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Effects of *Mamsyadi Kwatha* in primary insomnia - A randomized controlled trial

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ABSTRACT

Background: Insomnia is the second most commonly presenting symptom, after pain, in clinics. Insomnia prevalence in India is 28.1 %. Objective: This study explores the effect of *Mamsyadi Kwatha* in the management of primary insomnia.

Materials and methods: Fifty patients attending KLE Ayurveda hospital meeting the diagnostic criteria of primary insomnia (DSM IV TR) were enrolled. Patients were randomly divided into two groups: group MK and TK. Intervention in group MK was 24 ml of *Mamsyadi Kwatha* twice a day and in group TK was 24 ml of *Tagaradi Kwatha* twice a day for 30 days. Assessment was done through primary outcome measures like Pittsburgh sleep quality index (PSQI), Epworth sleepiness scale (ESS), insomnia severity index (ISI). Secondary outcome measures were sleep diary recordings of past 15 days and depression anxiety and stress scale (DASS). Follow ups were at base line, 15th and 30th day of interventions. Laboratory assessments of liver function test, haemoglobin, and serum creatinine levels were carried at base line and 30th day of intervention.

Results: Effect on primary and secondary outcomes showed that both the drugs were comparable. = Within group comparison of both the drugs showed that they produced significant improvement in PSQI, ESS, ISI, sleep diary variables, and DASS. However, *Mamsyadi kwath* has additional benefit of early recovery in total sleep. Both the drugs showed good safety profile evaluated through serum creatinine and liver function tests.

Conclusion: The effects of *Mamsyadi Kwatha* is comparable to *Tagaradi Kwatha.* Both drugs produced significant improvement in clinical assessments of insomnia, anxiety, depression, and stress.

1. Introduction

Insomnia is one of the growing problems of the 21st century. Insomnia disorder is a problem with initiating or maintaining sleep which is associated with daytime consequences [1]. Primary insomnia is sleeplessness that does not have a clearly identifiable etiological factor and is not attributable to medical, psychiatric, or environmental causes. [2].

Epidemiological studies have indicated a high prevalence of sleep disorders. Sleep disorders are as high as 50 % in population above 60 years or age and 20 % in the younger population. One-third of these people have chronic insomnia [3]. Insomnia can have a gross adverse effect on the individual, community, and the nation. Motor vehicle and workplace accidents, reduced productivity, and difficulty with intellectual, social, and/or vocational functioning are observed in insomnia [4].

In Ayurveda, *Nidra* (sleep), *Ahara* (diet), and *Brahmacharya* (behavioral practices) are considered as the three pillars of life [5]. Sleep induction is due to multi-contributory factors like fatigue, night period, and disturbance to *Chetana Sthana*. Fatigue causes dissociation with sensory and motor information processing and induces sleep [6]. Obstruction to channels by *Kapha* and *Tama* occur at night due to *Doshik* rhythms and help in sleep induction [7]. *Tama Guna* obstructing *Chetana Sthana* (consciousness promoting areas) produce sleep [8]. Optimum sleep produces benefits like improved sense of well-being, better quality of life, nourishment, fertility, longevity and is called as *Bhutadatri*

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(nourisher of all the living organisms) [9]. Pathophysiology of *Anidra* (insomnia) includes derangement of *Sharerika Dosha* like *Vata, Pitta* and *Manasika dosha* like *Raja, Tama. Srotas* involved are *Manovaha* and *Vatavaha*. Derangements are in *Rasa* and other *Dhatus*. Trauma to the mind and body can also contribute to sleep disturbance.

Conventional treatment for insomnia is through pharmacological agents like benzodiazepines, non-benzodiazepine hypnotics, sedative low-dose antidepressants along with other non-pharmacological treatments. Few of these managements have issues like dependence etc. [10] Hence patients are increasingly looking into other systems of medicine. Previous study has shown *Tagaradi Kwatha* [11] has beneficial role in insomnia [12]. *Mamsyadi Kwatha* [13] has been shown to have an antidepressant effect [14]. Both are being used by Ayurveda physicians for various psychiatric conditions including insomnia. Hence, this study was planned to evaluate the effect of *Mamsyadi Kwatha* in primary insomnia.

