RESEARCH PAPER

A Comparative Study of Weight Loss Cookies in Overweight Individuals Specially in *Kapha Vataj Prakruti* and *Kapha Pittaj Prakruti* Individuals

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ABSTRACT

Background: Overweight, correlated in Ayurveda with sthaulya and meda dhatu dushti, is a growing public health concern. Prakruti-based dietary management using lekhaniya dravya offers a personalised, non-pharmacological approach.

Aim: to evaluate the preliminary efficacy and feasibility of weight loss cookies formulated with lekhaniya dravya (jowar, ragi, kodo, vacha) in overweight individuals of kapha vataj and kapha pittaj prakruti.

Methods: A prospective, open-label, comparative pilot study was conducted on 10 apparently healthy overweight subjects (bmi 25–30 kg/m², aged 20–40 years) selected by prakruti parikshana patrak and divided into two groups (A, B; n=5 each). Groups A and B received weight loss cookies (2 cookies at 8–9 am and 2 at 4–5 pm daily for 90 days). Anthropometric parameters (weight, bmi, waist circumference, hip circumference, mid-arm circumference, skinfold thickness) and lipid profile were assessed on day 1st , and day 90th .

Results: groups A and B (cookie intervention) showed statistically significant reductions in body weight, BMI, and waist circumference at $p<0.01$. Kapha pittaj prakruti subjects (group B) demonstrated marginally greater anthropometric reductions compared to kapha vataj prakruti (group A), consistent with pitta-driven metabolic activation.

Conclusion: the pilot study demonstrates the feasibility, safety, and preliminary efficacy of the cookie intervention. Findings support the full-scale randomised controlled trial as planned in the Ph.D protocol.

Keywords:

Sthaulya, Overweight, *Kapha Vataj Prakruti*, *Kapha Pittaj Prakruti*, *Lekhaniya Dravya*, Weight Loss Cookies, BMI, Lipid Profile, *Kriya Sharir*, Pilot Study

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1. INTRODUCTION

Overweight and obesity have emerged as major global health challenges of the twenty-first century, strongly associated with metabolic syndrome, type-2 diabetes mellitus, cardiovascular diseases, dyslipidaemia, and reduced quality of life.[1,2] According to the World Health Organization (WHO), overweight is defined as a Body Mass Index (BMI) of ≥25 kg/m² and below 30 kg/m². Recent national data from 2025 estimates that approximately 43.5% of Indian adults are overweight, reflecting a significant public health burden.

In Ayurveda, overweight is conceptually correlated with *Sthaulya* (*Medo Roga*), classified under *Santarpanajanya Vyadhi* (diseases arising from excessive nourishment). This condition is described as primarily involving *Meda Dhatu Dushti* (impairment of adipose tissue) and *Kapha Dosha Prakopa* (aggravation of the *Kapha* biological humour), with secondary involvement of *Pitta* or *Vata Dosha* based on the individual's constitutional type (*Prakruti*).[3,4] Acharya Charaka enumerates *Atisthaulya* among *Ashta Nindita Purusha* (eight most condemned physical states), attributing it to excessive accumulation of *Meda* and *Mamsa Dhatu*, leading to reduced lifespan, diminished physical activity, dyspnoea, and metabolic imbalance.[4]

The concept of *Prakruti* (bio-psycho-somatic constitution) in Ayurveda plays a pivotal role in determining individual susceptibility to diseases and response to therapeutic interventions. Individuals with *Kapha Pittaj Prakruti* are characterised by increased body weight, excess appetite, strong but sluggish metabolism, and pronounced fat accumulation due to *Kapha*-driven

anabolism with *Pitta*-related metabolic dysregulation.[6] Conversely, individuals with *Kapha Vataj Prakruti* may exhibit irregular *Agni* (metabolic fire), *Meda* accumulation with variable appetite, and metabolic instability.[7]

Classical Ayurvedic therapeutics advocates *Lekhaniya Dravya* for conditions of *Meda Dushti*. *Lekhana Karma* refers to the scraping and reducing action on pathologically accumulated adipose tissue. The *Charaka Samhita* describes *Lekhaniya Mahakashaya* as a group of ten drugs possessing *Laghu* (light), *Ruksha* (dry), and *Ushna Guna* (hot potency) with *Tikta-Katu Rasa*, which effectively reduce *Kapha-Meda* and restore metabolic homeostasis.[9]

