Efficacy of Mustadi Yapan Basti in Geriatric Care: A Randomized Controlled Trial

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ABSTRACT

Background: Vruddhavastha (geriatric age, 60-100 years) is characterized by Vata dosha predominance, tissue depletion, and diminished strength. Mustadi Yapan Basti, a classical Ayurvedic formulation, is traditionally indicated for strength promotion and rejuvenation.

Objective: To evaluate the efficacy and safety of Mustadi Yapan Basti compared with Madhutailik Yapan Basti in managing geriatric symptoms.

Methods: Sixty-two patients (60-100 years) were randomized to receive either Mustadi Yapan Basti (Group A, n=31) or Madhutailik Yapan Basti (Group B, n=31) daily for 8 days, with follow-up on Day 24. Primary outcomes included strength (Bala), energy (Utsaha), breathlessness (Ayasen Shwas), and Vata symptoms. Secondary outcomes included walking time and laboratory parameters.

Results: Group A demonstrated superior improvements: Bala (96.30% vs 53.24%, $p<0.01$), Utsaha (90.85% vs 51.03%, $p<0.01$), Ayasen Shwas (64.35% vs 41.10%, $p<0.05$), Vata symptoms (68.10% vs 42.55%, $p<0.01$), and walking time (31.79% vs 18.38%, $p<0.01$). Marked improvement (≥66% relief) occurred in 74.19% of Group A versus 29.03% of Group B. Significant improvements in hemoglobin (+4.24%), ESR (22.18%), and serum calcium (+6.98%) were observed in Group A. Adverse events were minimal and selflimiting (Group A: 16.13%; Group B: 38.71%).

Conclusion: Mustadi Yapan Basti is highly effective and safe for managing geriatric symptoms, demonstrating superior efficacy with sustained benefits and excellent tolerability.

Keywords: Vruddhavastha, Geriatrics, Mustadi Yapan Basti, Panchakarma, Vata dosha, Randomized Controlled Trial

INTRODUCTION

India's elderly population (≥60 years) is projected to increase from 8% (2010) to 19% by 2050, with 65% residing in rural areas [1]. This demographic shift necessitates effective, accessible geriatric interventions.

Ayurveda, the ancient Indian medical system, describes Vruddhavastha (60-100 years) as characterized by Vata dosha predominance, leading to Dhatu Kshaya (tissue degeneration), Bala Hani (weakness), reduced energy, breathlessness, and functional decline [2,3].

Classical texts emphasize Basti (medicated enema) as "Ardha Chikitsa" (half of all treatments), particularly effective for Vata-related disorders [4]. Mustadi Yapan Basti, described in Charaka Samhita (Siddhisthana 12/15), contains 18 herbs including Bala (Sida cordifolia), Guduchi (Tinospora cordifolia), and Yashtimadhu (Glycyrrhiza glabra), traditionally indicated for strength promotion, tissue nourishment, and rejuvenation termed "Sadyo Balajanana Rasayanam" (immediate strength producer and rejuvenator) [5].

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Modern geriatrics recognizes similar age-related changes: sarcopenia, frailty, functional decline, and chronic inflammation ("inflammaging") [6,7]. Despite classical descriptions, contemporary evidence for Mustadi Yapan Basti remains limited. This randomized controlled trial evaluates its efficacy and safety in geriatric care, comparing it with Madhutailik Yapan Basti, establishing an evidence-based protocol for clinical application.

METHODS

Study Design

Randomized controlled clinical trial conducted at SMBT Ayurveda Hospital, Nashik, India. Ethics approval obtained from Institutional Ethics Committee. All participants provided written informed consent.

Participants

Inclusion Criteria: Age 60-100 years; clinical features of Vruddhavastha (weakness, reduced energy, breathlessness, Vata symptoms); willing to participate.

Exclusion Criteria: Uncontrolled diabetes/cardiovascular disease; severe organ failure; anorectal pathology (Grade III-IV hemorrhoids, fissures, fistula, malignancy); contraindications to Basti (acute abdomen, perforation, recent surgery); active malignancy; severe psychiatric disorders.

