

## Non-Pharmacological Management of Sleep Disorders in the Older Adults: The Role of Aromatic Footbath-Hydrotherapy

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### ABSTRACT

**Background:** The increase in physiological symptoms in the elderly has an impact on reducing the quality of sleep. This decrease in sleep quality has an impact on health both physically and psychologically. One of the psychological impacts is depression. Various studies explain that depression can lead to distortion of thoughts, decreased memory, increased risk of suicide, and death.

**Purpose:** The aimed to determine the effectiveness of the complementary therapy, especially aromatic footbath-hydrotherapy in reducing sleep disorders among the elder adults. The potential harming of the study were allergic and foot-wound, however the researcher select the participants based on inclusions and exclusions criteria.

**Methods:** The method used was quasi experiment with pre-post control group. The group was divided into three with the number of respondents, there was 39 elderly consumptions of Sahdu tea, 38 elderly consumptions of "wedhang uwuh", and 30 elderly aromatic footbath hydrotherapy. The inclusions were elderly ( $\geq 55$  years old), independent activities, good verbal communication. The exclusions were allergic with the herbal's composition, severe dementia, and severe cardiovascular disease. The data was located in Candibinangun, Ambarketawang, and Balecatu D.I. Yogyakarta in 2024. The data were scattered abnormally so using non-parametric tests to see the effectiveness of therapy. The questionnaire used PSQI. The one-way ANOVA test was implemented in the study.

**Results:** Based on Wilcoxon test, Sahdu tea had effectively in latency and the total PSQI score; Wedhang Uwuh Javanese Drink had only effectively in sleep disorders, and the latest therapy, aromatic footbath hydrotherapy had effectively in quality, latency, duration, sleep disorder, dysfunctional, and total score of PSQI. One way ANOVA found that aromatic footbath hydrotherapy was most effective in reducing elderly sleep disorders ( $p: 0.000$ ).

**Conclusion:** Aromatic footbath hydrotherapy (AH) was most effective in reducing elderly sleep disorders. However, the weakness of this study is that researchers cannot control the stability of water temperature during therapy.

**Keywords:** Aromatic Footbath-Hydrotherapy, Elderly, Sleep Quality

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**BACKGROUND**

WHO projects that the population of the older adults will continue to rise 12% to 22% between 2015 and 2050. By 2050 the number of the older adults is expected to reach 2 billion people or 80% of the elderly who live in low-and middle income countries (Kemenkes RI, 2022). At this stage of life, sleep disturbance are commonly experienced by elderly. Sleep disturbances refer to a range of problems that affect the duration, quality, and pattern of sleep (Hasibuan & Hasna, 2021). These issues occur because aging is often accompanied by physical and psychological problem, including arthritis, impaired hearing and vision, reduced memory, muscle loss, stress, and vulnerability to infectious diseases (WHO, 2013). Poor sleep can contribute to fatigue, daytime sleepiness, metabolic and endocrine dysfunction, immune system impairment, and conditions such as sleep apnea. Sleep apnea, characterized by repeated episodes of obstructed airflow during sleep, may result from snoring, medication effects, or narcotic use (Rodriguez et al., 2015; Yang et al., 2012), and is associated with elevated risks of hypertension, heart failure, and stroke due to reduced oxygen perfusion (CDC, 2021). Indonesia mirrors this demographic shift, experiencing a marked growth in its elderly population. To address this, the Ministry of Health introduced the Active Ageing initiative in 2002, emphasizing the importance of maintaining physical, social, and mental well-being to support a high quality of life among older adults (Kemenkes RI, 2022).

Hypertension is one of the most significant physical conditions influencing sleep quality in older individuals (Sambeka et al., 2018). Evidence indicates that up to 94.9% of elderly people with hypertension experience poor sleep (Sakinah et al., 2018). Shortened sleep duration is linked to a heightened risk of hypertension, as inadequate sleep disrupts the regulation of systolic and diastolic blood pressure (Martini et al., 2018). Elevated blood pressure is further associated with vascular dysfunction, inflammatory responses, altered sympathetic activity, and increased catecholamine release. Although cardiac output does not markedly increase (Calhoun & Harding, 2010; Liu et al., 2016). These physiological alterations contribute to the development and persistence of sleep disorders. Consequently, identifying effective therapeutic interventions to manage sleep disturbances in the elderly is essential.