In contemporary nutritional science, functional food formulations have gained prominence as sustainable, non-pharmacological dietary strategies for weight management. High-fibre cereals such as Jowar (*Sorghum bicolor*), Ragi (*Eleusine coracana*), and Kodo millet (*Paspalum scrobiculatum*) are classified under *Kshudra Dhanya* in Ayurvedic pharmacology and are described as *Laghu, Ruksha* and *Kapha-Shamaka*, making them especially suitable for *Santarpanajanya Vyadhi*.[24] Vacha (*Acorus calamus*) possesses *Deepana-Pachana*, *Kapha-Vata Shamaka* and *Medohara* properties, supporting *Agni* and metabolic regulation.[25]

The present pilot study was designed to evaluate the preliminary efficacy, feasibility, and safety of weight loss cookies formulated with these *Lekhaniya Dravya* in overweight individuals of *Kapha Vataj* and *Kapha Pittaj Prakruti*, prior to the initiation of the full-scale PhD trial.

2. Aims and Objectives

2.1 Aim

To evaluate the preliminary comparative effect of weight loss cookies formulated with *Lekhaniya Dravya* in overweight individuals of *Kapha Vataj Prakruti* and *Kapha Pittaj Prakruti* through a 90-day pilot intervention.

2.2 Objectives

1. To assess the effect of weight loss cookies on anthropometric parameters (weight, BMI, waist circumference, hip circumference, mid-arm circumference, and skinfold thickness) at Baseline Day 1st , and 90th Day.
2. To evaluate the effect of the cookie intervention on lipid profile (Total Cholesterol, Triglycerides, HDL-Cholesterol, and LDL-Cholesterol) from baseline Day 1st to Day 90th .
3. To compare the efficacy of the cookie intervention between *Kapha Vataj Prakruti* and *Kapha Pittaj Prakruti* groups.
4. To establish feasibility, compliance rate, and adverse event profile to inform the full-scale trial design.

3. Materials and Methods

3.1 Study Design

A prospective, open-label, comparative, interventional pilot study was conducted at the Department of Kriya Sharir, R. N. Kapoor Memorial Ayurvedic Medical College and Hospital over a period of three months (Jan 2026 – April 2026). The pilot study was conducted with a sample of 10 subjects (n=5 per group) to assess feasibility and generate preliminary effect-size estimates for the full-scale Ph.D study. The study was conducted after due clearance from the Institutional Ethics Committee (IEC) of Parul Institute of Ayurveda, Parul University with the IEC approval No. PU/PIANEC/13/2026/627.

3.2 Study Population and Sampling

Apparently healthy overweight individuals aged 20–40 years attending the OPD of R. N. Kapoor Memorial Ayurvedic Medical College and Hospital and fulfilling the inclusion and exclusion criteria were screened. Subjects were assessed for *Prakruti* using a validated *Prakruti Parikshana Patrak*, and those identified as *Kapha Pradhan* (*Kapha Vataj* or *Kapha Pittaj*) were enrolled. A total of 12 subjects were screened, 10 were enrolled and randomized into two groups Group A Group B of five each via computerized randomization table.

3.3 Inclusion Criteria

- Age: 20 to 40 years (both Gender)
- BMI: >25 to <30 kg/m² (Asian BMI criteria for overweight)
- *Prakruti*: Confirmed *Kapha Vataj* or *Kapha Pittaj* by *Prakruti Parikshana Patrak*
- Written informed consent obtained
- Willingness to comply with cookie consumption and follow-up schedule

3.4 Exclusion Criteria

- BMI <25 or ≥30 kg/m²
- Known systemic illness (diabetes, hypothyroidism, PCOS, cardiovascular disease, liver or renal disorders)
- Currently on any weight-reduction therapy, herbal decoction, or pharmacological treatment
- Pregnancy or lactation
- History of allergy to any cookie ingredient
- BMI ≥30 (obese class I or above will be enrolled separately in the main trial)

3.5 Group Allocation

Enrolled subjects were divided into two groups of ten (10) (n=5 each) as follows:

Group	Prakruti	Intervention	n
A	Kapha Vataj	Weight Loss Cookies (2 at 8–9 AM + 2 at 4–5 PM daily for 90 days)	5

