ISSN : 2443-4019 | eISSN : 2502-2083
ADI HUSADA Nursing Journal
Jurnal Keperawatan - Sekolah Tinggi Ilmu Kesehatan Adi Husada Surabaya

# The Effect of a Combination of Warm Water Foot Baths and Lavender Essential Oil Aromatherapy on Sleep Quality in Adult Hypertension Sufferers

**Novita Fajriyah[1*], Susanti[2], Rina Budi Kristiani[3], Hana Dodik Pramiasti[1], Li Yoong Tang[4]**

[1)]Nursing Professional Study Program, Stikes Adi Husada Surabaya, Indonesia
[2)]Bachelor Nursing Study Program, Stikes Adi Husada Surabaya, Indonesia
[3)]Diploma Nursing Study Program,Stikes Adi Husada Surabaya, Indonesia
[4)]Department of Nursing Science, Faculty of Medicine, University of Malaya, Malaysia

**Correspondent Author:**
Novita Fajriyah

Email :
novitafajriyah22@gmail.com

***Keywords :***
Hypertension;
Lavender Essential Oil Aromatherapy;
Sleep Quality
Warm Water Foot Baths.

**Abstract**

Hypertension is one of the deadliest diseases in the world that can attack anyone, both young and old. Hypertension sufferers have poorer sleep quality compared to those with normal blood pressure. This research is a quantitative research using a Quasi-Experimental Design. This research aimed to determine the effect of a combination of warm water foot baths and lavender essential oil aromatherapy on sleep quality in adults with hypertension. Wilcoxon test results (p = 0.004), which means that there is an effect of combination therapy with warm water foot baths and lavender essential oil aromatherapy on the sleep quality of adults with hypertension. The feet have many thermoreceptors and a high density of capillaries. Soaking your feet in warm water can help prepare the body for sleep naturally and quickly trigger peripheral vasodilation. There are two main ways to apply aromatherapy: topically and through inhalation. Lavender essential oil is said to activate the limbic system, especially the hippocampus and amygdala. Combining warm foot baths with aromatherapy would be a rational approach to the management of sleep disorders in adult patients with hypertension.

## INTRODUCTION

Hypertension or high blood pressure is a process of increasing the systolic blood pressure value to more than 140 mmHg and systolic blood pressure to more than 90 mmHg (Kementerian Kesehatan Republik Indonesia, 2019). Hypertension is one of the deadliest diseases in the world that can attack anyone, both young and old (Zhou et al., 2021). An estimated 1.28 billion adults aged 30-79 years worldwide suffer from hypertension, the majority (two-thirds) live in low and middle-income countries (Sari et al., 2021). One of the biggest risk factors for dementia, ischemic heart disease, stroke, other cardiovascular diseases (CVD), and chronic kidney disease is high blood pressure (Olsen et al., 2016). Hypertension treatment must be carried out continuously and takes a long time, even throughout life. Hypertension sufferers have poorer sleep quality than those with normal blood pressure (Puspawati et al., 2021). One of the risk factors for hypertension, which is an essential human need, is sleep (Ogugu et al., 2022). Neurobiology controls sleep, which is an important part of human physiological function (Krueger et al., 2016). Good sleep is very important for health (Sejbuk et al., 2022). Good sleep can increase growth hormone synthesis, promote human growth and development, and regulate energy metabolism and appetite (Magalhães et al., 2021). Poor sleep quality hurts physical and mental health (Riemann et al., 2020). Poor sleep quality can increase the incidence and mortality of cardiovascular disease, cancer, and

depression (Yuan et al., 2021). Hypertension is correlated with poor sleep quality (Yang et al., 2021).

