

The Effectiveness of Lavender Aroma Therapy for Better Quality of Sleep in Pregnant Women: Meta-Analysis

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ABSTRACT

Background: Sleep is a state of natural rest for the body that must be fulfilled every day. Sleep patterns of each individual are always different depending on age, lifestyle, environment, activities and health conditions. This study aims to analyze the primary study of the effectiveness of lavender aromatherapy to improve sleep quality in pregnant women with a meta-analysis.

Subjects and Method: This study is a systematic review and meta-analysis with PICO as follows Population: pregnant women, Intervention: Giving lavender aromatherapy, Comparison: No aromatherapy given Outcome: Sleep quality. The articles used in this study were obtained from three databases, namely: Google Scholar, Pubmed, Science Direct with a time span between 2015-2022. The keywords used are "Lavender aromatherapy effect OR improving the quality of sleep AND pregnant AND Randomized Controlled Trials". The articles were provided in full text in English and Indonesian, with a Randomized Controlled Trial study design and reporting on the Mean and SD in a multivariate analysis. The selection of articles was done by using a prism flow diagram. Articles were analyzed using the Review Manager 5.3 aplikasi application.

Results: A total of 9 randomized controlled trials originating from Iran and Indonesia were selected for a systematic review and meta-analysis. The data collected showed the effectiveness of aromatherapy on improving sleep quality in pregnant women was 0.38 times that of pregnant women who were not given aromatherapy (SMD= 0.38; 95% CI= 0.38 to 0.55) and statistically significant $p=0.004$.

Conclusion: Giving lavender aromatherapy can improve sleep quality in pregnant women.

Keywords: aromatherapy lavender, sleep quality in pregnant women, meta-analysis.

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BACKGROUND

Globally, the prevalence of insomnia which is one of the sleep disorders in pregnant women worldwide is 41.8%. The prevalence of insomnia in pregnant women in Asia is estimated at 48.2%, 57.1% in Africa, 24.1% in America, and 25.1% in Europe. (WHO,

2022), 79% of pregnant women experience some form of sleep disturbance. Therefore, 72% of pregnant women will experience a frequency of waking up more often at night (National Sleep Foundation, 2017).

The quality of sleep for pregnant women is expected to reach 8-10 hours. During

pregnancy, if the number of hours of sleep is less than 6 hours, especially at night, the risk is 4.5 times, allowing a cesarean delivery and affecting the baby's birth weight less than normal. While sleep quality is a condition that a person undergoes so that he gets freshness and fitness when he wakes up from his sleep (Fenny and Supriatmo 2016).

The quantity and quality of sleep are the two things that play the most roles in fulfilling the interrelated needs of sleep. If a person's sleep quantity is below normal, it can be said that the quantity of that person is lacking and the quality of sleep is poor, and vice versa (Fenny and Supriatmo, 2016).

When the gestational age enters the third trimester, more and more complaints are felt by the mother, both psychological and physical complaints. Complaints that arise in this trimester are usually lower back pain, heartburn, shortness of breath, anxiety about pelvic pain, frequent urination, and uncomfortable sleeping position. These complaints certainly result in a decrease in the quantity of sleep of pregnant women (Ratna, 2021). Aromatherapy is one of the interventions to overcome this problem. Aromatherapy is a therapeutic treatment by using fragrant smells. The scent of lavender is one of the aromas used to treat sleep disorders (Jamalzehi, 2017).

Several types of aromatherapy that can be used for sleep disorders are langon kleri, eucalyptus, geranium, and lavender flowers because they can help a person to have better sleep, because the aroma of essential oils can help to ease the mind and relax tense body muscles so that it can reduce stress anxiety and pain that can disturb sleep quality (National Academy Of Sciences, 2015).

One way to overcome discomfort in pregnant women is to provide lavender aromatherapy which comes from the Latin "lavera" which means refreshing. Lavender

contains linool which has a sedative effect (Kamalah, 2021). The aroma of lavender is believed to provide a sedative, relaxing effect for tense nerves and muscles after a tired activity. With the effects caused by the lavender aroma, a person will be more relaxed and comfortable during sleep so that the quantity of sleep will also increase (Mahnaz Keshavarz et al., 2015).

