

Role of Hot Foot Immersion and Eye Mud Pack in Modulating Stress and Improving Sleep in Individuals with Insomnia

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Abstract

Background: Insomnia is a common sleep disorder frequently precipitated and perpetuated by stress through cognitive and physiological hyperarousal. Simple naturopathic procedures such as hot foot immersion and eye mud pack may promote relaxation via thermal regulation, peripheral circulation, and reduction of sensory and mental strain.

Objectives: To evaluate the effect of combined hot foot immersion and eye mud pack on stress levels and sleep quality among individuals with stress-induced insomnia.

Materials and Methods: An interventional pre–post study was conducted on 10 participants (3 male, 7 female) aged 20–30 years with stress-induced insomnia. The intervention consisted of a hot foot immersion bath at 40–45°C for 10 minutes followed by an eye mud pack for 10 minutes, administered once daily for 10 days. Outcomes were assessed using the Pittsburgh Sleep Quality Index (PSQI), a stress assessment questionnaire, and a sleep diary before and after the intervention. Data were analysed using paired t-tests.

Results: Global PSQI score decreased significantly from 14.80 ± 1.32 to 11.90 ± 1.97 (mean difference 2.90; $p = 0.00079$). Stress score reduced from 71.80 ± 10.20 to 61.40 ± 8.22 (mean difference 10.40; $p = 0.037$). Sleep diary data showed reduced sleep-onset latency (42.8 to 35.0 min), increased total sleep duration (5.74 to 6.52 h), fewer nocturnal awakenings, and improved subjective sleep quality.

Conclusion: Hot foot immersion combined with eye mud pack is a safe, effective, low-cost, and non-invasive naturopathic intervention that significantly reduces stress and improves sleep quality in individuals with stress-induced insomnia. Larger controlled trials are recommended to confirm these findings.

Keywords: Insomnia; stress; sleep quality; hot foot immersion; eye mud pack; Pittsburgh Sleep Quality Index; naturopathy

1. Introduction

Insomnia is a common sleep disorder characterised by repeated difficulty in initiating sleep, maintaining sleep, waking earlier than desired, or obtaining restorative sleep despite adequate opportunity [1]. The night-time complaint is frequently accompanied by daytime fatigue, irritability, poor concentration, and impaired academic or occupational performance. In young adults, insomnia can disturb learning, emotional regulation, and social functioning, making early non-pharmacological management particularly relevant [1,18].

Stress and insomnia are closely interconnected. Stress increases cognitive and physiological arousal at the very time the body is expected to move toward rest. A stressful event may initially cause short-term sleep disturbance, but repeated worry, anticipation of poor sleep, and conditioned arousal can convert a temporary problem into persistent insomnia [2]. Neurobiological reviews describe stress-induced sleep dysregulation as an interaction between stress hormones, inflammatory mechanisms, neural arousal systems, and sleep-regulating brain circuits [3]. Academic stress is a major contributor in student populations because workload, examinations, deadlines, and social pressure increase mental load during evening hours [4,12].

Sleep quality depends on the balance between sympathetic and parasympathetic activity. A calm parasympathetic state supports relaxation and readiness for sleep, whereas sympathetic overactivity maintains alertness and delays sleep onset [5,26]. Naturopathic therapies that encourage relaxation may therefore be useful as supportive measures in stress-related sleep disturbance.

Hot foot immersion involves immersing both feet in warm water (typically 40–45°C) for a defined period. Warming of the distal limbs promotes peripheral vasodilation and heat redistribution, assisting the natural decline in core body temperature associated with sleep onset [7,27,32]. Eye mud pack is a traditional naturopathic modality in which therapeutic mud is applied over closed eyes, providing a gentle cooling stimulus that may reduce ocular strain, mental fatigue, and sensory arousal [8,38]. The combination of warmth at the feet and cooling relaxation over the eyes is theoretically complementary: the foot bath supports thermoregulation and peripheral circulation, while the eye pack reduces mental and ocular tension [9].

Although separate studies have examined warm foot baths and mud packs to the eyes, limited research has evaluated their combined effect on stress-induced insomnia. The present study was therefore undertaken to assess whether a short course of hot foot immersion followed by eye mud pack can reduce stress and improve sleep quality among individuals with insomnia.

2. Aims and Objectives

Aim: To evaluate the effect of hot foot immersion and eye mud pack on stress levels and sleep quality among individuals with insomnia.