The incidence of hypertension worldwide has reached more than 1.3 billion people, which represents 31% of the world's adult population, an increase of 5.1% greater than the global prevalence in 2000-2010 (Bloch, 2016). The number of people in Indonesia with hypertension is 13.2% of the 18–24 year age group; 20.1% of the 25–34 year age group; 31.6% from the 35–44 year age group; 45.3% from the 45–54 year age group; and 55.2% from the age group 65 years and over (Kementerian Kesehatan Republik Indonesia, 2019). Hypertension occurred in the age group 31-44 years (31.6%), age 45-54 years (45.3%), age 55-64 years (55.2%). The prevalence rate of hypertension in East Java Province is still quite high when compared with the prevalence rate in Indonesia, which is 26.2% (Badan Penelitian Dan Pengembangan Kesehatan Kementerian Kesehatan RI, 2013). Meanwhile, in 2016 the prevalence of high blood pressure was 13.47% (Dinkes Provinsi Jawa Timur., 2017). The city of Surabaya is included in the top five cities or districts in East Java which have the highest number of hypertension sufferers, namely 45,014 people or 10.43% (Dinkes Provinsi Jawa Timur., 2017). East Java is a province that ranks third in Indonesia with a population of productive age 15-64 years. with a large population of 27,140,295 (Dinkes Provinsi Jawa Timur., 2017). Surabaya is the capital of East Java province which has the largest population compared to other cities in East Java, namely 2,765,487 residents, and has the largest population of productive age so it is possible to have several risk factors for the incidence of hypertension (Dinkes Kota Surabaya, 2017). Poor sleep quality is very common in hypertensive patients worldwide, ranging between 14.9% and 85.7%. Poor sleep quality is a common problem for hypertensive patients in Turkey, 63.3%, in Ethiopia, 35.5%; and in China, 52.5% (Stanaway J et al., 2018)In Indonesia, 35.6% of hypertensive patients experience sleep quality problems (Mariani et al., 2019).

Sleep quality is a combination of a sleep index which contains the length of sleep time and disturbances therein which can be assessed objectively (Lo K, Woo B, Martin BN & W., 2017). Sleep disorders often occur in patients with cardiovascular disease (Li et al., 2019). The causes of sleep disorders in cardiac care units can be related to external aspects such as an uncomfortable environment, ambient noise, bright light, ongoing treatment, and medications (such as sedatives and inotropes) which can change the daily sleep rhythm (Rustam & Chaidir, 2023). Sleep is a basic human psychological need that is a regular mode that can be easily reversed, playing an important role in human health and well-being. Poor sleep quality causes a variety of physiological effects, including changes in immune function, increased sensitivity to pain, decreased vital capacity, reduced forced expiratory volume, changes in endocrine metabolism, increased secretion of norepinephrine and epinephrine, increased sympathetic activity, and decreased parasympathetic activity. These factors can cause increased heart rate and blood pressure, increased cardiac work, intensive ischemia, and infarction (Amagai et al., 2010). Sleep disorders and anxiety are associated with adverse health effects including reduced quality of life, worsening of disease states, and increased mortality (Forouzanfar et al., 2017). Several studies have found that poor sleep quality in hypertensive patients causes increased blood pressure and an increased risk of hypertension (Oliveira-Silva et al., 2020). Overcoming sleep disorders must be a primary part considering that the need for sleep rest is a person's

physiological need. In addition, treating sleep disorders and anxiety can reduce the risk of disease (Puravath & Bhargava, 2023).

Insufficient sleep has been shown to raise the stress hormone cortisol, activate the sympathetic nervous system, lower the level of antibodies in people who exhibit symptoms like weakness and fatigue, alter autonomic nervous system function, and raise blood pressure (Van Ryswyk et al., 2018). Early identification of sleep quality can provide basic data for assessing sleep patterns, and factors for adult sleep disorders, as well as various other components of sleep quality. Hypertension can worsen sleep quality, then poor sleep quality, in general, has the effect of increasing the incidence of hypertension. It is hoped that the evaluation of sleep quality can be used to determine hypertension management strategy plans.

The process of soaking your feet in warm water at an adjusted temperature will help dilate blood vessels and reduce muscle tension, thereby creating a relaxing effect and feeling comfortable. The results of Sari & Burhanto's research concluded that warm water foot soak therapy influenced sleep quality (Nuary & Triyanto, 2022). Lavender essential oil has a positive effect in improving sleep quality, by inhaling 3 drops of lavender aromatherapy before bed. Aromatherapy is a widely utilized treatment for mood disorders and issues related to poor sleep quality. According to a study, the aroma of lavender prepares people's minds for sleep. By altering the receptors, lavender essential oil has the potential to have a sedative impact. For those with insomnia, aromatherapy using lavender essential oil enhances the quality of their sleep. The impact of lavender essential oil on the quality of sleep, however, has not been documented in other investigations. There is little evidence in current studies to support the hypnotic or sedative effects of lavender essential oil. The effects of the combination of Warm Water Footbath and Lavender Essential Oil Aromatherapy on Sleep Quality in Adults with Hypertension have not been explained based on the findings of prior research, so further research and analysis are required, and this will take place in the Surabaya City area.

