

Yoga Exercise for Endurance Improvement in Coronary Heart Disease Patients: A Case Study

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ABSTRACT

Background: Coronary heart disease (CHD) is a leading cause of death, particularly in developing countries. It is characterized by the narrowing of coronary blood vessels, which restricts blood flow to the heart, leading to symptoms such as shortness of breath and reduced endurance. This study aims to explore the effectiveness of yoga exercise in improving endurance and reducing shortness of breath in patients with CHD.

Methods: A descriptive case study approach was utilized. A 61-year-old female patient with CHD participated in yoga and breathing exercises over a period of 16 weeks. Yoga was performed 2-3 times a week for 20-30 minutes, while breathing exercises were incorporated regularly. The Borg scale was used to assess breathlessness, and endurance was measured using the Six-Minute Walk Test (6MWT).

Results: After 16 weeks, the patient's Borg scale score decreased from 3 to 0.5, indicating a reduction in shortness of breath. Additionally, her endurance improved significantly, with the metabolic equivalents (METs) value increasing from 1.6 to 3.35. These results demonstrate substantial improvements in physical capacity and a reduction in breathlessness symptoms following yoga and breathing exercises.

Conclusion: This study suggests that yoga exercises, combined with breathing exercises, can be an effective adjunct to traditional cardiac rehabilitation, improving both endurance and symptoms of breathlessness in CHD patients. Further research with larger sample sizes and longer durations is recommended to confirm these findings and explore the long-term benefits of yoga for cardiovascular health.

Keywords: Coronary heart disease; Endurance; Yoga exercise

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INTRODUCTION

Cardiovascular diseases (CVDs) remain the leading cause of mortality worldwide, with their prevalence continuing to rise. Among these, coronary heart disease (CHD) significantly contributes to global morbidity and mortality. CHD results from the narrowing of coronary arteries due to atherosclerotic plaque buildup, which restricts blood flow to the myocardium, leading to ischemia, myocardial infarction, and potentially heart failure (1,2). The World Health Organization (WHO) estimates that by 2030, cardiovascular diseases will account for approximately 25% of global deaths, with a notable increase in prevalence in developing regions such as Asia (3). In Southeast Asia, CHD-related mortality rates reach 13.0%, compared to 7.5% in East Asia and 7.3% in South Asia (4).

CHD patients commonly experience symptoms such as chest pain, shortness of breath, and exercise intolerance, leading to decreased endurance and impaired quality of life. Reduced cardiovascular endurance, primarily due to limited oxygen uptake and cardiac output, can restrict daily activities and contribute to worsening disease progression (5). To assess endurance in CHD patients, the six-minute walk test (6MWT) is widely used as a reliable and validated measure of submaximal functional capacity, reflecting the ability to perform physical activities essential for daily living (6,7).

Exercise-based rehabilitation is a key component in CHD management, with yoga emerging as a promising intervention due to its holistic benefits on cardiovascular health. Yoga involves controlled breathing, stretching, and low-to-moderate intensity movements, which have been shown to improve cardiovascular endurance, autonomic regulation, and oxygen consumption capacity (8,9). Unlike high-intensity exercise, yoga is a low-impact modality that can be adapted to CHD patients' needs, potentially enhancing endurance without exacerbating symptoms (10). However, despite the growing interest in yoga as a complementary therapy, there remains limited evidence regarding its effectiveness in improving endurance among CHD patients.

Given the high burden of CHD and the associated decline in functional capacity, identifying effective, non-pharmacological interventions is crucial. Yoga, as a low-risk and accessible exercise modality, offers potential benefits in improving endurance and overall cardiovascular function. However, more empirical evidence is needed to

support its integration into CHD rehabilitation programs. This study aims to bridge this gap by investigating the impact of yoga exercise on endurance improvement in CHD patients. Therefore, this case study aims to assess the effectiveness of yoga exercise in improving endurance among coronary heart disease patient using the six-minute walk test as an outcome measure. This study also seeks to provide evidence-based insights into the role of yoga as a complementary rehabilitation approach for CHD patients.

