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Nigella Seed Water Innovation for Obese Women: A Natural Approach to Sustainable Weight ManagementDhyani Shubha¹, Shatakshi²

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Keywords*Nigella sativa*, obesity, functional beverage, plant-based nutrition, sustainable diets, women's health, black seed water.**ABSTRACT**

Background: Sustainable nutrition emphasizes the use of affordable, environmentally conscious, and culturally appropriate dietary practices to promote health and well-being. With obesity emerging as a critical global health issue, particularly among women, there is a need for accessible, plant-based solutions. Nigella seed (black seed) is a traditional medicinal plant known for its anti-obesity, antioxidant, and metabolic benefits. **Aim and Objectives:** This study aims to develop a low-calorie, natural, and functional beverage using Nigella sativa seeds to support weight management by reducing BMI in obese women, in alignment with sustainable nutrition principles. **Materials and Methods:** The formulation involved boiling 100 ml of drinking water at 100°C, adding 3 grams of Nigella sativa seeds, and boiling again for 5 minutes. The mixture was then filtered to obtain a clear herbal infusion. The estimated energy content was 0.99 kcal per 100 ml. The preparation was evaluated based on ease of preparation, safety, palatability, and its potential for supporting metabolic health. **Results:** The resulting Nigella seed water was light, palatable, and well-tolerated. Its minimal caloric content makes it suitable for calorie-restricted diets. Given its rich phytochemical profile, the drink holds potential for reducing BMI, regulating blood glucose levels, improving digestion, and enhancing lipid metabolism. The preparation method was simple, cost-effective, and adaptable to daily routines. **Conclusion:** Nigella seed water presents a sustainable and natural dietary approach for obese women. It is culturally acceptable, low-cost, and easy to integrate into nutrition plans. Further research may explore its long-term impact on metabolic parameters.

INTRODUCTION

Obesity is no longer confined to being a cosmetic or lifestyle concern; it has become a widespread health disorder with severe metabolic consequences. Globally, the prevalence of obesity has tripled since 1975, and women are increasingly affected by this epidemic due to unique physiological, hormonal, and socio-cultural factors (WHO, 2021). In India, urbanization, sedentary occupations, hormonal imbalances, and socio-cultural pressures have further escalated the rate of obesity among women, particularly in reproductive and post-reproductive age groups (Gupta et al., 2016). Female obesity not only contributes to increased risks of diabetes, cardiovascular diseases, and infertility but also impacts psychological well-

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being, quality of life, and social participation. Conventional treatment approaches such as pharmacotherapy, restrictive dieting, and bariatric surgery are often either inaccessible due to cost, or unsustainable due to side effects or poor long-term adherence. Moreover, these methods rarely integrate traditional wisdom or sustainable principles that align with cultural contexts. Therefore, the quest for safe, natural, affordable, and sustainable alternatives for weight regulation is both relevant and timely. In this context, re-examining the value of time-tested natural remedies, especially those rooted in indigenous knowledge systems, offers promising solutions for contemporary health challenges. Nigella seed, commonly referred to as black cumin or kalonji, is one such natural remedy with a rich ethnomedical legacy. Used for centuries across South Asia, the Middle East, and North Africa, Nigella seeds have been part of both culinary and medicinal traditions. Their use spans from treating digestive discomfort to enhancing immunity and alleviating metabolic disorders. Modern scientific inquiry has now begun to validate these traditional claims. The seeds contain potent bioactive compounds such as thymoquinone, thymohydroquinone, and nigellone that exhibit anti-inflammatory, antioxidant, antihyperlipidemic, and antidiabetic properties (Farooq & Sehgal, 2018). These properties make Nigella particularly suitable for addressing key metabolic dysfunctions that underlie obesity. Among various modes of consumption, Nigella seed water prepared by boiling the seeds in water lightly to create a decoction offers a simple, natural, and sustainable method of delivery. It requires no industrial processing, contains no additives, and can be prepared using minimal resources. As a result, Nigella seed water presents a feasible alternative for women, especially in low-resource or rural settings where access to pharmaceutical or commercial weight-loss aids is limited. More than just a household remedy, Nigella seed water embodies the idea of “functional hydration,” where the medium of water serves not only as a carrier of active phytochemicals but also promotes satiety, reduces appetite, and improves digestion. When consumed on an empty stomach in the morning, this water-based infusion may support detoxification pathways, enhance metabolism, and contribute to improved lipid and glucose regulation, all of which are key factors in sustainable weight management (Kocyigit et al., 2015). Another crucial reason for exploring Nigella seed water as a therapeutic option is its cultural relevance and non-invasive nature. Many Indian households are already familiar with traditional detox waters made from fenugreek, cumin, or fennel seeds. Nigella, therefore, fits naturally into existing dietary frameworks, increasing the

