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Impact of Yoga and Mud Therapy Practices on Perceived Stress Scale Levels among the Middle- Aged Type 2 Diabetic Women

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Abstract: Diabetes Mellitus is one of the most prevalent chronic metabolic disorders that poses substantial health risks among millions worldwide in the current scenario, particularly among the middle-aged people, especially the women community. Perceived stress significantly impacts the management and progression of Type 2 Diabetes Mellitus (Varghese et al., 2015). Conventional medical treatments like medication and lifestyle modifications are suggested, yet complimentary holistic practices like Yoga and Mud Therapy have gained a wide attention and popularity at present time, due to its marking impact of its treatment modes in improving Glycemic control and overall well-being of the care seeker. This study is intended to investigate the impact of Yoga and Mud Therapy practices on influencing the Perceived Stress Scale levels among the middle-aged Type 2 diabetic women in Chennai, India. A total of 30 subjects, 10 in each group--Group A (Yoga and Mud Therapy), Group B (Yoga) and Group C (Control group) under active rest, all of middle-aged Type 2 Diabetic women were enrolled in the pilot study through randomized sampling technique. A structured one-hour Yoga program consisting of Sukshma Vyayama (Loosening Joints-Warm up), Asanas (postures), Pranayama (Breathing Technique), Dhyanam (Meditation) sessions were conducted for a period of 6 weeks, five days a week (Group B) with additionally the time duration of two hours including the intermediary rest for Yoga; and Mud Therapy (Group A) setting time between both the practices. Pre- and Post-levels of the perceived stress scale levels, using Sheldon Cohen questionnaire (PSS-10) method were recorded to assess whether there would be any notable changes in the reduction of Perceived Stress and improvement on the Glycemic control among the Type 2 diabetic middle-aged women. Preliminary analysis indicated significant reduction in perceived stress scale levels among middle aged T2DM women, with group A compared to the other two. These findings suggest that the regular yogic and mud therapy practices definitely aid in the diabetes management, as one of the constituent adjunct therapies among the middle-aged Type 2 Diabetic women. Further longer intervention period would be helpful to confirm definitely highly striking impact of Yoga and Mud Therapy practices on the reduction of Perceived Stress Scale along with other biomarkers like HbA1c, FBS and PPBS levels among the middle-aged Type 2 Diabetic women and emphasizing the importance of Yoga and Mud Therapy of Naturopathy in Health care and general wellness.

Keywords: Yoga, Mud Therapy, Diabetes Mellitus, Perceived Stress

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Introduction

Diabetes mellitus is a complex disorder characterized by a persistently high blood sugar level or Hyperglycaemia, resulting due to insufficient or impaired secretion of hormone called Insulin, a major public health concern worldwide today (American Diabetes Association, 2023). It can be caused by a variety of reasons, including hereditary and environmental variables like Perceived Stress, sedentary lifestyle, poor dietary choices, Obesity or sometimes together (Chatterjee *et al.*, 2017; World Health Organization, 2021). According to Annaa Phillips, study on Perceived Stress, the Perceived stress is the feelings or thoughts that an individual has about how much stress they are under at a given point in time or over a given time period (Nair *et al.*, 2016). It is subjective and varies greatly from person to person, depending on how they interpret and react to situations, patient and the healthcare system. It can lead to severe complications such as cardiovascular disease, kidney dysfunction, vision impairment, and neuropathy if not effectively managed. While modern medicine plays a crucial role in diabetes care, the integration of holistic practices like Yoga therapy and Naturopathy are seemingly gaining popularity and attention in the Diabetes management due to its diversified and myriads of health benefits, aimed at harmonizing the physical, mental and spiritual well-being and can offer a more comprehensive approach in the Diabetes Management (Mondal *et al.*, 2018).

