

EFFECT OF AGARWOOD (*Aquilaria malaccensis* Lam) AROMATHERAPY ON ANXIETY AND PARENTING STRESS AMONG MOTHERS OF CHILDREN WITH SPECIAL NEEDS

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ABSTRACT

Background: Parents of children with special needs often experience psychological distress, including anxiety and parenting stress, due to the continuous demands of caregiving and concerns regarding their children's development and future. Long-term psychological burden may adversely affect parental well-being and caregiving quality. Agarwood (*Aquilaria malaccensis* Lam) is a medicinal plant containing various bioactive compounds, including flavonoids, alkaloids, terpenoids, and essential oils, which have been reported to exhibit sedative, anxiolytic, and relaxation effects. **Objective:** This study aimed to determine the effect of agarwood aromatherapy on anxiety levels and parenting stress among mothers of children with special needs. **Methods:** A pre-experimental study with a one-group pretest-posttest design was conducted among mothers of children with special needs selected through purposive sampling. Anxiety levels were assessed using the State-Trait Anxiety Inventory (STAI), while parenting stress was measured using the Parenting Stress Index (PSI). Agarwood aromatherapy was administered through inhalation during the intervention period. Data were analyzed using descriptive and inferential statistical methods with a significance level of $p < 0.05$. **Results:** The results showed that agarwood aromatherapy did not significantly reduce anxiety levels measured by STAI ($p > 0.05$). Most participants remained in the moderate anxiety category throughout the intervention period. However, a significant reduction in parenting stress scores was observed after the intervention ($p < 0.05$). **Conclusion:** Agarwood aromatherapy was effective in reducing parenting stress but did not significantly affect anxiety levels among mothers of children with special needs. Therefore, agarwood aromatherapy may serve as a complementary intervention to improve parental psychological well-being.

Keywords: Agarwood; Aromatherapy; Anxiety; Parenting stress; Special needs children

INTRODUCTION

Anxiety is an emotional response characterized by feelings of worry, fear, and uncertainty toward situations perceived as threatening^[1]. This condition affects both the psychological and physiological aspects of individuals, leading to increased heart rate,

sleep disturbances, impaired concentration, and behavioral changes. Persistent or prolonged anxiety may adversely affect quality of life and disrupt social functioning as well as overall health status.

Parents of children with special needs constitute a vulnerable group that is at a higher risk of experiencing anxiety. The process of accepting their child's condition, caregiving demands, concerns about the child's future, and social pressures often become contributing factors to psychological distress among parents^[2]. Parents may experience various stages of adjustment and acceptance, including denial, anger, bargaining, depression, and eventual acceptance, when coping with their child's special needs condition^[3].

Children with special needs are individuals who have physical, mental, intellectual, social, or emotional limitations that require specialized care and support during their growth and developmental processes^[4]. These conditions often increase the psychological burden on families, particularly on parents who serve as the primary caregivers.

The management of anxiety can be carried out through both pharmacological and non-pharmacological approaches. One complementary therapy that has gained increasing attention is aromatherapy^[5]. Aromatherapy utilizes essential oils derived from various parts of plants, such as flowers, leaves, stems, roots, and resins, to produce relaxation and improve psychological well-being. Inhaled essential oils stimulate the olfactory system and influence the central nervous system, thereby providing therapeutic effects on emotions and mood^[6].

Among the plant species with promising potential as aromatherapy agents is agarwood (*Aquilaria malaccensis* Lam). Agarwood contains various secondary metabolites, including alkaloids, flavonoids, triterpenoids, saponins, and tannins, which are known to exhibit biological activities such as antioxidant, antimicrobial, and neuroprotective effects^[7]. The active compounds present in agarwood essential oil are believed to influence neurotransmitter

systems through the regulation of glutamate and γ -aminobutyric acid, increase serotonin and norepinephrine levels, and produce sedative, relaxing, and antidepressant effects.

Several previous studies have demonstrated that aromatherapy can reduce anxiety levels. A study conducted by Sugiarto (2020) reported that inhalation of lavender aromatherapy significantly reduced anxiety levels, with a p-value of less than 0.05^[6]. However, studies investigating the use of agarwood aromatherapy among parents of children with special needs remain limited.

Based on these considerations, this study aimed to analyze the effect of agarwood aromatherapy on anxiety levels among parents of children with special needs. The findings are expected to provide an alternative non-pharmacological intervention for reducing anxiety and improving the psychological well-being of parents.