**METHODS**

This study employed a quasi-experimental design with pre-test and post-test control groups. The research population consisted of elderly individuals residing in several areas of Sleman, including Candinibangun, Ambarketawang, and Balecatu. A total of 107 older adults participated which was taken in 2024, comprising 39 who consumed Crocus Sativus Linnaeus tea, Clitoria Ternatea, and honey (Sahdu); 38 who consumed wedhang uwuh (a traditional Javanese drink) which containing ginger, secang wood, cloves, cinnamon leaves, nutmeg, cardamom, and rock sugar; and 30 who received Aromatic Footbath Hydrotherapy. The inclusion criteria were: (1) age  $\geq 55$  years; (2) independence in ADLs; and (3) adequate verbal communication. Exclusion criteria consisted of severe dementia, serious cardiovascular disease, allergies to herbal ingredients, and depression.

The Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality. A brief cognitive screening was also conducted to evaluate elderly conditions, particularly concerning dementia or Alzheimer's risk. Data collection involved administering Sahdu herbal tea bags containing honey, Crocus Sativus Linnaeus, and Clitoria Ternatea (Hidayati et al., 2024a), Wedhang uwuh included ginger, secang wood, cloves, cinnamon leaves, nutmeg, cardamom, and rock sugar (Hidayati et al., 2024b). The participants consumed their assigned herbal drink once daily before bedtime.

For Aromatic Footbath Hydrotherapy, the procedure incorporated aromatherapy oils lavender and lemon at a ratio of 2:1 (Kim et al., 2021), with up to three drops added to warm water at 39°C. The elderly soaked their feet up to the ankles for 15 minutes, either in the afternoon or before bedtime. This study was conducted by the research team with careful consideration and in adherence to predetermined procedures. The therapy was delivered individually to each elderly participant in a structured and systematic manner by the research team. This research has approved the ethical clearance from the Ethics Committee of the Faculty of Health, Jenderal Achmad Yani University Yogyakarta with Number: Skep/101/KEP/V/2024.

**RESULTS**

The study was conducted for 3 weeks by providing herbal therapy in the form of Sahdu Tea and wedhang uwuh, as well as aromatic hydrotherapy. Elderly people who fit the inclusion and exclusion criteria be included in the study, then the research team will observe the elderly. Based on the primary data taken, there was not any dangerous incidents report in this study, the characteristics of the elderly can be seen in table 1.

**Table 1.** Characteristics of Respondents

No	Characteristics	n (N = 107)	Mean (±SD)	Min – Max
1	Age		64,92 (± 7,4)	51 – 94
2	Gender			
	a. Female	79 (73, 8 %)		
	b. Male	28 (26, 2 %)		
3	Education			
	a. Not educated	7 (6, 5 %)		
	b. Elementary School	39 (36, 4 %)		
	c. Junior High School	19 (17, 8 %)		
	d. Senior High School	30 (28 %)		
	e. Diploma/ Bachelor/ Magister	12 (11, 2 %)		
4	Occupation			
	a. Housewife	66 (61, 7 %)		
	b. Farmer	3 (2, 8 %)		
	c. Self-employed	4 (3, 7 %)		
	d. Private	4 (3,7 %)		
	e. Labourer	15 (14 %)		
	f. Retired	15 (14 %)		
5	Duration of Outpatients' Care	71 (66, 4 %)		
	a. <1 year	25 (23, 4 %)		
	b. 1 – 5 years	8 (7, 5 %)		
	c. 6 – 10 years	3 (2, 8 %)		
	d. > 10 years			
6	Routine medication			
	a. Yes	83 (77, 6 %)		
	b. No	24 (22, 4 %)		

The average age of the elderly is 64 years old with most of the elderly being female (73.8%), elementary school education (SD) (36.4%), and status as housewives (IRT) (61.7%). In addition, most of the elderly had sought treatment in the past year (66.4%). Table 1 also shows that the majority of elderly people take routine medication (77.6%).

