



Effect of Nigella Seeds Supplementation on Total Cholesterol Levels among Working and Non-Working Obese Women: A Clinical Trial

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KEYWORDS

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ABSTRACT:

Objective(s): This comparative experimental study aimed to investigate the effects of Nigella seed recipe on the cholesterol level of obese women in Najibabad, Uttar Pradesh.

Materials and Methods: One hundred working and non-working obese women aged 25 to 45 were allocated to the experimental group. Participants in the treatment group received a daily oral preparation of *Nigella sativa* seeds. The preparation involved boiling 3 grams of whole *Nigella sativa* seeds in 100 millilitres of water at 100°C for 5 minutes. The mixture was then filtered using a sterile muslin cloth or fine filter paper to remove solid residue, and the resulting aqueous extract was allowed to cool to a drinkable temperature before administration. Participants were instructed to consume the entire 100 mL dose once daily, preferably in the morning on an empty stomach, for the duration of the 12-week intervention period. Adherence was monitored via daily intake logs and weekly check-ins. Participants abstained from taking any other drugs, herbal preparations, or food supplements throughout the study. Body weight, height, waist circumference, blood pressure, biochemical parameters, and hormonal levels were measured at baseline and at the end of the experiment face to face interview was carried out at baseline and every week to check for compliance.

Results: Both working and non-working groups significantly improved their total cholesterol level.

Conclusion: This study demonstrates that *Nigella sativa* supplementation has a significant impact on reducing total cholesterol levels in obese women. The findings suggest that regular intake of *Nigella sativa*, when combined with a controlled diet and lifestyle modifications, can contribute to the improvement of lipid profiles. The cholesterol-lowering properties of *Nigella sativa* may be attributed to its active compounds, particularly thymoquinone, which is known for its antioxidant and lipid-lowering effects. These results support the potential use of *Nigella sativa* as a natural adjunct therapy for managing hypercholesterolemia, especially in populations at risk for cardiovascular disease. However, further large-scale and long-term studies are warranted to validate these findings and elucidate the underlying mechanisms.

INTRODUCTION

Undoubtedly, one of the biggest and most significant worldwide healthcare concerns in the twenty-first century is obesity. Over 650 million people globally are dealing with obesity, which the World Health Organisation (WHO) defines as an abnormal or

excessive buildup of fat that poses a health risk. The incidence of obesity is continuously rising in both developed and developing nations (World Health Organization [WHO], 2023). The growing problem of obesity has increased to terrifying levels in the past several years, and the multiple medical conditions it causes are severely taxing economies and healthcare



providers. Obesity is more dangerous for women because of the direct physiological effects as well as the interaction of biological, social, and psychological variables that lead to its development and maintenance.

Women who are obese have a greater probability of being diagnosed with several chronic medical conditions, for example, cardiovascular disease, high blood pressure, type 2 diabetes, polycystic ovarian syndrome (PCOS), and some cancers, such as endometrial and breast cancer (Ng et al., 2014; Blüher, 2019).

Obesity has major psychological effects as well to its physical consequences. A lack of confidence, appearance discontentment, perceived inferiority, and higher levels of depressive symptoms and anxiety are common in obese women (Puhl & Heuer, 2009; Luppino et al., 2010). These psychological repercussions might exacerbate weight gain and impede treatment attempts by sustaining an unhealthy pattern of emotional eating and inactive lifestyle behaviors.

That is why controlling female obesity needs a comprehensive and multifaceted strategy. Typical traditional therapies include behavior therapy, dietary changes, and enhanced physical activity. These tactics, however, frequently ignore the psychological costs associated with obesity as well as the more comprehensive idea of well-being, which covers energy levels, emotional equilibrium, mental health, and sleep quality (National Institute for Health and Care Excellence [NICE], 2014). As an outcome, additional and alternative treatments that improve the general quality of life in addition to weight loss are gaining popularity.

In recent decades, the utilization of plants for medicinal purposes with psychotropic and metabolic capabilities gained scientific attention as one such intervention. Recognized with various names, like black seed, black cumin, or Kalonji, *Nigella sativa* has been utilized for a very long time in Islamic, Ayurvedic, and Unani medicine. Anti-inflammatory in nature anti-microbial, antioxidant, antihypertensive, and hypoglycemic properties are among the alleged health advantages of *Nigella sativa* seeds (Ahmad et al., 2013; Butt & Sultan, 2010). These pharmacological effects are primarily ascribed to its bioactive components, particularly thymoquinone, which has shown a variety of

advantageous effects in research involving both humans and animals.