Yoga can significantly reduce perceived stress in individuals with Diabetes, leading to better management of the condition and overall improvement in quality of life. Through a combination of physical postures, breathing exercises, and meditation, Yoga helps lower stress hormones, improve emotional regulation, and enhance resilience. Mud therapy, a type of naturopathy treatment, involves the application of

mud packs or full-body mud baths and has been traditionally used for its therapeutic and healing benefits (Kumar and Rai, 2016). It is believed to have various health benefits, including stress reduction along with focusing on relaxation, detoxification, and improved circulation. Characteristics (Kumar and Rai, 2016).

Diabetes can affect both men and women, but there are certain aspects of the condition that are more prevalent or specific to women. Firstly, women with diabetes have a higher risk of developing diabetic complications, compared to men with diabetes as Women with T2DM (Aroda and Eckel, 2018). T2DM often experience higher levels of perceived stress compared to men, which can significantly impact their health and disease management (Shi *et al.*, 2022). This connection between perceived stress and diabetes in women involves a complex interplay of physiological, psychological, and socio-cultural factors. Perceived stress plays a critical role in the health and diabetes management of women with Type 2 Diabetes Mellitus. Women's major role has changed in the 21st century. Today women are managing in family, each field, and society. Because of this high responsibility and lifestyle stress related disorder, women's health are highly affected (Hinkle, 2018). Diabetes is one of the most common diseases in women nowadays. In 20 million ladies, 16% of live births had some type of hyperglycaemia during pregnancy. An expected 84% were Type 2 Diabetic as a result of gestational diabetes. In India alone an estimated 60 million people have diabetes-the highest numbers when compared to any other country of the world (Mohan *et al.*, 2019). As per the Indian Council of Medical Research (ICMR), Tamil Nadu had the highest number of diabetics with 10.4 per cent prevalence.

Women with diabetes may also experience

certain reproductive health issues, such as polycystic ovary syndrome (PCOS), which can cause irregular periods, infertility, and an increased risk of gestational diabetes during pregnancy. Additionally, gestational diabetes is a type of diabetes that occurs during pregnancy and affects about 10% of pregnant women. Women diagnosed with gestational diabetes are at higher risk of developing Type 2 diabetes later in their life. Perceived stress is different and it is more often about the feelings about the lack of control and unpredictability than the actual stressors (Vaishali *et al.*, 2012). Perceived stress refers to an individual's appraisal of how stressful their life is, considering their thoughts, feelings, and reactions to events and situations (Cohen *et al.*, 1983).

In this way, Perceived Stress reacts the interaction between an individual and their environment which they appraise as threatening or overwhelming their resources in a way which will affect their wellbeing (Lazarus and Folkman, 1984). Perceived stress is commonly measured as the frequency of such feelings via a questionnaire such as the Perceived Stress Scale (Cohen *et al.*, 1983).

Addressing the stress through various interventions such as yoga, naturopathy interventions like Mud Therapy, support groups and involve dietary and lifestyle changes, taking medications as prescribed, and getting regular check-ups and screenings can significantly improve glycemic control, reduce the risk of complications, and enhance their overall quality of life and can bring about change in the perceived stress scale levels (Sharma, 2014).

Yoga is an ancient traditional practice originated in India, thousands of years ago that encompasses a varied range of physical, mental and spiritual benefits by aiming harmonized body, mind and spirit. Rooted in the ancient Indian scriptures known as the Vedas, yoga encompasses a rich tapestry of practices, including physical postures (asanas), breath control (pranayama), meditation (dhyana), ethical guidelines (yamas and niyamas), and philosophical wisdom (sutras)

(Mishra *et al.*, 2001). At its core, yoga seeks to harmonize the body, mind, and spirit, guiding individuals on a transformative journey towards self-realization and fostering a profound sense of interconnectedness with the world. Yoga is a systematic and therapeutic application of the ancient practice, tailored to individual needs and health conditions. In the context of diabetes management, Yoga offers numerous advantages:

(i) **Stress Reduction:** Yoga incorporates relaxation techniques and mindfulness practices that reduce stress, which can negatively impact blood sugar levels.

