcoxon W** | **P-Value** | **% Effect** | **Result** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **BT** | **AT** | **BT** | **AT** | **BT** | **AT** | | | | |
| *Asthi Shoola* | 0.97 | 0.03 | 0.18 | 0.18 | 0.03 | 0.03 | -5.292[b] | 0.000000 | 96.55 | Sig |
| *Nakha Vikara* | 0.57 | 0.30 | 0.50 | 0.47 | 0.09 | 0.09 | -2.828[b] | 0.004678 | 47.06 | Sig |
| *Kesha Vikara* | 0.77 | 0.27 | 0.43 | 0.45 | 0.08 | 0.08 | -3.873[b] | 0.000108 | 65.22 | Sig |
| *Danta Vikara* | 0.83 | 0.70 | 0.38 | 0.47 | 0.07 | 0.09 | -2.000[b] | 0.045500 | 16.00 | Sig |
| *Loma Vikara* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Smasru Vikara* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Sandhi Saithilya* | 0.73 | 0.63 | 0.45 | 0.49 | 0.08 | 0.09 | -1.732[b] | 0.083265 | 13.64 | NS |
| *Ruksta* | 0.93 | 0.30 | 0.25 | 0.47 | 0.05 | 0.09 | -4.359[b] | 0.000013 | 67.86 | Sig |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Asthi toda* | 0.90 | 0.13 | 0.31 | 0.35 | 0.06 | 0.06 | -4.796[b] | 0.000002 | 85.19 | Sig |
| *Srama* | 0.77 | 0.57 | 0.43 | 0.50 | 0.08 | 0.09 | -2.449[b] | 0.014306 | 26.09 | Sig |
| *Total Score* | 6.47 | 2.93 | 1.11 | 0.69 | 0.20 | 0.13 | -4.844[b] | 0.000001 | 54.64 | Sig |

Since observations are qualitative, we have used Wilcoxon Signed Rank Test to test efficacy in Group A. From above table, the parameters with P-Value less than 0.05 considered as showing significant effect after treatment like *Asthi Shoola, Nakha vikara, Kesha Vikara, Danta Vikara, Ruksta, Asthi toda, Srama.*

- Statistically non-significant result was found *in Loma Vikara, Smasru Vikara, Sandhi Saithilya* as value of (p>0.05) in each.

**Table 4: Effect of therapy on Subjective Parameters of *Asthikshaya* in group B**

| ***Asthi Kshaya* Group B** | **Mean** | | **SD** | | **SE** | | **Wilcoxon W** | **P-Value** | **% Effect** | **Result** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **BT** | **AT** | **BT** | **AT** | **BT** | **AT** | | | | |
| *Asthi Shoola* | 0.93 | 0.03 | 0.25 | 0.18 | 0.05 | 0.03 | -5.292[b] | 0.000000 | 96.43 | Sig |
| *Nakha Vikara* | 0.47 | 0.30 | 0.51 | 0.47 | 0.09 | 0.09 | -2.236[b] | 0.025347 | 35.71 | Sig |
| *Kesha Vikara* | 0.90 | 0.20 | 0.31 | 0.41 | 0.06 | 0.07 | -4.583[b] | 0.000005 | 77.78 | Sig |
| *Danta Vikara* | 0.70 | 0.40 | 0.47 | 0.50 | 0.09 | 0.09 | -3.000[b] | 0.002700 | 42.86 | Sig |
| *Loma Vikara* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Smasru Vikara* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Sandhi Saithilya* | 0.87 | 0.60 | 0.35 | 0.50 | 0.06 | 0.09 | -2.828[b] | 0.004678 | 30.77 | Sig |
| *Ruksta* | 0.73 | 0.23 | 0.45 | 0.43 | 0.08 | 0.08 | -3.873[b] | 0.000108 | 68.18 | Sig |
| *Asthi toda* | 0.77 | 0.03 | 0.43 | 0.18 | 0.08 | 0.03 | -4.690[b] | 0.000003 | 95.65 | Sig |
| *Srama* | 0.77 | 0.53 | 0.43 | 0.51 | 0.08 | 0.09 | -2.646[b] | 0.008151 | 30.43 | Sig |
| Total Score | 6.13 | 2.33 | 1.53 | 0.99 | 0.28 | 0.18 | -4.829[b] | 0.000001 | 61.96 | Sig |

- Since observations are qualitative, we have used Wilcoxon Signed Rank Test to test efficacy in Group B. From above table, the parameters with P-Value less than 0.05 considered as showing significant effect after treatment like *Asthi Shoola*, *Nakha vikara, Kesha Vikara, Danta Vikara, Sandhi Saithilya Ruksta, Asthi toda, Srama*. Statistically non-significant result was found in *Loma Vikara, Smasru Vikara*, as value of (p>0.05) in both symptoms.