The significant function of *Nigella sativa* in controlling metabolic illnesses has been at the center of recent scientific research, which has started to prove many of these traditional claims. Multiple observational research and clinical investigations have proven that supplementing with *Nigella sativa* may result in notable improvements in insulin sensitivity, body weight, lipid profile, and fasting blood glucose (Sabzghabae et al., 2012; Bamosa et al., 2010). *Nigella sativa* oil supplementation use, for instance, dramatically decreased body mass index (BMI), total cholesterol, and low-density lipoprotein (LDL) cholesterol levels in obese people, according to a randomized controlled trial conducted by Darakhshan et al. (2015).

The majority of research to far has been on the physiological effects of *Nigella sativa*, with little investigation into its wider implications on psychological well-being, despite these encouraging results. This disparity is noteworthy, especially in light of the psychological toll that obese people—especially women—bear. Throughout obese populations, lack of energy, changes in mood, problems with sleep, and a lower quality of life are frequently noted (Hasler et al., 2004; Faith et al., 2011). Investigating whether *Nigella sativa* can improve subjective state-of-mind indicators including emotions, state of energy, sleeping habits, and self-perceived health status in addition to metabolic measures is crucial.

Although the exact methods through which *Nigella sativa* may affect the level of energy and psychological state are unknown, a number of theories have been put up. The primary active component of *Nigella sativa*, thymoquinone, has shown neuroprotective qualities such as reducing pro-inflammatory cytokines, modulating the effects of oxidative stress, and improving the functioning of neurotransmitters (Alhebshi et al., 2013; Khan et al., 2021). These behaviours might help with better sleep management, anxiety reduction, and mental clarity. Furthermore, *Nigella sativa* might possess an adaptogenic impact, assisting the body in overcoming stress and preserving physiological equilibrium, according to certain animal studies (Sultan et al., 2009).

Also, in many places, particularly in communities with deep roots in natural and prophetic medicine, the



consumption of herbal supplements like *Nigella sativa* is culturally meaningful. For example, black seed is considered a panacea among South Asian and Middle Eastern societies, where it is frequently utilised to treat a wide range of illnesses and maintain general health. This cultural acceptability may improve adherence to *Nigella sativa*-based therapies, enhancing their viability and practicality.

The requirement for secure, easily accessible, and socially appropriate integrative treatment techniques is evident given the weight of mental and physical problems that obese women experience. Given its long history of use and increasing scientific support, *Nigella sativa* seems like a good fit for these integrative approaches. To completely grasp its medicinal value, however, especially in relation to its impact on subjective health indices, thorough scientific research is required.

Consequently, the purpose of this study was to investigate how *Nigella seeds* intake affected total cholesterol levels in obese women between the ages of 25 and 45. It particularly focused on assessing differences in cholesterol modulation between working and non-working women within this demographic, considering the potential influence of lifestyle, occupational stress, and time availability on metabolic outcomes. While the primary endpoint was the change in total cholesterol, the study also explored how these changes might reflect broader physiological adaptations, offering indirect insights into cardiovascular risk management. This focused investigation contributes to a more precise understanding of *Nigella sativa*'s lipid-lowering potential, emphasizing its application in targeted, parameter-specific interventions for hypercholesterolemia within the context of obesity management.

This study also fills a significant gap in the literature by concentrating on a population segment that has received less focused attention: obese women in their early to mid-adult years, a group often navigating complex hormonal and metabolic challenges. Weight management and lipid regulation efforts may be further complicated in this group due to age-specific factors such as pregnancy, postpartum shifts, contraceptive use, and the onset of perimenopausal changes (Wild et al., 2004; Santoro et al., 2015). Moreover, competing caregiving responsibilities and professional demands often faced by

working women in this age group may influence health behavior patterns, including dietary consistency and stress-related metabolic dysregulation. As such, exploring practical, culturally acceptable, and naturally derived supplements like *Nigella sativa* could provide a sustainable intervention that fits within the real-life constraints of this population.

All things considered; this study aims to assess the role of *Nigella seeds* as a natural therapeutic approach for managing elevated cholesterol levels in obese women. By focusing on total cholesterol as a key biomarker, this research contributes to the broader discourse on integrative approaches to chronic disease prevention. With implications for both clinical application and public health policy, it underscores the importance of accessible, evidence-based interventions that address the nuanced needs of different subpopulations within the obesity spectrum, particularly those influenced by occupational and psychosocial stressors.

Research Aim

The purpose of this study was to investigate how supplementing with *Nigella seeds* (black seed) affected total cholesterol levels in obese women between the ages of 25 and 45. Specifically, the study aimed to evaluate the lipid-lowering effects of consistent *Nigella sativa* consumption, with a focused analysis on its impact on total cholesterol as a primary marker of cardiovascular risk. In addition, the study explored potential differences between working and non-working women, considering how varying lifestyle demands may influence cholesterol metabolism and overall lipid regulation. By examining these differences, the study sought to capture the real-world relevance of *Nigella sativa* supplementation within the everyday routines and stress profiles of adult women.