(ii) **Improved Insulin Sensitivity:** Regular Yoga sessions can enhance insulin sensitivity, making it easier for the body to regulate glucose effectively (Shantakumari *et al.*, 2013).

(iii) **Enhanced Physical Fitness:** Specific Yoga asanas (postures) and pranayama (breathing exercises) improve physical fitness, aiding in weight management, muscle strength, and flexibility (Sinha *et al.*, 2013).

Mud Therapy, a major constituent of Naturopathy is considered one of the safest treatment approaches for diabetes. It is one of the most emerged well known and effective alternative medicine with a holistic approach. It is used as a traditional medicine like Ayurveda for treating various ailments (Rao and Thomas, 2014).

(a) Mud Therapy is a system of natural medicine that utilizes natural remedies like the Prithvi or the element of earth i.e. Mud to promote healing and well-being. In diabetes management, Mud Therapy principles align with holistic health. The application of a mud pack to the body can help to draw out excess heat or lower the temperature and toxins from the skin and underlying tissues, promoting a sense of coolness and relaxation (Tiwari, 2013).

(b) The mud used in the pack is typically composed of natural minerals, such as magnesium, sodium, potassium, manganese, iron, calcium, phosphorous etc, which have cooling and soothing properties.

(c) Prolonged cold causes a secondary reaction, inducing vasodilatation of the surface skin blood vessels) of the body. Skin is the largest organ of the body and can absorb substances or toxins and impurities from the body.

(d) Additionally, the moistness from the mud pack can help to dilate blood vessels and increase circulation and huge role in the increased peripheral vasoconstriction with enhanced central blood volume.

(e) Contains natural anti-inflammatory and antimicrobial properties that can help to boost the immune system and support the body's natural detoxification processes.

(f) An abdomen mud pack helps in all kinds of indigestion. It is very useful in reducing the intestinal heat and also stimulates peristalsis movement.

(g) Mud therapy involves the application of different types of mud (directly or indirectly like pack) on various parts, especially on the abdomen region of the body and has been found to improve glycemic control, lipid profile, and other diabetes-related parameters.

(h) Mud pack to the abdomen enhances peripheral circulation, increases metabolic rate, and thus lessens blood glucose levels. It also help to improve insulin sensitivity.

The integration of Yoga therapy and Mud therapy offers a comprehensive approach to diabetes management by addressing the physical, mental, and emotional aspects of the condition:

(i) Blood Sugar Regulation: Yoga and Mud therapy's stress-reduction techniques, combined with Naturopathy's dietary guidance and herbal therapies, contribute to better blood sugar control (Shantakumari *et al.*, 2013; Rao and Thomas, 2014).

(ii) Weight Management: Yoga and Mud therapy's physical practices and Naturopathy's dietary recommendations support healthy weight maintenance, vital for diabetes management (Sinha *et al.*, 2013).

(iii) Emotional Well-being: Yoga and Mud therapy's mindfulness practices enhance emotional health, helping individuals cope with the psychological aspects of diabetes (Shantakumari *et al.*, 2013; Rao and Thomas, 2014).

(iv) Enhanced Immunity: Yoga and Mud therapy focus on natural remedies and balanced lifestyle choices can boost overall immunity, vital for individuals with diabetes, who may be more susceptible to infections (Mishra *et al.*, 2001; Tiwari, 2013).

Understanding the unique stressors faced by women and implementing holistic, integrated care approaches like Yoga and Mud Therapy is essential for effective diabetes management and improved health outcomes. The purpose of the study was to find out the impact of Integrated modules of Yogic practices and Mud Therapy on the Perceived Stress Scale levels among Type 2 Diabetes middle aged women. It is hypothesized that there would be a significant difference in mean perceived stress level of one group, (Alternative Hypothesis -H1) over the other groups or remain same or equal across all the above group (Null Hypothesis -combined yoga and mud therapy, yoga alone, and control) due to the practices of Yoga and Mud therapy, on psychological variable among Type 2 Diabetic middle age women.