METHODS

This study employed a pre-experimental design using a one-group pretest–posttest to evaluate changes in participants' anxiety and parenting stress levels before and after the intervention. The study population consisted of mothers of children with special needs at Sanggar Gembira Belajar, Denpasar. Participants were recruited using purposive sampling based on predefined eligibility criteria. The inclusion criteria were: (1) mothers of children with special needs aged 2-5 years; (2) mothers who reported anxiety related to their child's condition; and (3) willingness to participate in all four intervention sessions. The exclusion criteria were: (1) mothers who declined to participate; (2) those who did not complete all intervention sessions; (3) those receiving antidepressant medication; and (4) those currently undergoing psychological therapy. The intervention consisted of inhalation of smoke generated from burning

agarwood (*Aquilaria malaccensis*) wood, rather than the use of agarwood essential oil. Participants inhaled the smoke produced from the controlled combustion of agarwood during each intervention session. Anxiety and parenting stress were assessed using the State-Trait Anxiety Inventory (STAI) and the Parenting Stress Index (PSI), respectively. The intervention was administered for 60 minutes once weekly over four consecutive weeks. The collected data were analyzed using univariate analysis to describe respondents' characteristics and anxiety levels, while bivariate analysis was performed using the paired *t*-test or the Wilcoxon signed-rank test, with a significance level of $p < 0.05$.

RESULTS

1. Respondent Characteristics

The study was conducted among 30 mothers of children with special needs at Sanggar Gembira Belajar, Denpasar. The majority of respondents were adults, had secondary to higher educational backgrounds, were self-employed, and were married. Most respondents had one to four children, with the children's ages ranging from 1 to 4 years. The most commonly reported conditions among the children were speech delay and hyperactivity. Detailed characteristics of the respondents are presented in Figure 1.

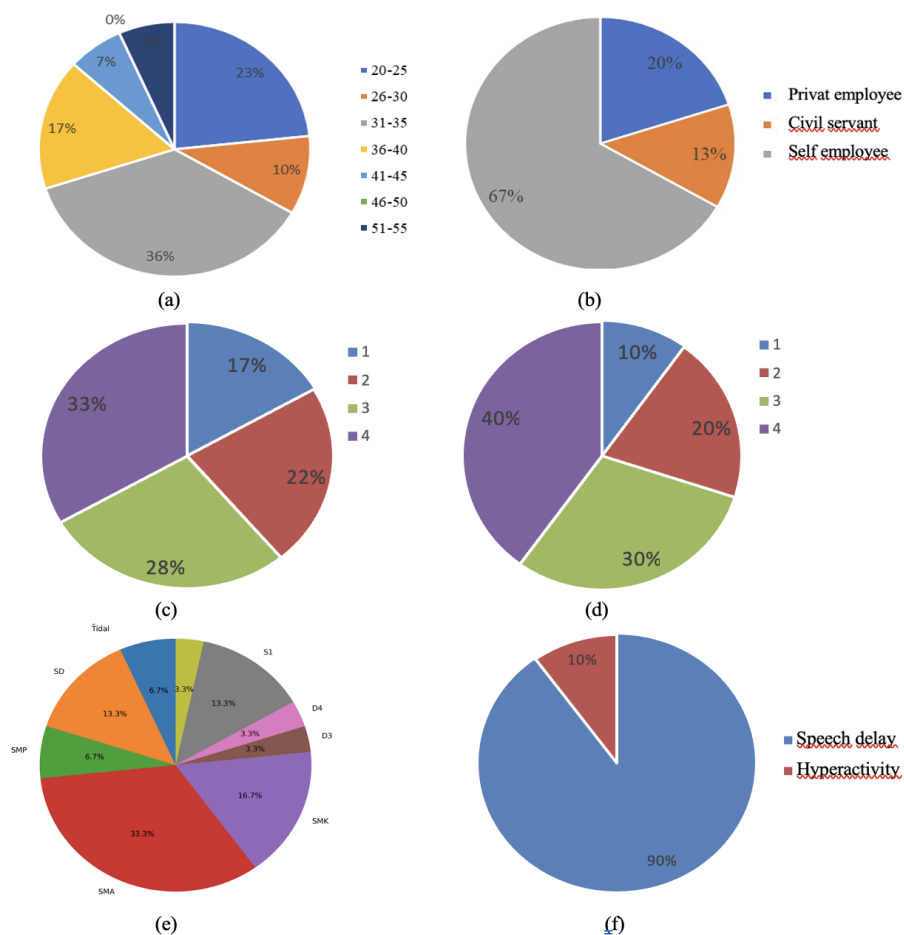


Figure 1. Distribution Diagram of Respondents Based on (a) Age, (b) Occupation, (c) Children's Age, (d) Number of Children, (e) Level of Education, (f) Child's Special Needs Condition

2. Results of Anxiety Assessment Using the State-Trait Anxiety Inventory (STAI)

The result in anxiety levels resulting from the use of agarwood aromatherapy was measured using the State-Trait Anxiety Inventory (STAI), as shown in Table 1. The results indicated that the majority of respondents remained within the moderate anxiety category throughout the study period. A total of 93.33% of respondents were classified as having moderate anxiety, while 6.67% were categorized as having severe anxiety. No respondents were classified as having mild anxiety. This pattern remained

relatively consistent from the first to the fifth week of the study.

