

ARTICLE INFORMATION

Received: December, 8, 2025

Revised: February, 1, 2026

Available online: February, 1, 2026

at : <https://e-jurnal.iphorr.com/index.php/minh>

The effect of mindfulness intervention on anxiety among patients with coronary heart disease prior to cardiac catheterization

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Abstract

Background: Cardiovascular disease remains a leading global health burden, with Coronary Heart Disease (CHD) accounting for nearly half of cases. Cardiac catheterization, widely performed in Indonesia, is vital for diagnosis and treatment but often provokes significant anxiety, potentially affecting hemodynamic stability. Mindfulness-based interventions have shown effectiveness in reducing psychological distress, enhancing emotional regulation, and improving patient resilience. However, evidence on their application in Indonesian pre-catheterization patients is limited, underscoring the need for context-specific research to optimize holistic care.

Purpose: To examine the effect of mindfulness intervention in reducing anxiety prior to cardiac catheterization.

Method: A quasi-experimental non-equivalent control group design was employed to examine mindfulness therapy effects among coronary heart disease patients scheduled for cardiac catheterization at Tarakan Hospital, Jakarta. A purposive sample of 32 participants (16 intervention, 16 control) was analyzed using univariate, t-tests, and ANCOVA, with validity, reliability, homogeneity, and normality tests ensuring methodological rigor.

Results: In the intervention group, the mean anxiety score dropped from 24.94 before treatment to 16.44 afterward, with statistical testing producing a p-value of 0.000, signifying a significant impact of mindfulness. Likewise, the control group showed a reduction in average anxiety scores from 25.13 pre-treatment to 20.88 post-treatment, and analysis also yielded a p-value of 0.000, indicating a significant change in anxiety levels within this group.

Conclusion: Mindfulness intervention proved to be effective in reducing anxiety among patients with coronary heart disease prior to cardiac catheterization.

Keywords: Anxiety; Coronary Heart Patients; Mindfulness, Pre-Cardiac Catheterization.

INTRODUCTION

Cardiovascular disease remains a major cause of morbidity and mortality worldwide (Global Burden of Disease Study, 2020) reports that the prevalence of cardiovascular disorders continues to increase almost twofold each year, with Coronary Heart Disease (CHD) contributing to approximately 43.8% of total cases (Santosa, & Baharuddin, 2020). In clinical practice, cardiac catheterization is one of the essential diagnostic and therapeutic procedures

performed to identify and manage coronary artery blockages. In Indonesia, an estimated 2,400 cardiac catheterization procedures are carried out annually, reflecting the substantial burden of CHD in the population.

Despite its critical role, cardiac catheterization is an invasive procedure that often triggers psychological distress, particularly anxiety. Patients may experience heightened worry related to

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procedural pain, potential complications, unfamiliar hospital environments, and uncertainty about clinical outcomes. Anxiety may also arise from being temporarily separated from family and support systems, fear of procedural failure, and concerns about postoperative recovery. These emotional responses can manifest as sleep disturbances, difficulty concentrating, physical tension, irritability, and general psychological discomfort (Hutagalung, Susilaningih, & Mardiyah, 2014). If unmanaged, anxiety may negatively affect hemodynamic stability, leading to increased heart rate and blood pressure, which could in turn elevate procedural risks.

Addressing psychological readiness is therefore crucial in the peri-procedural management of cardiac patients. One non-pharmacological approach that has gained increasing attention is mindfulness-based intervention. Mindfulness allows individuals to consciously observe their internal experiences—thoughts, emotions, and physical sensations without judgment and with an attitude of acceptance. Mindfulness therapy encourages awareness of the present moment, fostering psychological calmness, improved emotional regulation, and reduced reactivity to stressor (Dwidiyanti, Fahmi, Wahyu, Wiguna, & Munif, 2019). Through consistent practice, patients become more capable of perceiving their circumstances objectively, reducing cognitive distortions, and enhancing their ability to cope with medical procedures.