SUBJECTS AND METHOD

1. Study Design

This study was a systematic review and meta-analysis with PICO as follows: Population= pregnant women; Intervention= Giving lavender aromatherapy; Comparison= No aromatherapy given; Outcome= Sleep quality. The articles used in this study were obtained from three databases, namely: Google Scholar, Pubmed, Science Direct with a time span between 2015-2022. The keywords used were "Lavender aromatherapy effect OR improving the quality of sleep AND pregnant AND Randomized Controlled Trials". The articles were provided in full text and they are in English and Indonesian with a Randomized Controlled Trial study design and reporting on the Mean and SD in a multivariate analysis. Article selection was done by using PRISMA flow diagram. Articles were analyzed using the Review Manager 5.3 application.

2. Inclusion Criteria

Full paper article with an experimental study (Randomized Controlled Trial), analysis with Mean SD to measure the estimated effect, the study subject were pregnant women, Intervention: Giving lavender aromatherapy, Comparison: No aroma therapy given, Outcome: Sleep quality. The articles used in this study were obtained from three databases, namely: Google Scholar, PubMed, Science Direct with a time span between 2015-2022. The keywords used were "Lavender aromatherapy effect OR impro-

ving the quality of sleep AND pregnant AND Randomized Controlled Trials”. The articles were provided in full text in English and Indonesian, with a Randomized Controlled Trial study design and reporting on the Mean and SD in a multivariate analysis. The selection of articles was done by using PRISMA flow diagram. Articles were analyzed using the Review Manager 5.3 application.

3. Exclusion Criteria

Main articles published from the meta-analysis, articles published in languages other than English and Indonesian, and articles before 2015.

4. Operational Definition of Variable

Sleep quality is a measure where a person can feel the ease in starting sleep, and can be described by how long this person sleeps, and complaints that are felt when he wakes up.

Lavender aromatherapy is a treatment that uses aromatherapy that comes from

lavender flowers, plants, flowers, and trees which have a really good smell.

5. Instrument

Quality assessment in this study was carried out using the Critical Appraisal Checklist for Randomized Controlled Study published by CEBM University of Oxford (2020).

6. Data Analysis

Articles were collected using PRISMA diagrams and analyzed using the Review Manager 5.3 application by calculating effect sizes and heterogeneity to determine the combined research model and form the final results of the meta-analysis.

RESULTS

The article search process is carried out by searching electronic databases through Google Scholar, PubMed, Science Direct and Springerlink. Article search results are listed in the PRISMA diagram in Figure 1.