The relatively consistent distribution patterns of state anxiety and trait anxiety suggest that no categorical shift in anxiety levels occurred during the agarwood aromatherapy intervention period. However, the observed changes were reflected in a quantitative reduction in anxiety scores within the same anxiety category. These findings indicate that the effects of agarwood aromatherapy were more apparent in reducing the intensity of maternal anxiety rather than altering the overall anxiety classification.

Table 1. Anxiety Level by State-Trait Anxiety (STAI)

State Anxiety								
Anxiety Level	Week 1		Week 3		Week 4		Week 5	
	Number of subjects	%	Number of subjects	%	Number of subjects	%	Number of subjects	%
Mild	0	0	0	0.00	0	0.00	0	0.00
Moderate	28	93.33	28	93.33	28	93.33	28	93.33
Severe	2	6.67	2	6.67	2	6.67	2	6.67
Trait Anxiety								
Anxiety Level	Week 1		Week 3		Week 4		Week 5	
	Number of subjects	%	Number of subjects	%	Number of subjects	%	Number of subjects	%
Mild	0	0.00	0	0.00	0	0.00	0	0.00
Moderate	28	93.33	28	93.33	28	93.33	28	93.33
Severe	2	6.67	2	6.67	2	6.67	2	6.67

Information: score of anxiety level, Mild (20-39), Moderate (40-59), Severe (60-80)

The analysis of STAI indicator scores, as presented in Table 2, showed no statistically significant changes in either the favorable or unfavorable items. Statistical analysis revealed p-values of 0.974 for the

favorable items and 0.952 for the unfavorable items. These findings indicate that the administration of agarwood aromatherapy did not produce a significant effect on anxiety levels as measured by the STAI instrument.

Table 2. State-Trait Anxiety Indicator Scores at Weeks 1, 3, 4, and 5

Indicator	Item	Week-1 Mean±SD	Week-3 Mean±SD	Week-4 Mean±SD	Week-5 Mean±SD	p-value
State Anxiety	favorable 1,2,5,8,10,11,15,16,19,20	3.52 ± 0.45	3.49 ± 0.46	3.49 ± 0.46	3.49 ± 0.46	0.974
	unfavorable 3,4,6,7,9,12,13,14,17,18	1.58 ± 0.59	1.75 ± 0.71	1.75 ± 0.70	1.75 ± 0.71	0.952
Trait Anxiety	favorable 21,23,24,26,27,30,33,34,36,39	3.43 ± 0.57	3.42 ± 0.57	3.42 ± 0.57	3.42 ± 0.57	0.815
	unfavorable 22,25,28,29,31,32,35,37,38,40	1.70 ± 0.60	1.75 ± 0.68	1.76 ± 0.68	1.76 ± 0.68	0.994

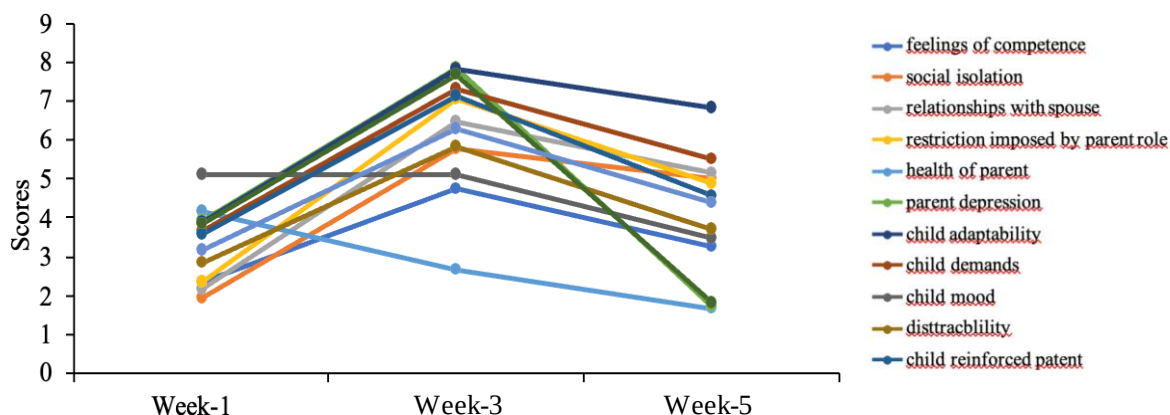
3. Result of Parenting Stress Index

The results of the Parenting Stress Index (PSI) assessment presented in Table 3 demonstrated a reduction in parenting stress scores following the administration of agarwood aromatherapy. The mean PSI score decreased from 87.33 in the first week to

69.43 in the third week and further declined to 59.70 in the fifth week. Statistical analysis revealed a significant overall difference, with a p-value of 0.000. In addition, a significant difference was observed between the first and third weeks ($p = 0.000$).