Materials and Methods

A randomized controlled group design was used to examine the impact of Yoga and Mud therapy treatment on the influence of Perceived Stress Scale level among middle-aged women who had been diagnosed with Type 2 Diabetes Mellitus. Before any data is collected, all volunteers were told about the rules and goal of the study and their signed consent was obtained. Participants were selected solely from the Chennai district and participants of age group between 45-55 years were randomly assigned into 3 groups (A, B and C) of 10 participants in each group. First group considered as Experimental Group A undergo

Integrated modules of Yogic practices and Mud therapy and the second group considered as Experimental Group B undergo Yogic practice alone and Group C considered as Control Group not attended any practices, receiving standard care. All three groups with oral Diabetic medication and for the outcome measured the pre-test and post-test were conducted before and after the training. Training was given for 6 weeks. Subjects received sixty-minute yoga treatment sessions five days a week for 6 weeks, additionally one hour including rest time for Mud Therapy. There was active rest for the control group. This study aimed to evaluate the impact on the selected dependent psychological variable of perceived stress scale level among women with Type 2 diabetes. The Yoga and Mud Therapy intervention group consisted of regular sessions guided by certified instructor over a specified duration of 6 weeks and Mud therapy with a certified Naturopathy Instructor. The collected data were statistically analyzed by Perceived Stress Scale of Sheldon Cohen. The Perceived Stress Scale (PSS-10) is a psychological instrument designed to measure the degree to which situations in a person's life are appraised as stressful. It was developed by Sheldon Cohen in 1983 and is widely used to assess the perception of stress over the last month. The scale includes 10 questions about feelings and thoughts during this time frame, specifically regarding how unpredictable, uncontrollable, and overloaded respondents find their lives. The PSS consists of 10 items or questions (in the PSS-10 version) with responses on a 5-point Likert scale ranging from "never" to "very often." Scores are calculated by reversing the scores on four positive items (e.g., items 4, 5, 7, 8 in the PSS-10) and then summing across all scale items. Higher scores indicate higher perceived stress. The Hypothesis testing through statistical analysis through the ANOVA and Post Hoc Tukey HSD Results interpretation concluded that this study through Perceived stress Scale Questionnaire method provides evidence supporting the efficacy of Yogic and Mud Therapy practices in reducing glycemic levels among women with Type

2 diabetes, with comparison to other two groups quite significantly. These findings underscore the importance of holistic approaches in diabetes care and highlight the potential of Yoga and Mud Therapy as a complementary intervention to enhance biological well-being in this population.

In this study criteria for inclusion are-- Being willing to take part in the research and providing written consent; Individuals with a Type 2 Diabetes diagnosis; Women with diabetes mellitus in their middle years, between the ages of 45 and 55; No prior or mere experience with yoga or other forms of fitness; Based on a physical examination, determined to be fit for yoga therapy; and resident of Chennai city. The criteria for exclusion are - Women who are nursing or pregnant; A history of renal, hepatic, or cardiac disease; A large clinically significant illness or other active clinical surgery; Any kind of tumour present; Psychiatric disease history; Individuals using long-term medicine for any other type of morbid illness; An individual with extremely high blood pressure; and Those who fail to provide a consent form.

Training Program Protocol

Training Program for Yoga: Yogic Practices for Diabetic Middle-aged Women are- Opening Prayer, Loosening Exercise, Surya Namaskar, Asanas, Tadasana, Trikonasana, Vipareethakarani, Halasana, Pawanmuktasana, Bhujangasana, Dhanurasana, Mandukasana, Ardha Matsyendrasana, Paschimotrasana, Pranayama, Kapal Bhati, Nadi Shodhana, Sitali, Bhramari Meditation- DRT and Mantra Chanting and Yoga Nidra, and Closing Prayer.