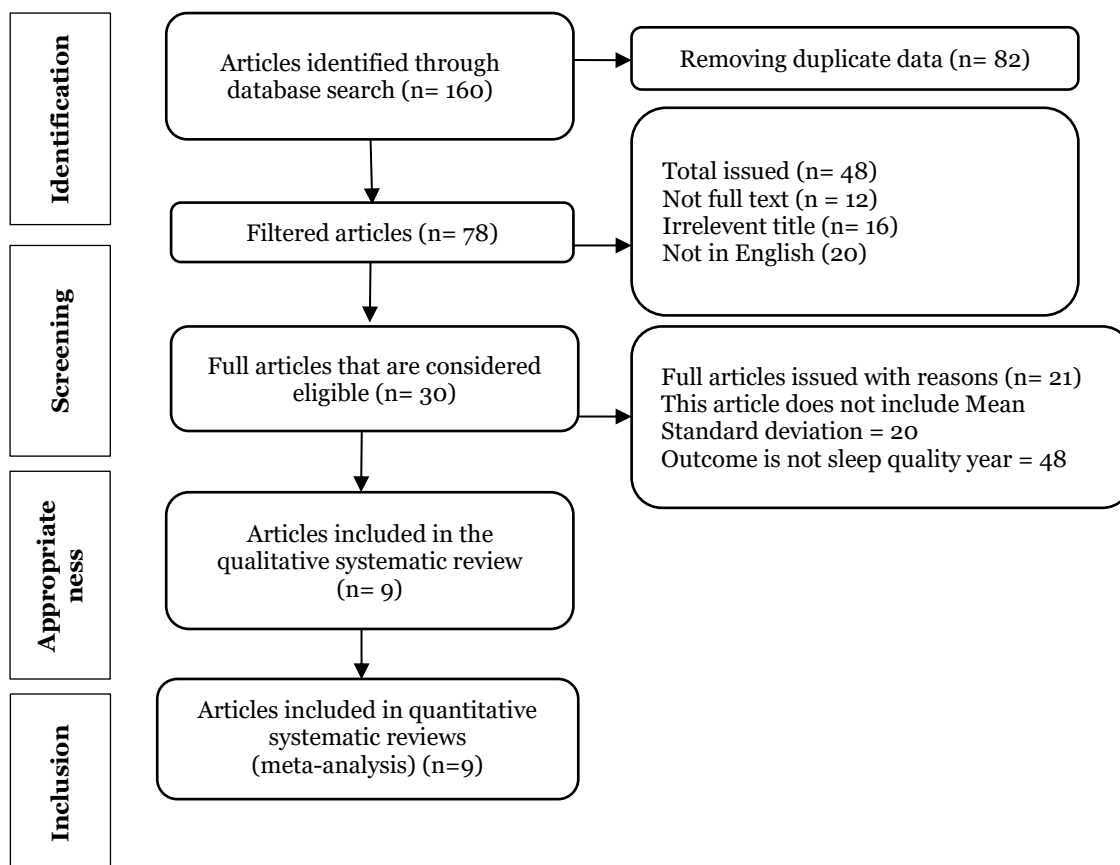


Figure 1. PRISMA Flowchart



Figure 2. Map of Research Locations

In the initial article search process, 160 articles were found, after the deletion process of several duplicated articles in several journals, the results obtained 78 articles and 30 of them were eligible for full text review. The complete reasons that included into the exclusion criteria are as follows:

- a) Outcome from RCT are not sleep quality.
- b) Study subjects are not pregnant women
- c) The intervention given is not lavender aromatherapy.
- d) The article does not include the mean-standard deviation value

A total of 9 RCT originating from Iran and Indonesia were selected for a systematic review and meta-analysis. The data collected showed that the effectiveness of aromatherapy on improving sleep quality in pregnant women was 0.38 times higher than pregnant women who were not given aromatherapy (SMD= 0.38; 95% CI= 0.21 to 0.55) and it was statistically significant $p= 0.004$. A total of 9 articles that met the quality assessment were included in the quantitative synthesis using Meta-Analysis.

Study Quality Assessment

This assessment criteria consisted of twelve criteria, with each measure given a score of 1

= if you answer yes, 0 = if you answer no. The following are the assessment criteria from the Critical Appraisal Randomized Controlled Trial (RCT) List published by CASP (Critical Appraisal Skills Program) as follows:

- 1) Does the research address clearly focused statements/ problems?
- 2) Is the RCT research method appropriate to answer the study question?
- 3) Are there enough subjects in the study to establish that the findings do not occur by chance?
- 4) Are subjects randomly allocated to the experimental and control groups? If not, could this be biased?
- 5) Are inclusion/exclusion criteria used?
- 6) Are the two groups comparable at the start of the study?
- 7) Are objective and unbiased outcome criteria used?
- 8) Are objective and validated measurement methods used in measuring the results? If not, are the results judged by someone who does not know the group assignment (ie was the assessment blinded)?
- 9) Is the effect size practically relevant?
- 10) How precise is the estimate of the effect?

- Is there a confidence interval?
 11) Could there be confounding factors that have not been taken into account?
 12) Are the results applicable to your study?
 The next step is to calculate the overall

effect of combining the data. Data analysis was carried out using Review Manager (Rev-Man) 5.3 software released by the Cochrane Collaboration.

