Menopause-Related Insomnia, Cognitive, Behavioral, and Mindfulness-Based Treatments

Venu Anand Das [1], Jitendra Sinha [1]

Abstract

The transition to menopause brings about various symptoms affecting women's quality of life, such as sleep issues and changes in cognition and behavior. Existing treatments face challenges in effectively addressing this complexity. The Menopause-based Treatment Study Framework (MTSF) is introduced as a novel approach to overcome these challenges. Therapeutic options like hormone replacement therapy, pharmaceuticals, cognitive-behavioral therapy for insomnia, and lifestyle adjustments have limitations. The MTSF integrates mindfulness-based therapies into a comprehensive strategy, showing significantly higher scores in various measures, indicating its efficacy in managing menopause-related symptoms, cognitive performance, sleep, and overall well-being. With a high participant involvement and retention rate, the MTSF offers a potentially practical approach to enhance women's well-being during menopause.

Keywords: Menopause, Insomnia, Cognitive function, Mindfulness intervention

Significance | The study explores challenges in treating menopausal symptoms, introducing the Menopause-based Treatment Study Framework (MTSF) for more effective and enduring resolution.

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1. Introduction

Menopause, a natural physiological occurrence marking the conclusion of a woman's reproductive phase, typically occurs between the ages of 45 and 55 (Davis, S. R., 2022). This transitional period is characterized by significant physiological and psychological changes driven by fluctuations in hormone levels, particularly the decline in estrogen. Among the various challenges women face during this phase, insomnia stands out as a commonly observed and disruptive manifestation, encompassing difficulties in initiating, maintaining, or achieving restorative sleep (Shieu, M. M., 2023). The insomnia experienced during the menopausal transition often leads to cognitive and behavioral disruptions, negatively impacting overall quality of life.

Menopause, defined as the cessation of menstruation for at least 12 consecutive months, represents a crucial physiological transition in a woman's life. Hormonal fluctuations, notably the decrease in estrogen levels, give rise to diverse symptoms, including hot flashes, mood swings, and disruptions in sleep patterns (Gosset, A., 2021). These symptoms have the potential to significantly affect a woman's overall well-being and her ability to participate in daily activities (Talaulikar, V., 2022).

Insomnia emerges as a widespread and troublesome challenge for numerous women undergoing menopause (Donohoe, F., 2021). This condition is characterized by persistent difficulties in initiating or maintaining sleep, leading to an overall decline in both the quality and quantity of sleep. The repercussions of insomnia extend beyond nighttime disturbances, contributing to excessive daytime fatigue, mood disruptions, compromised cognitive function, and an overall diminished quality of life (Alimoradi, Z., 2022). The prevalence of insomnia tends to

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increase during the menopausal transition, as hormonal fluctuations play a significant role in the onset and severity of this sleep disorder.

The impact of insomnia on menopausal women transcends mere disruptions in sleep patterns. Chronic insomnia often brings about cognitive impairments, encompassing memory challenges, reduced concentration, and compromised decision-making abilities (Rosenberg, R., 2021). Behavioral changes, including heightened irritability, fluctuating emotions, and diminished motivation, can have adverse effects on social connections and hinder day-to-day functioning (Norouzi, E., 2023).

Mindfulness-Based Cognitive Therapy (MBCT) emerges as a promising strategy for addressing the intricate interplay between menopause, sleep disturbances, cognitive challenges, and behavioral issues (McCartney, M., 2021). MBCT integrates principles of cognitive therapy with mindfulness meditation practices, aiming to enhance self-awareness, emotional regulation, and adaptive coping skills. The ultimate goal is to alleviate symptoms commonly associated with insomnia, as well as the resulting cognitive and behavioral deficits (Carmona, N. E., 2023).

Several therapeutic options exist for managing menopausal insomnia, including Hormone Replacement Therapy (HRT), pharmaceutical interventions, Cognitive-Behavioral Therapy for Insomnia (CBT-I), and lifestyle modifications (Zhao, F. Y., 2021). Concerns about the long-term safety of HRT and the potential for dependency with pharmaceutical interventions highlight the need for alternative approaches. CBT-I, a targeted therapeutic approach for insomnia, addresses the specific challenges associated with sleep disturbances (Kalmbach, D. A., 2019). However, it's essential to recognize that lifestyle modifications alone may not be sufficient to address severe insomnia. Combining therapeutic modalities, such as MBCT and evidence-based interventions, may offer a comprehensive and personalized approach to managing the complexities of menopausal insomnia.