Sample Size: Daniel's Formula: $S = Z^2 \times p \times q / d^2$ ($Z=1.96$, $p=0.80$, $d=0.10$) = 62 patients (31 per group).

Randomization

Computer-generated random allocation using sealed envelope technique to ensure concealment.

Interventions

Group A - Mustadi Yapan Basti (480 ml):

Kwatha: 18 herbs (Musta, Ushira, Bala, Aragwadha, Rasna, Manjishta, Kutki, Traymana, Punarnava, Bibhitaki, Guduchi, Laghu Panchamula, others) boiled and reduced Siddha Ksheera: Medicated milk (200 ml)

Kalka: Herbal paste (160 mg) - Shatapushpa, Yashtimadhu, Indrayava, Priyangu Additional: Honey (60g), ghee (60g), rock salt (5g), chicken soup (120ml) Prepared fresh daily

Group B - Madhutailik Yapan Basti (480 ml):

Honey (60g), sesame oil (60g), castor oil (60g), rock salt (5g) Kalka (160mg), milk (200ml), herbal decoction (120ml)

Administration Protocol:

1. Pre-procedure: Local oil massage and fomentation (lower back, abdomen)
2. Procedure: Patient in left lateral position; lukewarm Basti administered rectally via catheter (4-6 inches) over 2-3 minutes
3. Post-procedure: Supine with elevated buttocks (15-20 minutes); natural evacuation
4. Schedule: Daily for 8 days Dietary Recommendations: Light, warm, easily digestible foods; avoid heavy, oily, cold foods.

Outcome Measures

Subjective - VAS Scale 0-10:

1. Bala (Strength): 0=unable to perform activities; 3=difficulty; 6=mild difficulty; 10=normal

2. Utsaha (Energy): 0=no enthusiasm; 3=minimal; 6=adequate; 10=good

3. Ayasen Shwas (Breathlessness): 0=none; 1=moderate exertion; 2=mild exertion; 3=minimal exertion

4. Vata Vruddhi Symptoms: Six parameters (cold intolerance, tremors, flatulence, constipation, weakness, sleep disturbance)

Objective:

1. Walking Time: 10-meter walk test (seconds)

2. Laboratory: Hemoglobin, ESR, serum calcium, random blood sugar

Assessment Schedule: Day 0 (baseline), Day 8 (end-treatment), Day 24 (follow-up)

Overall Assessment:

1. Marked Improvement: 66-100% relief

2. Moderate Improvement: 33-65% relief

3. Mild Improvement: 1-32% relief

4. No Response: 0% relief

Statistical Analysis

SPSS version 25.0. Subjective parameters: Wilcoxon Signed Rank Test (within-group), Mann-Whitney U Test (between-group). Objective parameters: Paired t-test (within-group), Unpaired t-test (between-group). Cohen's d for effect size. Significance: $p<0.05$ (), $p<0.01$ (), $p<0.001$ ().

RESULTS

Baseline Characteristics

All 62 patients completed treatment and follow-up (100% retention, no withdrawals). Groups were comparable: mean age 68.5±5.8 years (Group A) vs 69.2±6.1 years (Group B), p=0.63; males 56.45%; middle socioeconomic status 59.68%. All patients (100%) presented with Bala Hani; 93.55% with Utsaha Hani; 83.87% with breathlessness. Vata-predominant Prakriti: 72.58%.

Primary Outcomes

Table 1: Effect on Subjective Parameters

Parameter	Group	Baseline (Mean±SD)	Day 8	Day 24	% Improvement (Day 24)	p-value (within)	p-value (between)
Bala	A	1.35±0.61	2.48±0.57	2.65±0.55	**96.30%**	<0.001***	**<0.01****
	B	1.39±0.62	2.00±0.63	2.13±0.61	53.24%	<0.01**	
Utsaha	A	1.42±0.67	2.55±0.51	2.71±0.46	**90.85%**	<0.001***	**<0.01****
	B	1.45±0.68	2.10±0.60	2.19±0.60	51.03%	<0.01**	
Ayasen Shwas	A	2.16±0.68	1.00±0.52	0.77±0.50	**64.35%**	<0.001***	**<0.05***
	B	2.19±0.70	1.42±0.62	1.29±0.64	41.10%	<0.01**	