Table 1. Assessment of the quality of this study using the Critical Appraisal Randomized Controller Trial (RCT) List published by CASP (Critical Appraisal Skills Program) as follows:

No	Primary Study	Criteria												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
1	Lestari et al. (2019)	2	2	2	2	2	2	2	2	2	2	2	2	24
2	Wurdiana et al. (2020)	2	2	2	2	2	2	2	2	2	2	2	2	24
3	Meihartarti et al. (2020)	2	2	2	2	2	2	2	2	2	2	2	2	24
4	Fransiska et al. (2020)	2	2	2	2	2	2	2	2	2	2	2	2	24
5	Amajerdi et al. (2021)	2	2	2	2	2	2	2	2	2	2	2	2	24
6	Shinta et al. (2020)	2	2	2	2	2	2	2	2	2	2	2	2	24
7	Mohammadi et al. (2022)	2	2	2	2	2	2	2	2	2	2	2	2	24
8	Kianpour et al. (2018)	2	2	2	2	2	2	2	2	2	2	2	2	24
9	Fattemeh et al. (2015)	2	2	2	2	2	2	2	2	2	2	2	2	24

Description: 2= Yes; 1= Do not know; 0= No

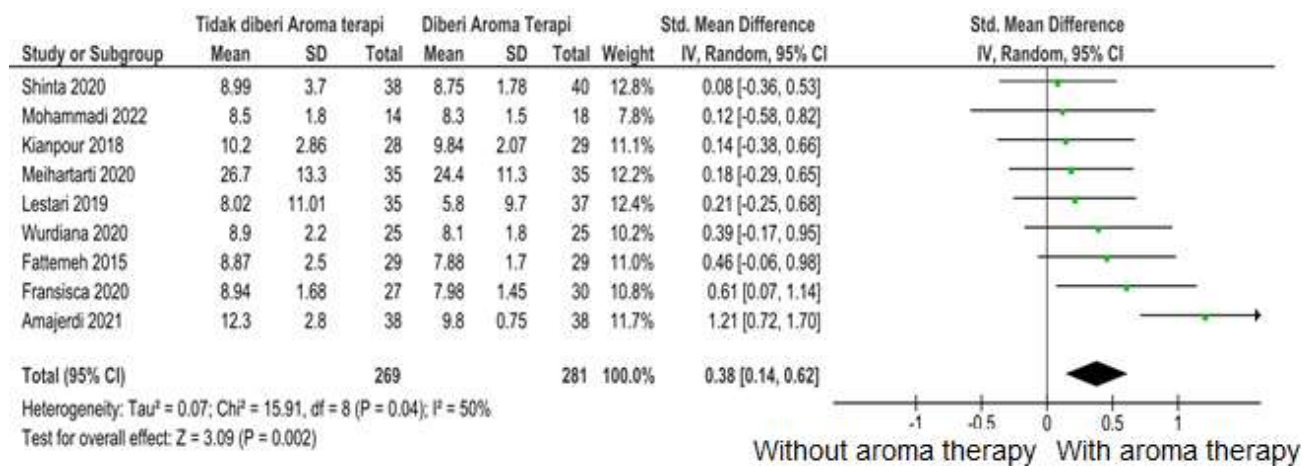


Figure 2. Forest Plot of the Effectiveness of Giving Lavender Aromatherapy to Improve Sleep Quality for Pregnant Women