## RESEARCH METHODS

This study is a quantitative study using the quasi-experiment design; the aim of the study was to describe an experimental condition in which it is not possible to control or manipulate all relevant variables. The study employed two groups: the intervention group received a combination of warm water footbath and essential oil lavender, while the control group received standard education. In this study, is sleep quality measured before and after intervention in both groups.

This research will be carried out in December 2023 in the city of Surabaya. The population in this study were adults with hypertension aged 20-45 years who had sleep quality problems. The sample in this study was 20 respondents who experienced sleep quality problems, especially in Surabaya, and met the following criteria:

1. Inclusion criteria: Inclusion criteria are the limits of the general traits or characteristics of the research subjects, minus the characters included in the exclusion criteria. The inclusion criteria in this study are:
    1) Willing to be a respondent
    2) Respondents with a history of hypertension

3) Respondents are male or female aged 20-45 years who experience sleep quality problems

2. Exclusion criteria: The exclusion criteria are subjects who meet the inclusion criteria who are excluded from the study because they can influence the research results resulting in bias. The exclusion criteria in this study are as follows:
   1) Respondents whose legs have open, closed, or bleeding wounds
   2) Currently undergoing other complementary therapies
   3) Comorbidities (Diabetes mellitus, stroke, kidney failure)
   4) Patients who consume alcohol
   5) Patients with severe anxiety
   6) Respondents who consume drugs containing anti-depressants or other drugs.

A questionnaire or questionnaire is a measuring tool in the form of a questionnaire or questionnaire with several questions. The Pittsburgh Sleep Quality Index (PSQI) questionnaire is a research tool used to measure sleep quality before and after the test. Researchers conducting this research used the PSQI questionnaire to see sleep quality. The validity test results of all questions are valid with a value of $r > 0.361$ (r count > r table). Sleep quality, sleep latency, duration, efficiency, sleep disturbances, use of sleeping pills, and problems with daily functioning or activities are the seven areas of the questionnaire consisting of eighteen items (Park, 2020). The total score of the 7 aspects is in the range 0-2. Each aspect of the questionnaire is given a score of 0-3. The score categories are divided into good and bad, with a higher score ($\geq 5$) indicating lower sleep quality (Suralaga et al., 2023).

The research procedure was carried out for 4 weeks with 8 meetings with respondents. The stages of providing therapy in the intervention group are:

1) Before the intervention (by soaking the feet in warm water), the patient rests for 10 minutes, then the quality of sleep is measured and recorded on the observation sheet.
2) Prepare warm water by measuring the water temperature at 40°C with a water thermometer (Nugroho et al., 2023). Wash the patient's feet if they look dirty.
3) Prepare a Lavender Essential Oil Aromatherapy Diffuser at a distance of 1 meter from the respondent to maximize the effectiveness of aromatherapy. The Diffuser instrument can be used safely because the procedure does not burn and is small so it is effective to use (Fabbri et al., 2021).
4) Soak the patient's feet in warm water while inhaling Lavender Essential Oil Aromatherapy for 15 minutes. To measure the soaking time, use a stopwatch for each patient (Nugroho et al., 2023).
5) Cover the bucket with a towel to maintain the temperature. The water temperature is measured again every 5 minutes, if the temperature drops then add hot water until the temperature returns to 40°C (Nugroho et al., 2023). The bucket used to soak feet in warm water measures 40 cm in diameter (L. Azmi, N. Yuliadarwati, 2017).
6) The observation sheet is used to record the research code, research session, examination date, and sleep quality results before the intervention and after the combination therapy intervention, the group soaking the feet in warm water as well as aromatherapy and therapy.