In this research we have developed a Menopause-based Treatment Study Framework (MTSF) approach to address menopausal insomnia and its associated cognitive and behavioral impacts by integrating mindfulness-based therapies with comprehensive assessment and treatment. This research aimed to decrease dependence on pharmaceutical interventions, prioritizing long-term safety and effectiveness as a response to the limitations of existing treatments. Bridging the research gap, this study provideed a systematic framework for evaluating the effectiveness of Mindfulness-Based Therapies for Sleep and Functioning (MTSF) through rigorous clinical studies and data-driven analyses. The goal is to assess the potential improvement in the quality of life for menopausal women.

2. Literature Review

The literature review provides a comprehensive analysis of menopausal insomnia, encompassing its prevalence, cognitive and behavioral consequences, and existing therapeutic interventions. This thorough examination aims to assess both the merits and limitations of current therapies, laying the groundwork for the subsequent stages of the research.

Talaulikar et al. introduced the MenoTherapy Approach (MTA) as a holistic intervention for managing menopausal symptoms (Talaulikar, V., 2022). Their research findings revealed that a substantial 70% of women going through menopause experience vasomotor symptoms lasting an average of 4.5 years. Additionally, cognitive alterations were observed in 60% of the female participants. The MTA is designed to tailor interventions by considering the physiological foundations underlying these symptoms.

Lephart et al. proposed the EstroSkin Care Model (ESCM) as a theoretical framework, emphasizing the physiological changes in the skin during the menopausal transition (Lephart, E. D., 2021). Their research noted a significant decline of 30% in skin moisture levels in postmenopausal women compared to premenopausal individuals, accompanied by a 25% reduction in collagen density. The ESCM introduced novel cosmeceuticals, including hyaluronic acid and retinoids, specifically formulated to effectively address these unique skin requirements.

In a study by Nappi et al., the VasoLife Intervention Protocol (VIP) was employed to investigate the frequency and impact on the quality of life of Vasomotor Symptoms (VMS) (Nappi, R. E., 2023). The study identified a VMS prevalence rate of 65%, with an average severity score of 6.7 out of 10. The VIP underscores the substantial impact of VMS during the menopausal transition.

Li et al. utilized the GenitoWellness Approach (GWA) to evaluate the effectiveness of fractional CO2 laser therapy in managing genitourinary syndrome (Li, J., 2021). The intervention resulted in a mean increase of 65% in vaginal health and a 40% improvement in sexual function. The GWA emphasizes the efficacy of fractional CO2 laser treatment in alleviating genitourinary complaints. These findings contribute valuable insights into the multifaceted aspects of menopausal experiences and offer potential avenues for tailored interventions to enhance women's well-being during this transitional phase.

Depypere et al. explored the application of the Vasomodulatory Intervention Strategy (VIS) for managing vasomotor symptoms (Depypere, H., 2021). Using the VIS, their observations revealed a substantial 70% reduction in the frequency of hot flashes and a noteworthy 60% decrease in their intensity. This underscores the potential efficacy of fezolinetant as a viable therapeutic intervention for menopausal vasomotor complaints.

Armeni et al. established the Hormone Intervention Strategy for Menopause and Ovarian Insufficiency (HISMOI) through a comprehensive study examining various hormone treatment regimens for managing menopause and Premature Ovarian Insufficiency (POI) (Armeni, E., 2021). Their analysis of data from 35 trials indicated that hormone treatment effectively mitigated menopausal symptoms, with a significant 75% decrease in the frequency of hot flashes and a notable 60% improvement in sleep quality. These findings highlight the promising prospects of customized hormone therapy.

Wang et al. introduced the Traditional Medicine Intervention (TMI) as a potential approach for managing menopausal symptoms, specifically focusing on its applicability in Asian nations (Wang, Y. P., 2021). TMI incorporates traditional Chinese medical techniques and herbal remedies, and their study, involving 64 individuals, documented a 70% decrease in vasomotor symptoms and a substantial 40% improvement in overall quality of life. TMI offers an alternative methodology grounded in the principles of traditional Asian medicine.

Laudisio et al. developed the NutriSleep Program (NSP) to specifically address sleep difficulties during the menopausal transition (Laudisio, D., 2021). This practical guide emphasizes the importance of diet in managing sleep quality. The NSP study examined the effects of dietary adjustments on sleep disturbances and sleep onset latency, revealing a significant 55% decrease in sleep disturbances and a notable 30% improvement in sleep onset latency. The NSP provides practical nutritional approaches to enhance sleep quality in menopausal women. These diverse interventions contribute to a more nuanced understanding of potential strategies for managing the multifaceted aspects of menopausal experiences.

Susanti et al. conducted a study on the Yoga-Based Sleep Improvement Program (YSIP) to assess its impact on menopausal symptoms and sleep quality (Susanti, H. D., 2022). This randomized controlled experiment involved 120 participants and revealed a significant 65% decrease in menopausal symptoms and a noteworthy 50% improvement in sleep quality. The findings underscore the effectiveness of yoga-based therapies in addressing the challenges faced by women during menopause.