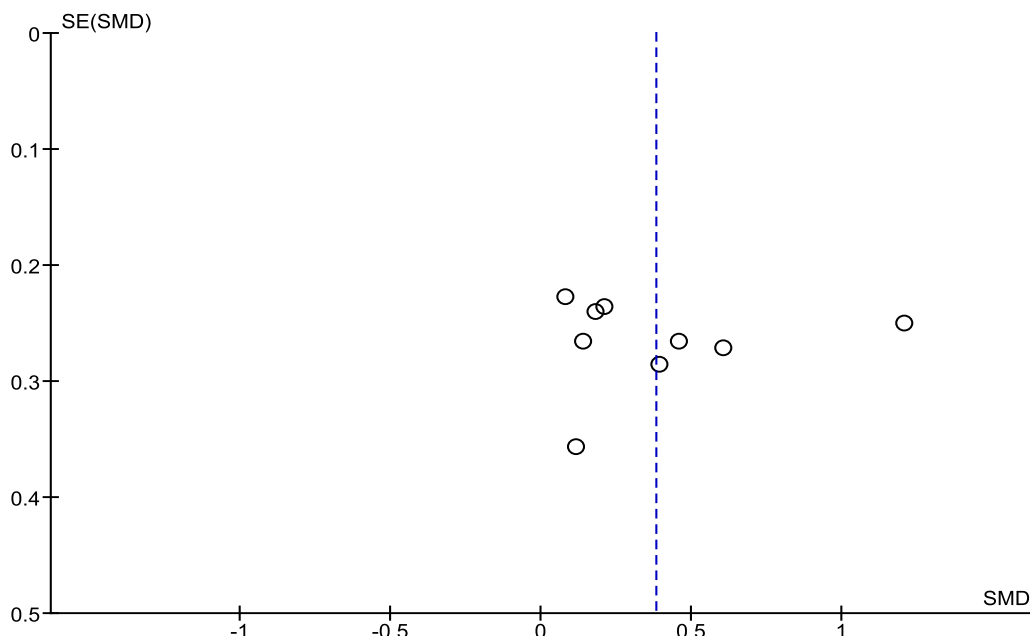


Figure 3. Funnel Plot of the Effectiveness of Giving Lavender Aromatherapy to Improve Sleep Quality for Pregnant Women

Table 1 shows the assessment of study quality using the study cohort checklist published by CASP (Critical Appraisal Skills Program). Table 2 shows a description of the primary studies included in the meta-analysis.

In Figure 2, the forest plot showed that there was an effect of giving lavender aromatherapy, the average quality of sleep was 0.38 units better than not using lavender aromatherapy, the effect was statistically significant (SMD= 0.38; 95% CI= 0.21 to 0.55 p= 0.001). The forest plots in this meta-analysis showed moderate heterogeneity of effect estimates between primary studies ($I^2= 50\%$; $p= 0.040$). Thus, the calculation of the average effect estimate was carried out using a fixed effect model. The funnel plot in Figure 3 showed a more or less symmetric distribution of the estimated effects on the right and left of the vertical line, the average of the estimated effects thus this meta-analysis did not show any publication bias.

DISCUSSION

The quality of sleep for pregnant women was expected to reach 8-10 hours. During pregnancy, if the number of hours of sleep was less than 6 hours, especially at night, the risk was 4.5 times to have a cesarean delivery and affecting the baby's birth weight to be less than normal. While the quality of sleep is a condition that a person goes through so that he gets freshness and fitness when he wakes up from his sleep (Fenny and Supriatmo, 2016).

Good sleep quality will maintain maternal health during pregnancy and provide maternal health by providing enough energy during childbirth. This has an impact on normal physiological changes during pregnancy such as an increase in uterine size, physical discomfort and an increase in the hormone progesterone. The solution to improve the quality of mother's sleep is to provide lavender aromatherapy. This study is aimed to prove the effect of lavender aromatherapy on sleep quality in pregnant women (Meihartati et al, 2020).

Table 2. Description of the main studies included in the meta-analysis primary study

Author (Year)	Country	Study Design	Sample Size			P (Population)	I (Intervention)	C (Comparison)	O (Outcome)	Given Aromatherapy		Not Given Aromatherapy	
			Total	Given Aroma therapy	Not Given Aroma therapy					Mean	SD	Mean	SD
Lestari, et al. (2019)	Indonesia	RCT	72	37	35	Pregnant Woman	Given Lavender Aromatherapy	Not Given Aromatherapy	Sleep Quality	8.02	11.01	5.80	9.70
Wurdiana et al. (2020)	Indonesia	RCT	50	25	25	Pregnant Woman	Given Lavender Aromatherapy	Not Given Aromatherapy	Sleep Quality	8.90	2.20	8.10	1.80
Meihartarti et al. (2020)	Indonesia	RCT	70	35	35	Pregnant Woman	Given Lavender Aromatherapy	Not Given Aromatherapy	Sleep Quality	26.70	13.30	24.40	11.30
Fransiska et al. (2020)	Indonesia	RCT	57	30	27	Pregnant Woman	Given Lavender Aromatherapy	Not Given Aromatherapy	Sleep Quality	8.94	1.68	7.98	1.45
Amajerdi et al. (2021)	Iran	RCT	76	38	38	Pregnant Woman	Given Lavender Aromatherapy	Not Given Aromatherapy	Sleep Quality	12.30	2.80	9.80	0.75
Shinta et al. (2020)	Indonesia	RCT	78	40	38	Pregnant Woman	Given Lavender Aromatherapy	Not Given Aromatherapy	Sleep Quality	8.99	3.70	8.75	1.78
Mohammadi et al. (2022)	Iran	RCT	32	18	14	Pregnant Woman	Given Lavender Aromatherapy	Not Given Aromatherapy	Sleep Quality	8.50	1.80	8.30	1.50
Kianpour et al. (2018)	Iran	RCT	57	29	28	Pregnant Woman	Given Lavender Aromatherapy	Not Given Aromatherapy	Sleep Quality	10.20	2.86	9.84	2.07
Fattemeh et al. (2015)	Iran	RCT	58	29	29	Pregnant Woman	Given Lavender Aromatherapy	Not Given Aromatherapy	Sleep Quality	8.87	2.50	7.88	1.70