The stages of providing standard therapy in the control group are:

1) Respondents fill out the pretest
2) Respondents were given education about the effect of warm water footbath (soaking feet in warm water) and lavender essential oil aromatherapy on the sleep quality of adult patients with hypertension
3) A visit was carried out after 4 weeks for respondents to assess sleep quality and complete the post-test.

## RESULT

**Table 1**
**Characteristics of Adult Respondents Suffering from Hypertension with Impaired Sleep Quality in the Surabaya Area (n=20)**

| | Intervention Group **(N = 20)** | Control Group **(N=20)** |
|---|---|---|
| **Age** Adults (20-50) | 20 (100%) | 20 (100%) |
| **Gender** Woman | 20 (100%) | 20 (100%) |
| **Type of Work** Housewife | 20 (100%) | 20 (100%) |

Based on the results of the table above, it was found that the ages of the respondents consisted of adults (20 to 50 years) with 20 (100%) respondents in the intervention group and 20 (100%) respondents in the standard group. The gender in the intervention group was 20 (100%) respondents female. In the control group, 20 (100%) respondents were female. From the table above, it can be seen that the ages of all participants ranged from 20-60 years.

**Table 2. Comparison of Sleep Quality in Adults with Hypertension Between the Intervention and Control Group (pre-post)**

| **Sleep Quality** | **Intervention group** | | | |
|---|---|---|---|---|
| | Pre | % | Post | % |
| Good Sleep Quality | 7 | 25% | 15 | 65% |
| Poor Sleep Quality | 13 | 75% | 5 | 35% |
| **Sleep Quality** | **Control group** | | | |
| | Pre | % | Post | % |
| Good Sleep Quality | 5 | 20% | 17 | 82% |
| Poor Sleep Quality | 15 | 80% | 3 | 18% |

**Table 3. Sleep Quality of the intervention group before and after being given a Combination of Warm Water Foot Baths and Lavender Essential Oil Aromatherapy on Sleep Quality in Adult Hypertension Sufferers (n=20)**

| Variable | Combination of Warm Water Foot Baths and Lavender Essential Oil Aromatherapy | | | |
|---|---|---|---|---|
| | n | Mean | SD | z |
| **Sleep Quality (pretest)** | 20 | 1.46 | 0.508 | - 2.849 |
| **Sleep Quality (posttest)** | 20 | 2.00 | 1.040 | |
| ***Wilcoxon Signed Ranks Test, p-value = 0.004*** | | | | |

Based on Table 2 shows that most of the respondents after the intervention had good quality sleep 15 people (65%). The results of the Wilcoxon Signed Ranks Test, it was found that p-value = 0.004 < 0.05, which means that there is an influence of the Combination of Warm Water Foot Baths and Lavender Essential Oil Aromatherapy on improving the sleep quality of hypertension sufferers in adults in Surabaya.

## DISCUSSION

### 1. Analysis of Respondent Characteristics

From information on the age, gender, and occupation of the respondents. According to study findings involving forty female participants, women's sleep quality was shown to be lower than that of men. Hormonal fluctuations may be the source of this, which is linked to physiological, psychological, and physical issues that can exacerbate sleep-related issues. Hormonal fluctuations are to blame for this, which might exacerbate sleep-related issues. The hormones progesterone and estrogen have receptors in the hypothalamus, so there is a direct impact on circadian rhythms and sleep patterns which can cause women to have poor sleep quality. Psychosocial disorders such as anxiety and increased and uncontrolled emotions in women can cause a decrease in estrogen levels, which results in poor sleep quality in women (Fitrah & Karmila, 2020). According to researchers' assumptions, gender greatly influences sleep quality. Based on the results of this study, the highest number of patients who experienced stress levels affecting sleep quality among respondents based on employment status were housewives with a total of 40 respondents (100%). The large amount of work done by housewives every day results in ineffective sleep quality because housewives themselves have various kinds of work and responsibilities in their household from morning to night. Therefore, the amount of work that housewives do daily can trigger stress which can have an impact on people's sleep quality.