likelihood of adherence and long-term behavioral change. This contrasts with foreign or synthetic solutions that may be perceived as intrusive, unaffordable, or incompatible with local customs. Obesity, particularly in women, presents complex clinical and public health challenges. In addition to its association with numerous comorbidities—including insulin resistance, hypertension, dyslipidemia, and non-alcoholic fatty liver disease—female obesity also contributes to reproductive dysfunctions such as anovulation, infertility, and polycystic ovarian syndrome (PCOS) (Rathnayake et al., 2021). The psychosocial impact is equally profound, often manifesting in reduced self-esteem, body image dissatisfaction, and depression (Wardle & Cooke, 2005). These multidimensional burdens demand holistic, integrative solutions that are not only clinically effective but also safe, affordable, and sustainable in the long term. Conventional weight-loss approaches often rely on calorie restriction, high-intensity physical activity, and commercial supplements. However, these interventions are typically associated with poor long-term adherence due to issues such as cost, unrealistic expectations, metabolic adaptations, and side effects (MacLean et al., 2015). Additionally, in low-income and rural populations, limited access to professional health services and culturally inappropriate interventions further reduce their effectiveness. This gap necessitates the exploration of time-honored, food-based solutions with evidence-backed therapeutic outcomes. Nigella sativa is one such candidate, recognized not only for its historical use in folk medicine but also for its documented pharmacological effects in scientific literature. The seeds have shown anti-obesity, hypoglycemic, hypolipidemic, and hepatoprotective activity in both animal and human models (Bamosa et al., 2010). A meta-analysis by Namazi et al. (2018) concluded that Nigella sativa supplementation significantly reduces body weight, waist circumference, and BMI among obese individuals. These findings suggest that it may act by modulating appetite, reducing oxidative stress, and influencing fat metabolism at the cellular level. The mechanism behind Nigella’s anti-obesity effects is believed to involve several pathways. Thymoquinone, the primary bioactive constituent, is known to downregulate inflammatory cytokines such as TNF- α and IL-6, which play a role in obesity-related inflammation (Gholamnezhad et al., 2016). It also inhibits lipid peroxidation and improves insulin sensitivity, which can be particularly beneficial for women experiencing hormonal imbalances or insulin resistance, a common occurrence in female obesity. What sets Nigella seed water apart from capsules or oil-based preparations is its simplicity and compatibility with

traditional consumption practices. Unlike encapsulated extracts, the aqueous form retains water-soluble phytochemicals and allows for a gentle introduction of therapeutic compounds without overwhelming the digestive system. Infusing seeds in water, through decoction, is also a method traditionally used in Indian households for herbs such as ajwain, methi, and jeera, making it both familiar and culturally acceptable (Baliga et al., 2013). Furthermore, the psychological acceptance of "functional waters" is higher among women, who often prefer lighter and natural health remedies compared to invasive or artificial interventions. The ritualistic morning consumption of herbal infusions is already embedded in many health routines, which increases compliance and potential long-term benefits. Importantly, Nigella seed water offers an environmentally conscious alternative to commercial weight-loss drinks and supplements. The seeds are non-perishable, locally available, and inexpensive. They require no industrial processing, refrigeration, synthetic additives, or elaborate packaging. When

incorporated into a community health strategy, this approach can minimize ecological impact while maximizing health outcomes, making it especially relevant in the context of planetary health and sustainable food systems (Willett et al., 2019). Given these promising properties, Nigella seed water represents more than just a weight-loss aid; it stands as a functional health beverage rooted in tradition and supported by science. It offers a rare convergence of accessibility, efficacy, safety, and sustainability. Yet, despite its historical popularity, systematic research into its structured use, especially among obese women, is limited.