The main goal was to provide a comprehensive understanding of *Nigella seed*'s potential role in targeted metabolic intervention, specifically in the management of hypercholesterolemia associated with obesity. The research was designed to determine whether *Nigella sativa* could serve as a safe, practical, and effective adjunct to conventional cholesterol-lowering strategies, particularly in populations with unique metabolic and lifestyle challenges. By focusing on a demographic often underrepresented in clinical research—obese women navigating both biological and social complexities—the



study aimed to inform future clinical protocols, shape public health policy, and support informed personal decision-making regarding the use of plant-based supplements for improving lipid profiles and reducing cardiovascular risk.

Gender-Specific Variables in the Management of Obesity

A gender-sensitive approach that takes into consideration physiological, psychological, and lifestyle-specific factors is necessary to address obesity in women, especially those between the ages of 25 and 45. Due to menstruation, fertility, pregnancy, postpartum recuperation, and the start of perimenopause, this stage of life is frequently marked by significant hormonal and metabolic changes (Santoro et al., 2015). Insulin resistance, energy control, and fat distribution can all be strongly impacted by these mechanisms. For example, perimenopausal hormonal alterations are linked to a decrease in estrogen, which raises the risk of metabolic syndrome by causing central obesity and unfavorable changes in lipid profiles (Lovejoy et al., 2008). Also, certain prevalent medical conditions that affect women, such thyroid issues and polycystic ovarian syndrome (PCOS), are strongly associated with mood problems and

weight gain, making it more difficult to manage weight effectively (Rosenfield & Ehrmann, 2016).

Women's obesity outcomes are greatly impacted by social aspects of health along with biological predispositions. Women in their early and middle adult years are frequently disproportionately burdened by cultural expectations of caring, household duties, and professional obligations (Williams et al., 2017). Chronic stress, emotional tiredness, and less chances to engage in regular exercise and physical workload or health-focused behaviours can result from these responsibilities. Additionally, it has been demonstrated that women are prone to internalise weight stigma, which can lead to disordered eating, social disengagement, and even avoiding medical facilities (Puhl & Suh, 2015). Interventions for obesity must be not only clinically beneficial but also beneficial for psychological resilience and adapted to the needs of women's real-life situations due to the intricate interaction between internal and external influences. This makes the development of non-invasive, durable, and easily accessible treatment modalities, like those offered by phytotherapeutic substances like Nigella seeds, a clinical and public health necessity.

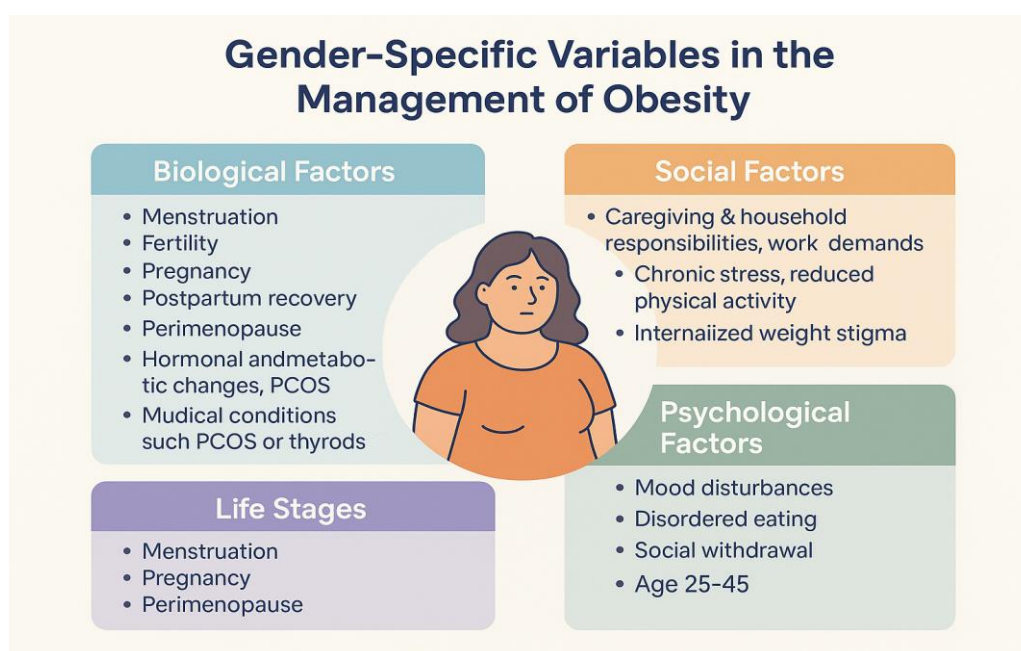


Fig.1. This infographic highlights the key biological, psychological, social, and life-stage-related factors contributing to obesity in women, underscoring the importance of tailored, gender-responsive, and holistic treatment approaches.