2. Materials and Methods

The null hypothesis states that there is a no difference in clinical outcome of *Mamsyadi Kwatha* in primary insomnia when compared to the standard drug *Tagaradi Kwatha*.

Patients attending outpatient department of the institute were recruited for the study. The CONSORT statement and extension for herbal interventions [15] guidelines were used in reporting the study.

2.1. Patients

Fifty patients diagnosed with primary insomnia as per DSM IV TR criteria (APA, 2000) [16] were recruited from OPD and IPD of KLE Ayurveda Hospital Belagavi, Karnataka, India. DSM IV TR criteria for primary insomnia includes- predominant difficulty in initiating or maintaing sleep for atleast one month. Sleep disturbance is not due to other sleep disorders like narcolepsy, breathing-related sleep disorders etc. Sleep disturbance is not associated with other psychiatric disorders like depression etc. Sleep disturbance is not due to the direct physiologic effect of a substance. Sleep disturbance causes significant distress to the patient.

2.1.1. Inclusion criteria

Patients of primary insomnia between the age group of 20–80 years of either sex fulfilling the diagnostic criteria of primary insomnia as per DSM IV TR criteria were recruited for the study.

2.1.2. Exclusion criteria

Patients with axis I disorders like schizophrenia, major depressive disorder, psychosis, anxiety disorders; axis II disorders like personality disorders. Patients with alcohol or drug dependency. Patients with other sleep disorders like narcolepsy, breathing-related sleep disorder, circadian rhythm sleep disorder, parasomnia and other axis III disorders like epilepsy, asthma, malignancies, liver cirrhosis, chronic renal failure, etc. were excluded. Pregnant and lactating women were also excluded from the study.

2.1.3. Screening measures

All the patients were screened for primary insomnia. Patients were evaluated through various clinical and laboratory parameters. The laboratory parameters were carried out at clinical laboratory, KLEU's Shri B.M.K. Ayurveda Mahavidyalaya, Belagavi to all patients at baseline and 30th day of the intervention.

2.2. Research design

The present study is a randomized controlled parallel group trial. The scholars involved in the randomization, distribution, and administration of study articles were independent of the investigators. Random numbers were generated from an online software (Random Number Generator). Sequence generationand sealing in opaque envelopes were carried out by the principal investigator. Sealed envelopes were sequentially opened on patient enrolment by an independent research staff not involved with the study. Allocation was in 1:1 ratio between the control and test groups. The block size was two. During the study, the patients were asked to stick to the treatment protocol and report any adverse events to the investigator. Adherence was evaluated through adherence charts and unused medications.

2.2.1. Interventions

The patients were randomized into two groups: group MK and group TK. Group MK received 24 ml *Mamsyadi Kwatha* twice a day for 30 days and Group TK received 24 ml *Tagaradi Kwatha* twice a day for 30 days. *Mamsyadi Kwatha* [13] and *Tagaradi Kwatha* [11] dosages were as per classical literature. Identification, authentication, and analytical studies like loss on drying, ash values (water insoluble, acid insoluble, total ash) ,and extractive values of *Mamsyadi* and *Tagaradi Kwatha Churna* were done at AYUSH-approved research lab for ASU drugs at KLEU'S Shri B. M.K. Ayurveda Mahavidyalaya, Belagavi. *Kwatha Churna* was prepared in GMP-certified KLEU's pharmacy at Belgavi as per the standard operating procedures. Finished product assessments like loss on drying, ash values (water insoluble, acid insoluble, total ash), extractive values, qualitative phytochemical analysis, and microbiological limit test as per Ayurveda Pharmacopeia of India were conducted. Phytochemical screening of *Tagaradi Kwatha churna* (powder) revealed it was positive for carbohydrates, saponin glycosides, flavonoids, and tannins. Similarly, *Mamsyadi Kwatha churna* showed the presence of carbohydrates, flavonoids, and tannins.