Most respondents were 100% women (10 people), according to (Khasanah, K., & Wahyu, 2017). The hormones progesterone and estrogen have receptors in the hypothalamus, so there is a direct impact on circadian rhythms and sleep patterns which can cause women to have poor sleep quality. Psychosocial disorders such as anxiety and increased and uncontrolled emotions in women can cause a decrease in estrogen levels, which results in poor sleep quality in women. The majority of work samples are housewives (100%). Work is a factor in why a person's sleep

quality is disturbed, the heavy demands of work cause a lack of sleep time, and those who should sleep at night and perhaps rest during the day still wake up which causes poor health conditions or experience a lack of quality sleep (Fildzah alifah maulani, Eko Prabowo, 2023).

## 2. Analysis of the Effect of a Combination of Warm Water Footbath and Lavender Essential Oil Aromatherapy on Sleep Quality in Adults with Hypertension

Statistical analysis of pre-test and post-test sleep quality in the intervention and control groups using the Wilcoxon Signed Ranks Test resulted in a P value of 0.004 < 0.05, these results can be concluded that Ho was rejected and $H_1$ was accepted, which means there is an influence from giving warm therapy Water footbath and lavender essential oil aromatherapy on sleep quality in adults with hypertension.

One of the most popular complementary therapies for enhancing sleep quality management compliance is foot bathing. In hospitals, foot bathing is an inexpensive remedy that is easy to use and secure. The feet contain a large number of capillaries and a high density of thermoreceptors. Consequently, a heated foot bath can enhance the body's natural sleep preparation and rapidly cause peripheral vasodilation. Exogenous skin heating has been shown to improve the efficiency, latency, and quality of sleep (Ohayon et al., 2017). Traditionally utilized for its vast spectrum of bioactivities, including pain treatment and sleep difficulties, aromatherapy is an effective complementary therapy. Since lavender essential oil is known to have sedative and antinociceptive qualities, it stands to reason that these benefits will enhance mental clarity, well-being, and quality of sleep while reducing anxiety and aggression. The cholinergic system may have a role in the sedative, analgesic, mood-stabilizing, and anxiolytic actions of lavender essential oil. There are two main ways to apply aromatherapy: topically and through inhalation. Lavender essential oil is said to activate the limbic system, particularly the hippocampus and amygdala. Furthermore, topical application of lavender essential oil has been proposed to potentially lessen central nervous system alertness. Given this information, combining warm foot baths with aromatherapy would be a rational approach to the management of sleep disorders in adult patients with hypertension (Li et al., 2019). In line with this, previous research showed that foot baths with lavender oil which are associated with autonomic changes can have a positive impact, namely a relaxing effect (Rustam & Chaidir, 2023). Warm water is a therapeutic medium that can prevent and recover a person from hypertension. This is due to its hydrostatic, hydrodynamic, and warm temperature effects which make blood circulation in the body smooth. Apart from improving blood circulation, warm water also has a calming effect on the body so that balance in the body (homeostasis) can be achieved properly. By conduction, where heat transfer occurs from warm water to the body, it will cause dilation of blood vessels and can reduce muscle tension, so that it can stimulate the release of endorphin hormones in the body and suppress adrenaline hormones and can reduce blood pressure if done with awareness and through discipline (Uslu et al., 2024).

According to (Kurniadi et al., 2022) therapy by immersing the lower extremities using warm water has many benefits, including the physical impact, hot/warm water can cause solid, liquid, and gaseous substances to expand in all directions, of course, it can increase the term chemical reactions. in tissues throughout the body, in these tissue metabolism increases, and the chemical exchange of substances with all body fluids. The biological impact of warmth also widens blood vessels (dilation). Of course, with this dilatation, circulation increases and

blood viscosity decreases (Puspawati et al., 2021). According to (Fadlilah et al., 2021), research results show that Warm Water Footbath and Essential Oil Aromatherapy. Research results from Fadlilah et al., (2020), show that foot soaking therapy in warm water and progressive muscle relaxation are useful for improving sleep quality. Non-pharmacological therapy is cheaper, easier, and safer so it can be practiced in the wider community and used every day.

Thus, researchers can conclude that warm water footbaths and lavender essential oil aromatherapy can improve sleep quality, from initially decreasing sleep quality to increasing. This proves that by carrying out warm water footbaths and lavender essential oil aromatherapy in the intervention group and control group, respondents can improve good quality sleep carrying out actions with a calm mind and being able to rest well. So this non-pharmacological therapy technique can be an effective solution for hypertension sufferers who experience sleep quality problems.