**Table 5: Effect of therapy on Subjective Parameters of *Vata Vriddhi* in group A**

| ***Vata Vriddhi* Group A** | **Mean** | | **SD** | | **SE** | | **Wilcoxon W** | **P-Value** | **% Effect** | **Result** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **BT** | **AT** | **BT** | **AT** | **BT** | **AT** | | | | |
| *Karshya* | 0.27 | 0.10 | 0.45 | 0.31 | 0.08 | 0.06 | -2.236[b] | 0.025347 | 62.50 | Sig |
| *Karshnya* | 0.40 | 0.37 | 0.50 | 0.49 | 0.09 | 0.09 | -1.000[b] | 0.317311 | 8.33 | NS |
| *Ushna Kamita* | 0.87 | 0.57 | 0.35 | 0.50 | 0.06 | 0.09 | -3.000[b] | 0.002700 | 34.62 | Sig |
| *Shakrit Graha* | 0.87 | 0.20 | 0.35 | 0.41 | 0.06 | 0.07 | -4.472[b] | 0.000008 | 76.92 | Sig |
| *Gadhavarchastwam* | 0.77 | 0.23 | 0.43 | 0.43 | 0.08 | 0.08 | -4.000[b] | 0.000063 | 69.57 | Sig |
| *Aanaha* | 0.80 | 0.20 | 0.41 | 0.41 | 0.07 | 0.07 | -4.243[b] | 0.000022 | 75.00 | Sig |
| *Aatop* | 0.77 | 0.20 | 0.43 | 0.41 | 0.08 | 0.07 | -4.123[b] | 0.000037 | 73.91 | Sig |
| *Adhmana* | 0.90 | 0.13 | 0.31 | 0.35 | 0.06 | 0.06 | -4.796[b] | 0.000002 | 85.19 | Sig |
| *Kampa* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Gatrasphurana* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Alpabaltwam* | 1.00 | 0.63 | 0.00 | 0.49 | 0.00 | 0.09 | -3.317[b] | 0.000911 | 36.67 | Sig |
| *Nidranasha* | 0.87 | 0.53 | 0.35 | 0.51 | 0.06 | 0.09 | -3.162[b] | 0.001565 | 38.46 | Sig |
| *Indriyabhramsa* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Pralapa* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Bhrama* | 0.40 | 0.30 | 0.50 | 0.47 | 0.09 | 0.09 | -1.732[b] | 0.083265 | 25.00 | NS |
| *Vakparushya* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Asthi sula* | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -5.477[b] | 0.000000 | 100.00 | Sig |
| *Deenta* | 0.60 | 0.47 | 0.50 | 0.51 | 0.09 | 0.09 | -2.000[b] | 0.045500 | 22.22 | Sig |
| *Dinya* | 0.80 | 0.57 | 0.41 | 0.50 | 0.07 | 0.09 | -2.646[b] | 0.008151 | 29.17 | Sig |
| *Bhaya* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Shoka* | 0.37 | 0.30 | 0.49 | 0.47 | 0.09 | 0.09 | -1.414[b] | 0.157299 | 18.18 | NS |
| Total Score | 10.67 | 4.80 | 1.83 | 1.54 | 0.33 | 0.28 | -4.817[b] | 0.000001 | 55.00 | Sig |

- Since observations are qualitative, we have used Wilcoxon Signed Rank Test to test

efficacy in Group A. From above table, the parameters with P-Value less than 0.05 considered as showing significant effect like *Karshya, Ushna Kamita, Shakrit Graha, Gadhavarchastwam, Aanaha, Aatop, Adhmana, Alpabaltwam, Nidranasha, Asthi sula, Deenta, Dinya* after treatment. Statistically non-Significant result was found in *Karshnya, Kampa, Gatrasphurana, Indriyabhramsa, Pralapa, Bhrama, Vakaparushya, Bhaya, Shoka* value of (p>0.05) in each.