Nigella Sativa Integration into Culturally Informed and Holistic Care

Nigella sativa is a particularly intriguing contender as healthcare systems shift towards integrated treatments that incorporate lifestyle and alternative therapies with biological treatment. Its comprehensive pharmacological profile enables it to play two important functions in the treatment of obesity: metabolic management and mental health support. For example, it has been discovered that thymoquinone, the main active ingredient in *Nigella sativa*, reduces insulin resistance by altering the PI3K/Akt signalling pathway, which is essential for maintaining glucose homeostasis (Tembhurne & Sakarkar, 2010). By inhibiting inflammatory cytokines and strengthening antioxidant defences in the central nervous system, it simultaneously has neuroprotective benefits that support emotional stability and cognitive clarity (Alhebshi et al., 2013; Khan et al., 2021). These complementary effects imply that *Nigella sativa* may be able to successfully address the psychological as well as the physiological aspects of obesity, especially in women whose health outcomes are frequently influenced by these interrelated variables.

More importantly, *Nigella sativa*'s affordability and cultural familiarity make it a desirable therapeutic tool, particularly in cultures where long-term adherence to pharmaceutical therapies is limited by cost or convenience or where traditional healthcare may be viewed with skepticism. Black seed is already ingrained in many South Asian, Middle Eastern, and North African cultures as oil, seeds, or supplements, and is frequently used for preventative health maintenance (Ahmad et al., 2013). In addition to lowering usage obstacles, this ingrained cultural meaning raises the possibility of regular use, which is essential for attaining therapeutic efficacy. Research has also emphasized the significance of cultural customization in health interventions, showing that adherence and outcome measures typically improve dramatically when therapy is in line with a patient's beliefs and way of life (Kandula et al., 2012).

Despite these encouraging qualities, nothing is known about *Nigella sativa*'s capacity to improve the subjective well-being and quality of life of obese people, especially women. Few research has thoroughly investigated changes in mental health markers like mood balance, energy levels, and sleep regulation, while the majority have concentrated on its effects on lipid profiles, body weight, and glycaemic control. These elements must be given top priority in any obesity management plan that aims to produce long-lasting effects since they have the potential to significantly impact motivation and behavior changeability. Additionally, much clinical research has shown *Nigella sativa*'s safety and tolerability, with the most frequent adverse effect at regular dosages being moderate gastrointestinal symptoms (Gholamnezhad et al., 2016).

As opposed to solely focusing on numerical indicators like total cholesterol levels, this positions *Nigella seeds* as a low-risk supplement within integrative treatment regimens aimed at supporting comprehensive cardiovascular health and overall well-being.

In the end, examining *Nigella sativa* from a gender-based, holistic, and culturally aware perspective offers a novel approach to addressing critical gaps in the current literature. This study aims to provide evidence-based insights into the lipid-lowering potential of *Nigella sativa*, particularly in a demographic that has historically been underrepresented in clinical trials—obese women in early to mid-adulthood. By evaluating total cholesterol levels as the primary outcome, the study contributes to the growing understanding of how natural supplements can serve as effective metabolic interventions. At the same time, it acknowledges the broader context of women's health, including the lifestyle and hormonal complexities that influence treatment outcomes. This research lays the foundation for more person-centered strategies in managing obesity-related dyslipidemia—approaches that not only target biochemical parameters but also respect the multifaceted nature of women's health care needs.