METHODS

This study adopts a descriptive case study approach to explore nursing interventions aimed at improving endurance and managing shortness of breath in a coronary heart disease (CHD) patient. A case study was selected for an in-depth examination of a single patient's experience with yoga and breathing exercises over a 16-week period.

Data Collection and Evidence-Based Nursing Approach

Data collection was conducted through a direct patient interview, focusing on the patient's symptoms and functional capacity (11). This study follows the four-stage framework of Evidence-Based Nursing (EBN):

1. Asking clinical questions: The study posed the PICO (Problem, Intervention, Comparison, Outcome) question: *"What is the appropriate intervention to reduce shortness of breath and increase endurance in coronary heart patients?"*
2. Searching for evidence: A literature review was conducted using PubMed, ScienceDirect, and Scopus databases. Keywords included Yoga exercise OR endurance exercise AND coronary heart disease OR Cardiovascular Disease.
3. Assessing evidence: Relevant studies were analyzed to determine the most effective nursing interventions for improving physical endurance and managing symptoms of breathlessness.
4. Applying evidence: Based on the evidence gathered, interventions involving yoga exercises and breathing exercises were selected, implemented, and evaluated in the case study.

Research Setting and Participants

This study was conducted at a Nursing Home elderly residence. The participant was a 61-year-old female diagnosed with coronary heart disease (CHD), who reported symptoms such as shortness of breath and weakness during physical activity. Informed consent was obtained from the patient and her family prior to data collection.

Procedure and Intervention

A comprehensive nursing assessment was carried out, including anamnesis, physical examination, nursing diagnosis formulation, intervention planning, and implementation. The patient had been practicing yoga and breathing exercises for 16 weeks prior to the single-day data collection. During the study, the patient participated in:

Interventions included:

- Breathing exercises (15 minutes, 3 sets of 8 repetitions)
- Yoga exercises (moderate intensity, typically recommended 2–3 times per week) (12).

While the patient had been practicing these interventions over 16 weeks, the study focused on evaluating immediate effects on endurance and breathlessness on the day of data collection.

Outcome Measurement

- Shortness of breath was assessed using the Borg Scale.
- Endurance was measured using the Six-Minute Walk Test (6MWT), a validated tool for functional capacity assessment in cardiac patients (6).

RESULTS

This case study examines a 61-year-old female patient (Mrs. R) diagnosed with Coronary Heart Disease (CHD) who had been practicing yoga and breathing exercises for 16 weeks. Primary data were collected through direct patient interviews and physical examinations. The main nursing concerns identified were shortness of breath and fatigue during activities. The severity of shortness of breath was measured using the Borg Scale, where the patient initially reported a score of 3. Endurance was assessed using the Six-Minute Walk Test (6MWT) to evaluate functional capacity and cardiovascular endurance.