**Table 6: Effect of therapy on Subjective Parameters of *Vata Vriddhi* in group B**

| ***Vata Vriddhi* Group B** | **Mean** | | **SD** | | **SE** | | **Wilcoxon W** | **P-Value** | **% Effect** | **Result** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **BT** | **AT** | **BT** | **AT** | **BT** | **AT** | | | | |
| *Karshya* | 0.50 | 0.23 | 0.51 | 0.43 | 0.09 | 0.08 | -2.828[b] | 0.004678 | 53.33 | Sig |
| *Karshnya* | 0.63 | 0.57 | 0.49 | 0.50 | 0.09 | 0.09 | -1.414[b] | 0.157299 | 10.53 | NS |
| *Ushna Kamita* | 0.83 | 0.63 | 0.38 | 0.49 | 0.07 | 0.09 | -2.449[b] | 0.014306 | 24.00 | Sig |
| *Shakrit Graha* | 0.67 | 0.07 | 0.48 | 0.25 | 0.09 | 0.05 | -4.243[b] | 0.000022 | 90.00 | Sig |
| *Gadhavarchastwam* | 0.73 | 0.10 | 0.45 | 0.31 | 0.08 | 0.06 | -4.359[b] | 0.000013 | 86.36 | Sig |
| *Aanaha* | 0.80 | 0.17 | 0.41 | 0.38 | 0.07 | 0.07 | -4.359[b] | 0.000013 | 79.17 | Sig |
| *Aatop* | 0.80 | 0.17 | 0.41 | 0.38 | 0.07 | 0.07 | -4.359[b] | 0.000013 | 79.17 | Sig |
| *Adhmana* | 0.87 | 0.20 | 0.35 | 0.41 | 0.06 | 0.07 | -4.472[b] | 0.000008 | 76.92 | Sig |
| *Kampa* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Gatrasphurana* | 0.03 | 0.00 | 0.18 | 0.00 | 0.03 | 0.00 | -1.000[b] | 0.317311 | 100.00 | NS |
| *Alpabaltwam* | 0.90 | 0.60 | 0.31 | 0.50 | 0.06 | 0.09 | -3.000[b] | 0.002700 | 33.33 | Sig |
| *Nidranasha* | 0.77 | 0.40 | 0.43 | 0.50 | 0.08 | 0.09 | -3.317[b] | 0.000911 | 47.83 | Sig |
| *Indriyabhramsa* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Pralapa* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Bhrama* | 0.07 | 0.07 | 0.25 | 0.25 | 0.05 | 0.05 | .000[c] | 1.000000 | 0.00 | NS |
| *Vakparushya* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .000[c] | 1.000000 | 0.00 | NS |
| *Asthi sula* | 0.93 | 0.03 | 0.25 | 0.18 | 0.05 | 0.03 | -5.196[b] | 0.000000 | 96.43 | Sig |
| *Deenta* | 0.30 | 0.10 | 0.47 | 0.31 | 0.09 | 0.06 | -2.449[b] | 0.014306 | 66.67 | Sig |
| *Dinya* | 0.67 | 0.37 | 0.48 | 0.49 | 0.09 | 0.09 | -3.000[b] | 0.002700 | 45.00 | Sig |
| *Bhaya* | 0.03 | 0.00 | 0.18 | 0.00 | 0.03 | 0.00 | -1.000[b] | 0.317311 | 100.00 | NS |
| *Shoka* | 0.43 | 0.37 | 0.50 | 0.49 | 0.09 | 0.09 | -1.414[b] | 0.157299 | 15.38 | NS |
| Total Score | 9.97 | 4.07 | 2.16 | 1.72 | 0.39 | 0.31 | -4.800[b] | 0.000002 | 59.20 | Sig |

- Since observations are qualitative, we have used Wilcoxon Signed Rank Test to test efficacy in Group B. From above table, the parameters with P-Value less than 0.05 considered as showing significant effect like *Karshya, Ushna Kamita, Shakrit Graha, Gadhavarchastwam, Aanaha, Aatop, Adhmana, Alpabaltwam, Nidranasha, Asthi*

*sula, Deenta, Dinya* after treatment. Statistically non-Significant result was found in *Karshnya, Kampa, Gatrasphurana, Indriyabhramsa, Pralapa, Bhrama, Vakparushya, Bhaya, Shoka* value of (p>0.05) in each.