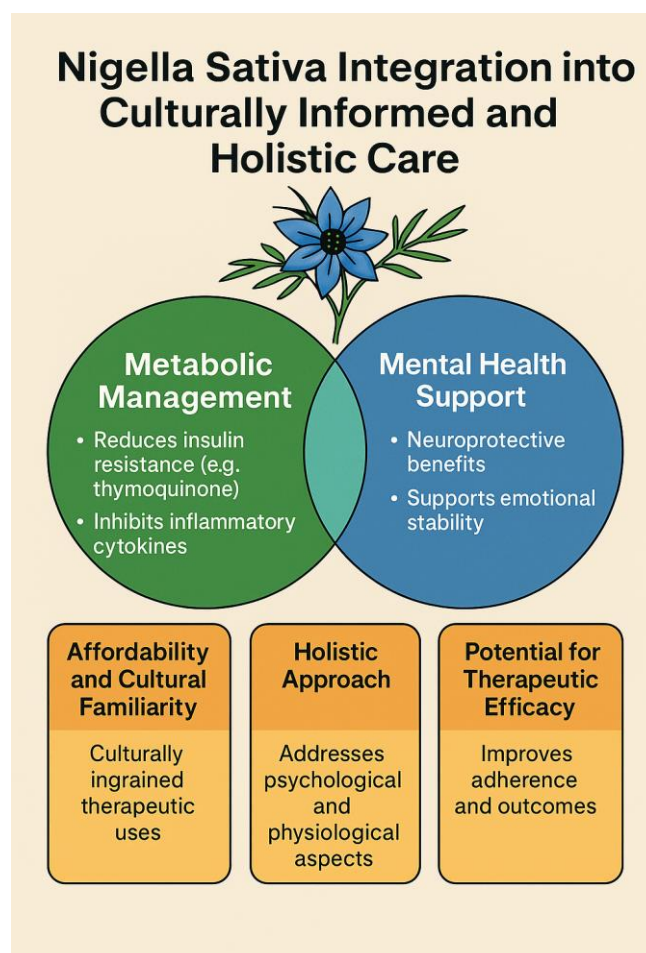


Fig.2. This infographic highlights *Nigella sativa*'s dual role in supporting metabolic health and emotional well-being, emphasizing its cultural relevance and holistic value in gender-sensitive obesity care.

MATERIALS AND METHODS

Participants: Working and non-working obese women aged between 25 and 45 years, presenting with obesity and signs of metabolic imbalance, were included in this study. Participants were recruited from the urban areas of Najibabad, Uttar Pradesh. Women who had received hormone replacement therapy (HRT) within the past three months were excluded.

Additionally, individuals taking any herbal supplements or pharmaceutical drugs that could influence metabolic parameters were not eligible for participation. Further exclusion criteria included a history of uncontrolled hypertension, stroke or transient ischemic attack, myocardial infarction, or a diagnosis of cancer within the

past five years. Women currently using lipid-lowering agents, anti-diabetic medications, or antihypertensive drugs were also excluded from the study.

Study design:

This study was a 12-week comparative experimental trial designed to investigate the effects of *Nigella sativa* supplementation on the metabolic profile of working and non-working obese women. The study population consisted of 100 obese women between the ages of 25 and 45 years, recruited and divided into two groups based on their employment status: non-working (Group I) and working (Group II). Participants were allocated to the experimental intervention group, receiving a standardized preparation of *Nigella sativa*.

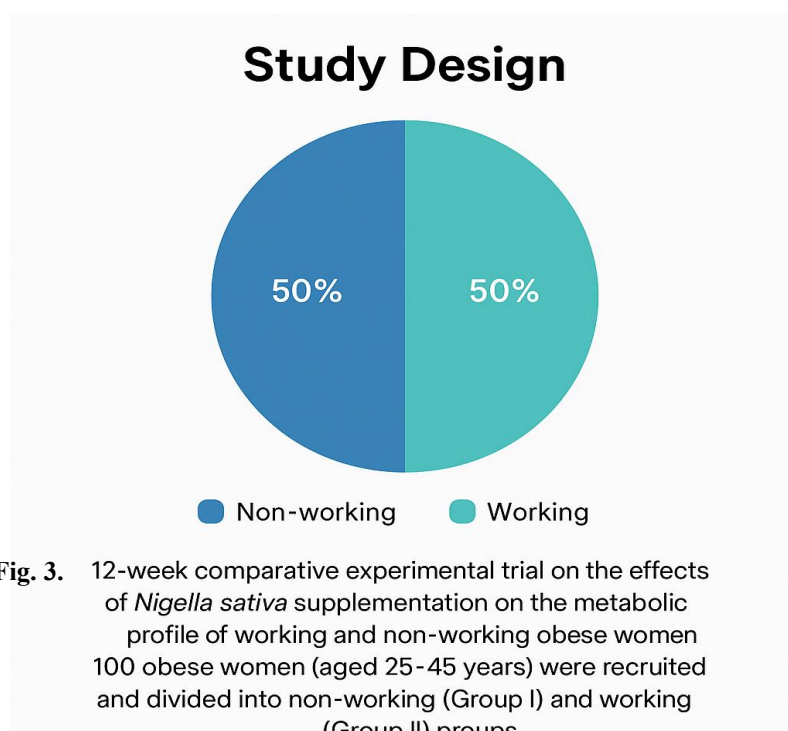


Fig. 3. 12-week comparative experimental trial on the effects of *Nigella sativa* supplementation on the metabolic profile of working and non-working obese women. 100 obese women (aged 25-45 years) were recruited and divided into non-working (Group I) and working (Group II) groups.