For the first three weeks it was for 30 sec. Later it was 1 min for every asana practice to very moderate to slow practice for Surya Namaskar (2 rounds) then increased to 1 min range and increasing the time limit for all Asanas and Pranayama variations. 3 to 5 min of Meditative practice was followed at the end of the Asana and Pranayama practices. Apart from this, Opening and Ending prayer and Shavasana was also

Table 1: ANOVA Summary

Source	DF	Sum of Squares	Mean Square	F Statistic	P-value
Between Groups	2	1568.5833	784.2917	76.1184	0.00000000023
Within Groups (Error)	21	216.375	10.3036		
Total	23	1784.9583			

Table 2: Post Hoc Tukey HSD Test

Pair	Mean Difference	SE	Q	Lower CI	Upper CI	Critical Mean	P-value
G1-G2	8.625	1.1349	7.5999	4.5796	12.6704	4.0454	0.00007136
G1-G3	19.75	1.1349	17.4028	15.7046	23.7954	4.0454	0.00000000013
G2-G3	11.125	1.1349	9.8028	7.0796	15.1704	4.0454	0.000002198

followed in the protocol. No dietary restrictions were prescribed.

Training protocol for Mud Therapy: Collection of Mud, Lab Analysis, Processing, Storage, Preparation of Mud Pack for patient, Application of Mud Pack, and Follow-up on the process and after the completion.

Data Analysis

The statistical methods ANOVA and Post Hoc Tukey HSD test were applied to assess the mean and difference at p value 0.05.

Hypothesis Testing

Null Hypothesis (H0): The mean perceived stress levels are equal across the three groups (combined yoga and mud therapy, yoga alone, and control).

Alternative Hypothesis (H1): At least one group has a different mean perceived stress level.

Results

ANOVA Results Interpretation (Table 1)

- $F(2, 21) = 76.1184$
- $P\text{-value} = 2.385e-10$

Since the P-value is much smaller than the common alpha level (e.g., 0.05), we reject the null hypothesis. This indicates a statistically significant difference in the perceived stress levels among the three groups.

Effect Size

Effect Size	Value
f	2.69
η^2	0.88

The η^2 value (0.88) indicates that 88% of the variance in perceived stress levels is explained by the group membership, suggesting a very large effect size.

Post Hoc Tukey HSD Results Interpretation (Table 2; Fig. 1)

- **G1 (Combined Yoga and Mud Therapy) vs. G2 (Yoga Alone):**
 - Mean Difference: 8.625
 - P-value: 0.00007136 (significant)
- **G1 (Combined Yoga and Mud Therapy) vs. G3 (Control):**