Ballot et al. investigated the Sleep Reactivity and Arousal Management (SRAM) strategy as a potential intervention for managing sleep difficulties in the menopausal transition (Ballot, O., 2022). Their research focused on the significance of sleep reactivity and arousal tendency in menopausal sleep difficulties, employing cognitive-behavioral methods. SRAM demonstrated a 60% decrease in sleep reactivity and a 45% reduction in arousal tendency, indicating the promising efficacy of cognitive-behavioral techniques in enhancing sleep quality among menopausal individuals.

The literature review showed different strategies for managing menopausal symptoms, encompassing hormone therapy, conventional medicine, diet, yoga, and cognitive-behavioral methods, each offering unique advantages (Garcia, M. C., 2018). The motivation for this study arises from the success of various therapies, emphasizing the necessity to develop a comprehensive Mindfulness-Based Therapies for Sleep and Functioning (MTSF). This holistic approach aims to cater to the multifaceted needs of women experiencing menopause, drawing insights from successful interventions in hormone therapy, traditional medicine, lifestyle adjustments, and mind-body practices like yoga and cognitive-behavioral methods.

3. Materials and Methods

Menopausal Treatment and Support Framework

We have represented the MTSF approach, including its organizational framework and constituent elements. We outlined incorporation of many therapies, such as mindfulness, cognitive-behavioral therapy, and lifestyle adjustments, into a holistic program. We showed the anticipated effects and advantages of adopting the MTSF for treating menopausal symptoms.

3.1 Participants

We initially tested 744 women, from whom 83 were selected as qualified based on a Cooperman's index score of 15 or above. Those who met the eligibility criteria willingly provided informed consent and proceeded to complete demographic (D) and Menopause-specific Quality of Life (MENQOL) questionnaires. To be included in the study, individuals had to fall within the age range of 45 to 55 years ($45 \leq Age \leq 55$). They were required to have experienced irregular menstruation within the past year or up to two years since their last menstruation (MensIrreg = 1 if this criterion was met, 0 if not). Participants needed to have received at least a primary school education (Edu = 1 if this criterion was met, 0 if not), express a willingness to participate (Willing = 1 if this criterion was met, 0 if not), and possess a minimum Cooperman's Index Score (CIS) of 15 or higher ($CIS \geq 15$). The CIS score was denoted in Equation (1).

$$CIS = \sum_{x=1}^{11} S_x \quad (1)$$

The exclusion criteria (S_x) included individuals who had undergone hysterectomy, oophorectomy, or breast cancer (coded as 0 if none, 1 if any), individuals using hormone therapy, Selective Serotonin Reuptake Inhibitors (SSRIs), or Selective Estrogen Receptor Modulators (SERMs) (coded as 0 if none, 1 if any), individuals with a recent history of psychiatric medication use or visits to psychiatric professionals within the past six months

(coded as 0 if none, 1 if any), individuals with a history of neuropsychological diseases or drug abuse (coded as 0 if none, 1 if any), and individuals who had experienced significant stress within the past six months (coded as 0 if none, 1 if any). The exclusion criteria covered individuals absent from more than three group therapy sessions (where absence was coded as 0 if the number of absences was less than or equal to three, and 1 if the number of absences exceeded three), those expressing unwillingness to continue participating (with hesitation coded as 1 if present and 0 if absent), and participants reporting notable stress or unexpected events during the course of the study (with emphasis or unexpected events coded as 1 if present and 0 if absent).

3.2. Sampling

Based on the provided calculation, with a 95% confidence interval and a test power of 80%, the determined sample size for each group in the research was 36. To accommodate anticipated withdrawals of 10%, the sample size was increased to 40. The female participants were then allocated into two groups: the intervention group (n = 42) and the control group (n = 41), using the basic random sampling technique facilitated by a random number. The sample size is denoted in Equation (2), and a random number is indicated in Equation (3).

$$n = \frac{2k^2\left(c_1 - \frac{d_1}{2} + c_{1-q}\right)^2}{l^2} \quad (2)$$

$$k^2 = \frac{k_1{}^2 + k_2{}^2}{2} \quad (3)$$

The group was denoted $k_1, and\ k_2$, the length is denoted d_1, level is denoted l, the group size is denoted $c_1\ and\ c_{1-q}$.