This study therefore, focuses on developing and validating a Nigella seed water protocol designed for obese women, assessing its health impact. Through anthropometric and lipid profile tracking, user adherence, and subjective feedback, the research aims to understand not only whether the intervention is effective, but also how acceptable and scalable it is in real-world settings.

Table 1. Functional Benefits of Nigella Seed Water in Obese Women

Health Domain	Mechanism of Action	Benefits for Obese Women
Metabolic Regulation	Thymoquinone improves insulin sensitivity and glucose uptake	Lowers blood sugar, improves HbA1c, and supports weight loss
Lipid Profile Support	Reduces LDL oxidation, improves HDL, and reduces triglycerides	Protects against heart disease and fatty liver
Hormonal Balance	Modulates LH/FSH, reduces testosterone levels	Helpful in managing PCOS and restoring ovulatory cycles
Digestive Health	Stimulates bile and digestive enzymes	Enhances digestion, reduces bloating, and improves gut function
Satiety & Appetite	Promotes fullness, may regulate hunger-related hormones	Helps reduce overeating and supports mindful eating
Antioxidant Defense	Neutralizes free radicals, lowers inflammatory cytokines	Reduces oxidative stress and inflammation
Safety & Accessibility	Traditional use, no side effects, easy preparation	Affordable, culturally accepted, ideal for long-term use
Sustainability	Minimal processing, low ecological footprint	Eco-friendly health solution for community-scale adoption

Table 1. This table highlights the multi-dimensional health benefits of Nigella seed water, especially for obese women. Its natural bioactive compounds support metabolic, hormonal, and digestive functions, making it a sustainable and accessible solution for long-term weight management and women's health improvement.

Therapeutic Mechanisms of Nigella Seed Water: Phytochemical and Antioxidant Properties:

Nigella sativa seeds are known for their rich and diverse profile of bioactive compounds, most notably thymoquinone, which has been extensively studied for its antioxidant, anti-inflammatory, and metabolic effects. In obese individuals, chronic low-grade inflammation and oxidative stress play a major role in the onset of insulin resistance, metabolic syndrome, and cardiovascular complications. The antioxidant capacity of Nigella seed water may help neutralize free radicals, reduce

systemic inflammation, and protect tissues from oxidative damage (Samarghandian et al., 2016).

Besides thymoquinone, Nigella seeds contain nigellone, carvacrol, p-cymene, and alpha-hederin, compounds that possess anti-obesity, anti-lipidemic, and immunomodulatory actions (Ali & Blunden, 2003). These components are partially extracted through traditional water-based methods like soaking and decoction, making Nigella seed water a gentle, effective, and sustainable delivery method — ideal for long-term use in lifestyle-based obesity management.

Regulation of Blood Glucose and Lipid Profiles:

One of the most clinically relevant benefits of *Nigella sativa* is its ability to regulate blood glucose and lipid metabolism. Research shows that thymoquinone improves insulin sensitivity, stimulates pancreatic beta-cell function, and

modulates glucose uptake at the cellular level (Bamosa et al., 2010). These actions are especially crucial for obese women, who are more likely to develop impaired glucose tolerance, prediabetes, or Type 2 diabetes.

Regular consumption of Nigella seed water may contribute to:

- Reduction in fasting blood sugar and HbA1c levels
- Decrease in total cholesterol, LDL, and triglycerides
- Improvement in HDL levels, offering cardiovascular protection

These effects support better metabolic health and help reduce the risk of fatty liver disease, hypertension, and insulin resistance (Gholamnezhad et al., 2016).

Hormonal Modulation and Support in PCOS:

Obesity in women is commonly linked to hormonal dysregulation, including hyperandrogenism, anovulation, and menstrual irregularities—symptoms that often overlap with Polycystic Ovary Syndrome (PCOS). Research has shown that Nigella possesses anti-androgenic properties and may help restore ovulatory function (Ansari et al., 2013).