Patients were provided with 12 gms sachets of *Tagaradi Kwatha Churna*. *Tagaradi Kwatha was* prepared by adding 16 times water (192 ml) and reducing it to 48 ml. *Mamsyadi Kwatha Churna* were 16.5 gms sachets and 10 times water was added (165 ml) and Kwatha was prepared by reducing it to 48 ml. Preparation of the decoctions was as per the textual information. Both decoctions were consumed 24 ml twice a day with warm water after food. Patients were provided with plastic glass (200 ml volume) with different markings so as to help them in preparing *Kashaya* accurately. *Kashaya* preparation protocol was used. Assessments were done at baseline, 15th day, and 30th day of interventions. The nature and design of the study were explained to patients, and informed consent was taken. The study was approved by the Institute Ethics Committee (IEC letter BMK/14/PG/KC/01, Dated-09.01.2015 and CTRI Registration Number-CTRI/2019/09/021224). The sample size was calculated from a previous study [17]. With the estimated effect size of d = 0.82, 5 % alpha error , and 80 % power the total sample size was 50, 25 in each arm.

2.3. Assessment criteria

1. Primary outcome measures were the Pittsburgh sleep quality index [18] (PSQI) assessing quality and patterns of sleep, Epworth sleepiness scale [19] (ESS) that evaluates daytime sleepiness, and insomnia severity index [20] (ISI) that evaluates the severity of insomnia.
2. Secondary outcomes were measured through a sleep diary in which detailed records of the activities of the past 15 days were recorded. Patients were provided with sleep diary forms and were advised to fill the information about their sleep on awakening the next day morning for 15 days. Patient enrollment was also on the basis of compliance with sleep diary form for the past 15 days. The depression anxiety and stress scale [21] (DASS) assessed the psychological state of patients.

Blood investigations like hemoglobin (gm%), liver function tests like total protein, globulin, albumin, albumin:globulin ratio, total and direct bilirubin, aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase and serum creatinine were carried out at

baseline and 30th day of interventions in all patients. All clinical assessment scales were measured at baseline, 15th and 30th day of interventions.

2.4. Statistical methods

Statistical analysis was carried out using SPSS Version 20.0 (IBM Corporation, Chicago, Illinois, United States). Chi Squared test was used to assess the homogeneity of the data across the groups. Comparison of groups across different time points was carried out by Repeated Measures ANOVA with Bonferroni post-hoc test. Comparison of within groups at two-time points was analyzed by paired *t*-test. Comparison of groups at a time point was through independent sample *t*-test. Effect size interpretation was: 0–0.2 as minimal, 0.2–0.5 as small, 0.5–0.8 as medium, and above 0.8 as large effect size [22]. Values are reported as mean ± standard deviation. All tests were considered statistically significant at $p < 0.05$.

3. Results

A total of 50 patients were recruited and divided into two groups. 48 participants completed the study. One patient each from Group MK and Group TK dropped out of the study. Drop-outs were due to intercurrent illness and migration respectively. No adverse effects were reported in any of the patients (Fig. 1).

3.1. Patient characteristics

Maximum number of patients were in the age group of 50–60 years (30 %), males (56 %), married (88 %), graduates (40 %), lower middle class (72 %), mixed diet (67.5 %), body constitution of *Vata Kapha Prakrti* (50 %), mean duration of the illness was 1.96 ± 2.61 years. (Table 1). All parameters were comparable at baseline across the groups, namely weight ($p = 0.08$), BMI ($p = 0.05$), systolic blood pressure ($p = 0.81$), diastolic blood pressure ($p = 0.68$), PSQI ($p = 0.11$), ESS ($p = 0.92$), ISI ($p = 0.65$), DASS total ($p = 0.60$), DASS-anxiety ($p = 0.95$), DASS-depression ($p = 0.69$) and DASS-stress ($p = 0.43$).