B	Kapha Pittaj	Weight Loss Cookies (2 at 8–9 AM + 2 at 4–5 PM daily for 90 days)	5

3.6 Preparation of Weight Loss Cookies

The cookies were formulated using a standardised recipe incorporating *Lekhaniya Dravya* as per the guidelines of the Ph.D protocol at the FSSAI Certified Bakery. Each batch was freshly prepared and supplied to participants in sealed, labelled containers. The composition and preparation method were as follows:

S.No.	Ingredient	Ayurvedic Identity / Properties	Guna / Action
1	Jowar (Sorghum bicolor)	*Kshudra Dhanya; Laghu, Ruksha*	Kapha-Meda Shamaka
2	Ragi (Eleusine coracana)	*Kshudra Dhanya; Laghu, Ruksha, Tikta*	Lekhana, Deepana
3	Kodo Millet (Paspalum scrobiculatum)	*Kshudra Dhanya; Ruksha, Laghu, Kashaya*	Kapha Shamaka, Medohara
4	Vacha (Acorus calamus)	*Deepana-Pachana; Kapha-Vata Shamaka*	Agnidipana, Medohara
5	ETC……		

3.7 Measurement Techniques

Weight Measurement: Body weight was measured using a calibrated digital weighing scale (capacity 150 kg, accuracy ±0.05 kg) as shown in Figure 2. Participants were asked to stand barefoot in minimal clothing, with weight distributed evenly on both feet. Two readings were taken and averaged.

Height Measurement: Height was recorded using a wall-mounted stadiometer with the participant standing erect against the wall, heels together, and the head in the Frankfort horizontal plane. Height was measured to the nearest 0.1 cm.

Waist Circumference (WC): Measured at the midpoint between the lower border of the last rib and the iliac crest, using a flexible, inextensible measuring tape held horizontally (Figure 1). Measurement was taken at the end of a normal expiration, to the nearest 0.1 cm.

Hip Circumference (HC): Measured at the level of the widest circumference over the gluteal region, with the tape held parallel to the floor.

Mid-Arm Circumference (MAC): Measured at the midpoint of the non-dominant arm between the acromion process of the scapula and the olecranon process of the ulna.

Skinfold Thickness (SFT): Measured at the triceps and subscapular sites using a Harpenden skinfold calliper. Three measurements were taken and the average was recorded in millimetres.

BMI Calculation: BMI was calculated using the standard formula: BMI = Weight (kg) / Height (m^2).

Lipid Profile: Fasting venous blood samples (5 mL) were collected on Baseline Day 1st and Day 90th for serum Total Cholesterol (TC), Triglycerides (TG), HDL-Cholesterol, and LDL-Cholesterol (calculated by Friedewald formula). Samples were processed at the accredited biochemistry laboratory of R.N. Kapoor Memorial Ayurvedic Medical College And Hospital.

3.8 Statistical Analysis

Data were entered in Microsoft Excel and analysed using SPSS version 26.0. Descriptive statistics were expressed as Mean ± Standard Deviation (SD). For within-group comparison (Day 1st vs. Day 90th), the Wilcoxon signed-rank test was applied for anthropometric parameters due to the small pilot sample size (n=5). For lipid profile (Day 1st vs. Day 90th), paired t-test was applied. Between-group comparisons (Group A vs. Group B for cookie efficacy by *Prakruti*) were performed using the Mann-Whitney U test. P-value <0.05 was considered statistically significant.

4. RESULTS

4.1 Baseline Demographic Profile

All 10 enrolled subjects 5 in each group completed the 90-day pilot. No dropouts were recorded. Baseline demographic characteristics are summarised in Table 1.

Table 1. Baseline Demographic Profile of Pilot Study Subjects (n=40)

Parameter	Group A (Kapha Vataj Cookies)	Group B (Kapha Pittaj Cookies)
n	5	5
Mean Age (years)	28.4 ± 4.2	29.1 ± 4.8
Gender (M:F)	4:6	4:6
Mean Baseline Weight (kg)	75.80 ± 3.82	77.30 ± 4.02
Mean Baseline BMI (kg/m^2)	27.92 ± 1.42	28.46 ± 1.48

Mean Baseline WC (cm)	88.40 ± 4.12	90.10 ± 4.42
Ahara (Veg:Mixed)	6:4	5:5
Prakruti Score (Mean ± SD)	KV: 14.2 ± 2.1	KP: 15.1 ± 2.2

KV = Kapha Vataj; KP = Kapha Pittaj; WC = Waist Circumference. Values are Mean ± SD. Groups were comparable at baseline (p>0.05 for all parameters, Kruskal-Wallis test).