Nigella seed water is believed to influence reproductive hormones by:

- Modulating Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH) levels
- Reducing testosterone levels and improving insulin resistance
- Supporting menstrual cycle regularity and ovarian function

This makes Nigella seed water particularly relevant for obese women with PCOS, as it offers a natural, hormone-supportive, and metabolic aid with minimal side effects.

Anti-Inflammatory Effects:

Chronic inflammation plays a central role in obesity and related complications like insulin resistance and PCOS. Thymoquinone inhibits pro-inflammatory cytokines such as TNF- α , IL-6, and NF- κ B, helping to reduce systemic inflammation in obese individuals (Woo, C. C., 2012).

Gut Microbiota Modulation:

1. Macronutrients

Nutrient	Amount (per 100g)	Role in Weight Management
Protein	20–22 g	Promotes satiety and lean mass maintenance (Ali, 2003).
Fat	30–40 g (mostly unsaturated)	Contains essential fatty acids (linoleic and oleic acid) that help regulate lipid metabolism (Ramadan, 2007).
Carbohydrates	35–40 g	Slow-releasing energy; rich in dietary fiber (Ali, 2003).

Recent studies suggest Nigella sativa has prebiotic-like effects that support gut health. It promotes beneficial bacteria and suppresses harmful species, which is particularly important in obese women, where gut dysbiosis is common (Bamagous, G. A., et al. 2022).

Appetite and Satiety Regulation:

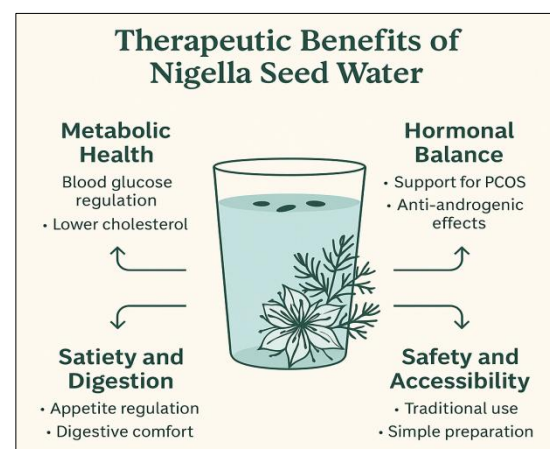
Some clinical trials show that Nigella supplementation reduces appetite and food intake by influencing ghrelin and leptin, hormones that control hunger and fullness (Sabzghabae, A. M., et al., 2012).

Liver Function & Fatty Liver Protection:

Obese individuals are at high risk of Non-Alcoholic Fatty Liver Disease (NAFLD). Thymoquinone shows hepatoprotective effects by reducing liver fat accumulation and improving liver enzyme levels (Ahmed, M., et al., 2014).

Improvement in Menstrual Cycle and Fertility Parameters:

In obese women with PCOS, Nigella sativa has been shown to improve menstrual regularity, follicle development, and ovulation rate, supporting its traditional use in fertility management (Dehkordi, F. R., & Kamkhah, A. F., 2008).



Nutritional Composition of Nigella Seeds (Nigella sativa):

Nigella seeds are nutritionally dense and contain a variety of bioactive compounds, macronutrients, and micronutrients that contribute to their weight management and metabolic benefits.

Fiber	7–10 g	Aids digestion and enhances satiety (M.T., 2010).
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Table 2. The macronutrient profile of Nigella seeds demonstrates their potential in promoting satiety, supporting lipid metabolism, and maintaining energy balance. These properties align with their traditional use and emerging role in dietary interventions for obesity management in women.

2. Essential Fatty Acids

• Linoleic acid (Omega-6):	- 50–60% of total fat content
• Oleic acid (Omega-9):	20–25%
• Palmitic acid:	12–14% These fatty acids improve lipid profiles, reduce inflammation, and support metabolism. (S. et al. (2007).

3. Phytochemicals (Bioactive Compounds)

Compound	Function
Thymoquinone	Antioxidant, anti-inflammatory, enhances glucose and lipid metabolism (Gholamnezhad, Z. et al., 2016).
Nigellone	Bronchodilator, antioxidant
α -Hederin	Enhances insulin sensitivity
Flavonoids, Saponins, Tannins	Regulate fat absorption, antioxidant action (M.W., 2015).