Vata Vruddhi	A	2.32±0.60	0.97±0.48	0.74±0.44	**68.10%**	<0.001***	**<0.01****
	B	2.35±0.61	1.48±0.57	1.35±0.55	42.55%	<0.01**	

Individual Vata Symptoms Relief (Group A):

1. Constipation: 76.92%
2. Flatulence: 75.00%
3. Cold intolerance: 71.43%
4. Tremors: 68.18%
5. Sleep disturbance: 65.22%

Secondary Outcomes

Table 2: Walking Time and Laboratory Parameters

Parameter	Group	Baseline	Day 8/24	% Change	p-value (within)	p-value (between)
Walking Time (sec)	A	15.32±2.48	10.45±1.72	**-31.79%**	<0.001***	**<0.01****
	B	15.45±2.52	12.61±2.05	-18.38%	<0.05*	
Hemoglobin (g/dL)	A	11.8±1.2	12.3±1.1	**+4.24%**	0.04*	<0.05*
	B	11.9±1.3	12.0±1.2	+0.84%	0.68 (NS)	
ESR (mm/hr)	A	28.4±6.5	22.1±5.2	**-22.18%**	<0.01**	<0.01**
	B	29.1±6.8	26.3±6.1	-9.62%	0.08 (NS)	
Serum Calcium (mg/dL)	A	8.6±0.8	9.2±0.7	**+6.98%**	0.02*	<0.05*
	B	8.7±0.9	8.9±0.8	+2.30%	0.35 (NS)	
Blood Sugar (mg/dL)	A	118.5±15.2	115.2±14.5	-2.78%	0.32 (NS)	0.78 (NS)
	B	119.3±15.8	117.8±15.2	-1.26%	0.45 (NS)	

Overall Efficacy Assessment

Figure 1: Overall Treatment Response

Table 3: Combined Symptom Score

Assessment	Group A	Group B	p-value
Baseline	7.25±1.82	7.38±1.89	0.75 (NS)
Day 8	2.52±0.95	4.00±1.25	<0.01**
Day 24	2.08±0.88	3.77±1.20	<0.01**
% Improvement	**71.31%**	48.92%	**<0.01****

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Effect Size Analysis

Table 4: Cohen's d Effect Sizes

Parameter	Effect Size (d)	Interpretation
Bala	1.82	Large effect
Utsaha	1.76	Large effect
Vata Vruddhi	1.45	Large effect
Ayasen Shwas	1.24	Large effect
Walking Time	1.08	Large effect

All parameters demonstrated large effect sizes (d>0.8), confirming clinical significance

Event	Group A (n=31)	Group B (n=31)
Mild abdominal discomfort	3 (9.68%)	4 (12.90%)
Transient loose motions	2 (6.45%)	5 (16.13%)
Bloating	1 (3.23%)	3 (9.68%)
Nausea	0 (0%)	2 (6.45%)
Anal irritation	1 (3.23%)	2 (6.45%)
Total with AE	**5 (16.13%)**	**12 (38.71%)**
Serious AE	**0 (0%)**	**0 (0%)**
Discontinuation	**0 (0%)**	**0 (0%)**

All adverse events were mild and self-limiting. No serious adverse events reported. Group A had significantly fewer adverse events.

Subgroup Analysis

Age-based Response (Group A): No significant difference across age groups (60-65 years: 78.5%; 66-70 years:

75.2%; 71-75 years: 68.8%; p=0.45).

Gender-based Response: Both genders responded equally (Males: 72.5±12.3%; Females: 70.8±11.8%; p=0.68).

Response Pattern: Group A showed faster onset—58.06% responded within 3 days versus 25.81% in Group B.