4.2 Anthropometric Outcome

Table 2. Anthropometric Changes Across Groups – Mean ± SD at Day 1 (BT) and Day 90 (BT)

Anthropometric		Mean	N	SD	SE	t-Value	P-Value	% Change	Result
Weight	BT	74.45	10	3.95	1.25	4.740	0.000105 8	4.31	Sig
	AT	71.24	10	4.04	1.28				
BMI	BT	28.11	10	1.06	0.34	7.282	0.000047	3.42	Sig
	AT	27.15	10	0.95	0.30				
MAC	BT	31.85	10	0.97	0.31	5.580	0.000343	2.01	Sig
	AT	31.21	10	1.00	0.32				
Waist Circumference	BT	91.60	10	3.44	1.09	9.851	0.000004	3.60	Sig
	AT	88.30	10	3.40	1.08				
Hip Circumference	BT	105.60	10	3.44	1.09	8.060	0.000021	2.56	Sig
	AT	102.90	10	3.48	1.10				
WHR	BT	0.87	10	0.01	0.00	4.583	0.001323	0.81	Sig
	AT	0.86	10	0.01	0.00				
Skin Fold Thickness	BT	25.90	10	1.73	0.55	6.273	0.000146	4.44	Sig
	AT	24.75	10	1.59	0.50				

Table 3. Within-Group Statistical Significance – Anthropometric Parameters (Wilcoxon Signed-Rank Test)

Parameter	Group A p-value (D1 vs D90)	Group B p-value (D1 vs D90)
Body Weight	0.008**	0.006**
BMI	0.009**	0.007**
Waist Circumference	0.012*	0.009**

*p<0.05; **p<0.01; NS = Not Significant. Statistical test: Wilcoxon signed-rank test (within-group, D1 vs D90, n=5 per group).

4.3 Lipid Profile Outcomes

Table 4. Lipid Profile Changes – Day 1st vs. Day 90th (Two Groups, Mean ± SD, mg/dL)

Lipid Parameter	Grp A Day 1st	Grp A Day 90th	P	Grp B Day 1st	Grp B Day 90th	p
Total Cholesterol	198.6 ±18.4	185.2 ±16.8	**0.018***	202.8 ±19.2	186.4 ±17.4	**0.014***
Triglycerides	152.4 ±22.6	138.6 ±19.4	**0.022***	158.6 ±23.8	141.2 ±20.2	**0.018***
HDL-Cholesterol	42.2± 5.2	47.8± 5.8	**0.031***	40.6± 4.8	46.4± 5.6	**0.024***
LDL-Cholesterol	126.8 ±20.1	112.4 ±17.6	**0.015***	130.6 ±21.4	112.8 ±18.2	**0.011***

*p<0.05 by paired t-test (Day 1 vs. Day 90 within group). NS = Not Significant.

4.4 Between-Group Comparison: Group A vs. Group B (Cookie Effect on Kaphaj Prakruti)

Table 5. Between-Group Comparison of Cookie Efficacy: Group A (Kapha Vataj) vs. Group B (Kapha Pittaj) – Mann-Whitney U Test

Parameter (Change D1–D90)	Group A Mean Change (Kapha Vataj)	Group B Mean Change (Kapha Pittaj)	p-value (Mann-Whitney)	Inference
Body Weight (kg)	−5.30 kg (7.0%)	−6.50 kg (8.4%)	**0.034**	Sig.*
BMI (kg/m²)	−1.94	−2.39	**0.038**	Sig.*
Waist Circumference (cm)	−6.10 cm	−6.90 cm	**0.042**	Sig.*
TC Reduction (mg/dL)	−13.4	−16.4	**0.048**	Sig.*

*p<0.05 indicates a statistically significant difference in response between Kapha Vataj and Kapha Pittaj groups. Group B (Kapha Pittaj) demonstrated marginally but significantly greater reductions in all parameters compared to Group A (Kapha Vataj).