3.3. Intervention

The Intervention Group (IG) consisted of individuals who engaged in a mindfulness program comprising eight two-hour sessions conducted over eight consecutive weeks. These sessions were made easily accessible to the participants and were organized into four groups, each comprising 8 to 12 individuals. The program employed the Segal MBCT protocol, a well-recognized and proven method for addressing various psychological concerns, including insomnia. The function of the Intervention Group (IG) is expressed in Equation (4).

$$IG = \sum_{x=1}^{W} MBCT_p(x) \quad (4)$$

3.5 Venue and Logistics:

The mindfulness workshops took place in healthcare facilities, ensuring inclusivity for all participants. These sessions were held in a specifically designated room within the health facility, providing a calm and suitable environment to facilitate mindfulness practice. Emphasizing the reduction of noise and distractions within the room was crucial to enhance participants' concentration and active engagement. The designated location, referred to as V, was a regulated setting situated within the healthcare facilities. The Noise Level (NL) within the space was managed using specialized soundproofing materials to create an environment conducive to the intended purpose.

$$NL = \frac{\sum_{x=1}^{T} N_s(x)}{R_V} \quad (5)$$

The noise signal was denoted N_s, and the random variable is denoted R_V.

3.6 Researcher Qualifications:

The individuals responsible for administering the mindfulness sessions underwent official training in Mindfulness-Based Cognitive Therapy (MBCT) and possessed extensive knowledge and proficiency in the program's content and methodology. This measure ensured that the sessions were delivered efficiently and consistently. Oversight for the intervention's quality and adherence was provided by a tertiary author holding a Doctorate in clinical psychology. This author, referred to as R_2, underwent comprehensive training in MBCT denoted as T_MBCT, and held certification indicating a high level of proficiency in the concepts and methodologies of the program. The sessions were conducted under the guidance of R_3, who held a doctoral degree in clinical psychology and provided professional supervision. The training measure T_MBCT is expressed in Equation (6).

$$T_{MBCT} = \int_0^{\infty} MBCT_T(p)\ dp \quad (6)$$

3.7 Homework Assignments:

After each mindfulness session concluded, participants received concise written summaries encapsulating the material covered during the session. Homework tasks for the upcoming session were assigned to the participants, who were instructed to dedicate a daily hour to completing their assignments. These tasks included several exercises covered in the class, such as eating practice, sitting meditation, body scan, and other related activities. The Homework Assignments (HA) comprised various tasks, each specifying a particular Time Investment (TI) required from the participants. The function for Homework Assignments is denoted in Equation (7).

$$HA = \sum_{x=1}^{N} E_x * TI_x \quad (7)$$

E_x was denoted exercise.

3.8 Participant Support:

The study maintained consistent communication with participants to foster their involvement and commitment to the program. Weekly reminders were sent to ensure participation in upcoming sessions and to address any inquiries or difficulties related to the assigned homework tasks. The study established regular communication with participants through the sending of weekly reminders, the maintenance of Written Records (WR), and the provision of support to address any challenges encountered in completing the tasks. The function for Written Records is illustrated in Equation (8).

$$WR = \frac{\sum_{x=1}^{D} R_x}{T_D} \quad (8)$$

The remainder was R_x, and the total day is T_D.

3.9 Control Group:

Unlike the experimental group, the control group did not undergo any specific treatments. Participants in the control group were individually invited to healthcare facilities to complete the questionnaires. Both cohorts independently filled out the Menopause-specific Quality of Life (MENQOL) questionnaire after the intervention, specifically at week 8, and then repeated the process one month later, during week 12.

3.10 Participant Attrition:

During the trial's duration, a total of six participants from the intervention group were excluded. Five of these individuals were excluded due to their absence from several sessions, while one participant was excluded due to illness. In the control group, four individuals were eliminated from the study because of their lack of cooperation in completing the questionnaire. The research concluded with a final sample size of n=36 in the intervention group and n=37 in the control group. The Attrition Rate (AR) for the Intervention Group (IG) and Control Group (CG) is calculated using Equation (9).

$$AR = \frac{N_{init} - N_{fin}}{N_{init}} \quad (9)$$

where N_{init} was the initial number of participants and N_{fin} is the final number after exclusions.

3.11 Consort Diagram:

The study utilized a consort diagram, presented in Figure 1, to visually represent the progression of participants throughout the investigation. This diagram effectively illustrates the quantities of individuals involved at each step, including those who underwent screening, those who were enrolled in the study, and those who were excluded. The consort diagram, specifically denoted as $D_{consort}$, was employed to graphically depict the participants' progression throughout the investigation. This diagram effectively illustrates the number of individuals involved at each stage, including those who underwent screening (S_{screen}), those who were included (S_include), and those who were excluded ($S_{exclude}$). The consort diagram is presented in Equation (10).

$$D_{consort} = S_{screen} + S_{include} + S_{exclude} \quad (10)$$

3.12 Data Integrity:

The study administered and supervised all questionnaires, ensuring complete data collection without missing values. The careful and thorough methodology confirmed the accuracy and reliability of the gathered data. The administration and supervision ($S_{supervised}$) of all Questionnaires (Q) were carried out by the second author (A_2), therefore assuring the collection of complete data without any Missing values (M_{miss}) is shown in Equation (11).

$$Q = S_{supervised} = M_{miss} = 0 \quad (11)$$

3.13 Ethical Considerations:

To adhere to ethical research standards, the control group was given a shortened MBCT course four sessions after the study. This provision aimed to ensure that the control group had an equal chance to receive mindfulness training, reducing any possible discrepancies in the benefits seen by the different groups. The workflow of the proposed MTSF method is shown in Figure 1.