3.2. Primary outcomes-

Between the group assessment showed that PSQI ($p = 0.50$), ESS($p = 0.726$), and ISI (0.604) were comparable. Within group comparison showed a significant improvement on the 15th and 30th day of both interventions in PSQI ($p < 0.0001$), ESS($p < 0.0001$), and ISI ($p < 0.0001$) in both groups (Table 2).

3.3. Secondary outcomes

3.3.1. DASS

DASS-total ($p = 0.86$), DASS-anxiety ($p = 0.85$), DASS-depression ($p = 0.89$), DASS-stress ($p = 068$) showed a non-significant difference between groups. Within group comparison showed a significant improvement on the 15th and 30th day of both interventions in all the parameters like DASS-total ($p < 0.0001$), DASS-anxiety ($p < 0.0001$), DASS-depression ($p < 0.0001$), DASS-stress ($p < 0.0001$). (Table 2).

3.3.2. Sleep diary

Frequency of waking up refreshed ($p = 0.76$), number of naps ($p =$

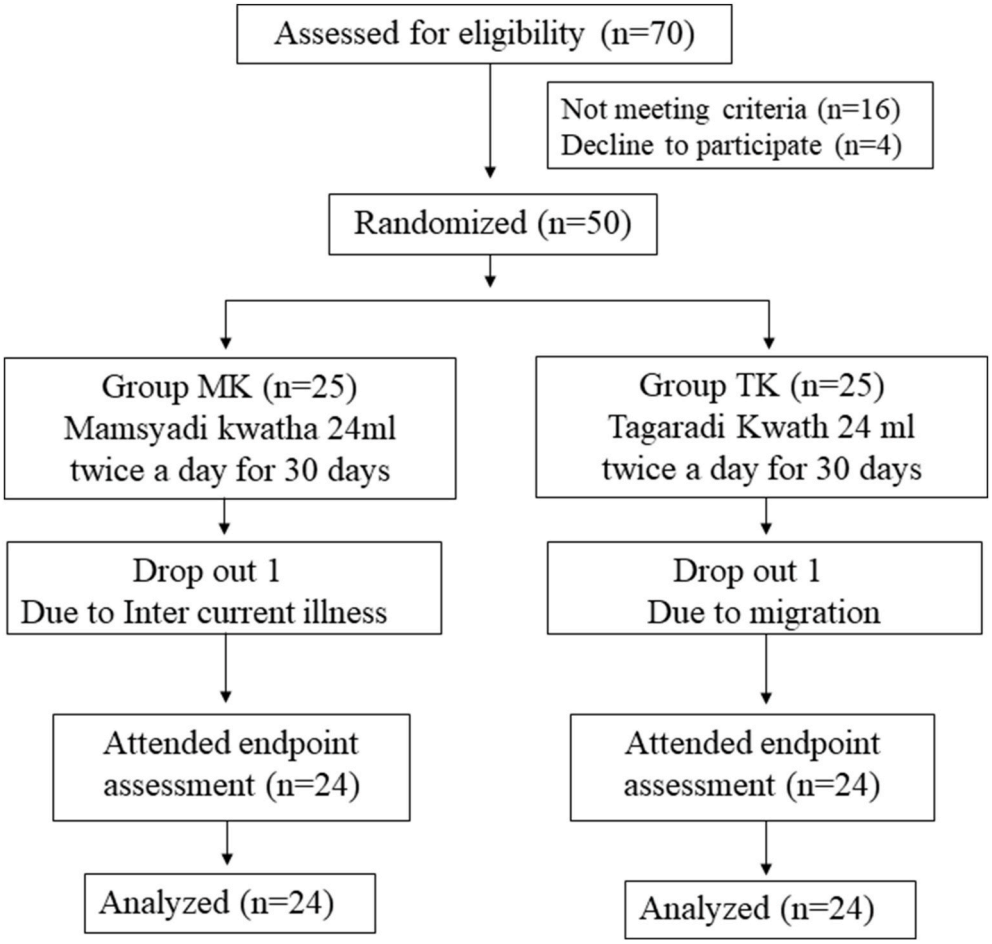

Fig. 1. Subject flow chart through the study.