Evidence from prior studies supports the effectiveness of mindfulness in reducing various forms of psychological distress (McConville, McAleer, & Hahne, 2017) found that mindfulness interventions improve self-efficacy, emotional resilience, and psychological well-being among health-related populations. Similarly (Pan, Gau, Lee, Jou, Liu, & Wen, 2019) reported that mindfulness-based programs effectively decrease stress, anxiety, and depressive symptoms in clinical and non-clinical groups. Given its benefits, mindfulness offers a promising complementary strategy in preparing patients for invasive procedures such as cardiac catheterization.

However, despite the growing body of evidence internationally, research on the application of mindfulness specifically among pre-cardiac

catheterization patients in Indonesia remains limited. Cultural, environmental, and health literacy factors may influence the effectiveness of psychological interventions, making it important to investigate mindfulness within local clinical settings. Understanding the role of mindfulness in reducing anxiety prior to cardiac catheterization can support healthcare providers in delivering more holistic, patient centered care, ultimately improving procedural outcomes and patient experience.

RESEARCH METHOD

A quantitative approach was employed using a quasi-experimental method, which aims to examine the effect of an intervention on an outcome under controlled conditions. The specific design used was a quasi-experimental non-equivalent control group design. This design involves two groups an experimental group and a control group that are not randomly assigned and therefore do not receive identical conditions.

The study population consisted of patients with coronary heart disease scheduled for pre-cardiac catheterization at Tarakan Regional General Hospital, Jakarta, in 2023. Pre-catheterization patient data were collected from September to November 2023, total 118 patients. The sample consisted of coronary heart disease patients undergoing pre-cardiac catheterization who participated in mindfulness therapy at the same hospital. The sample size was calculated using the Federer formula: where t is number of groups and n is number of samples. To prevent dropout, an additional 10% was added to the sample size (Sastroasmoro & Ismael, 2014) resulting in 16 participants in each group. Thus, the total sample consisted of 32 participants (16 in the intervention group and 16 in the control group). This study used purposive sampling, in which participants were selected based on predetermined criteria. The inclusion is coronary heart disease patients scheduled for cardiac catheterization, elective PCI patients, consciousness compos mentis, patients without hearing impairment, first-time cardiac catheterization patients and patients experiencing mild to moderate anxiety. Exclusion Criteria is

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patients who did not undergo cardiac catheterization, patients who refused mindfulness therapy, patients with hearing impairment and patients experiencing severe anxiety.

Univariate analysis was used to describe demographic variables such as age, occupation, ethnicity, and gender, while bivariate analysis applied the t-test and multivariate analysis utilized ANCOVA. Severe anxiety may lead to panic, disorganized behavior, and difficulty following instructions, often reducing social interaction (Pamungkas, 2018). Research activities began with proposal development in March 2023, data collection in July, and the main study phase from December 2023 to January 2024. Homogeneity of variance between groups was tested using Levene's Test, with results interpreted based on p-values (<0.05 indicating non-homogeneity and ≥ 0.05 indicating homogeneity) (Sugiyono, 2017).

Following the validity and reliability assessments, a normality test was conducted using the Kolmogorov–Smirnov test with Lilliefors correction. Data with $p > 0.05$ were considered normally distributed and analyzed using parametric tests, whereas data with $p < 0.05$ were considered not normally distributed and analyzed using non-parametric tests. Bivariate analysis employed the independent t-test to compare post-intervention outcomes between groups and the paired t-test to measure changes before and after the intervention within each group. Furthermore, ANCOVA was applied as a multivariate technique appropriate for both experimental and observational studies, offering advantages such as increasing the precision of the research design when group classification is uncertain, controlling baseline differences in the dependent variable, and reducing the influence of extraneous variables.

RESEARCH RESULTS

Table 1. Characteristics of the Participants (N=32)

Variable	Group		Homogeneity (Levene Test)
	Intervention (n=16)	Control (n=16)	
Age (Mean $\pm$SD)(Range)(years)	54.38 $\pm$ 5.24 (50-67)	54.31 $\pm$ 4.81 (50-64)	
Gender (n/%)			
Male	11/68.75	6/37.50	
Female	5/31.25	10/62.50	
Occupation (n/%)			
Employed	3/18.75	4/25.00	0.41
Unemployed	13/81.25	12/75.00	
Ethnicity (n/%)			
Java	7/43.75	9/56.25	1.00
Non-Java	9/56.25	7/43.75	