**Table 2.** Wilcoxon test of PSQI

No	Variable	Sub-Divition	P < 0, 05
1	Sahdu Tea (Pre-Post Test)	a. Quality	0,317
		b. Latency	0,000*
		c. Duration	1,000
		d. Efficient	0,157
		e. Sleep disorders	0,513
		f. Dysfunction	0,830
		g. <b>PSQI</b>	0,000*
2	Wedhang Uwuh (Pre-Pos Test)	a. Quality	0,929
		b. Latency	0,293
		c. Duration	0,408
		d. Efficiency	0,564
		e. Sleep disorders	0,013*
		f. Dysfunction	0,260
		g. <b>PSQI</b>	0,300
3	<i>Aromatic Hydrotherapy</i> (Pre-Post Test)	a. Quality	0,000*
		b. Latency	0,008*
		c. Duration	0,036*
		d. Efficiency	0,157
		e. Sleep disorders	0,000*
		f. Dysfunction	0,002*
		g. <b>PSQI</b>	0,000*

\*: p <0,05

Table 2 shows that Sahdu Tea has an effect on elderly sleep latency and PSQI scores (p: 0.000 and 0.000). In contrast to Sahdu Tea, Wedhang Uwuh had an effect only on sleep disturbance with p: 0.013. The test results also appear very different from Aromatic hydrotherapy (AH) which has an influence on almost all PSQI components, namely sleep quality (p: 0.000), sleep latency (p: 0.008), sleep duration (0.036), sleep disturbance (p: 0.000), sleep dysfunction (p: 0.002) and PSQI (p: 0.000). Table 3 indicated that One-Way ANOVA result's test was p: 0.000, which means that there is a difference between the three therapies in improving the quality of elderly sleep. Furthermore, the significance between each therapy can be seen at table 4 with the Games-Howell test. It showed that Sahdu tea and Aromatic footbath hydrotherapy are more effective in reducing sleep disorder than wedhang uwuh (p: 0.000).

**Table 3.** One-Way ANOVA test results Sleep Quality

No	Variable	df.	P < 0, 05
1	Teh Sahdu – Wedhang Uwuh – <i>Aromatic Footbath Hydrotherapy</i>	2	0,000*

\*: p <0,05

**Table 4.** Results of the Games-Howell Test for Sleep Quality

No	Variable	Mean (SD)	P < 0,05	Lower – Upper	Description
1	Sahdu & Wedhang Uwuh	-2, 621 (0,549)	0,000*	-3,94 – (-1,30)	Sahdu tea was more effective than Wedhang Uwuh
2	Sahdu & Aromatic Footbath Hydrotherapy	0, 349 (0,462)	0,732	-0,76 – 1,46	Sahdu had equal effect as Aromatic hydrotherapy (AH)
3	Wedhang Uwuh & Aromatic Footbath Hydrotherapy	2, 97 (0,600)	0,000*	1,53 – 4,41	AH was more effective than Wedhang Uwuh

\*: p &lt; 0,05

## DISCUSSION

Sahdu tea contains saffron, clitoria ternatea, and honey (Hidayati et al., 2024b, 2024a). Saffron is a flower that contains crocin, saffron, and safranal which has a hypnotic impact. This has an impact on increasing sleep duration and sleep quality (Lopresti et al., 2021; Sadat Rafiei et al., 2023). In addition saffron has an impact on melatonin at night (Lopresti et al., 2021). Melatonin is synthesized from methoxy indole which is secreted by the pineal gland at night during dark conditions or normal lighting (Claustrat & Leston, 2015). Melatonin plays an important role in circadian rhythm and sleep during the night (Fatemeh et al., 2022). Melatonin also plays a role in preventing someone from waking up from the suprachiasmatic nucleus (Scheer & Czeisler, 2005). The dose of saffron used in this study was 14 mg per consumption. This is in line with Lopresti et al., al. that the use of 14- 28 mg is an effective dose (Lopresti et al., 2021). Another content of sahdu tea is Clitoria Ternatea. Based on the results of the study, it was found that Clitoria Ternatea had a significant impact on improving sleep quality. One of the causes of insomnia is an increase in toxins in the body that can oxidize stress. Increased toxins in the body can be neutralized by administering antioxidants. Antioxidants will increase melatonin and increase signals that result in decreased insomnia (Solihati & Kusumastuti, 2023). Clitoria ternatea flower is one of the plants that has antioxidants (Vidana Gamage et al., 2021). Therefore, sahdu tea can improve sleep quality (p: 0.000) and sleep latency (p: 0.000).