Table 1
Patient profile - expressed in mean, standard deviations and number.

S. No	Patient profiles	Group MK (n = 25)	Group TK (n = 25)	p-Value
1.	**Age (yrs)**	**48.36 ± 13.46**	**45.04 ± 12.83**	**0.958**
2.	**Gender**	**17**	**11**	**0.08**
	Male			
	Female	**8**	**14**	
3.	**Occupation**			**0.082**
	Business	**5**	**2**	
	Employee	**6**	**3**	
	Farmer	**4**	**2**	
	Housewife	**3**	**8**	
	Labourer	**3**	**9**	
	Retired officer	**1**	**1**	
	Student	**3**	**0**	
4.	**Socioeconomic status**			**0.574**
	Poor	**5**	**5**	
	Middle class	**17**	**19**	
	Higher middle class	**3**	**1**	
5.	**Education**			**0.384**
	Graduate	**11**	**20**	
	Post Graduate	**2**	**2**	
	Primary	**4**	**9**	
	Secondary	**7**	**18**	
	Uneducated	**1**	**1**	
6.	**Life style**			**0.801**
	Hard	**7**	**5**	
	Moderate	**17**	**19**	
	Sedentary	**1**	**1**	
7.	**Marital status**	**4**	**2**	**0.384**
	Unmarried			
	Married	**21**	**23**	
8.	Duration of illness (months)	**2.13 ± 3.30**	**1.78 ± 1.73**	**0.171**
9.	Drop outs	**1**	**1**	
10.	Study completed	**24**	**24**	
11.	Total	**25**	**25**	

0.27), longest nap (p = 0.27), time required to sleep (p = 0.48), number of awakenings (p = 0.15), actual sleep (p = 0.62), duration of awakenings (p = 0.76), total sleep (p = 0.35) showed a non-significant difference in between group comparison. Within group comparison showed a significant improvement on the 15th and 30th day of both interventions in various subcomponents of sleep diary like waking up refreshed (p < 0.001), number of naps (p < 0.001), actual sleep (p < 0.001). Longest nap showed significance only at 0th–30th day comparison in group MK (p = 0.002)and group TK (p = 0.005), however, in group MK improvement (p = 0.02) was also seen in 15th −30th day of intervention. Time to sleep showed significance at both 0 th–15th day comparison in group MK (p < 0.001) and group TK (p = 0.001) and also at 0th–30th day comparison in both groups (p < 0.001). The number of awakenings showed significant at both 0–15th day comparison in group MK (p < 0.001) and group TK (p = 0.002) and also at 0–30th day comparison in both groups (p < 0.001). Duration of awakenings did not show any significant change in any of the groups at any of time point. Total sleep showed significance at both time points of 15th (p = 0.04) and 30th day (p = 0.003) in group MK only. At baseline to 30th day comparison significant improvement was observed in group TK (p < 0.001).

All the sleep diary parameters showed no significant change in comparison between group. Within group comparison showed significant improvement at both time points in waking up refreshed, number of naps, time to sleep, number of awakenings, actual sleep, longest nap only at 0–30th day comparison, total sleep improvement in group MK was at both time points, but in group TK was it was for only 0–30th day comparison. Duration of awakenings was reduced but not significantly in any group at time points (Table 3).

Effect size assessment showed that a small effect was seen in PSQI, ESS, DASS-T, DASS-D, DASS-S, frequency of waking up refreshed, longest nap, time to sleep, number of awakenings, total sleep. Minimal effect was in ISI, actual sleep, number of naps, duration of awakenings, DASS-A favoring *Mamsyadi Kwatha.*

3.3.3. Blood parameters

All the blood parameters like haemoglobin, serum creatinine, and liver function tests were within the normative ranges both before and after the interventions. Interventions didn't produce any change within or between the groups (Table 4, Supplementary document).