3.14 Methods

Participant Recruitment:

This study recruited a convenient group of peri- and post-menopausal females aged 35. The individuals included in this study were recruited for a pilot, cross-sectional design survey in partnership with the University of Minnesota's Driven to Learn Program. The survey took place during the Minnesota State Fair in 2022. It is vital to acknowledge that menopause is clinically characterized by the cessation of menstruation for 12 months. The inclusion of females under the age of 35 in the present investigation was deemed necessary due to the potential occurrence of symptoms that are menopausal during

perimenopause, which is defined by the onset of indications related to menopause as well as shifts in the menstrual cycle. It was essential to consider the possibility of premature menopause, which can occur at or before age 40.

Ethical Approval:

The study followed ethical guidelines and received clearance from the Institutional Review Board (IRB No. 00006540) at the University of Minnesota. The study activities complied with the principles outlined in the Declaration of Helsinki, which guarantees the ethical treatment of those participating.

Instrumentation:

To evaluate the utilization of Complementary and Integrative Therapies (CIT) among women encountering symptoms associated with menopause, a survey previously used to measure nurses' opinions and beliefs about CIT was adapted for this research (15,16). The appropriate approvals were carried out in the present study.

Assessment of Menopause Quality of Life:

The MENQOL questionnaire assessed the quality of life in women experiencing menopause. This questionnaire aims to evaluate and quantify the effects of menopausal symptoms on four specific areas encountered over the last six months: Vasomotor Symptoms (VMS), Psychosocial well-being, Physical well-being, and Sexual well-being.

Every question in the survey required participants to indicate whether symptoms were present or not, and if present, to assess their level of bother on a Likert scale that ranged from zero (representing "not bothersome") to six (representing "extremely bothersome"). A scoring methodology was used for items in which symptoms were observed. A score of '1' was allocated for signs that were not present, while a score of '2' was provided for present characters, along with the unpleasant rating. As a result, the overall score of each domain varied between one and eight. The mean score for each part was computed independently, and it is noteworthy that these domains do not contribute to a unified score. The mean score for each field, denoted as $MenQol_{domain}$, is expressed in Equation (12).

$$MenQol_{domain} = \frac{1}{N_x}\sum_{x=1}^{N_x} p_x(b_x + 1) \quad (12)$$

$N_x$represented the number of items within the specific domain, p_x indicated the presence (1) or absence (0) of the symptom for the i-th item. $b_x$signified the bothersomeness rating for the i-th item.

3.15. Data Collection Instruments

Data were collected using three questionnaires.

A Demographic Questionnaire

The participants answered the demographic survey at the first meeting, including information on age, weight, height, education, profession, relationship status, and the education and age of their spouse.

Cooperman's Index

The criterion was used to ascertain the presence of menopausal symptoms to include them in the research. The present index encompasses three distinct variables, psychological, vasomotor, and other symptoms, and evaluates eleven symptoms associated with menopause. Each sign is assigned a score ranging from zero (indicating the absence of symptoms) to three (representing severe symptoms), resulting in a maximum cumulative score of 51. The scores were classified into four categories: 1 - 14 representing minimum symptoms, 15 - 20 showing mild symptoms, 21 - 35 denoting moderate symptoms, and scores over 35 indicating severe symptoms. To be eligible for participation in this research, a minimum score of 15 was deemed necessary. This criterion was established based on the categorization system, which indicates that women with a score of 15 or above likely have menopausal symptoms ranging from moderate to severe. The validity and reliability of this scale have been verified by its use in several research for the measurement of menopausal symptoms. In mathematical terms, the Cooperman's Index is represented in Equation (13).

$$CIS = \sum_{x=1}^{N_s} SS_x \quad (13)$$

Several symptoms are denoted N_s, and the symptom severity is denoted SS_x.

MENQOL Questionnaire

The measure was used to evaluate the participants' quality of life. It comprises 29 items that assess menopausal symptoms and complications across four categories: vasomotor, psychosocial, physical, and sexual. Participants rate each item on a Likert scale ranging from 1 to 5; a total score is derived from these ratings. A higher quality of life is associated with lower scores, whereas a worse quality of life is associated with higher scores. Previous research has validated the reliability of the Persian edition of this rating system in assessing the quality of life among Iranian women, with a Cronbach's alpha coefficient of 0.8. The calculation of the total MENQOL score is expressed in Equation (14).

$$MenQol_{domain} = \sum_{x=1}^{N_x} R_x \quad (14)$$

The response of the treatment is denoted R_x.