4. Vitamins

• Vitamin A
• Vitamin B1 (Thiamine), B2 (Riboflavin), B3 (Niacin)
• Vitamin C
• Vitamin E (Tocopherol) These help in energy metabolism, fat oxidation, and antioxidant defense. (M.A.F., 1998).

5. Minerals

Mineral	Function
Calcium	Supports metabolic activity
Iron	Required for oxygen transport & energy production
Zinc	Regulates insulin function
Magnesium	Improves glucose control
Potassium	Assists in sodium balance, reduces bloating (M.A. et al., 2003).

How This Supports Weight Management

• High fiber and protein content promote satiety and reduce appetite.
• Thymoquinone enhances fat oxidation and reduces insulin resistance.
• Essential fatty acids improve lipid metabolism and reduce body fat accumulation.
• Antioxidants reduce inflammation, which is linked with obesity and metabolic syndrome.

AIM AND OBJECTIVE:

To prepare a standardized decoction of Nigella seeds that provides key nutrients and bioactive compounds to promote weight management in obese women, with a specific focus on reducing Body Mass Index (BMI) as a measurable clinical parameter, through natural and sustainable nutrition.

MATERIALS AND METHODS:

1. Materials:

- Nigella sativa (black seeds): Dried Nigella seeds were procured from a certified organic supplier to ensure purity and absence of contaminants.
- Water: Distilled water was used for all preparations to maintain consistency and prevent microbial interference.
- Glassware and Equipment: Standard laboratory glassware, stainless steel boiling vessel, filtration setup (muslin cloth/filter paper), digital weighing scale, and measuring cylinders were used.

2. Preparation of Nigella Seed Water (Decoction):

A traditional decoction method was employed:

- Quantity: 3 grams of Nigella sativa seeds were weighed using a digital scale.
- Boiling: The seeds were added to 100 mL of distilled water and boiled gently for 5 minutes at a temperature of 100°C.
- Cooling and Filtration: The mixture was allowed to cool to room temperature, and then filtered using a sterile muslin cloth to remove solid residues.
- Analytical Reagents: All chemicals used for nutritional and phytochemical analysis were of analytical grade.

3. Participants

- Working and non-working obese women.
- Age between 25–45 years.
- Recruitment from the urban areas of Najibabad, Uttar Pradesh.

4. Study design

- This was a comparative experimental trial for 12 weeks.
- Design to investigate the effect of Nigella seed's water on the BMI and weight management of obese women.
- The total number of participants was 100, divided into 2 groups based on their employment status: non-working (Group I) and working (Group II).

5. Dose

- 100 ml was administered once daily on an empty stomach in the morning.

RESULTS AND DISCUSSION:

Nutritional Composition:

The nutritional analysis of Nigella seed water was conducted per 100 mL serving. The results are

summarized below:

Parameter	Result (per 100 mL)	Method Used
Fat	0.07 g	FSSAI Manual
Protein	0.09 g	IS 7217:1973
Carbohydrate	Nil	IS 1656:2022
Energy (Calories)	0.99 kcal	IS 1433:2007
Sodium	3.76 mg	DTRL-STP-QCC-275
Potassium	17.70 mg	DTRL-STP-QCC-275S

Table 3. Nutritional composition of Nigella seed water per 100 mL, showing minimal energy contribution and trace macronutrient presence, indicating its suitability as a low-calorie functional recipe.

The formulation is extremely low in calories, providing less than 1 kcal per 100 mL, making it a suitable option for individuals aiming for weight control. The minimal fat (0.07 g) and protein content (0.09 g) indicate that the decoction does not significantly contribute to macronutrient intake, aligning with its intended role as a functional or therapeutic drink rather than a complete nutritional supplement.

Sodium and potassium were present in trace amounts, with potassium (17.70 mg/100 mL) being more prominent than sodium (3.76 mg/100 mL). This balance supports fluid regulation and metabolic function, especially important for obese individuals who may have hypertension or metabolic imbalances.