4. Discussion

The present study showed that the effects of *Mamsyadi Kwatha* is comparable to *Tagaradi Kwatha* in both primary as well as secondary outcome measures. Additional advantage of *Mamsyadi Kwatha* was an improvement in total sleep at both the time points suggestive of early onset of action.

Within group comparison showed that both the drugs produced significant improvement in the various clinical sleep parameters like PSQI, ISI, ESS, and sleep diary. Improvement in parameters of sleep diary like increase in total sleep time, actual sleep time, decrease in the number of naps, total duration of the nap, number of awakenings, and period of time to sleep. The frequency of waking up refreshed was increased. Decreases in DASS total, DASS anxiety, DASS-depression and DASS-stress scores were also noted in both interventions showing psychological improvements.

Effect size assessment showed that a small effect favouring *Mamsyadi Kwatha* was seen in night sleep profile (PSQI), daytime sleepiness (ESS), psychological disturbance profile (DASS-T), depression (DASS-D), stress (DASS-S), frequency of waking up refreshed, longest nap, time to sleep, number of awakenings and total sleep. Minimal effect was observed in

Table 2
Effect of Interventions on Clinical assessment scales. PSQI, ESS, ISI, DASS – Anxiety, Stress, Depression Scale. Values are expressed in mean ± SD.

Clinical Variables	Groups	Baseline	15th day	30th day	BL-15th day	15th–30th day	BL-30th day	P value	Effect Size (0–30days)
PSQI	MK	12.50 ± 2.32	10.04 ± 2.13	6.62 ± 2.65	<0.001	<0.001	<0.001	0.5	0.36
	TK	13.45 ± 1.81	10.20 ± 2.10	6.62 ± 2.93	<0.001	<0.001	<0.001		
ESS	MK	5.95 ± 2.67	4.00 ± 2.71	2.41 ± 2.50	<0.001	<0.001	<0.001	0.72	0.36
	TK	5.87 ± 3.31	3.70 ± 2.42	2.16 ± 2.27	<0.001	<0.001	<0.001		
ISI	MK	18.62 ± 3.39	13.41 ± 2.61	8.04 ± 2.94	<0.001	<0.001	<0.001	0.6	0.08
	TK	18.12 ± 4.15	13.04 ± 3.64	7.95 ± 3.40	<0.001	<0.001	<0.001		
DASS- Total	MK	19.33 ± 11.21	10.66 ± 8.05	4.16 ± 5.55	<0.001	<0.001	<0.001	0.86	0.25
	TK	17.75 ± 9.61	10.70 ± 7.35	4.58 ± 5.86	<0.001	<0.001	<0.001		
DASS-Anxiety	MK	4.20 ± 2.91	2.50 ± 2.06	0.87 ± 1.19	<0.001	<0.001	<0.001	0.85	0.03
	TK	4.16 ± 2.54	2.37 ± 1.43	0.75 ± 0.94	<0.001	<0.001	<0.001		
DASS- Depression	MK	6.58 ± 4.83	3.16 ± 3.22	1.12 ± 2.50	<0.001	<0.001	<0.001	0.89	0.32
	TK	6.04 ± 4.59	3.50 ± 3.69	1.70 ± 2.95	<0.001	<0.001	<0.001		
DASS- Stress	MK	8.54 ± 4.49	5.00 ± 3.27	2.16 ± 2.27	<0.001	<0.001	<0.001	0.68	0.28
	TK	7.54 ± 4.32	4.87 ± 3.66	2.12 ± 2.65	<0.001	<0.001	<0.001		

Table 3
Effect of Interventions on Sleep Diary variables. Values are expressed in mean ± standard deviation.