Participants and Recruitment

A total of 100 participants were initially enrolled in the study. Group I (non-working women) included 50 participants, and Group II (working women) included 50 participants. During the course of the study, five participants were withdrawn: three from Group I and two from Group II. Reasons for dropout included changes in dietary habits and voluntary withdrawal without a specific cause.

Following attrition, 95 participants completed the study — 47 in Group I and 48 in Group II. All participants provided informed consent before inclusion and were screened to meet eligibility criteria, including age, BMI within the obesity range, and no existing chronic conditions that might interfere with the study protocol.

Intervention

Participants in both groups received an oral aqueous extract of *Nigella sativa* seeds daily. The preparation involved the following procedure:

- **Dose:** 3 grams of whole *Nigella sativa* seeds
- **Method:** Seeds were boiled in 100 mL of water at 100°C for 5 minutes

- **Filtration:** The mixture was filtered through sterile muslin cloth or fine filter paper to remove any solid particles

- **Administration:** The resulting cooled aqueous extract (100 mL) was administered once daily

Participants were instructed to consume the entire 100 mL dose on an empty stomach in the morning. The intervention continued for a total duration of 12 weeks.

Compliance Monitoring

Adherence to the intervention was closely monitored through:

- Daily intake logs maintained by participants
- Weekly in-person or telephonic follow-ups conducted by the researcher

These steps were taken to ensure regular consumption of the supplement and to document any adverse events or changes in lifestyle that could impact the results.

Outcomes Measured

The primary outcome of this study was the change in **total cholesterol levels** as a key indicator of lipid metabolism and cardiovascular risk. Secondary observations included other contextual variables such as



working status (working vs. non-working women) to assess potential lifestyle-related influences on total cholesterol levels.

Measurements were taken at baseline and the end of the 12-week intervention period for both groups.

Ethical Considerations

The ethical standards of the institutional review board were followed when conducting the study. Written informed consent was obtained from all participants prior to enrolment.

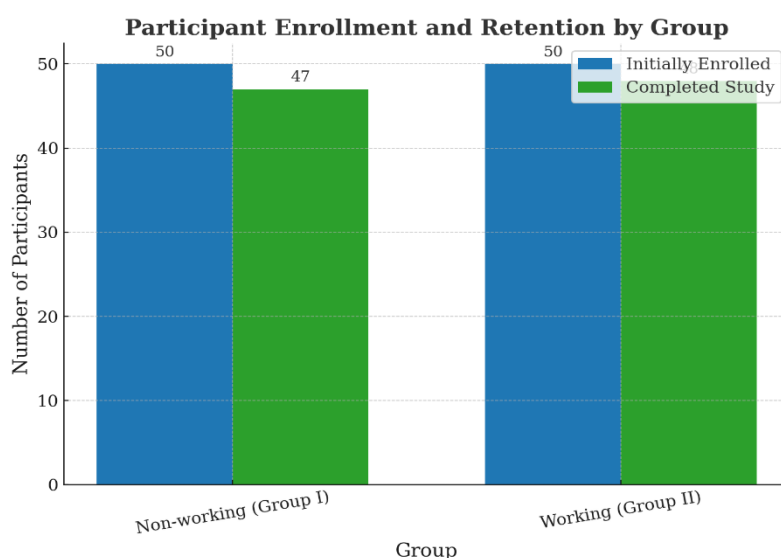


Fig.4. Here's the graph showing participant enrollment and retention in both the non-working and working groups of this study.

Clinical Assessment

Clinical assessments were conducted at baseline and at the end of the intervention period to evaluate the effect of *Nigella seeds* supplementation on total cholesterol levels. Blood samples were collected and analysed to measure changes in total cholesterol, providing a direct assessment of the supplement's impact on lipid metabolism. Additional demographic and lifestyle data, including working status, were recorded to contextualize variations in cholesterol response among participants.

Biochemical Assessment

Biochemical evaluation was a critical component of this study, aimed at determining the impact of *Nigella seeds* supplementation on total cholesterol levels as a primary indicator of lipid metabolism and cardiovascular risk in obese women. To ensure accuracy and consistency, all participants underwent standardized blood collection procedures at two time points: baseline and after

completion of the intervention period. Following an overnight fast of 8–12 hours, venous blood samples were drawn from each subject using aseptic techniques to minimize contamination and ensure the integrity of the samples.

The collected blood samples were immediately processed for serum separation through centrifugation and were subsequently analyzed for **total cholesterol (TC)** using validated enzymatic colorimetric methods on a fully automated biochemical analyzer. This method is widely recognized for its precision and reliability in quantifying serum cholesterol concentrations. Although additional lipid profile components such as triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) were recorded during the analysis, this study prioritized **total cholesterol** as the central biochemical parameter of interest, in alignment with its primary research objective.