## CONCLUSION

The results of the study showed that the therapeutic intervention of a combination of warm water foot baths and lavender essential oil aromatherapy could improve the sleep quality of adult hypertension sufferers.

## BIBLIOGRAPHY

Amagai, Y., Ishikawa, S., Gotoh, T., Kayaba, K., Nakamura, Y., & Kajii, E. (2010). Sleep duration and incidence of cardiovascular events in a Japanese population: The Jichi medical school Cohort study. *Journal of Epidemiology*, *20*(2), 106–110. https://doi.org/10.2188/jea.JE20090053

Badan Penelitian Dan Pengembangan Kesehatan Kementerian Kesehatan RI. (2013). *Riset Kesehatan Dasar (2013)*.

Bloch, M. J. (2016). The worldwide prevalence of hypertension exceeds 1.3 billion. *Journal of the American Society of Hypertension*, *10*(10), 753–754. https://doi.org/10.1016/j.jash.2016.08.006

Dinkes Kota Surabaya. (2017). *Profil Dinas Kesehatan Kota Surabaya Tahun 2016.* . Dinas Kesehatan Kota Surabaya.

Dinkes Provinsi Jawa Timur. (2017). *Profil Dinas Kesehatan Provinsi Jawa Timur Tahun 2016*. Dinas Kesehatan Provinsi Jawa Timur.

Fabbri, M., Beracci, A., Martoni, M., Meneo, D., Tonetti, L., & Natale, V. (2021). Measuring subjective sleep quality: A review. *International Journal of Environmental Research and Public Health*, *18*(3), 1–57. https://doi.org/10.3390/ijerph18031082

Fadlilah, S., Amestiasih, T., Pebrianda, B., & Lanni, F. (2021). Terapi Komplementer Kombinasi Rendam Kaki Air Hangat dan Aromaterapi Lemon dalam Menurunkan Tekanan Darah. *Faletehan Health Journal*, *8*(02), 84–91. https://doi.org/10.33746/fhj.v8i02.262

Fildzah alifah maulani, Eko Prabowo, R. (2023). Hubungan Kualitas Tidur dengan depresi pada komunitas lansia wanita di dahlia senja limo depok. *Jurnal Kesehatan*, *13*, 26–38.

Fitrah, N., & Karmila. (2020). HUBUNGAN JENIS KELAMIN DENGAN KUALITAS TIDUR LANSIA Relationship Between Sex and Sleep Quality in the Elderly Lailatul. *JIM FKep Volume*, *16*(1), 90.

Forouzanfar, M. H., Liu, P., Roth, G. A., Ng, M., Biryukov, S., Marczak, L., Alexander, L., Estep, K., Hassen Abate, K., Akinyemiju, T. F., Ali, R., Alvis-Guzman, N., Azzopardi, P., Banerjee, A., Bärnighausen, T., Basu, A., Bekele, T., Bennett, D. A., Biadgilign, S., … Murray, C. J. L. (2017). Global Burden of Hypertension and Systolic Blood Pressure of at Least 110 to 115 mm Hg, 1990-2015. *JAMA*, *317*(2), 165. https://doi.org/10.1001/jama.2016.19043

Kementerian Kesehatan Republik Indonesia. (2019). *Laporan Nasional Riskesdas 2018*.

Khasanah, K., & Wahyu, H. (2017). Kualitas tidur Lansia Balai Rehabilitasi Sosial "MANDIRI." *Journal Nursing Studies*, *1*.

Krueger, J. M., Frank, M. G., Wisor, J. P., & Roy, S. (2016). Sleep function: Toward elucidating an enigma. *Sleep Medicine Reviews*, *28*, 46–54. https://doi.org/10.1016/j.smrv.2015.08.005

Kurniadi, I., Utomo, W., & Sabrian, F. (2022). Pengaruh Rendaman Kaki Dengan Air Hangat Dan Aroma. *Jurnal Ners Indonesia*, *12*(2), 186–195.