This meta-analysis study investigated the effectiveness of lavender aromatherapy on sleep quality in pregnant women. In the intervention of giving lavender aroma therapy, it can improve the quality of sleep in pregnant women. The independent variable is giving lavender aromatherapy, and the dependent variable is improving sleep quality in pregnant women. This study is related to preventive efforts in order to prevent the increase in mortality and mortality rates in pregnant women. From this primary study spread across the Asian continent, there were 9 articles from Iran and Indonesia. This meta-analysis included 550 pregnant women from 9 primary randomized control trials (RCTs). The studies were identified from 2015 to 2022, with each article having a Mean and SD statistical outcome. Based on the results of the analysis of 9 primary studies conducted in a systematic review and meta-analysis, it was shown that there was high heterogeneity between experimental studies ($I^2 = 50\%$; $p = 0.004$) so the analysis used the Random Effect Model. High heterogeneity was based on the variation or diversity between populations that can be seen from the number of different samples between the experimental group and the control group.

The results of this meta-analysis of 9 articles related to the effectiveness of giving lavender aromatherapy to sleep quality in pregnant women showed that the intervention of giving lavender aromatherapy could improve sleep quality in pregnant women (SMD= 0.38; 95% CI= 0.21 to 0.55; $p= 0.001$). There were 7 primary study articles that show significant value in study on the effectiveness of giving lavender aromatherapy to improving sleep quality in pregnant women, marked by not touching the horizontal line of each study with a vertical line on the forest plot, including research by Shinta et al., 2020; Meihartati et al., 2020;

Asih et al., 2020; Mohammadi et al., 2022, Kianpour et al., 2018; Fatemeh et al., 2015; Lestari et al., 2019.

This study explained that pregnant women who were given aromatherapy interventions can provide evidence that there was an effectiveness of lavender aromatherapy on sleep quality in pregnant women by 0.38 times higher than mothers who were not given lavender aromatherapy (CI 95%= 0.21 to 0.55; $p= 0.004$). In this eye-analysis study, there was a tendency for publication bias which is indicated by funnel plots with symmetrical distribution of plots.

Lavender flowers aromatherapy can help a person to sleep better because the aroma of essential oils can help to ease the mind and relax tense body muscles so that it can reduce stress, anxiety, and pain that often interferes with sleep (Meihartati et al., 2020). Aromatherapy has been widely used to improve mood and relax the body. The scent of lavender induces the mind to improve one's sleep quality and can provide a mild sedative effect. There are two important components in lavender, namely the content of linalool and linalyl acetate which provide sedative and narcotic effects. This component stimulates the activity of the limbic and parasympathetic systems. Activation of the parasympathetic system in turn increases alpha waves in the brain, improves cardiovascular function and increases coronary artery perfusion thereby creating a more relaxed body condition (Wurdiana et al., 2020).

Research conducted in Iran found that giving aromatherapy to pregnant women at gestational age above 30 weeks can improve sleep quality in pregnant women. In the group given aromatherapy lavender there were (Mean = 8.75 and SD = 1.78), in the group who were not given aromatherapy the score was (Mean= 8.50; SD= 1.80) and it was statistically significant $P<0.001$ (Mohammadi et al., 2022). Research conducted in