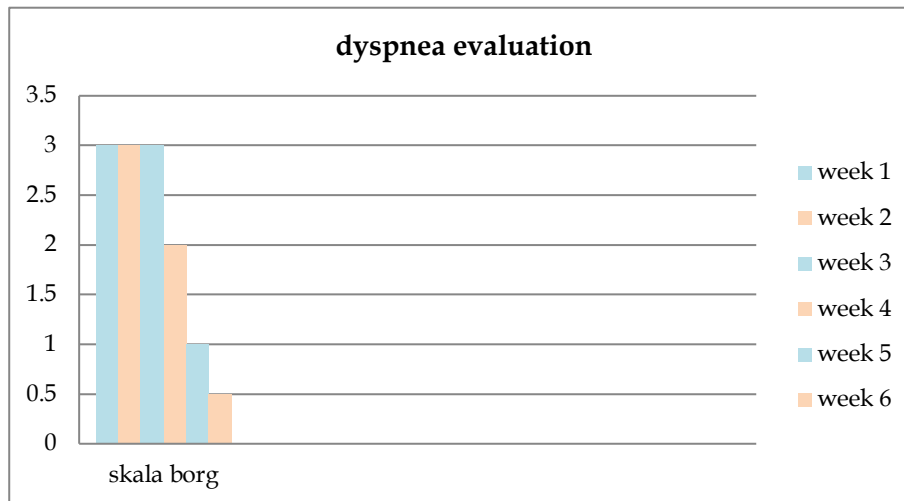
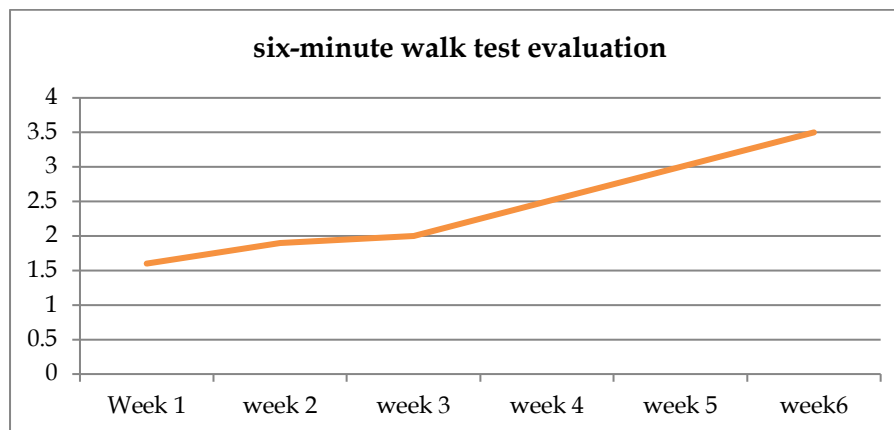
Based on these clinical findings, the short-term goal was to reduce shortness of breath and improve endurance, while the long-term goal aimed for the patient to resume daily activities with minimal or no symptoms. The nursing intervention included a combination of breathing exercises and yoga exercises, both selected based on evidence-based nursing (EBN) practices.

- Breathing exercises were performed for 15 minutes, with 8 repetitions per session in 3 sets. This technique aims to enhance breath control, lung capacity, and overall respiratory function.
- Yoga exercises, incorporating postures, controlled breathing, and meditation, were prescribed based on EBN recommendations of 2-3 sessions per week for 30 minutes per session to enhance cardiovascular endurance, flexibility, and mental well-being.

While evidence suggests that regular yoga practice over several weeks improves endurance in coronary heart patients, this study was conducted over a single-day session, limiting the ability to measure long-term effects. However, preliminary observations indicate a decrease in shortness of breath after the intervention. In follow-up evaluations (conducted weekly over six weeks), the Borg Scale score improved from 3 to 0.5, indicating reduced breathlessness during daily activities as in the **Figure 1**.

Additionally, endurance assessments using the 6MWT showed an increase in METs level from 1.5 to 3.5 by the sixth evaluation as in the **Figure 2**, suggesting an improvement in functional capacity.

While the observed improvements align with previous research on the benefits of yoga for coronary heart disease (CHD) patients, this study cannot definitively conclude the effectiveness of a single session in improving endurance. The observed changes may be influenced by factors such as placebo effects, pre-existing physical fitness, or psychological factors. Given that the patient had been practicing yoga and breathing exercises for 16 weeks prior to this observation, the immediate effects observed could reflect accumulated benefits over time. Future studies should incorporate a longer intervention period, objective baseline assessments, and control comparisons to better validate the findings and assess the true impact of yoga on endurance and symptom management in CHD patients.

Figure 1: Evaluation of breath**Figure 2:** Six minutes walking test evaluation

DISCUSSION

The case study explores the potential benefits of yoga exercises in improving endurance for a coronary heart disease (CHD) patient. Yoga, an ancient practice originating from India, incorporates a variety of physical, mental, and spiritual components, such as physical postures, breathing exercises, meditation, and relaxation (13). These components aim to achieve balance and harmony between the body and mind, which can contribute positively to both physical and psychological health. Physical postures enhance flexibility, strength, and balance, while breathing exercises help regulate energy and calm the mind. Together, these techniques can significantly improve overall well-being, which is especially beneficial for cardiac patients (14).

Evidence suggests that yoga exercise, when practiced 2-3 times a week with moderate intensity, can improve endurance and

cardiovascular health in heart patients. Previous studies recommend a duration of 20-40 minutes per session to achieve benefits (15). For coronary heart patients, yoga can help improve flexibility, reduce stress, and strengthen the cardiovascular system, but the intensity and frequency must be tailored to the individual's health condition and under the supervision of a healthcare provider (16).