Clinical Variables	Groups	Baseline	15th day	30th day	BL-15th day	BL–30th day	15th −30th day	P value	Effect Size (0–30days)
Frequency of waking up Refreshed	MK	39.16 ± 13.24	53.33 ± 9.63	70.27 ± 13.03	<0.001	<0.001	0.001	0.76	0.37
	TK	39.99 ± 8.10	55.55 ± 9.56	64.99 ± 10.81	<0.001	<0.001	<0.001		
Number of Naps	MK	0.47 ± 0.42	0.35 ± 0.32	0.22 ± 0.19	0.002	0.008	0.048	0.27	0.01
	TK	0.56 ± 0.45	0.41 ± 0.35	0.31 ± 0.32	0.007	<0.001	0.002		
Longest Nap (mins)	MK	3.14 ± 2.48	2.68 ± 2.88	1.49 ± 1.70	0.216	0.002	0.029	0.27	0.32
	TK	3.58 ± 2.53	2.96 ± 2.66	2.50 ± 2.68	0.181	0.005	0.149		
Time to sleep (mins)	MK	60.22 ± 31.93	47.18 ± 25.60	31.96 ± 23.11	<0.001	<0.001	<0.001	0.48	0.27
	TK	66.45 ± 38.07	52.08 ± 40.05	31.34 ± 16.66	0.001	0.0001	0.008		
Number of Awakenings	MK	0.46 ± 0.28	0.31 ± 0.28	0.18 ± 0.16	<0.001	<0.001	0.002	0.15	0.22
	TK	0.59 ± 0.45	0.39 ± 0.28	0.24 ± 0.20	0.002	<0.001	<0.001		
Actual Sleep (mins)	MK	281.25 ± 74.96	334.37 ± 56.20	384.37 ± 54.67	<0.001	<0.001	<0.001	0.62	0.01
	TK	290.00 ± 48.18	338.75 ± 39.04	393.75 ± 68.70	<0.001	<0.001	0.002		
Duration of awakenings (mins)	MK	62.06 ± 48.06	48.73 ± 37.08	44.43 ± 47.67	0.459	0.400	1.000	0.76	0.16
	TK	68.58 ± 44.62	54.33 ± 41.58	42.16 ± 50.40	0.196	0.062	0.831		
Total sleep (mins)	MK	403.54 ± 94.96	430.29 ± 64.90	460.77 ± 52.51	0.041	0.003	<0.001	0.35	0.25
	TK	425.04 ± 52.23	445.16 ± 43.56	467.26 ± 44.42	0.05	<0.001	0.006		

the severity of insomnia (ISI).

In the present study, most of the patients were suffering from mild to moderate insomnia, mild anxiety, depression, and stress. The average duration of illness was 1.9 years. Our study showed severe insomnia reduced to mild on the basis of PSQI values in both groups. The daytime sleepiness assessed through ESS scores, both before and after interventions were within the non-sleepiness limits of 10. The mean ISI score in our patient was 18 suggestive of moderate severity of insomnia.

The effects of *Mamsyadi Kwatha* could be attributed to its ingredients like *Jatamansi* (*Nardostachys jatamansi* DC.), *Ashwagandha* (*Withania somnifera* Dunal) and *Parsika Yavani*. (*Hyoscyamus niger* Linn.). The neurobiological activity of *Jatamamsi* is through an increase in serotonin, GABA, and taurine [23]. *Parasika yavani* has anxiolytic and antidepressant activity [24].