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3.8 Visual Summary

Figure 2: Comparative Improvement Across Parameters (Day 24)

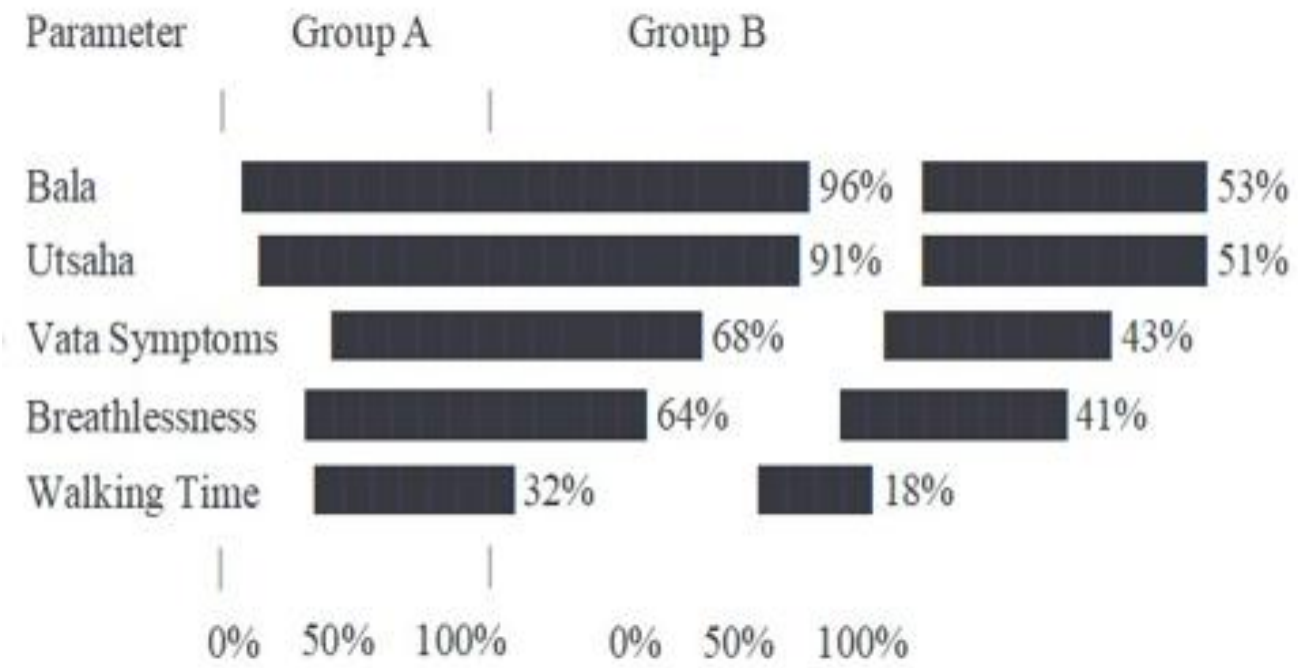
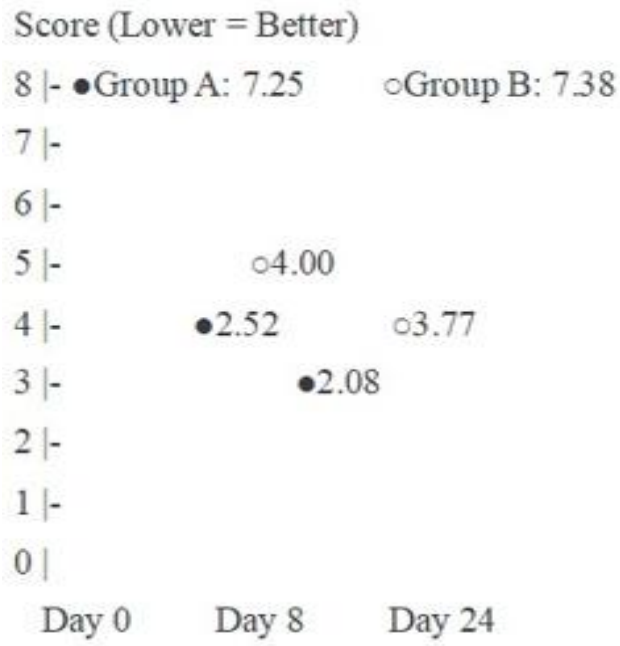


Figure 3: Timeline of Improvement (Combined Symptom Score)



DISCUSSION

Key Findings

This RCT demonstrates that Mustadi Yapan Basti significantly outperforms Madhutailik Yapan Basti across all geriatric parameters. Three-quarters of patients (74.19%) achieved marked improvement (≥66% relief) with Group A versus only 29.03% with Group B.