Iran showed that aromatherapy lavender with a foot bath or alone can be used for pregnant women to reduce stress, anxiety, and depression in pregnant women. In the group that was given to those who were not given each, there were 29 pregnant women. In the group that was not given aromatherapy the score were (Mean= 8.87; SD= 2.50), in the group that was given aromatherapy, the score were (Mean= 7.88; SD= 1.70). There was no statistically significant difference between the two experimental groups in terms of results (Fattemeh et al., 2015). Research in Indonesia showed that giving lavender aromatherapy to improve sleep quality in pregnant women has a positive impact on sleep quality during pregnancy, which fulfill the research criteria by 72 people, with purposive sampling. The sleep quality instrument is the Pittsburg Sleep Quality Index (PSQI) which has 7 components. This study uses aromatherapy spray with spray duration every 10 minutes for 7 days. The results of the Wilcoxon test showed that $p= 0.001$ which means that sleep quality can be improved with lavender aromatherapy as evidenced (80%) of respondents there is an improvement in sleep quality (Lestari et al, 2019).

Research conducted in Indonesia showed that giving lavender aromatherapy is the right strategy to improve sleep quality and anxiety in pregnant women. The sample in this study was obtained using purposive sampling technique. There was a significant difference in sleep quality in the treatment group and in the control group ($p= 0.004$) (Shinta et al., 2020). Research in Iran reported that there was a difference between giving aromatherapy and not giving aromatherapy. Pregnant women who were not given lavender aromatherapy had a six times greater risk, compared to pregnant women who used lavender aromatherapy, $RR= 5.8$, 95% $CI= 2.813-12.374$ (Amajerdi et al., 2021).

Given the positive effects of giving lavender aromatherapy, pregnant women will contribute to the goal of improving good sleep quality during pregnancy in the final trimester, in this study there were a sample of 57 pregnant women. In the group that was not given aromatherapy, there were 27 people with (Mean= 8.94; SD= 1.68) and those who were given lavender aromatherapy were 30 people in a random block with a score of (Mean= 7.98; SD= 1.45) (Fransiska et al, 2020).

This study was conducted in Iran with a sample of 57 pregnant women at 35-37 weeks of gestation included using convenience sampling and randomly divided into three groups. The results of the average score in the group of not given lavender aromatherapy decreased significantly compared to the group of given lavender aromatherapy $F= 9.412$, $p<0.001$ (Kianpour et al., 2018). Aromatherapy is a therapeutic modality or alternative treatment using pure aromatic plant extracts in the form of volatile plant liquids and other aromatic compounds from plants. These liquids obtained through various processing methods are known as essential oils. The way aromatherapy works is very specific and different from other types of sensory stimulation. Like every pleasure sensation, the smell will release substances such as endorphins which are used to combat stress (Oktaviasari et al., 2021). Among the therapies that can be used to improve sleep quality is the use of essential oils such as lavender flowers which have sedative or hypnotic properties and have been widely used as therapy for individuals who experience poor sleep quality (Sari et al., 2018).

AUTHOR CONTRIBUTION

Zadia Dara Cynintya Teha as the main researcher who chose the topic, conducted a search for data collection in this study. Uki Retno Budihastuti and Hanung Prasetya

conducted data analysis and reviewed study documents.

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This study is self-funded.

CONFLICT OF INTERESTS

There is no conflict of interest in this study.