Strict quality control measures were implemented throughout the analytical process to ensure data validity and reproducibility. All laboratory procedures were conducted according to established clinical guidelines and under the close supervision of trained and certified clinical laboratory personnel. This rigorous biochemical assessment protocol was designed to deliver reliable data that could accurately reflect the physiological response to *Nigella seeds* supplementation and offer meaningful insights into its cholesterol-lowering potential.

Dietary Intake

To control for variations in dietary intake and eliminate potential confounding effects, total energy expenditure for each participant was estimated using the Harris-Benedict equation, based on individual anthropometric and activity data. An iso-caloric diet plan was then prescribed for each participant to ensure uniform energy intake across both groups throughout the intervention period.

Dietary intake was assessed using a combination of three-day food records (including two weekdays and one weekend day) and 24-hour dietary recalls, collected at both the baseline and end of the study period. Participants were instructed by trained nutritionists on how to record their food intake accurately, including portion sizes and preparation methods.

Nutrient analysis was performed using 'DietCal' software (version X.X, Profound Tech Solutions, India), which is specifically adapted for Indian dietary patterns and food composition tables. This allowed for precise estimation of daily energy, macro-, and micro-nutrient intakes based on culturally relevant food data.

A qualified dietitian reviewed all dietary data to ensure completeness and accuracy, and participants were periodically counselled to maintain dietary compliance throughout the study.

Sample Size and Statistical Analysis

Based on existing literature and statistical power considerations, a total of 100 obese women were recruited for the study, equally divided into two groups: Group I (non-working, $n = 50$) and Group II (working, $n = 50$), with a significance level (α) of 0.05 and 80% power.

During the study, five participants dropped out — three from Group I and two from Group II — due to changes in dietary habits or voluntary withdrawal without a specified reason. Thus, 95 participants completed the study: 47 in Group I and 48 in Group II.

Statistical analysis was carried out using **IBM SPSS Statistics for Windows, version 20.0** (IBM Corp., Armonk, NY, USA) and **R software, version 4.2.2** (R Foundation for Statistical Computing, Vienna, Austria), which are widely used in Indian research settings. The significance level was set at $P < 0.05$.

To assess the normality of data, the Shapiro-Wilk test was applied. If non-normality was detected ($P < 0.05$), data were transformed using the Box-Cox transformation method. Continuous variables were presented as mean \pm standard deviation (SD), while categorical variables were expressed as counts and percentages.

□ **Continuous variables** were expressed as mean \pm standard deviation (SD), and comparisons between the two groups were made using **independent samples t-tests** (for normally distributed data) or the **Mann-Whitney U test** (for non-normal data).

□ **Categorical variables** were presented as counts and percentages, and analysed using the **Chi-square test or Fisher's exact test, as appropriate**.

□ For within-group comparisons before and after the intervention, **paired t-tests** were used.

□ To evaluate the effect of the intervention between groups while adjusting for baseline values, **analysis of covariance (ANCOVA)** was performed.

RESULTS

Out of 120 women screened for eligibility, a total of 100 obese women met the inclusion criteria and were enrolled in the study. The participants were equally divided into two groups: Group I (non-working women, $n = 50$) and Group II (working women, $n = 50$).

During the intervention period, five participants withdrew from the study. Specifically, three participants from Group I and two from Group II discontinued participation due to protocol violations, voluntary withdrawal, and personal reasons such as changes in dietary habits and family travel commitments (Table 1).



Consequently, 95 participants completed the study and were included in the final analysis — 47 in Group I and 48 in Group II.

Table1 . Reasons for early discontinuation

Reason for Withdrawal from Study	No. of Participants	Percentage (%)
Protocol violation	2	2.11%
Adverse events (e.g., change in dietary habits)	1	1.05%
Voluntary withdrawal (no specific reason)	1	1.05%
Other reasons (e.g., family holiday/travel abroad)	1	1.05%
Total	5	5.26%

Lipid Profile

Total Cholesterol

Significant reductions were observed in both groups:

- Non-working women: Decrease of 79.62 ± 40.19 mg/dL, from 244.21 ± 44.91 to 164.59 ± 33.79 ($p = 0.000$).

- Working women: Decrease of 90.7 ± 43.91 mg/dL, from 265.31 ± 53.19 to 174.61 ± 36.21 ($p = 0.000$).

No significant baseline difference ($p = 0.134$), but a significant post-intervention difference ($p = 0.030$) indicates both groups benefited, with working women showing slightly larger reductions.