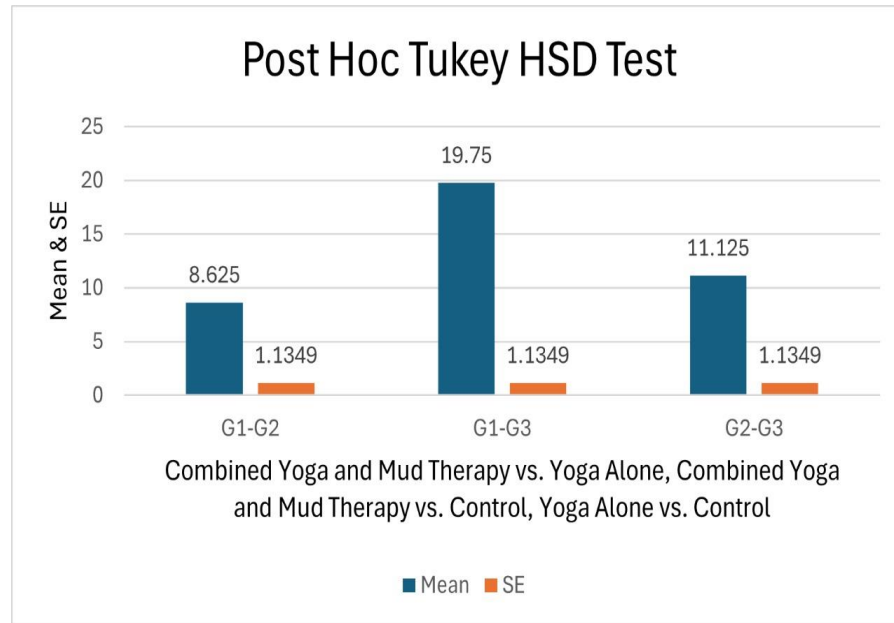


Fig. 1: Post Hoc Tukey HSD Test. The bars represent the mean differences between the groups, and the p-values are annotated on top of each bar- (i) Combined Yoga and Mud Therapy vs. Yoga Alone: Mean difference is 8.625 with a p-value of 0.00007136; (ii) Combined Yoga and Mud Therapy vs. Control: Mean difference is 19.75 with a highly significant p-value of 1.351×10^{-10} ; and (iii) Yoga Alone vs. Control: Mean difference is 11.125 with a p-value of 0.000002198.

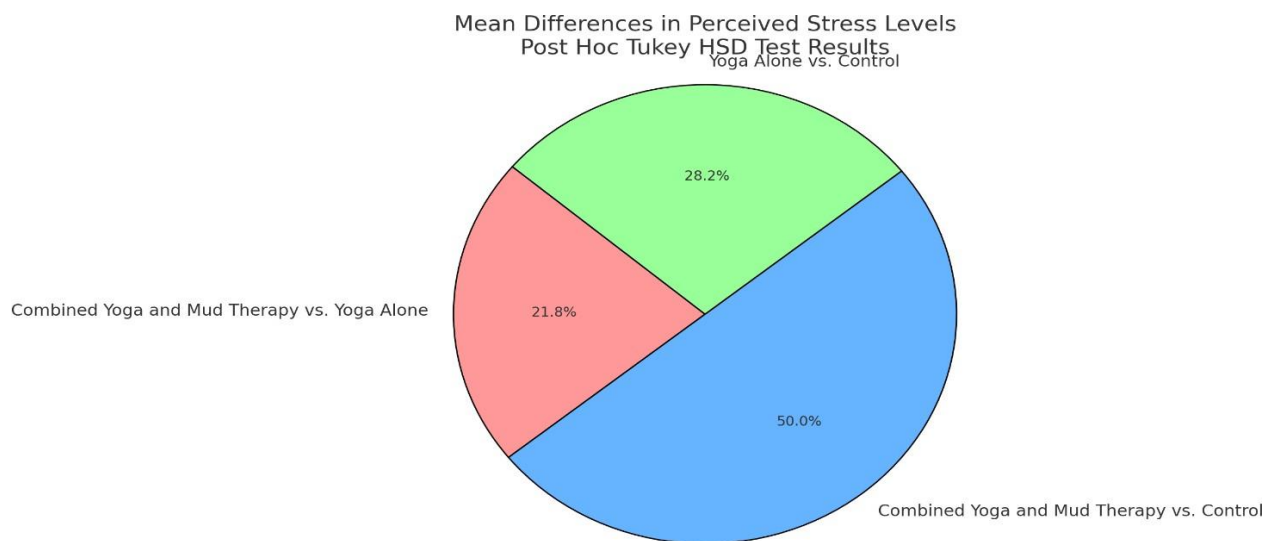


Fig. 2: Pie chart representing the mean differences in perceived stress levels between the groups, as determined by the Post Hoc Tukey HSD Test. (i) Combined Yoga and Mud Therapy vs. Yoga Alone: Mean difference of 8.625 (significant); (ii) Combined Yoga and Mud Therapy vs. Control: Mean difference of 19.75 (highly significant); and (iii) Yoga Alone vs. Control: Mean difference of 11.125 (significant).