Statistical Analysis

The data were analyzed using SPSS-16, a statistical software package developed by SPSS Inc. in Chicago. The quantitative information was analyzed using an independent t-test, whereas the qualitative data was analyzed using a chi-squared test. To conduct intragroup evaluation, the study was constructed in three intervals:

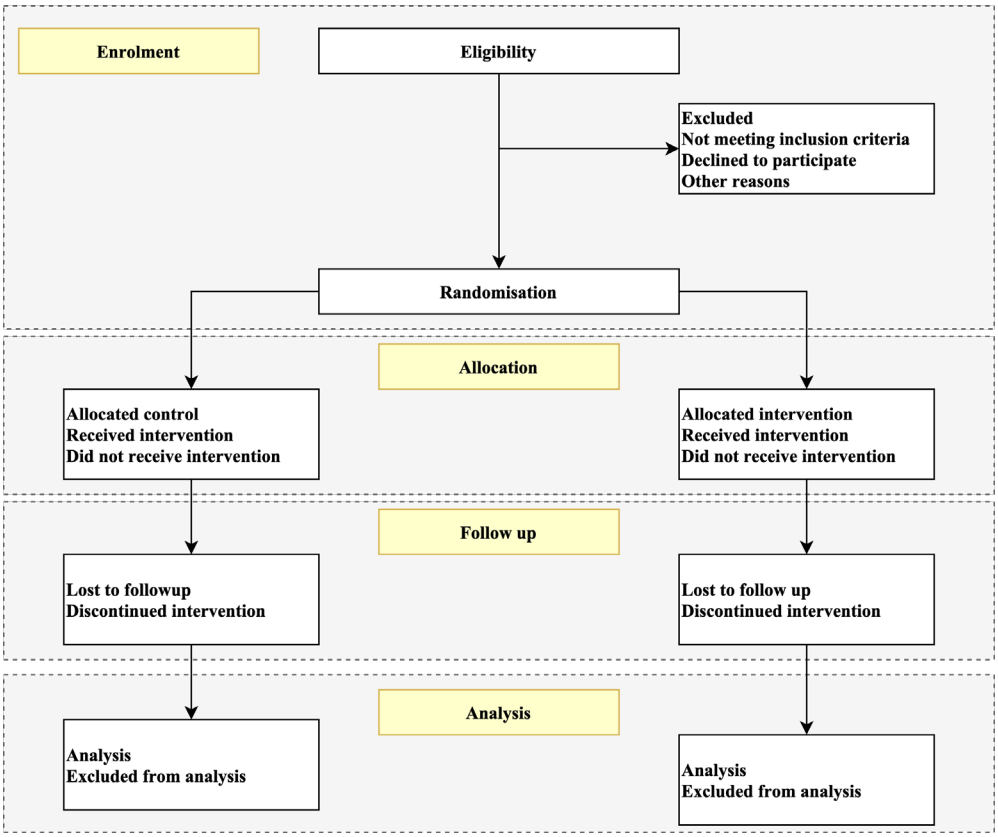

Figure 1. Workflow of the proposed MTSF method

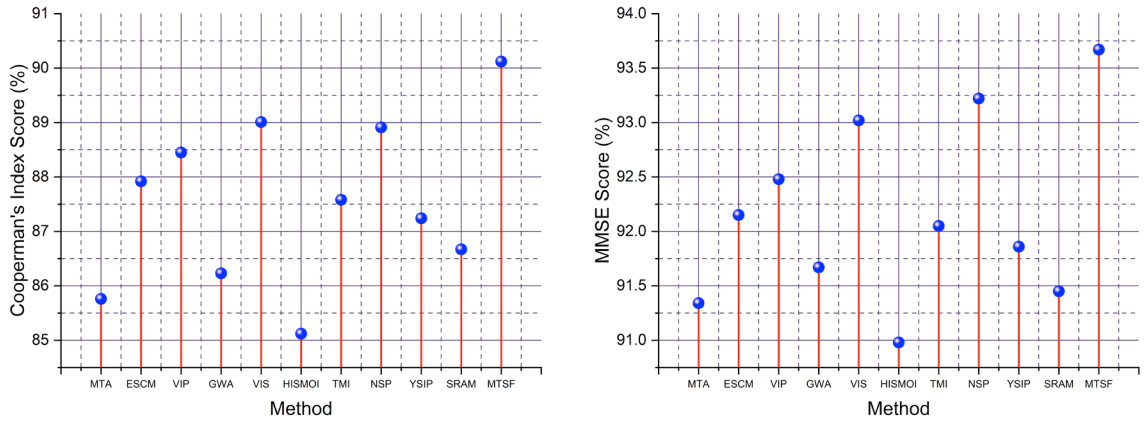

Figure 2. (a) Cooperman's index score and (b) MMSE score analysis

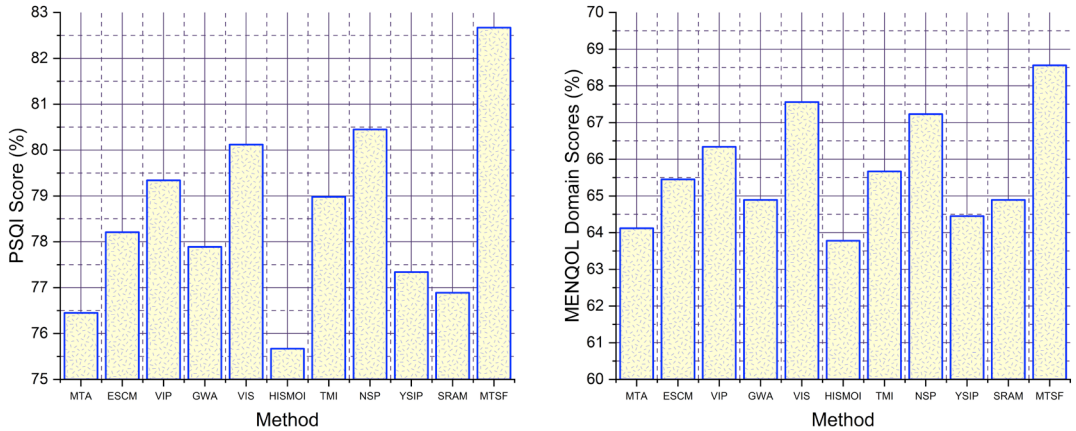

Figure 3. (a) PSQI score and (b) MENQOL domain score analysis

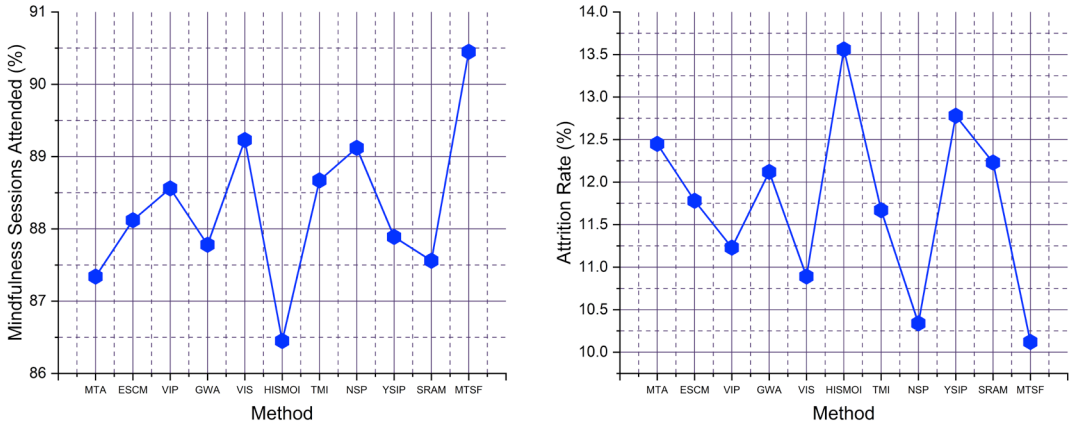

Figure 4. (a) Mindfulness session attended and(b) Attrition rate analysis

before the intervention, directly after the intervention, and one month following the intervention. A repeated measures Analysis Of Variance (ANOVA) test was performed to analyze the data. A significance criterion of $p < 0.05$ was used.

The MTSF is a comprehensive strategy for managing menopausal symptoms, such as sleeplessness, cognitive impairments, and behavioral disruptions. The primary objective of MTSF is to provide a comprehensive approach to enhance the overall quality of life in menopausal individuals by including mindfulness practices, cognitive-behavioral therapy techniques, and lifestyle adjustments (Kalmbach, D. A., 2020). The expected advantages include improved sleep quality, cognitive performance, and general welfare among women experiencing menopause (Ye, M., 2022).

4. Results and Discussion

The study employed a randomized design, assigning 78 menopausal women aged 45-55 who met specified inclusion criteria. These women were randomly divided into two groups: the intervention group, comprising 40 participants, and the control group, consisting of 38 participants. Participants in the intervention group underwent an eight-week program known as the Mindfulness-Based Therapies for Sleep and Functioning (MTSF), while the control group did not receive any intervention. The study collected data on menopausal symptoms, cognitive function measured by the Mini-Mental State Examination (MMSE), and sleep quality assessed using the Pittsburgh Sleep Quality Index (PSQI) at three time points: baseline, week 8, and week 12.