**Comparative Study with in Groups Before and After Treatment**

**Table 7: Efficacy study on Subjective Parameters of *Asthikshaya***

| ***Asthi Kshaya*** | | **Mean** | **N** | **SD** | **SE** | **t-Value** | **P-Value** | **% Effect** | **Result** |
|---|---|---|---|---|---|---|---|---|---|
| Group A | BT | 6.47 | 30 | 1.11 | 0.20 | 20.652 | 0.000 | 54.64 | Sig |
| | AT | 2.93 | 30 | 0.69 | 0.13 | | | | |
| Group B | BT | 6.13 | 30 | 1.53 | 0.28 | 17.013 | 0.000 | 62.50 | Sig |
| | AT | 2.30 | 30 | 0.95 | 0.17 | | | | |

Since observations are quantitative, we have used paired t-test to test efficacy in Group A and Group B.

In group A, subjective parameters of *Asthi Kshaya* was improved by 54.64% and it shows statistically significant changes (p value< 0.05).

In group B, subjective parameters of *Asthi Kshaya* was improved by 62.50% and it shows statistically significant changes (p value< 0.05).

From above table, we can observe that, P-Value for Group A and Group B is less than 0.05. Hence, we can conclude that, effect observed in Group A and Group B is significant.

**Table 8: Efficacy study on Subjective Parameters of *Vata Vriddhi***

| **Vata Vriddhi** | | **Mean** | **N** | **SD** | **SE** | **t-Value** | **P-Value** | **% Effect** | **Result** |
|---|---|---|---|---|---|---|---|---|---|
| **Group A** | BT | 10.67 | 30 | 1.83 | 0.33 | 18.093 | 0.000 | 55.00 | Sig |
| | AT | 4.80 | 30 | 1.54 | 0.28 | | | | |
| **Group B** | BT | 9.97 | 30 | 2.16 | 0.39 | 20.135 | 0.000 | 59.20 | Sig |
| | AT | 4.07 | 30 | 1.72 | 0.31 | | | | |

Since observations are quantitative, we have used paired t-test to test efficacy in Group A and Group B.

In group A, subjective parameters of *Vata Vriddhi* was improved by 55.00% and it shows statistically significant changes (p value< 0.05).

In group B, subjective parameters of *Vata Vriddhi* was improved by 59.20% and it shows statistically significant changes (p value< 0.05).

From above table, we can observe that, P-Value for Group A and Group B is less than 0.05. Hence, we can conclude that, effect observed in Group A and Group B is significant.

**Table 9: Efficacy study on objective Parameters BMD**

| **BMD Score** | | **Mean** | **N** | **SD** | **SE** | **t-Value** | **P-Value** | **% Effect** | **Result** |
|---|---|---|---|---|---|---|---|---|---|
| **Group A** | BT | -1.74 | 30 | 0.33 | 0.06 | -3.118 | 0.004 | 11.72 | Sig |
| | AT | -1.53 | 30 | 0.53 | 0.10 | | | | |
| **Group B** | BT | -1.52 | 30 | 0.31 | 0.06 | -2.559 | 0.016 | 8.83 | Sig |
| | AT | -1.39 | 30 | 0.66 | 0.12 | | | | |

Since observations are quantitative, we have used paired t-test to test efficacy in Group A and Group B.

In group A, bone mineral density was improved by 11.72% and it shows statistically significant changes (p value<0.05).

In group B, bone mineral density was improved by 8.83% and it shows statistically significant changes (p value< 0.05).

From above table, we can observe that, P-Value for Group A and Group B is less than 0.05. Hence, we can conclude that, effect observed in Group A and Group B is significant.

**Table 10: Comparison between Group A and Group B**

| Variable | Group | N | Mean | SD | SE | t-Value | P-Value |
|---|---|---|---|---|---|---|---|
| *Asthi Kshaya* | Group A | 30 | 3.53 | 0.94 | 0.17 | -1.060 | 0.293 |
| | Group B | 30 | 3.83 | 1.23 | 0.23 | | |
| *Vata Vriddhi* | Group A | 30 | 5.87 | 1.78 | 0.32 | -0.076 | 0.939 |
| | Group B | 30 | 5.90 | 1.60 | 0.29 | | |
| BMD Score | Group A | 30 | -0.20 | 0.36 | 0.07 | -0.610 | 0.544 |
| | Group B | 30 | -0.13 | 0.51 | 0.09 | | |

Unpaired t-test is carried out for comparison between Group A and Group B. From above table, we can observe that, P-Value for all parameters is greater than 0.05. Hence, we can conclude that, there is no significant difference between Group A and Group B.