Table 1 shows in the intervention group, participants had a mean age of 54.38 years (SD = 5.24), with ages ranging from 50 to 67 years. The 95% confidence interval for the mean age was 52.25–57.00 years. In the control group, the mean age was 54.31 years (SD = 4.81), with a minimum age of 50 years and a maximum of 64 years; the 95% confidence interval was 52.13–56.75 years. Demographic analysis revealed that most participants in the intervention group were male (68.75%), unemployed (81.25%), and of non-Javanese ethnicity (56.25%). In contrast, the control group was predominantly female (62.50%), unemployed (75.00%), and of Javanese ethnicity (56.25%).

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Table 2. The Average Difference Before and After Mindfulness Intervention against Anxiety

Variable	Intervention			Control		
	Mean $\pm$ SD	p-value	95%CI	Mean $\pm$ SD	p-value	95%CI
Anxiety						
Pretest	24.94 $\pm$ 1.44	0.000	24.17-25.70	25.13 $\pm$ 1.50	0.000	24.33-25.92
Posttest	16.44 $\pm$ 2.80		14.94-17.93	20.88 $\pm$ 1.50		20.08-21.67

Table 2 demonstrates a reduction in mean anxiety scores among patients following cardiac catheterization in both study groups. In the intervention group, the average anxiety score decreased from 24.94 prior to treatment to 16.44 after treatment. Statistical analysis revealed a p-value of 0.000, indicating a significant effect of mindfulness in this group. Similarly, in the control group, the mean anxiety score declined from 25.13 before treatment to 20.88 after treatment. The comparison also yielded a p-value of 0.000, confirming a significant difference in anxiety levels within the control group.

DISCUSSION

The participants' average age was 54 years. This aligns with existing theories suggesting that advancing age contributes to a higher risk of arterial damage and narrowing, weakening or thickening of the heart muscle, and increased vascular stiffness, all of which can impair smooth cardiac blood flow (Jumayanti, Wicaksana, & Akhmad Budi Sunaryo, 2020).

The majority of participants were male, consistent with previous research reporting that 76.3% of CHD cases occurred in men (Ayu & Muflihatin, 2020). This trend may be linked to lifestyle factors, particularly smoking, as nicotine stimulates adrenaline release, which reduces HDL levels and elevates triglycerides, thereby increasing arterial blockages (Fadilah & Munandar, 2020). Men are estimated to face an 80% higher risk of heart attacks, often occurring earlier than in women (Andarmoyo & Nurhayati, 2014). In contrast, premenopausal women benefit from estrogen, which regulates cholesterol and fat metabolism, lowering their risk of CHD. However, after menopause, estrogen levels decline sharply, making women more vulnerable to cardiovascular dysfunction (Mulyana, Sonia, Sukarno, Pamungkas, Erwin, Nuraeni, & Wariani, 2023; Nursanti, Muhdiana, & Anggraini, 2020). Overall, both

hormonal influences and lifestyle factors contribute to higher CHD prevalence in men, highlighting the importance of adopting healthy habits early to reduce disease risk across genders.

Most participants do not work. This is in line with research stating that the participants in his study did not work, because they were housewives and retirees (Praptiwi & Jadmiko, 2017). Stress from not working affects income, prolonged stress can damage arteries and increase the risk of heart disease, the existence of life demands that have an impact on excessive stress will have an impact on worse health problems (Putri, Wibhawa, & Gutama, 2015). When the body feels stressed, blood pressure will naturally increase, this is partly due to the release of the hormone cortisol, and every double increase in cortisol in the body will increase the risk of cardiovascular events by 90%. When stressed, the hormone epinephrine increases. This condition causes heart rate and blood pressure to increase, and blood vessels will narrow. High blood pressure also appears due to hormones released during stress and leads to an increased risk of heart disease. When blood pressure is high, blood flow becomes unsmooth and then causes disturbances in the work of the heart organ. High blood pressure is said to be one of the triggering factors for heart attacks (Fuchs & Whelton, 2020). Supported by theories related to controlling stress by doing activities or work that are beneficial, thinking positively, reducing the risk of health problems including heart disease. In accordance with the theory by doing work the body automatically performs activities, and this can affect High density lipoproteins (HDL), also known as good cholesterol, cleanses the arteries of excess cholesterol. HDL carries that excess cholesterol to the liver to undergo a metabolization process. then reduced the risk of atherosclerosis and coronary heart disease (Sylvia & Wilson, 2005).