Wedhang uwuh is a traditional drink from Yogyakarta that contains spices, such as ginger, lemongrass, cloves, cinnamon, sappan wood, and rock sugar (Fitra, 2021). Based on the results, it is known that wedhang uwuh only affects the sleep quality component, namely sleep disturbances (p: 0.013). Sleep disturbances in the elderly are mostly caused by micturition and pain. Ginger has been shown to reduce osteoarthritis pain (Mozaffari-Khosravi et al., 2016; Rondanelli et al., 2020). This is because ginger is able to inhibit prostaglandins through COX and LOX, antioxidant activity, inhibit transcription factor nf-kB, or act as an agonist of vanilloid nociceptor. Oral and typical administration of ginger can reduce inflammation (Rondanelli et al., 2020). Based on another study, it was found that ginger has the same effect as mefenamic acid in reducing pain (Shirvani et al., 2015).

Aromatic footbath hydrotherapy is a hydrotherapy therapy using warm foot soaking with aromatherapy. This therapy uses lavender and lemon aromatherapy with a ratio of 2: 1.

Based on the results, it is known that this therapy is effective in improving sleep quality (p: 0.000) in most components including sleep quality (p: 0.000), sleep latency (p: 0.008), sleep duration (p: 0.036), sleep disturbance (p: 0.000), and sleep dysfunction (p: 0.002). Aromatherapy can improve sleep quality; it is further mentioned that lavender has sedative and anxiolytic effects. This has an impact on increasing relaxation and inducing someone to fall asleep (Salamung & Elmiyanti, 2023). In lavender there is linalool acetate and linalool. Linalool is a sedative gamma-aminobutyric acid receptor in the central nervous system (Davari et al., 2021). This is reinforced by the effect of lemon or citrus, the aromatherapy contains linalool which has a sedative, hypnotic, and anti-anxiety impact. The use of lavender and lemon aromatherapy inhalers can increase comfort and reduce cortisol secretion, reduce sympathetic nerve activity, and increase parasympathetic. Lavender also prevents the release of acetylcholine and linalool acetate increases muscle comfort (Abbaspoor et al., 2022).

In addition to aromatherapy, the effect of water therapy with warm foot baths has also been shown to improve sleep quality. This is in line with the results of other studies that warm water foot soaks are a form of non-pharmacological therapy to improve sleep quality that is safe, inexpensive, and efficient (Nasiri et al., 2024). Foot soaking can be done using water with a temperature of 37<sup>0</sup>- 40<sup>0</sup>C. This therapy works by lowering the main body temperature through increasing the temperature of the distal body parts and dilating the peripheral arteries, increasing rapid eye movement during sleep which is produced due to decreased sympathetic nerve work, and increasing parasympathetic nerves. Increased peripheral temperature and higher than basal temperature, so the technique is effective in the preparation and process of sleep (Armat et al., 2021).

## CONCLUSION

Based on the results of the study, it was found that herbal drink (Sahdu Tea) had effective benefit for latency and PSQI score in total. However, aromatic footbath hydrotherapy was the most effective therapy for sleep disorder, especially on reducing symptoms of sleep disorders. This study has limitations, namely that researchers have not used a device that keeps the water temperature stable at 39<sup>0</sup> C. Therefore, further research is expected to be able to use a device that can stabilize the water temperature during therapy (15 minutes). Therefore, for the further research is expected to be able to use a tool that is able to stabilize the water temperature during the therapy.

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