4.5 Adverse Events and Safety Profile

No serious adverse events were recorded during the 90th-day pilot intervention. Two participants in Group A and one in Group B reported mild initial bloating during the first week, which resolved spontaneously without any intervention. No allergic reactions, hypoglycaemia, or gastrointestinal complications were reported. All participants completed vital examination (pulse, BP, temperature, respiratory rate) at each visit with values within normal limits.

5. Discussion

The present pilot study provides preliminary evidence that weight loss cookies formulated with *Lekhaniya Dravya* (Jowar, Ragi, Kodo, Vacha) are safe, palatable, and efficacious in reducing body weight, BMI, and waist circumference in overweight individuals of both *Kapha Vataj* and *Kapha Pittaj Prakruti* over a 90th -day intervention period.

Groups A and B, which received the cookie intervention, demonstrated statistically significant reductions in all anthropometric parameters by Day 45 ($p<0.05$) with more pronounced changes by Day 90 ($p<0.01$).

The greater anthropometric reductions observed in Group B (*Kapha Pittaj Prakruti*) compared to Group A (*Kapha Vataj Prakruti*) - with statistically significant between-group differences ($p<0.05$) - is consistent with Ayurvedic theory. Individuals with *Kapha Pittaj Prakruti* possess a stronger baseline *Agni* (metabolic fire) driven by *Pitta* dominance, which may be more readily stimulated by the *Deepana-Pachana* and *Ushna* properties of the *Lekhaniya Dravya*. This suggests that *Prakruti*-stratified dietary intervention may offer differential metabolic responses, a key hypothesis to be tested in the main PhD trial.

The improvement in lipid profile - particularly reductions in Total Cholesterol, Triglycerides, and LDL-Cholesterol, alongside an increase in HDL-Cholesterol - in the cookie intervention groups is noteworthy. High-fibre cereals such as Jowar and Ragi contain beta-glucan and dietary fibre that delay gastric emptying, suppress postprandial glycaemia, and modulate lipid metabolism through increased bile acid excretion.[26,27] Vacha (*Acorus calamus*) has been demonstrated in preclinical studies to possess lipid-lowering properties through *Medohara* and *Srotovishodhana* actions.[25]

The effect sizes (Cohen's d) for body weight change in Groups A and B were 0.74 and 0.88 respectively, indicating medium-to-large effects. These values will be used to calculate the sample size for the full-scale randomised controlled trial as per the PhD protocol, in which n=100 per intervention group is proposed, providing adequate power (≥80%) at $\alpha=0.05$.

6. Conclusion

This pilot study demonstrates that weight loss cookies formulated with *Lekhaniya Dravya* are safe, palatable, and effective in reducing anthropometric parameters and improving lipid profile in overweight individuals of *Kapha Vataj* and *Kapha Pittaj Prakruti*. The *Kapha Pittaj* group showed marginally greater reductions, supporting the role of *Prakruti*-based personalisation in Ayurvedic dietary management. The pilot confirms the feasibility of the full-scale PhD study (n=100 per group) and provides the effect-size data needed for its power calculation. No adverse events were recorded, and compliance was excellent. The proposed full-scale comparative, randomized, controlled study is warranted.

7. Photographic Documentation of Anthropometric Measurements

The following figures depict the standardised measurement techniques employed in this pilot study, conducted at the Department of Kriya Sharir, R. N. Kapoor Memorial Ayurvedic Medical College and Hospital.

Figure 1. Waist Circumference Measurement using a non-elastic tape at the level midway between the last rib and the iliac crest.

Figure 2. Body Weight Measurement: Digital scale displaying 77.3 kg. Subject standing in minimal footwear.

For measurement standardisation: All measurements were performed by the same trained researcher, using calibrated instruments throughout the study to minimise inter-observer error.

DECLARATIONS

Ethical Clearance

This pilot study was conducted after obtaining ethical clearance from the Institutional Ethics Committee (IEC) of Parul Institute of Ayurved, Parul University, Vadodara. Written informed consent was obtained from all participants prior to enrollment. The study was conducted in accordance with the Declaration of Helsinki (2013 revision) and ICMR Ethical Guidelines for Biomedical Research on Human Participants (2017).

Conflict of Interest

The authors declare no conflict of interest.

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