L. Azmi, N. Yuliadarwati, K. U. et al. (2017). Pengaruh Terapi Rendam Kaki Air Hangat Dan Massage Terhadap. *Pengaruh Terapi Rendam Kaki Air Hangat Dan Massage Terhadap Kualitas Tidur Komunitas Lanisa Di Kelurahan Tunjungsekar*, 69–75.

Li, H., Ren, Y., Wu, Y., & Zhao, X. (2019). Correlation between sleep duration and hypertension: a dose-response meta-analysis. *Journal of Human Hypertension*, *33*(3), 218–228. https://doi.org/10.1038/s41371-018-0135-1

Lo K, Woo B, Martin BN, W., & W. (2017). *Subjective sleep quality, blood pressure, and hypertension : a meta-analysis*. 1–14.

Magalhães, P., Pereira, B., Oliveira, A., Santos, D., Núñez, J. C., & Rosário, P. (2021). The Mediator Role of Routines on the Relationship between General Procrastination, Academic Procrastination and Perceived Importance of Sleep and Bedtime Procrastination. *International Journal of Environmental Research and Public Health*, *18*(15), 7796. https://doi.org/10.3390/ijerph18157796

Mariani, D., Muzasti, R. A., & Thamrin, A. (2019). The Relationship Between Quality of Sleep and Quality of Life of Patients in Medan, Indonesia. *Open Access Macedonian Journal of Medical Sciences*, *7*(11), 1794–1797. https://doi.org/10.3889/oamjms.2019.353

Nuary, A. A., & Triyanto, E. (2022). Efektivitas Warm Water Footbath dan Aromatherapy Terhadap Kualitas Tidur Lansia: Systematic Review. *Jurnal Keperawatan Klinis Dan Komunitas*, *6*(2), 125. https://doi.org/10.22146/jkkk.75759

Nugroho, F. P. A., Widiharti, W., Suminar, E., & Fitrianur, W. L. (2023). The Use Of Soaking Warm Water For Blood Pressure Reduction In Elderly Y Hypertensive Patients. *Indonesian Nursing Journal of Education and Clinic (INJEC)*, *8*(2), 281–292. https://doi.org/10.24990/injec.v8i2.601

Ohayon, M., Wickwire, E. M., Hirshkowitz, M., Albert, S. M., Avidan, A., Daly, F. J., Dauvilliers, Y., Ferri, R., Fung, C., Gozal, D., Hazen, N., Krystal, A., Lichstein, K., Mallampalli, M., Plazzi, G., Rawding, R., Scheer, F. A., Somers, V., & Vitiello, M. V. (2017). National Sleep Foundation's sleep quality recommendations: first report. *Sleep Health*, *3*(1), 6–19. https://doi.org/10.1016/j.sleh.2016.11.006

Oliveira-Silva, L., Peçanha, T., Fecchio, R. Y., Rezende, R. A., Abreu, A., Silva, G., Mion-Junior, D., Cipolla-Neto, J., Forjaz, C. L. M., & Brito, L. C. (2020). Poor sleep quality is associated with cardiac autonomic dysfunction in treated hypertensive men. *The Journal of Clinical Hypertension*, *22*(8), 1484–1490. https://doi.org/10.1111/jch.13949

Olsen, M. H., Angell, S. Y., Asma, S., Boutouyrie, P., Burger, D., Chirinos, J. A., Damasceno, A., Delles, C., Gimenez-Roqueplo, A.-P., Hering, D., López-Jaramillo, P., Martinez, F., Perkovic, V., Rietzschel, E. R., Schillaci, G., Schutte, A. E., Scuteri, A., Sharman, J. E., Wachtell, K., & Wang, J. G. (2016). A call to action and a life course strategy to address the global burden of raised blood pressure on current and future generations: the Lancet Commission on hypertension. *The Lancet*, *388*(10060), 2665–2712. https://doi.org/10.1016/S0140-6736(16)31134-5

Park, B. K. (2020). The Pittsburg Sleep Quality Index (PSQI) and Associated Factors in Middle-school Students: A Cross-sectional Study. *Child Health Nursing Research*, *26*(1), 55–63. https://doi.org/10.4094/chnr.2020.26.1.55