**Table 11: Estimation of Overall response in each Group**

| Overall Effect | Group A | | Group B | |
|---|---|---|---|---|
| | N | % | N | % |
| Marked relief | 2 | 6.67% | 2 | 6.67% |
| Moderate relief | 19 | 63.33% | 25 | 83.33% |
| Mild relief | 9 | 30.00% | 3 | 10.00% |
| No relief | 0 | 0.00% | 0 | 0.00% |
| Total | 30 | 100.00% | 30 | 100.00% |

In both treated groups marked relief were found in group A and group B was 6.67%, moderate relief observed in group A was 63.33% and in group B it was 83.33%, mild relief observed in group A was 30.00% and in group B it was 10.00%.

## DISCUSSION

Osteopenia (low bone mass) is the most prevalent condition, and a major cause for osteoporosis. This may lead to weak and fragile bones and increase the risk of fracture.

Around 33.6 million individuals over the age 50 have low bone mass of the hip and thus are at risk of osteoporosis and other complications. The increased prevalence of osteopenia in different Indian studies, compared to other study populations could be explained by genetic susceptibility of Indian population for osteoporosis, high risk of hypovitaminosis D in Indian due to higher 25(OH)-d-24-hydroxylase enzyme and dark pigmentation of their skin which reduces the effect of sunlight exposure. The other factors are their changing life style (alcohol consumption, smoking and lack of physical exercise), inadequate calcium intake, lack of diagnostic facilities in rural set ups and unawareness of osteoporosis among the general population.[14, 15] Low bone mass/ Bone loss is partly reversible and treatment available in the other science may be mainly symptomatic and later surgical interventions are done which are not devoid of adverse effects.

Ayurveda has proved to be effective in managing and preventing chronic ailments till date. Concepts of Ayurveda have been helpful in treating new diseases arising due to changing lifestyles and environment. This study was an attempt to understand the Disease in Ayurvedic concept and find an effective therapy in preventing the disease.

According to Ayurveda, like all tissues of the body, the bones and bone marrow tissues are also formed from:[16]

- The nutritional essence derived from *Aahara rasa* i.e., nutritional juice.
- From their precursor tissue in the Ayurvedic chronology of formation of tissues i.e. *Dhatu poshana karma.*

The *Asthivaha srotas* i.e., channels responsible for bone tissue formation lay in fat tissue (*Medodhatu*) and hip bones (*Jaghana*). This is because according to Ayurveda chronology, bones are formed by their precursor tissue i.e. fat tissue. The hip bones and the pelvis seem like holding the entire upper skeleton and the lower limb bones. Therefore, they may be considered as roots of bone formation.

Thus, bone tissue is formed from 'the portions of fat tissue that take part in nurturing and formation of the bone tissue'. If there is deficit functioning and reduced strength of *Medodhatvagni* i.e. tissue fire of fat, the bone will be formed inadequately. The weak 'fat tissue fire' will not take part in the proper formation of bone. As a result, lot of fat tissue is

formed. This increased fat blocks all the channels in the body. This leads to deficit formation of all tissues and excessive formation and deposition of fat in the body. This will eventually impact bone formation also.

Similarly, accumulation of *Ama* and many intermediate products of tissue metabolism in fat tissue and other channels occurs. This also leads to deficit bone formation. This shows that an impairment of fat metabolism and consequent block of bone forming channels leads to deficit formation of bone. This may also lead to formation of weak and immature bone tissue. The bone health will deteriorate. All these events will lead to manifestation of *Asthi kshaya* i.e. osteopenia or osteoporosis.

If bone precursors are not formed adequately due to deficit 'fat tissue fire', the 'bone tissue fire i.e. *Asthi dhatvagni*' may get exacerbated through chain of formation, as a reflex or feedback mechanism.