Objectives:

1. To assess the effect of hot foot immersion bath and eye mud pack on stress levels in individuals with insomnia.

2. To evaluate improvement in sleep quality following the intervention using the Pittsburgh Sleep Quality Index.
3. To observe changes in sleep duration, latency, and continuity using a sleep diary before and after the intervention.

3. Review of Literature

Insomnia is defined by difficulty in sleep initiation, maintenance, early morning awakening, or non-restorative sleep associated with daytime impairment [13]. Stress acts both as a trigger and a maintaining factor by sustaining hyperarousal—cognitive (worry, racing thoughts), emotional (anxiety), and physiological (elevated heart rate, muscle tension) [14,22]. The hypothalamic–pituitary–adrenal (HPA) axis is a central biological pathway; moderately elevated cortisol levels have been documented in chronic insomnia, supporting the hyperarousal model [23,24]. Autonomic imbalance (sympathetic predominance) and disturbed thermoregulation further impair sleep onset [26,27].

University students show a high burden of insomnia symptoms linked to academic pressure, irregular schedules, and screen exposure [18,19]. Non-pharmacological approaches are preferred for mild-to-moderate cases in this age group to avoid drug dependence [10,42].

Warm foot baths improve sleep by raising distal skin temperature, facilitating core-temperature decline, and reducing sleep-onset latency [7,32–37]. Systematic reviews and meta-analyses support passive body heating before bedtime for sleep improvement [32,37]. Eye mud packs and cold mud applications have been shown to reduce psychological tension, improve autonomic balance, and promote relaxation [8,38–40]. The combination of distal warming and ocular cooling therefore offers a dual, complementary mechanism for reducing stress-related arousal and facilitating sleep.

The Pittsburgh Sleep Quality Index (PSQI) is a validated self-report instrument widely used in insomnia research [28,29]. Sleep diaries provide prospective data on latency, duration, awakenings, and subjective quality [31]. These tools were selected as primary outcome measures for the present study.

4. Materials and Methods

4.1 Study Design and Setting

A single-group, pre–post interventional study was conducted at Tapovana Medical College of Naturopathy and Yogic Sciences, Doddabathi, Davangere, Karnataka.

4.2 Participants

Ten participants (3 male, 7 female) aged 20–30 years with stress-induced insomnia were enrolled. All completed the 10-day protocol with no dropouts.

Inclusion criteria:

- Age 20–30 years, either gender
- Presence of stress-induced insomnia (difficulty initiating or maintaining sleep associated with stress)

- Willingness to provide written informed consent and comply with the daily protocol
- No current use of sleep medication or ongoing psychiatric treatment

Exclusion criteria:

- Severe psychiatric illness, substance use disorder, or diagnosed sleep-related breathing disorder
- Skin conditions or hypersensitivity precluding foot immersion or mud application
- Pregnancy or any acute medical illness

4.3 Ethical Considerations

The study protocol received institutional ethics committee approval. Written informed consent was obtained from all participants. Participation was voluntary and confidentiality was maintained throughout.

4.4 Intervention

The intervention was administered once daily for 10 consecutive days, preferably in the evening before bedtime. Participants first received a hot foot immersion bath: both feet were immersed in water maintained at 40–45°C for 10 minutes. Immediately thereafter, an eye mud pack (clean therapeutic mud applied over closed eyelids) was applied for 10 minutes. Temperature of the foot bath was monitored to ensure safety and consistency.

4.5 Outcome Measures

Pittsburgh Sleep Quality Index (PSQI): A validated 19-item self-report questionnaire yielding a global score (0–21); higher scores indicate poorer sleep quality [28].

Stress assessment questionnaire: A structured questionnaire used to quantify perceived stress levels before and after the intervention.

Sleep diary: Prospective daily record of sleep-onset latency, total sleep duration, number of awakenings, wake after sleep onset, and subjective sleep quality [31].

4.6 Statistical Analysis

Data were expressed as mean $\pm$ standard deviation. Pre- and post-intervention scores were compared using the paired Student's t-test. A p-value < 0.05 was considered statistically significant.

5. Results

All 10 participants completed the 10-day intervention with no reported adverse events.

5.1 Demographic Profile

Table 1 summarises the demographic characteristics of the participants.