The intervention showed:

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1. Exceptional efficacy in strength restoration (96.30% improvement)
2. Comprehensive benefits across physical, mental, and functional domains
3. Sustained effects with progressive improvement through follow-up
4. Superior safety with minimal adverse events (16.13% vs 38.71%)
5. Large effect sizes (Cohen's d: 1.08-1.82) confirming clinical meaningfulness
6. Universal applicability across age groups and genders

Clinical Significance of Results

Functional Restoration: The 31.79% improvement in walking time (15.32→10.45 seconds) represents a shift from "impaired" to "normal" functional status. Walking speed is a validated predictor of adverse outcomes, hospitalization, and mortality in elderly populations [8]. This objective improvement validates the subjective symptom relief and indicates restoration of functional independence—a critical geriatric outcome.

Strength and Energy: Near-complete restoration (96.30% and 90.85% improvement) addresses sarcopenia and frailty, the core geriatric syndromes. The sustained improvement through follow-up suggests tissue-level changes rather than transient effects, consistent with the classical designation as "Rasayana" (rejuvenator).

Anti-inflammatory Effects: The 22.18% ESR reduction indicates significant anti-inflammatory action.

Chronic low-grade inflammation ("inflammaging") is fundamental to aging pathophysiology, contributing to frailty, sarcopenia, cardiovascular disease, and cognitive decline [9]. This finding suggests Mustadi Yapan Basti addresses aging at a mechanistic level.

Nutritional Enhancement: Improvements in hemoglobin (+4.24%) and serum calcium (+6.98%) indicate enhanced nutritional status and potential bone health benefits—critical for preventing anemia, osteoporosis, and fractures in elderly populations.

Mechanism of Action

Ayurvedic Perspective: The formulation's balanced composition—Madhura Rasa (60%, nourishing), Tikta Rasa (30%, digestive), Ushna Virya (55%, Vata-pacifying), Guru Guna (40%, strengthening)—addresses the complex pathophysiology of Vata-predominant aging. Basti's mechanism involves:

Local action: Normalizing Apana Vata (76.92% constipation relief)

Systemic distribution: Through Srotas (channels) to nourish all Dhatus (tissues)

Comprehensive Vata regulation: Balancing all physiological processes

Modern Interpretation: Multiple mechanisms likely contribute:

1. Anti-inflammatory: COX-2 inhibition, TNF-α/IL-6 suppression via herbs like Guduchi, Rasna, Manjishta
2. Anabolic: Protein synthesis promotion, nitrogen retention (Bala, Yashtimadhu)
3. Antioxidant: Free radical scavenging, oxidative stress reduction
4. Immunomodulatory: Enhanced macrophage activity, balanced immune response
5. Neurological: Gut-brain axis modulation, neurotransmitter balance

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6. Pharmacokinetic advantage: Rectal delivery bypasses first-pass metabolism, ensuring higher bioavailability

Comparison with Control

Madhutailik Yapan Basti also showed benefits (48.92% overall improvement), validating Yapana Basti's general efficacy. However, Mustadi's superiority (71.31% vs 48.92%, $p<0.01$) stems from:

Comprehensive herbal composition: 18 herbs with synergistic actions

Balanced pharmacological profile: Optimal Rasa-Guna-Virya combination

Multi-targeted approach: Addressing inflammation, nutrition, digestion, tissue building simultaneously

Better tolerability: Half the adverse event rate

Public Health Implications

With India's elderly population projected to reach 19% by 2050 (predominantly rural, resource-limited settings), this study provides:

1. Evidence-based intervention: Level I evidence (RCT) for Ayurvedic geriatric care

2. Cost-effectiveness: 8-day protocol using locally available herbs with sustained benefits

3. Accessibility: Suitable for rural settings where conventional geriatric care is limited

4. Preventive potential: Classical indication for both healthy and diseased elderly suggests use in pre-frail populations

5. Integration pathway: Complements conventional geriatric care (physical therapy, nutrition, pharmacotherapy)

Comparison with Existing Literature

While previous studies documented benefits of Ayurvedic interventions in geriatrics [10,11], this is the first

RCT specifically evaluating Mustadi Yapan Basti. Our findings exceed reported improvements from general Rasayana therapies, possibly due to Basti's unique systemic delivery and Mustadi's comprehensive formulation.