Table 2. Clinical parameters before and after 12 weeks' treatment with Nigella seed recipe

Parameter	Group	Pre-Intervention (Mean \pm SD)	Post-Intervention (Mean \pm SD)	Mean Change \pm SD	p-value (Within Group)	p-value (Between Groups, Post)
Cholesterol (mg/dL)	Non-working	244.21 ± 44.91	164.59 ± 33.79	-79.62 ± 40.19	<0.001	Significant ($p = 0.030$)
	Working	265.31 ± 53.19	174.61 ± 36.21	-90.70 ± 43.91	<0.001	

Data are presented as Mean values (SD)

NS: not significant

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

DISCUSSION

This study aimed to evaluate the effects of *Nigella seeds* supplementation on total cholesterol levels in working and non-working obese women. The findings reveal that *Nigella seeds* supplementation significantly reduced

total cholesterol, with distinct differences observed between the two groups. The non-working group demonstrated a more pronounced reduction in total cholesterol levels compared to the working group, suggesting that lifestyle factors may play a critical role in influencing the effectiveness of *Nigella seeds* supplementation.

Our results show a substantial reduction in total cholesterol in both groups, with the non-working women experiencing a mean decrease of 79.62 mg/dL, compared



to 90.70 mg/dL in the working women. These results suggest that *Nigella seeds* has a significant lipid-lowering effect, aligning with previous studies that have highlighted its potential in improving lipid profiles. The reductions observed in total cholesterol levels in both groups are consistent with the proposed mechanisms of *Nigella seeds*, such as its antioxidant and anti-inflammatory properties, which likely contribute to improved lipid metabolism.

However, the more substantial reduction in total cholesterol in the working group could be influenced by a combination of factors, including daily physical activity levels, dietary habits, and the presence of higher stress levels typically associated with work-related responsibilities. Working women may experience more irregular eating habits and elevated stress, both of which could potentially reduce the bioavailability and efficacy of *Nigella seeds* supplementation, compared to non-working women who may have fewer stressors and more consistent daily routines. These findings highlight the importance of considering contextual factors, such as work-life balance and stress, when evaluating the efficacy of dietary interventions.

In addition to the effects on cholesterol, the results of this study indicate that *Nigella seeds* supplementation can complement traditional weight management approaches, but it should not be viewed as a standalone solution. Effective management of total cholesterol, as well as other metabolic disorders, requires an integrated approach that includes lifestyle modifications, such as dietary changes and regular physical activity. While *Nigella seeds* shows promise in improving metabolic markers, sustainable improvements are best achieved through a holistic approach to obesity management.

The observed differences between the working and non-working groups emphasize the need for personalized supplementation strategies. Factors like cortisol levels, stress, physical activity, and dietary patterns could mediate the impact of *Nigella seeds* supplementation. Future research should explore the mechanisms underlying these differences, particularly the interaction between lifestyle factors and the bioavailability of *Nigella seeds* compounds, in order to develop more tailored intervention strategies.

In conclusion, *Nigella seeds* supplementation appears to have a significant impact on reducing total cholesterol

levels in obese women, with distinct responses observed between working and non-working individuals. These findings underline the importance of personalized approaches in the management of obesity and its related metabolic disorders, considering both physiological and lifestyle factors that may influence the effectiveness of interventions.

CONCLUSION

This study demonstrates that *Nigella seeds* supplementation has a positive effect on the metabolic profile of obese women, with notable improvements observed in both working and non-working groups. The supplementation led to significant reductions in total cholesterol levels, highlighting the potential of *Nigella seeds* as a natural therapeutic agent for improving lipid profiles and metabolic health.

However, the impact of *Nigella seeds* was more pronounced in non-working women, suggesting that factors such as daily activity levels, stress, and lifestyle habits may modulate the effectiveness of the supplement. These findings emphasize the need to consider individual lifestyle factors when designing interventions for metabolic disorders, especially when addressing lipid-related conditions such as high cholesterol.

While *Nigella seeds* supplementation shows promising results in improving total cholesterol levels, it is clear that its full potential can only be realized when combined with broader lifestyle changes, including physical activity, dietary adjustments, and stress management. Future research should focus on exploring the mechanisms underlying these variations between groups and further investigate how *Nigella seeds* can be integrated into holistic strategies for managing obesity, improving metabolic health, and specifically targeting dyslipidemia.

In summary, *Nigella seeds* supplementation appears to be a beneficial adjunct in improving the metabolic profile of obese women, particularly in reducing total cholesterol levels, with varying levels of effectiveness depending on lifestyle factors. Continued research is needed to better understand the role of *Nigella seeds* in metabolic health and how it can be optimized for different populations, ensuring the best possible outcomes for individuals with varying lifestyle profiles.



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