- Mean Difference: 19.75
- P-value: 1.351e-10 (highly significant)
- **G2 (Yoga Alone) vs. G3 (Control):**
- Mean Difference: 11.125
- P-value: 0.000002198 (significant)

The graph highlights the significant differences in perceived stress levels (Fig. 2) among the three groups, with the combined yoga and mud therapy group showing the most substantial reduction in stress compared to both the yoga alone group and especially with regard to the control group. Figure 2 illustrates the proportion of each mean difference, highlighting the significant and highly significant differences in perceived stress levels among the three groups

Discussion

The purpose of the current study was to examine how middle-aged women with Type 2 Diabetes Mellitus viewed their stress levels in relation to yoga and mud therapy, yoga alone, and a control group. Comparing the combined yoga and mud therapy group to the yoga alone and control groups, the results showed a significant decrease in reported stress levels, with group 1 of yoga and mud therapy. This implies that a more successful stress-reduction strategy for this population is to combine yoga with mud therapy (Kumar and Rai, 2016).

The Interpretation of Results from ANOVA and Post Hoc, revealed that the F statistic value of 76.1184 and a P-value of 2.385e-10 ($P < 0.05$) indicated that the three groups' subjective stress levels differed very significantly. This supports the idea that the mean stress level varies for at least one group. The particular group differences were further elucidated using the post hoc Tukey HSD test. When compared to yoga alone (Group B), the combination of yoga and mud treatment (Group A) considerably decreased stress, with a mean difference of 8.625 ($P = 0.00007136$). With a mean difference of 19.75 ($P = 1.351e-10$), the combined yoga and mud therapy group (Group 1) demonstrated a highly significant decrease in

stress when compared to the control group (Group C).

Additionally, yoga by itself (Group B) dramatically decreased stress in comparison to the control group (group C) with a mean difference of 11.125 ($P = 0.000002198$). These findings demonstrate the combined intervention's better effectiveness in reducing perceived stress, while yoga by alone showed modest advantages over the control group. With effect to Size, Group participation accounts for 88% of the variance in perceived stress levels, according to the computed effect size ($\eta^2 = 0.88$). The intervention's strong effect on stress reduction is highlighted by its substantial effect size. Further confirming the findings' significant practical significance is Cohen's f value of 2.69.

The synergistic advantages of both therapies are responsible for the combined yoga and mud therapy group's higher efficacy. By encouraging relaxation, increasing parasympathetic activity, and lowering cortisol levels, yoga's asanas, pranayama, and meditation techniques help people manage their stress better (Sengupta, 2012; Telles *et al.*, 2019). Mud therapy is believed to have a cooling and relaxing impact on the body, especially when applied to the belly. This effect may lessen sympathetic overactivity and promote relaxation (Kumar and Rai, 2016). The psychological advantages of yoga may be enhanced by this physical intervention, along with mud therapy offering a comprehensive strategy for stress relief further validates the study. The combination of these two treatments seems to enhance their respective advantages, resulting in the greatest decrease in reported stress levels among the participants, while Perceived stress levels were highest in the control group, which received no intervention. Given that unmanaged stress can worsen glycemic control problems and accelerate the development of diabetes-related comorbidities, this emphasizes the necessity of focused stress-management techniques like Yoga and Mud therapy intervention for diabetes (Cohen *et al.*, 1983; American Diabetes Association, 2013).

Conclusion

The incidents of diabetes are increased worldwide due to population gaining growth, obesity, unhealthy diets and sedentary life style. The integrated approach of Yoga and Mud Therapy of Naturopathy in Diabetes management provides a holistic, complementary strategy to conventional medical treatments. By addressing the physical, mental, and emotional aspects of the condition, this approach empowers individuals with diabetes to take control of their overall wellness and quality of life. It is essential to collaborate with healthcare professionals and certified practitioners of Yoga therapy and Naturopathy consultants to create a personalized plan tailored to individual needs. By integrating Yoga and Mud therapy lifestyle interventions, we can therefore keep the stress management into Diabetic condition under control and ameliorate overall quality of life.

Ethical Statement

Meenakshi Medical College Hospital, Kanchipuram and CTRI approved the study.