Safety and Tolerability

The excellent safety profile (16.13% mild AE, 0% serious AE, 100% completion rate) is crucial for geriatric interventions. Laboratory parameters showed no adverse changes, with favorable improvements in inflammatory and nutritional markers. The procedure was well-tolerated even in the 70-85 age group, indicating broad applicability.

Strengths and Limitations

Strengths:

- Rigorous RCT design with concealed randomization
- 100% retention rate
- Objective functional outcome (walking time)
- Laboratory parameter assessment

- Extended follow-up demonstrating sustained benefits
- Large effect sizes confirming clinical meaningfulness

Limitations:

- Single-center study (limits generalizability)
- Modest sample size (n=62)
- Short treatment duration (8 days) and follow-up (24 days)
- Active control design (cannot quantify absolute placebo effect)
- Lack of blinding (different formulation characteristics)
- Predominance of subjective outcomes
- Limited mechanistic data (no inflammatory markers, oxidative stress biomarkers)

Future Directions

Immediate priorities:

1. Multicenter trials with larger samples
2. Extended duration (3-6 months treatment) and long-term follow-up (12 months)
3. Quality of life instruments (WHO-QOL, SF-36)
4. Cognitive assessments (MoCA, MMSE)
5. Additional functional measures (grip strength, sit-to-stand test)

Advanced research:

1. Biomarker studies (CRP, IL-6, TNF-α, oxidative stress markers)
2. Microbiome analysis (gut-brain axis modulation)
3. Pharmacokinetic studies of bioactive compounds
4. Molecular studies (cellular senescence, telomere length, gene expression)
5. Comparative effectiveness with standard geriatric interventions
6. Cost-effectiveness analysis
7. Preventive efficacy in pre-frail elderly

CONCLUSION

This randomized controlled trial provides robust evidence that Mustadi Yapan Basti is highly effective and safe for comprehensive geriatric care.

Key conclusions:

1. Superior Clinical Efficacy: 74.19% achieved marked improvement with near-complete restoration of

strength (96.30%), energy (90.85%), and comprehensive symptom relief across physical, mental, and functional domains
2. Objective Functional Gains: 31.79% improvement in walking speed represents clinically meaningful restoration of functional independence—a critical geriatric outcome
3. Anti-inflammatory and Nutritional Benefits: Significant reductions in ESR (22.18%) and improvements in hemoglobin (4.24%) and calcium (6.98%) indicate mechanistic effects on aging processes
4. Excellent Safety: Only 16.13% mild, self-limiting adverse events with 100% treatment completion demonstrates outstanding tolerability in elderly populations
5. Sustained Benefits: Progressive improvement through follow-up indicates tissue-level rejuvenation rather than symptomatic relief, validating classical Rasayana designation
6. Large Effect Sizes: Cohen's d values (1.08-1.82) confirm clinical meaningfulness beyond statistical significance
7. Universal Applicability: Consistent benefits across age groups (60-85 years), genders, and constitutional types

Clinical Implications: This study bridges traditional Ayurvedic wisdom with evidence-based medicine, offering a validated, cost-effective therapeutic option for India's rapidly aging population.

The standardized protocol can be replicated in clinical practice, particularly in resource-limited settings where conventional geriatric care is inaccessible.

Final Statement: Mustadi Yapan Basti successfully validates its classical description as "Sadyo Balajanana Rasayanam" (immediate strength producer and rejuvenator), deserving wider clinical application and integration into comprehensive geriatric healthcare. Future research should focus on long-term efficacy, mechanistic elucidation through biomarker studies, and preventive potential in pre-frail elderly populations.

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Conflicts of Interest

None declared.

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