Tagaradi Kwatha contains ingredients like *Tagara* (*Valeriana wallichi* DC), *Jatamamsi* (*Nardostachys jatamansi* DC.), *Ashwagandha* (*Withania somnifera* Dunal), *Shankhapushpi (Convolvulus pluricaulis* Choisy), *Brahmi* (*Bacopa monnieri* Linn), *Aragwadha* (*Cassia fistula* Linn), *Raktachandan* (*Pterocarpus santalinus* Linn), *Musta* (*Cyperus rotundus* Linn.), *Draksha* (*Vitis vinifera* Linn), *Katuki* (*Picrorhiza kurroa*) and *Dashamoola* (Group of ten roots). The properties of most of the drugs are *Vata-Pitta Shamaka, Rasayana* (regenerative), *Medhya* (intellect promoting), *Nidrajanana* (sleep promoting). *Shankapushpi* has sedative effects. Valerinic acid decreases the breakdown of GABA in the brain and acts as GABA-A receptor substrate resulting in its sedative and anxiolytic actions [25]. Sedative, hypnotic, and anxiolytic effects of Valerian could be through action on GABA receptors [26]. *Valeriana wallichii* root extract improved sleep quality by significantly decreasing sleep latency, and increasing duration of total sleep as well as NREM sleep [27]. *Tagaradi Kwatha* is also widely used by Ayurveda physicians in the management of insomnia. *Tagaradi Kwatha* was considered as control drug in this study due to its wide clinical utility along with its various evidences.

Similar to our findings, a study [28] showed that a single drug formulation of *Tagara Churna* and *Jatamamsi churna* in primary insomnia were comparable. However, *Tagara Churna* showed better trends of clinical improvement. In our study, we used classical compound formulation, used in decoction form and assessed through standard clinical assessment scales. Many studies have been carried out on compound formulations of Ayurveda drugs. Compound formulation (*Rauwolfia serpentina, Nardostachys jatamansi, Tinospora cordifolia*) showed significant improvement in both subjective and polysomnographic parameters of sleep [23]·A poly herbal preparation (NSF-3) (extracts of *Valeriana officinalis, Passiflora incarnate, and Humulus lupulus*) has shown clinical outcomes comparable to zolpidem in primary insomnia [17]. Polyherbal compound [29] (*Nardostachys jatamansi, Convolvulus pluricaulis, Withania somnifera,* and *Valeriana wallichi*) has shown to decrease sleeplessness in patients of stress induced insomnia. *Tagaradi Kwatha* [12] (formulation with 21 ingredients) decreased subjective symptoms of insomnia. Insomrid tablet (*Ashwagandha, Sarpagandha, Jatamansi, Tagara, Parasika yavani*) has shown significant improvement in insomnia [30].Ayurveda therapeutic procedure of *Shirodhara* with warm milk [30] and buffalo milk [12] have also shown improvement in insomnia.

This study has various strengths. The randomized controlled clinical trial assessed through various standard assessment scales is one of the merits of the study. Comprehensive assessment of sleep patterns, insomnia severity, daytime sleepiness along with psychological components like anxiety and depression are its strength. Both drugs did not produce any adverse effects and had a good safety profile assessed through liver and renal function tests. However, the study has a limitations such as a shorter duration of intervention and assessment through subjective assessments. The use of *Tagaradi churna* instead of gold standard controls like benzodiazepines etc. is a limitation of the study. Objective assessments of sleep through polysomnography and actigraph would be beneficial. Assessments through endocrinal parameters will provide better information. Future studies can be planned in multicentric settings with a large sample.

5. Conclusion

Study showed that the effect of *Mamsyadi Kwatha* and *Tagaradi Kwatha* interventions in primary insomnia were comparable. *Mamsyadi Kwatha* has additional advantage of early improvement in total sleep. Both drugs showed beneficial effects on sleep parameters. An Increase in total sleep time, actual sleep time and frequency of waking up refreshed were observed. The duration of longest nap, number of naps, and

number of awakenings were decreased. Both interventions have anti-stress, antidepressant, and anxiolytic effects. Both drugs showed good safety profiles measured in terms of serum creatinine and liver function tests and had no adverse events.

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Declaration of generative AI in scientific writing process

Nothing to disclose.

Author contributions

AL- Visualization, Data collection, Writing - Reviewing and Editing.
BRT- Conceptualization, Methodology, Writing - Original draft preparation, Writing -Reviewing and Editing, Statistical analysis.
KS- Visualization, Data collection, Writing - Reviewing and Editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jaim.2023.100830.

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