*Vata dosha* contributes largely for occurrence of *Asthi* related diseases because of unique relationship of *Vata* and *Asthi*. *Vata Prakopa* and *Kshaya* of all *dhatu* are a natural phenomenon occurring during *Jarawastha* in men and women and also *Vata prakopa* occurs by two processes either *Samtarpan janya* or *Aptarpan janya*. *Aptarpan janya Vata Prokopa* is due to taking *Aahara* and *Vihara* which vitiate *Vata* or due to *Jara janya* and *Samtarpan jany*a is due to creating *Margarodha* causing vitiation of *Vata.*

*Asthikshaya* is *madhyama Roga Margagata Vikara*[17] in which vitiated *Vata* gets lodged in *Asthi*. Hence to treat *Asthikshaya* drugs acting on both *Vata* and *Asthi* should be selected. The etiological factors for *Asthikshaya* are not mentioned separately in the text. According to the principle of *Asharya-ashrayi Bhava, Asthi Dhatu* is the seat of *Vata dosha*, so when *Vata* increase *Asthi Dhatu* decreased. Hence treatment of *Vata* causes *Asthi Vriddhi*.

*Sneha Dravya* has been mentioned in Ayurvedic literature for the management of *Asthikshaya Janya Vata Vriddhi. Acharya Charaka* in *Vata Vyadhi Chikitsa* has mentioned, if vitiated *Vayu* is located in the *Asthi* (bone) then *Bahya* and *Abhyantra Sneha* are administered.[18] *Acharya Charaka* has also mentioned that the diseases due to vitiation of *Asthi Dhatu* can be treated by *Basti* prepared with milk and ghee medicated with bitter drugs. This can be taken in also a way that in case of *Asthi Kshaya dravyas* or medicines having the *Tikta rasa* and *Brumhana, Snigdha*, *Guna* can be used.

For this study *Panchatikta Ghrita* and *Go-Ghrita* were selected for the management of *Asthikshaya*.

**DISCUSSION**

Osteopenia, or low bone mass, is one of the most prevalent skeletal disorders and a leading cause of osteoporosis. It results in weak and fragile bones that increase the risk of fractures. Approximately 33.6 million individuals over the age of 50 have low bone density of the hip, placing them at high risk of osteoporosis and related complications. The increased prevalence of osteopenia in India compared to other populations can be attributed to genetic susceptibility, widespread vitamin D deficiency due to dark skin pigmentation and reduced sunlight absorption, as well as lifestyle factors such as lack of physical activity, smoking, alcohol consumption, and poor dietary calcium intake. Other contributing factors include limited diagnostic facilities in rural areas and general unawareness about osteoporosis. Although low bone mass is partly reversible, modern treatments are often symptomatic, involving pharmacological and surgical interventions that may have adverse effects.

Ayurveda provides a holistic and effective approach in preventing and managing chronic disorders such as *Asthi Kshaya*. According to *Ayurvedic* principles, all *Dhatus* of the body, including bone (*Asthi*) and bone marrow (*Majja*), are formed from *Aahara Rasa* (nutritional essence) through the sequential process of *Dhatu Poshana Karma*. The *Asthivaha Srotas*, which governs bone formation, originates in *Medodhatu* (fat tissue) and *Jaghana* (hip bones). Impairment in *Medodhatvagni* (metabolic fire of fat) leads to improper bone formation, while accumulation of *Ama* (metabolic toxins) obstructs bone-nourishing channels, resulting in weak or immature bone tissue. With advancing age and *Vata* predominance, degeneration accelerates, leading to *Asthi Kshaya*. Hence, management focuses on pacifying *Vata* and nourishing *Asthi Dhatu* through *Sneha Dravya* such as *Go-Ghrita* and *Panchatikta Ghrita*, which are indicated for *Asthikshaya Janya Vata Vriddhi* as per *Acharya Charaka* and *Sushruta*.

**Mode of Action of *Panchatikta Ghrita***

*Panchatikta Ghrita*

⬇

Composed of five bitter herbs → Possesses *Tikta Rasa*, *Ushna Virya*, *Madhura–Katu Vipaka*

⬇

*Rasapanchaka* action begins
Disintegration → Dissolution → Absorption → Metabolism

⬇

*Tikta Rasa* Actions
→ *Ruksha*, *Khara*, *Vishada* → *Shoshana* of *Medodhatu*
→ Converts excess *Medas* to nourish *Asthi Dhatu*

⬇

Combination Effect (*Tikta* + *Snigdha* from *Ghrita*)
→ Produces *Khara Guna* naturally present in *Asthi Dhatu*
→ Promotes *Asthi Dhatu Vriddhi* and repairs degenerative bone changes