Puravath, F., & Bhargava, S. (2023). Sleep disorders in adolescents. *Encyclopedia of Child and Adolescent Health, First Edition*, *1*(May 2020), 1034–1040. https://doi.org/10.1016/B978-0-12-818872-9.00097-2

Puspawati, N. L. P. D., Ari Santi, N. K., & Saraswati, N. L. G. I. (2021). The Effect of Foot Massage with Lavender Essential Oil on The Sleep Quality of The Elderly in Banjar Gelumpang, Sukawati Village. *Basic and Applied Nursing Research Journal*, *2*(2), 47–51. https://doi.org/10.11594/banrj.02.02.03

Riemann, D., Krone, L. B., Wulff, K., & Nissen, C. (2020). Sleep, insomnia, and depression. *Neuropsychopharmacology*, *45*(1), 74–89. https://doi.org/10.1038/s41386-019-0411-y

Rustam, J. S., & Chaidir, R. (2023). Environmental Factors as Sleep Disturbance on Critically Ill Patients in Intensive Care Units (ICU): A Cross-Sectional Study. *NurseLine Journal*, *8*(2), 127. https://doi.org/10.19184/nlj.v8i2.39150

Sari, O. I., Hartutik, S., & Yuningsih, D. (2021). *Penerapan Isometrik Handgrip Exercise Dan Aromaterapi Lavender Terhadap Tekanan Darah Lansia Hipertensi Di RSUD Karanganyar*.

Sejbuk, M., Mirończuk-Chodakowska, I., & Witkowska, A. M. (2022). Sleep Quality: A Narrative Review on Nutrition, Stimulants, and Physical Activity as Important Factors. *Nutrients*, *14*(9), 1912. https://doi.org/10.3390/nu14091912

Stanaway J, Abbafati, C., Abbasi, N., Abbastabar, H., Abd-Allah, F., Abdela, J., Abera, S. F., Abil, O. Z., Abraha, H. N., Abraham, A. R., Abu-Raddad, L. J., Abu-Rmeileh, N. M., Accrombessi, M. M. K., Acharya, D., Acharya, P., Adamu, A. A., Adane, A. A., Adebayo, O. M., Adedoyin, R. A., … Murray, C. J. L. (2018). Global, regional, and national

comparative risk assessment of 84 behavioral, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet, 392*(10159), 1923–1994. https://doi.org/10.1016/S0140-6736(18)32225-6

Uslu, Y., Akbayrak, H., Kuytak Ortahisar, B., & Barak, T. H. (2024). The effect of lavender foot baths on postoperative pain and sleep quality in comparison with foot baths with warm water only—A prospective randomized controlled study. *EXPLORE, 20*(3), 385–391. https://doi.org/10.1016/j.explore.2023.10.003

Van Ryswyk, E., Mukherjee, S., Chai-Coetzer, C. L., Vakulin, A., & Mcevoy, R. D. (2018). Sleep disorders, including sleep apnea and hypertension. *American Journal of Hypertension, 31*(8), 857–864. https://doi.org/10.1093/ajh/hpy082

Yang, Z., Heizhati, M., Wang, L., Li, M., Pan, F., Wang, Z., Abudureyimu, R., Hong, J., Yao, L., Yang, W., Liu, S., & Li, N. (2021). Subjective Poor Sleep Quality is Associated with Higher Blood Pressure and Prevalent Hypertension in General Population Independent of Sleep Disordered Breathing. *Nature and Science of Sleep, Volume 13*, 1759–1770. https://doi.org/10.2147/NSS.S329024

Yuan, Y., Heizhati, M., Wang, L., Li, M., Lin, M., Gan, L., Cai, X., Yang, W., Yao, L., Wang, Z., Abudereyimu, R., & Li, N. (2021). Poor sleep quality is associated with new-onset hypertension in a diverse young and middle-aged population. *Sleep Medicine, 88*, 189–196. https://doi.org/10.1016/j.sleep.2021.10.021

Zhou, B., Perel, P., Mensah, G. A., & Ezzati, M. (2021). Global epidemiology, health burden and effective interventions for elevated blood pressure and hypertension. *Nature Reviews Cardiology*, *18*(11), 785–802. https://doi.org/10.1038/s41569-021-00559-8