Table 3. PSI Scores Over Time

PSIScores	Time		
	Week 1	Week 3	Week 5
Mean	87.33	69.43	59.70
Standard Deviation (SD)	9.55	8.65	10.95
Overall p-value	0.001		
p-value Week 1 vs 3	0.001		
p-value Week 3 vs 5			


Figure 2. PSI Profile Score Changes

Reductions in scores were observed across several dimensions of parenting stress, particularly in the domains of parental depression, role restriction as a mother, parental health, and emotional distress experienced during the caregiving process. As shown in Figure 2, nearly all indicators demonstrated an increase in scores during the third week, which was subsequently followed by a decline in the fifth week, indicating an adaptive response of the mothers to the agarwood aromatherapy intervention.

In the *Parental Distress* aspect, the indicators of parent depression and restriction imposed by the parent role showed the greatest decline in the third week compared with the second week, indicating a reduction in emotional burden and role-related stress experienced by the parents. In the *Difficult Child* aspect, all indicators, including child demands, child mood, and distractibility, demonstrated lower scores in the third week, reflecting mothers' perceptions that their children's behavior had become more manageable and less anxiety-provoking.

Meanwhile, in the Parent–Child Dysfunctional Interaction domain, the indicators of acceptability of the child to the parent and child also showed a marked reduction in scores at the end of the assessment period.

DISCUSSION

The results of the study showed that agarwood aromatherapy was not able to significantly reduce maternal anxiety levels as measured by the STAI. The majority of respondents remained within the moderate anxiety category throughout the study period. These findings suggest that the anxiety experienced by mothers of children with special needs is relatively persistent and is associated with the long-term demands of caregiving.

Anxiety among mothers of children with special needs is influenced by various

factors, including concerns regarding the child's development, caregiving burden, social conditions, and uncertainty about the child's future. These factors may contribute to chronic anxiety, making it difficult for a relatively short intervention period to produce statistically significant changes^[8]. Nevertheless, a descriptive tendency toward reduced subjective anxiety intensity was observed in several respondents.

Agarwood aromatherapy is presumed to exert a relaxing effect through stimulation of the olfactory system, which subsequently influences the central nervous system. Active compounds present in agarwood, such as agarofuran and benzylacetone, are known to contribute to increased levels of serotonin and norepinephrine, which are associated with emotional regulation and stress responses^[9]. In addition, the flavonoid and phenolic compounds contained in agarwood possess antioxidant and neuroprotective activities^[10].

In contrast to the anxiety assessment findings, agarwood aromatherapy was found to be effective in reducing maternal parenting stress. The decrease in Parenting Stress Index scores indicates that the aromatherapy intervention was able to alleviate emotional distress and psychological burden associated with caring for children with special needs. The greatest reductions were observed in the domains of parental depression, role restriction as a mother, and parental health.

The relaxing effects of aromatherapy may contribute to improvements in the mothers' psychological well-being. The inhalation of agarwood aroma can induce feelings of comfort and tranquility, thereby helping to alleviate stress arising from the daily demands of caregiving. Previous studies have also reported that the inhalation of agarwood smoke exerts anxiolytic and sedative effects through increased serotonin levels and modulation of neurotransmitter

pathways involved in emotional regulation^[11].

The result of this study indicates that agarwood aromatherapy is more effective as a complementary therapy for reducing parenting stress than for alleviating situational anxiety. These findings are consistent with previous studies reporting that the inhalation of agarwood smoke exerts relaxing and anxiolytic effects through neurobiological mechanisms involving neurotransmitters associated with the regulation of emotions and stress^[12]. Therefore, agarwood aromatherapy has the potential to be used as a complementary therapy to reduce parenting stress among mothers of children with special needs.

However, future studies may consider combining agarwood aromatherapy with psychosocial interventions, such as counseling, family support, group therapy, and parenting education, to explore their potential contribution to anxiety reduction. In this study, parenting stress scores decreased after the intervention, although the one-group pretest–posttest design without a control group does not allow these changes to be attributed solely to agarwood aromatherapy.

CONCLUSION

Agarwood aromatherapy significantly reduced parenting stress among mothers of children with special needs, as evidenced by a significant decrease in Parenting Stress Index scores ($p < 0.05$). However, no significant effect was observed on state-trait anxiety levels ($p > 0.05$). These findings suggest that agarwood aromatherapy may serve as a complementary intervention for reducing parenting stress, although additional psychosocial interventions may be required to achieve optimal anxiety management.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this article.

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