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REFERENCES

- Amajerdi, Maryam K, Montazeri A, Bekhradi R (2021). Effect of Lavender oil on nausea, vomiting, and sleep quality in pregnant women: A randomized clinical trial. (Preprint). Research square. <https://doi.org/10.21203/rs.3.rs-681694/v1>.
- Fenny, Supriatmo, Santoso (2016). Hubungan kualitas dan kuantitas tidur dengan prestasi belajar pada mahasiswa fakultas kedokteran (Relationship between sleep quality and quantity with academic achievement in medical faculty students). *Jurnal Pendidikan Kedokteran Indonesia: The Indonesian Journal of Medical Education*. 5(3): 140-147.
- Fattemeh ED, Sakineh M, Alizadeh C, Mojgan M, Mohsen T, Mohammad A. (2015). Effect of Lavender Cream with or without Foot-bath on Sleep Quality, Stress and Depression in Pregnancy: a Randomized Placebo-Controlled Trial: *Journal of Caring Sciences*. 4(1): 63-73 doi:10.5681/jcs.2015.007
- Fransisca A, Farid H, Oki S, Eka F, Dany H (2021). A randomized controlled trial of combination of peppermint, lavender, and turmeric oil for Sleep Quality in pregnant women. *Med J Indones*. 2021 (30): 39–44.
- Jamalzehi A, Omeidi K, Javadi M, Dashi-pour A (2017). Evaluation of sleep quality in third trimester of pregnancy and its relation to birth characteristics in women referred to gynecology clinic of tamin ejtemaee hospital of zahe-dan. *Der Pharmacia Lettre*. 9(2): 194-201.
- Kamalah Rizki, (2021). Pengaruh prenatal yoga terhadap kualitas tidur ibu hamil (The effect of prenatal yoga on sleep quality for pregnant women). *Jurnal Bidan Pintar*. 2(1) 2721- 3536. doi: 10.30737/jubitar.v2i1.1650
- Kianpour M, Reza FMG, Kheirabad, Asghari, Dehghani A, Dehghani-tafti A (2018). The effects of inhalation aromatherapy with rose and lavender at week 38 and postpartum period on sleep quality in high-risk women referred to selected health centers of yazd, Iran in 2015. doi: 10.4103/ijnmr.
- Lestari Indah, Maisaro (2019). Pengaruh aromaterapi lavender terhadap kualitas tidur ibu hamil trimester III (The effect of lavender aromatherapy on the quality of sleep for pregnant women in the third trimester). *Jurnal Ilmu Kesehatan*. 8(1).
- Mahnaz, Afshar K, Behboodi Z, Moghadam, Taghizadeh Z, Reza B, Mokhtari (2015). Lavender fragrance essential oil and the quality of sleep in postpartum women. *Iran Red Crescent Med J*. 17(4): e25880.
- Meihartati T, Iswara (2020). Pengaruh aromaterapi lavender terhadap kualitas tidur ibu hamil (The effect of lavender aromatherapy on the sleep quality of pregnant women).
- Mohammadi F, Moradi M, Niazi A, Jamal J (2022). The impact of aromatherapy

- with lavender essential oil on sleep quality in pregnant women with sleep disorders: a randomized controlled clinical trial. Retrieved from: IJCBNM4-83371651951800.pdf.
- Oktasari D, Desssy H (2021). Efektivitas aromaterapi lavender terhadap kualitas tidur penderita hipertensi (The effectiveness of lavender aromatherapy on sleep quality for hypertensive patients). *TMI Journal of Tropical Medicine*, (1.1.34-43).
- Ratna (2021). Penatalaksanaan gangguan tidur pada ibu hamil trimester III di polindes paopale daya I kabupaten sampang (Management of sleep disorders in third trimester pregnant women at polindes paopale daya I sampang regency).
- Shinta R, Dianita P (2020). Combination of prenatal gentle yoga exercises and lavender aromaterapy inhalation to improving sleep quality in trimester iii pregnant women. *Journal of Midwifery*. 5(1).
- Sari D, David L (2018). Pengaruh aroma terapi lavender terhadap kualitas tidur lansia di wisma cinta kasih (The effect of lavender aromatherapy on the sleep quality of the elderly at cinta kasih home). *Jurnal Endurance*. 3(1): (121-130)
- Sari ZED (2018). Perbedaan efektivitas pemberian essential oil peppermint dan aroma terapi lavender terhadap intensitas mual dan muntah pada ibu hamil trimester I di puskesmas baso kabupaten agam tahun 2017 (Differences in the effectiveness of giving peppermint essential oil and lavender aromatherapy to the intensity of nausea and vomiting in first trimester pregnant women at baso health center, agam regency in 2017). *Menara Ilmu*-12(4).
- Sari PN, Sanjaya R (2021). Pengaruh aromaterapi lavender terhadap nyeri persalinan (Effect of Lavender Aromatherapy on labor pain). *Majalah Kesehatan Indonesia*, 2(1): 45-49.
- WHO (2022). Formaldehyde. international programme on chemical safety. Retrieved from: <http://www.inchem.org/documents/ehc/ehc/ehc89.htm> accessed on january 2022
- Wurdiana S, Diana P (2020). Implementation of prenatal gentle yoga and lavender aromaterapy inhalation in improving sleep quality of pregnant women. *Jurnal of Ners Community*. 11(02): 166 –178.