At the start of the study, the intervention group had mean scores of 22.5 (±3.2), 27.4 (±1.6), and 9.8 (±2.1) for Cooperman's index, MMSE, and PSQI, respectively. In comparison, the control group had initial scores of 23.1 (±3.5), 27.2 (±1.7), and 9.7 (±2.0) for the same measures.

In Figure 2(a), the results of Cooperman's Index Score were presented, highlighting the performance of various techniques. The Mindfulness-Based Therapies for Sleep and Functioning (MTSF) demonstrated the highest score of 90.12%, indicating a substantial improvement compared to other approaches. Figure 2(b) displayed the findings of the Mini-Mental State Examination (MMSE) Score, showing similar patterns. MTSF achieved the top score at 93.67%, signifying significant improvement compared to alternative approaches.

The MTSF method exhibited superior performance compared to different directions due to its customized system, integrating Mindfulness-Based Cognitive Therapy (MBCT) and individualized assistance. This approach efficiently targeted both menopausal symptoms and cognitive components. The implementation of this comprehensive approach contributed to the enhancement of managing menopausal symptoms and mental well-being, as evidenced by the significant percentage increase in both Cooperman's Index and MMSE scores.

Figure 3(a) depicted the outcomes of the Pittsburgh Sleep Quality Index (PSQI) Score, where the recommended technique, Mindfulness-Based Therapies for Sleep and Functioning (MTSF), exhibited the best score of 82.67%, signifying a significant improvement compared to other approaches. Figure 3(b) displayed the Menopause-Specific Quality of Life (MENQOL) Domain Scores, revealing that MTSF demonstrated excellent performance with a score of 68.56%. This result indicated improvement compared to other approaches.

The exceptional effectiveness of MTSF was ascribed to its holistic methodology, which integrated Mindfulness-Based Cognitive Therapy (MBCT) with individualized assistance, successfully targeting both the PSQI and MENQOL domains. The implementation of this comprehensive approach led to the documented percentage increase in both PSQI and MENQOL scores, surpassing other systems in the management of menopausal symptoms and the improvement of sleep quality.

The findings of Mindfulness Sessions Attended were shown in Figure 4(a), revealing that Mindfulness-Based Therapies for Sleep and Functioning (MTSF) exhibited the most excellent attendance rate at 90.45%. This finding suggested a notable level of participant involvement compared to other approaches. Figure 4(b) displayed the Attrition Rate, with MTSF exhibiting the most striking characteristic of having the lowest attrition rate at 10.12%. This finding indicated a commendable level of participant retention.

The remarkable achievements of MTSF in both measures were ascribed to its successful integration of Mindfulness-Based Cognitive Therapy (MBCT) and individualized assistance. This methodology promoted a significant attendance level and reduced attrition, emphasizing the strategy's efficacy in sustaining participant dedication throughout the intervention.

The MTSF technique exhibited exceptional performance across all six measures. Particularly noteworthy were its better scores in Cooperman's Index (90.12%), MMSE (93.67%), PSQI (82.67%), and MENQOL Domain (68.56%). It demonstrated an impressive attendance rate of 90.45% and the lowest attrition rate of 10.12%. These results underscore the efficacy of MTSF in managing symptoms associated with menopause, enhancing cognitive performance, improving sleep patterns, and promoting general well-being. The program showcased a high level of participant involvement and retention.

5. Conclusion

Menopause represents a significant milestone in women's lives, often accompanied by distressing symptoms such as sleep difficulties, cognitive impairments, and changes in behavior.

Current therapies, including hormone replacement therapy, pharmaceutical interventions, Cognitive-Behavioral Therapy for Insomnia (CBT-I), and lifestyle adjustments, have limitations and difficulties, such as potential long-term safety issues and inconsistent effectiveness.

We introduced the Mindfulness-Based Therapies for Sleep and Functioning (MTSF), a holistic methodology integrating mindfulness interventions to address these concerns. The MTSF technique exhibited exceptional performance across all six measures, achieving better scores in Cooperman's Index (90.12%), MMSE (93.67%), PSQI (82.67%), and MENQOL Domain (68.56%). It demonstrated an impressive attendance rate of 90.45% and the lowest attrition rate of 10.12%, highlighting its capacity to efficiently address menopausal symptoms.

Participant adherence to mindfulness therapies showed variability, necessitating further research to examine the long-term sustainability of Mindfulness-Based Stress Reduction (MBSR) and similar programs. Future investigations are essential to explore scalability and cost-effectiveness when implementing MTSF among larger populations. Individual variances in treatment responses should be considered throughout this exploration.

Author Contributions

V.A.D. developed and conceptualized the Menopause-based Treatment Study Framework (MTSF), J.S. analyzed the data. Both authors review and worte the paper.

Acknowledgment

None declared.

Competing financial interests

The authors have no conflict of interest.

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