The cardiovascular adaptations resulting from consistent exercise include increased cardiac output, stroke volume, and blood volume entering the ventricles, as well as improved VO2Max (maximum oxygen uptake) values. VO2Max refers to the maximum amount of oxygen the body can use during exercise, and it is a key indicator of cardiovascular fitness. These effects are generally seen after at least 4-8 weeks of consistent training (17). Although the VO2Max value was not directly measured in this study, the METS (metabolic equivalents) value, which represents the energy

cost of physical activity, was used as a proxy to assess endurance. The patient's METS level improved from 1.5 to 3.5 during the study, indicating a positive response to the yoga intervention.

However, it is crucial to note that increasing endurance in coronary heart patients requires more than just exercise. A healthy lifestyle, including a balanced diet, avoiding sedentary behaviour, and managing stress, plays an essential role in heart disease prevention and management (18). Nutrition and physical activity must be combined to address blockages in the heart's blood vessels and reduce overall cardiovascular risk (19). Breathing exercises, in particular, are effective in reducing shortness of breath, which is a common symptom of low physical fitness (20). In this study, the patient showed a decrease in shortness of breath and fatigue after undergoing breathing exercises, reflecting the effectiveness of these interventions in improving respiratory function and overall endurance. Increased endurance was observed as a result of the enhanced oxygen delivery to the lungs and other organs (21).

CONCLUSION

This case study demonstrates that yoga exercise and breathing exercises can be effective interventions for improving endurance and reducing shortness of breath in a 61-year-old patient diagnosed with coronary heart disease (CHD). After 16 weeks of therapy, the patient's METS score improved from 1.6 to 3.35, and the degree of shortness of breath decreased from 3 to 0.5 on the Borg scale. These findings suggest that incorporating yoga and breathing exercises into the management plan for coronary heart disease patients may enhance cardiorespiratory fitness and alleviate symptoms associated with physical exertion, such as shortness of breath and fatigue. However, the results of this case study should be interpreted with caution due to the limitations of a single-patient study design and the lack of a control group. Further research with larger sample sizes, more rigorous experimental designs, and longer follow-up periods are needed to validate these findings and assess the long-term benefits of yoga and breathing exercises for coronary heart disease patients.

LIMITATIONS

This study has several limitations that should be acknowledged. Although the patient had been practicing yoga and breathing exercises for 16

weeks, the intervention was assessed during a single visit, limiting the ability to fully evaluate the long-term effects on endurance and symptom improvement in coronary heart disease (CHD) patients. Endurance typically requires sustained and consistent practice to show measurable benefits, and thus, the findings should be interpreted with caution. Furthermore, the reliance on a single case study restricts the generalizability of the results, as individual responses to the intervention may vary. While this study provides exploratory insights into the immediate effects of these interventions, further research with a larger sample size, longer intervention periods, and objective baseline assessments is necessary to draw more definitive conclusions about the efficacy of yoga and breathing exercises in improving endurance and reducing shortness of breath in CHD patients.

RECOMMENDATIONS

Future studies should focus on conducting randomized controlled trials (RCTs) to establish stronger evidence regarding the effectiveness of yoga and breathing exercises in improving endurance and overall cardiac health. Additionally, the measurement of VO2Max and other cardiovascular biomarkers in future studies would help to provide more objective evidence of the impact of these interventions on cardiovascular fitness. Incorporating a more diverse patient population with varying stages of coronary heart disease would also provide a broader understanding of how yoga can benefit different individuals with heart conditions. Finally, investigating the role of lifestyle modifications alongside exercise interventions would further clarify how to optimize the benefits of yoga and breathing exercises in improving cardiovascular health.

CONFLICT OF INTEREST

The author(s) has no conflict of interest to declare with regard to this work.

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AUTHOR CONTRIBUTIONS

HR: data collection and manuscript drafting.

IA: data collection and literature review.

P: data collection and problem statement identification.

TSSJ: study conceptualization and finalizing manuscript.

MKCH: data analysis.

NNKNMH: methodology development.

SZS: literature support for discussion.

MSN: overall project supervision.

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