BMI (Body Mass Index):

Significant reductions were observed in both groups:

- Non-working women: Decrease of 4.72 ± 2.19 , from 34.30 ± 4.50 to 29.58 ± 4.09 , which was highly significant ($p < 0.001$).
- Working women: Decrease of 3.32 ± 2.51 , from 32.68 ± 4.09 to 29.36 ± 3.79 , also highly significant ($p < 0.001$).

No significant difference in BMI between the two groups before the intervention, a significant difference emerged after the intervention, indicating that non-working women experienced a greater reduction in BMI. Overall, the Nigella seed water proved effective in reducing BMI in both working and non-working obese female patients.

Table 4. Clinical parameters before and after 12 weeks of treatment with Nigella Seed Water

Group	Before Intervention (Mean $\pm$ SD)	After Intervention (Mean $\pm$ SD)	Mean Reduction $\pm$ SD	Within-Group Comparison (Paired t-test) t-value	Within-Group Comparison (Paired t-test) p-value
Non-Working Women (n=47)	34.30 ± 4.50	29.58 ± 4.09	4.72 ± 2.19	12.919	<0.001
Working Women (n=48)	32.68 ± 4.09	29.36 ± 3.79	3.32 ± 2.51	9.799	<0.001
Between-Group Comparison (Unpaired t-test) Before Intervention				1.832	0.069
Between-Group Comparison (Unpaired t-test) After Intervention				2.509	0.013

Data are presented as Mean Value (SD)

NS: not significant

* $P < 0.05$ (paired t-test for the evaluation within the treatment group)

DISCUSSION:

The present study demonstrates a statistically significant reduction in Body Mass Index (BMI) among both working and non-working obese women following a three-month intervention with Nigella seed water. The mean BMI reduction was greater among non-working women (4.72 ± 2.19 ; $p < 0.001$) compared to working women (3.32 ± 2.51 ; $p < 0.001$), indicating a strong within-group effect in both cohorts. The between-group analysis after the intervention revealed a statistically significant difference ($p = 0.013$), suggesting that lifestyle factors such as physical

activity, daily routine, or stress levels might have influenced the differential impact.

Although Nigella seed water contains negligible carbohydrates and low caloric value, its efficacy can be attributed to its rich phytochemical profile, particularly thymoquinone and antioxidants. These bioactive compounds are known to modulate inflammation, improve insulin sensitivity, and support lipid metabolism, all of which are crucial in managing obesity. The absence of added sugars, synthetic flavourings, or preservatives ensures that the decoction aligns with clean-label and health-conscious dietary preferences.

Compared to commercially available herbal beverages, Nigella seed water provides a safer, natural, and cost-effective alternative for

individuals aiming for sustainable weight management. The significant BMI reduction observed in this study supports its potential role as a functional dietary intervention, particularly for women seeking natural remedies without compromising energy balance or nutritional safety.

These findings also reinforce the feasibility of incorporating traditional medicinal knowledge into modern health frameworks, especially in community-based obesity interventions. Further studies may explore long-term outcomes, hormonal effects, and metabolic biomarkers to deepen the understanding of *Nigella* seed's therapeutic potential.

CONCLUSION:

The present study successfully developed a *Nigella* seed water formulation using traditional decoction methods and evaluated its nutritional, functional, and clinical efficacy. Nutritional analysis confirmed that the formulation is low in calories, fat, and sodium, making it a safe and suitable option for obese individuals pursuing natural weight management strategies. Despite its minimal macronutrient content, the presence of essential minerals such as potassium and potent bioactive compounds like thymoquinone underlines its antioxidant and anti-inflammatory potential, both vital in metabolic regulation and fat reduction.

Clinically, a significant decrease in BMI was observed in both non-working and working obese women following a three-month intervention, with greater mean BMI reduction noted among non-working women (4.72 ± 2.19) compared to working women (3.32 ± 2.51). The statistically significant within-group and between-group differences affirm the therapeutic potential of *Nigella* seed water in real-world settings.

Importantly, the decoction was free from detectable heavy metals, alleviating concerns often linked with commercial weight-loss supplements. Given its safety profile, affordability, and cultural acceptance, *Nigella* seed water emerges as a promising, sustainable dietary intervention for obesity management. However, future clinical trials are necessary to explore its long-term impact on metabolic health markers, hormonal balance, and overall well-being across diverse populations.

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