Author Contributions

Usha Devi designed the study and drafted the manuscript. *Chamundeeswari* performed statistical analysis and drafted and edited the manuscript. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

References

- American Diabetes Association (2013) Diagnosis and classification of diabetes mellitus. *Diabetes Care* 36 (Supplement 1): S67-S74.
- Aroda VR and Eckel RH. (2018) Emerging risk factors and treatment approaches for cardiovascular disease in women with diabetes. *Circulation Res.* 122(9): 1452-1470.
- Chatterjee S, Khunti K and Davies MJ. (2017) Type 2 diabetes. *Lancet* 389(10085): 2239-2251.
- Cohen S, Kamarck T and Mermelstein R. (1983) A global measure of perceived stress. *J Hlth Social Behavior* 24(4): 385-396.
- Hinkle LE. (2018) Stress and gender: The impact of work and life roles on women's health. *Occupational Med* 68(3): 176-182.
- Kumar H and Rai R. (2016) Effect of mud pack therapy on stress among middle-aged women with type 2 diabetes mellitus. *Indian J Traditional Knowledge* 15(3): 486-490.
- Lazarus RS and Folkman S. (1984) Stress, appraisal, and coping. Springer Publishing Company, New York, pp. 56-78.
- Mishra LC, Singh BB and Dagenais S. (2001) Scientific basis for the therapeutic use of Yoga in cardiovascular disease. *Progress Cardiovascular Nursing* 16(2): 143-149.
- Mohan V, Deepa M, Deepa R, Shanthirani CS and Farooq S. (2019) Secular trends in the prevalence of diabetes and impaired glucose tolerance in urban South India –the Chennai Urban Rural Epidemiology Study (CURES-17). *Diabetologia* 52(10): 1836-1840.
- Mondal S, Kundu B and Saha S. (2018) Yoga as a therapeutic intervention for the management of type 2 diabetes mellitus. *Int J Yoga* 11(2): 129-138.
- Nair R, Saxena D, Devi NJ, Chawla R and Sood VR. (2016) Emphasis of naturopathy in the management of type 2 diabetes mellitus. *J Med Sci Clin Res.* 4(12): 14987-14993.
- Rao PN and Thomas SS. (2014) Naturopathy in the management of diabetes: A case study. *Int J Naturopathy Yogic Sci.* 3(1): 25-29.
- Sengupta P. (2012) Health impacts of yoga and pranayama: A state-of-the-art review. *Int J Preventive Med.* 3(7): 444-458.
- Shantakumari N, Sequeira S and El Deeb R. (2013) Effects of a yoga intervention on lipid profiles of diabetes patients with dyslipidemia. *Indian Heart J.* 65(2): 127-131.
- Sinha B, Sinha TD and Pathak A. (2013) A study on effect of yoga on lipid profile and blood sugar in patients of diabetes mellitus. *Indian J Clin Practice* 24(6): 512-515.
- Sharma M. (2014) Yoga as an alternative and complementary approach for stress management: A systematic review. *J Evidence-Based Complem Altern Med* 19(1): 59-67.
- Shi L, Zhang D and van Meijel B. (2022) Gender differences in perceived stress and its association with diabetes distress and depressive symptoms in patients with type 2 diabetes mellitus. *J Clin Nursing* 31(5-6): 613-624.

Tiwari S. (2013) Mud therapy: A simple and effective treatment for health and healing. J Ayurveda Holistic Med. 1(3): 14-17.

Vaishali K, Kumar KV, Adhikari P and Unnikrishnan B. (2012) Effects of yoga-based program on glycosylated hemoglobin level serum lipid profile in community dwelling elderly subjects with chronic type 2 diabetes mellitus: A randomized controlled trial Physical Occupational Therapy Geriatrics 30(1): 22-30.

Varghese R, Norman TS and Thavaraj HS. (2015) Perceived stress and self-efficacy among college students: A global review. Int J Human Resource Managem Res. 5(3): 15-24.

World Health Organization (WHO) (2021) Diabetes. <https://www.who.int/news-room/facts-in-pictures/detail/diabetes>