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The majority of participants were of Javanese ethnicity, consistent with national data showing the Javanese as the largest ethnic group in Indonesia, comprising about 40% of the population. Cultural beliefs strongly influence health-seeking behavior, with many relying on self-healing practices such as scraping, herbal remedies, or over-the-counter medicines rather than clinical care. Research in Yogyakarta highlights a common pattern in which families first consult shamans before turning to health professionals (Kartikasari, 2019). Limited engagement in routine medical check-ups often delays early detection of disease, increasing the risk of complications. Therefore, community education on the importance of regular health monitoring is essential across all ethnic groups. Improved health literacy is closely linked to better compliance with follow-up care at polyclinics (Tampubolon, Purnamawati, Jumaiyah, & Rayasari, 2021).

The results revealed a reduction in average anxiety scores following mindfulness intervention. This finding is consistent with theoretical perspectives suggesting that mindfulness provides positive stimuli, promotes the release of endorphins, and redirects attention away from distressing thoughts. Such mechanisms foster relaxation and diminish anxiety by enhancing focus and reducing cognitive tension (Potter & Perry, 2015).

Approximately 70–75% of patients scheduled for cardiac catheterization experience anxiety, underscoring the importance of thorough assessment and management prior to the procedure. Anxiety in this context can adversely impact cardiac function and is frequently accompanied by distressing physical symptoms such as palpitations. These manifestations often prompt patients to seek clarification about their condition and the medical steps to be undertaken, highlighting the need for effective communication and supportive interventions to ensure patient safety and comfort (Ziyaeifard, Zahedmehr, Ferasatkish, Faritous, Alavi, Alebouyeh, & Yousefi, 2017).

According to theoretical frameworks, the physiological response to anxiety and stress involves activation of the central nervous system, specifically the hypothalamic–pituitary–adrenal (HPA) axis and

the sympathetic nervous system. This activation typically manifests as elevated pulse rate and blood pressure. Such changes pose significant risks during cardiac catheterization, as increased heart rate and vascular resistance place additional strain on the cardiovascular system, heighten myocardial oxygen demand, and intensify cardiac workload. Consequently, these responses may elevate the likelihood of procedural complications (Sylvia & Wilson, 2005).

Before cardiac catheterization is performed, patients often imagine pain in the wound area and the patient is afraid to do body movements or light exercises due to pain in the wound area. The pain and complications of the procedure cause patients to feel anxious (Davris, Mailani, & Muliantino, 2023). While external factors that can increase the anxiety of patients who will undergo cardiac catheterization procedures, namely related to stress and unfamiliar environments, patients' perceptions of cardiac catheterization procedures can affect the level of anxiety of patients who will undergo cardiac catheterization procedures (Sutrisno & Astrid, 2019).

The comparison of anxiety levels before and after the intervention demonstrated a significant reduction following mindfulness practice. Cardiac catheterization, as an invasive procedure, often provokes anxiety, making psychological support essential. Mindfulness helps redirect attention, physiologically engaging the reticular activation system to regulate sensory input. Pleasant stimuli further promote endorphin release, while distraction techniques shift focus away from distressing thoughts, collectively reducing fear and anxiety and supporting patients' emotional readiness for the procedure (Potter & Perry, 2015).

Mindfulness has been shown to effectively reduce anxiety and depression while enhancing awareness, cognitive performance, and emotional memory (Sari, Nababan, & Daulay, 2023). Beyond psychological benefits, mindfulness interventions can lower blood pressure, alleviate motor dysfunction, improve mobility, and foster spiritual well-being and overall quality of life (Sriati et al., 2022). Importantly, mindfulness is practical and accessible, as patients can practice independently at home or within hospital

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settings to observe thoughts and emotions without judgment. Evidence further confirms its significant influence in reducing anxiety (Dhamayanti & Yudianto, 2020).