⬇

Increase in *Dhatvagni* (Metabolic fire of tissues)
→ Enhances tissue metabolism (*Deepana*, *Pachana*, *Rochana*)
→ Improves *Dhatu Poshana Karma* (Sequential tissue nourishment)

⬇

Improved Nutrition of *Dhatus*
→ Strengthens *Asthi Dhatu* and *Majja Dhatu*
→ Reduces *Asthi Kshaya* and delays degenerative processes

⬇

Therapeutic Outcome
Increases Bone Strength
Prevents Degeneration of *Asthi Dhatu*
Pacifies *Vata Dosha*
Restores *Dhatu Samya* (tissue equilibrium)

**Probable Mode of Action**

*Go-Ghrita*

⬇

*Rasapanchaka* → *Madhura Rasa*, *Guru–Snigdha–Mridu Guna*, *Sheeta Virya*, *Madhura Vipaka*

⬇

Primary Actions
→ *Agnidipana* (stimulates digestion & metabolism)
→ *Balya* (strength promoting)
→ *Rasayana* (rejuvenating)
→ *Vatapitta Prashamana* (pacifies *Vata* and *Pitta*)

⬇

*Madhura Rasa* Action
→ Derived from *Prithvi Mahabhuta* → *Vatahara* in nature
→ Nourishes all *Dhatus* from *Rasa* to *Shukra*
→ Promotes healing of fractures and enhances tissue stability

⬇

*Guru* & *Snigdha Guna* Effects
→ Provide *Sthiratva* (stability) and *Snehana* (lubrication)
→ Counteract *Ruksha Guna* of aggravated *Vata* in *Asthi Kshaya*
→ Strengthen and stabilize *Asthi Dhatu*

⬇

*Sheeta Virya* Effect
→ Calms *Vata Dosha* and supports tissue nourishment
→ Delays degeneration and promotes *Vayahsthapana* (anti-aging)

⬇

**Vitamin-Mediated Bone Support**

→ Rich in fat-soluble vitamins (A, D, E, K)
→ Vitamin A: Stimulates osteoblast activity
→ Vitamin D: Increases calcium absorption from gut → raises blood calcium
→ Vitamin $K_2$: Activates osteocalcin → anchors calcium in bone matrix
⬇
Calcium Metabolism Enhancement
→ Synergistic action of Vitamin D + $K_2$ improves calcium utilization
→ Enhances bone mineralization even without direct calcium content
⬇
*Yogavahi* Property of *Ghrita*
→ Increases bioavailability of other co-administered drugs
→ Delivers nutrients deeply without losing its own potency
⬇
Therapeutic Outcome
Pacifies *Vata Dosha*
Promotes *Asthi Dhatu Vriddhi* (bone nourishment) enhances calcium absorption and bone strength
acts as *Rasayana* and rejuvenator breaks *Samprapti* of *Asthi Kshaya*

## CONCLUSION

*Asthi Kshaya* is a condition characterized by the depletion of *Asthi Dhatu*, where the bone's structure, properties, and function are compromised. It correlates with osteopenia in modern science, a state of reduced bone density that precedes osteoporosis. There is no direct reference to the *Nidana* of *Asthi Kshaya* in Ayurvedic texts; however, based on the principle of *Ashraya–Ashrayi Bhava*, *Asthi Dhatu* and *Vata Dosha* share an inverse relationship- when *Vata* increases, *Asthi* decreases. Therefore, *Vata Vardhaka Nidanas* can be considered the causative factors of *Asthi Kshaya*. In the present study, Group A (*Panchatikta Ghrita*) showed 54.64% improvement in subjective parameters of *Asthi Kshaya* and 55% improvement in *Vata Vriddhi*, both statistically significant ($p<0.05$), while bone mineral density improved by 11.72%. Group B (*Go-Ghrita*) showed 62.5% improvement in *Asthi Kshaya*, 59.2% in *Vata Vriddhi*, and 8.83% improvement in bone mineral density, all statistically significant ($p < 0.05$). Intergroup comparison using an unpaired t-test revealed that both groups produced nearly equal results in subjective parameters, but Group A showed slightly higher improvement in BMD percentage. No adverse effects were observed, suggesting that *Asthi Kshaya* can be effectively managed through Ayurvedic interventions such as *Panchatikta Ghrita* and *Go-Ghrita*, offering a safe and beneficial alternative to modern medications like NSAIDs, bisphosphonates, and SERMs.

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