Variable	Category	Frequency (n)	Percentage (%)
Age	20–25 years	6	60
	26–30 years	4	40
Gender	Male	3	30
	Female	7	70

Table 1. Demographic profile of participants (n = 10)

5.2 Effect on Sleep Quality (PSQI)

Table 2 presents the pre- and post-intervention PSQI scores.

Outcome	Pre (Mean ± SD)	Post (Mean ± SD)	Mean Diff.	p-value
Global PSQI score	14.80 ± 1.32	11.90 ± 1.97	2.90	0.00079
Subjective sleep quality	3.00 ± 0.00	2.20 ± 0.63	0.80	<0.05
Sleep latency component	2.70 ± 0.48	2.10 ± 0.57	0.60	<0.05
Sleep duration component	2.30 ± 0.48	1.80 ± 0.63	0.50	<0.05
Sleep efficiency component	2.30 ± 0.48	1.90 ± 0.57	0.40	<0.05
Sleep disturbance component	2.50 ± 0.53	2.00 ± 0.47	0.50	<0.05
Daytime dysfunction component	2.00 ± 0.00	1.90 ± 0.32	0.10	>0.05

Table 2. Pre- and post-intervention PSQI scores (n = 10)

The global PSQI score decreased significantly (p = 0.00079), indicating a clinically relevant improvement in overall sleep quality. Most component scores also showed statistically significant improvement.

5.3 Effect on Stress Score

Table 3 presents the change in stress scores.

Outcome	Pre (Mean $\pm$ SD)	Post (Mean $\pm$ SD)	Mean Diff.	p-value
Stress score	71.80 $\pm$ 10.20	61.40 $\pm$ 8.22	10.40	0.037

Table 3. Pre- and post-intervention stress scores (n = 10)

A statistically significant reduction in mean stress score was observed (p = 0.037).

5.4 Sleep Diary Findings

Table 4 summarises key sleep-diary variables.

Sleep-diary variable	Baseline	Post-intervention	Change / Interpretation
Sleep-onset latency	42.8 min	35.0 min	↓ 7.8 min (improved initiation)
Total sleep duration	5.74 h	6.52 h	↑ 0.78 h (increased duration)
Number of awakenings	3.0 / night	2.0 / night	↓ 1 (improved continuity)
Subjective sleep quality*	7.70 $\pm$ 0.95	5.40 $\pm$ 1.58	↓ 2.30 (improved quality)

Table 4. Sleep-diary variables before and after intervention (*lower score = better quality on the scale used)

Sleep-diary data demonstrated consistent improvements in sleep initiation, continuity, duration, and subjective quality.

6. Discussion

The present study evaluated the combined effect of hot foot immersion and eye mud pack on stress and sleep quality in individuals with stress-induced insomnia. The intervention produced a highly significant improvement in global PSQI score (p = 0.00079) and a significant reduction in stress score (p = 0.037). Sleep-diary findings corroborated these results with shorter sleep-onset latency, longer total sleep time, fewer awakenings, and better subjective quality.

These outcomes are consistent with the established thermoregulatory mechanism of warm foot baths: distal warming promotes peripheral vasodilation, facilitates the nocturnal decline in core temperature, and thereby shortens sleep latency [7,27,32]. Systematic reviews support passive body heating before bedtime as an effective strategy for improving sleep [32,37]. The cooling ocular stimulus of the mud pack is thought to reduce sensory and mental arousal, promote parasympathetic tone, and contribute to stress reduction [8,38–40]. The simultaneous use of a warming distal stimulus and a cooling cranial

stimulus therefore offers a complementary dual action that addresses both physiological and cognitive components of stress-related hyperarousal.

The study has limitations. The sample size was small ($n = 10$), the design lacked a control group, the intervention period was short (10 days), and outcomes relied on self-report instruments without objective polysomnography or actigraphy. These factors limit causal inference and generalizability. Nevertheless, the magnitude and consistency of change across multiple measures, together with the absence of adverse events, provide preliminary support for this simple, low-cost naturopathic protocol.

Future research should employ larger samples, randomized controlled designs, longer follow-up, and objective sleep measures to confirm efficacy and explore dose–response relationships.

7. Conclusion

Hot foot immersion combined with eye mud pack, administered daily for 10 days, significantly reduced stress and improved sleep quality in individuals with stress-induced insomnia. The intervention is safe, inexpensive, non-invasive, and easy to administer. Within the limitations of this preliminary study, the findings support its use as a complementary naturopathic approach for stress-related sleep disturbance. Larger controlled trials are warranted.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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