These differences can also be influenced by the aspect of doing with awareness so that the participants are focused and fully aware of what is being done now. Mindfulness therapy is a form of concentration exercise on something to achieve higher awareness so that individuals can feel more positive which ultimately improves body condition, provides psychological comfort and reduces anxiety levels in individuals (Romadhoni & Widiati, 2020). This can allow a person to overcome problems in his life by turning negative thoughts into positive ones and providing support and motivation to himself in every face of problems. Mindfulness can improve the parasympathetic nervous system, decrease the production of the hormones adrenaline and epinephrine so that symptoms of stress and anxiety can decrease.

In this study, mindfulness was given for 45 minutes in 1 day and influenced reducing anxiety. Mindfulness carried out for 1 time with a duration of 45 minutes influences reducing anxiety (Ariyanti, Agusyana, & Widodo, 2023). Although mindfulness is given in a single session such as 10-15 minutes, the results can show a decrease in intensity and response to negative emotions, effective in reducing emotional tension in responding to positive and negative events and anxiety (Wu, Liu, Zhu, Su, Cao, Zhong, & Jiang, 2019).

Mindfulness interventions were shown to effectively reduce anxiety among pre-catheterization cardiac patients, with regular practice enhancing relaxation, awareness of bodily sensations, and fostering an attitude of acceptance. Multivariate statistical analysis revealed that gender significantly influenced anxiety levels ($p = 0.022$), consistent with findings which reported a strong relationship between sex and pre-catheterization anxiety in patients with acute coronary syndrome. Gender differences are closely linked to lifestyle and behavioral factors, particularly in coronary heart disease, where men are more likely to engage in smoking, thereby increasing cardiovascular risk

(Listiana, 2019; Hutajulu, Prabandari, Bintoro, Wiranata, Widiastuti, Suryani, & Allsop, 2022). These results highlight the importance of considering gender in psychological interventions, while reinforcing mindfulness as a practical strategy to reduce anxiety in patients undergoing cardiac catheterization.

Gender was found to significantly influence anxiety levels, with women generally more vulnerable due to their tendency to process experiences emotionally, making them more susceptible to stress and impatience. Biologically, higher estrogen levels in women contribute to increased serotonin (5HT) activity, which is associated with mood disorders, while simultaneously inhibiting GABA receptors, the brain's primary inhibitory system, thereby heightening anxiety risk (Sylvia & Wilson, 2005). In men, anxiety often manifests through physical symptoms such as headaches, appetite loss, and tremors, and is frequently linked to feelings of helplessness or lack of control. Reduced testosterone levels further exacerbate anxiety in men, as hormonal decline elevates cortisol, the stress hormone, intensifying psychological distress (Anggraeni & Saudia, 2021).

Conversely, age, occupation, and ethnicity did not show significant associations with anxiety. Some individuals, regardless of age, demonstrated varying capacities to manage anxiety, suggesting that maturity alone does not guarantee emotional regulation. Employment status also proved unrelated to anxiety, it was likely due to modern access to diverse resources that support independent work both online and offline (Sulastini & Fitria, 2016). Ethnicity similarly showed no effect, which researchers attributed to cultural adaptation and increased knowledge of healthcare environments, often facilitated by social media and broader information access.

Overall, these findings emphasize gender as a key determinant of anxiety in pre-catheterization patients. Mindfulness emerges as a practical intervention for both men and women, offering consistent benefits when practiced regularly for 45 minutes daily. By fostering relaxation, awareness, and acceptance, mindfulness provides an effective

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non-pharmacological strategy to reduce anxiety and enhance psychological readiness for cardiac procedures.

CONCLUSION

Mindfulness intervention is effective in reducing anxiety among pre-cardiac catheterization patients, with the intervention group showing a significantly greater decline in anxiety scores compared to the control group, thereby confirming its specific therapeutic impact. Gender emerged as the only confounding variable significantly influencing anxiety, while age, occupation, and ethnicity showed no effect. Despite limitations related to environmental distractions in shared patient rooms, efforts were made to minimize disturbances, and the findings underscore mindfulness as a valuable non-pharmacological strategy to enhance psychological readiness and reduce procedural anxiety in cardiac patients.

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DOI: <https://doi.org/10.33024/minh.v8i11.1975>