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Review Article

The effectiveness of hydrotherapy on quality of life and exercise capacity in patients with cardiac diseases: a scoping review

Alaa A Khushhal, Mohamed S Alayat, Ashraf AM Abdelaal

Department of Medical Rehabilitation Sciences, College of Applied Medical Sciences, Umm Al-Qura University, Makkah, Saudi Arabia

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Abstract: Although hydrotherapy is an alternative treatment for people with heart conditions, it is still unknown how hydrotherapy would affect these patients' quality of life and ability to exercise. The aim of this review is to investigate the impact of hydrotherapy on heart disease patients. A search of the databases PubMed, the Physiotherapy Evidence Database (PEDro), EBSCO, Scopus, and Google Scholar was conducted to identify randomized controlled trials (RCTs) examining how hydrotherapy affects people with heart conditions. The PEDro scale was used to evaluate the methodological quality of the research for bias risk. This scoping review comprised eleven studies with a total of 245 cardiac patients. Hydrotherapy reduced heart rate, mean arterial pressure, systemic vascular resistance, and cardiac index in patients with chronic heart failure and increased exercise tolerance, peak power output, and total body strength in male patients with coronary artery disease. It also improved work rate, cardiac output, stroke volume, exercise and walking capacity, and peak oxygen uptake. The risk of bias assessment revealed that one study was excellent quality, eight studies were good quality, and two were poor quality. Hydrotherapy is an effective physical therapy modality for the rehabilitation of patients with cardiac diseases. However, further, larger studies with less heterogeneity are required due to the low-quality studies and low-quality evidence to confirm the findings and elucidate the underlying mechanisms of hydrotherapy in cardiac patients.

Keywords: Cardiac diseases, hydrotherapy, aquatic therapy, chronic heart failure

Introduction

An estimated 17.9 million people die each year from cardiac disorders, such as heart failure and heart attack, accounting for 32% of all fatalities worldwide [1, 2]. Cardiac patients, including those with chronic heart failure (CHF), suffer from reduced quality of life, physical function, activity of daily living, cardiac output, dyspnea, and fatigue [3]. Patients with heart conditions are typically treated to improve their quality of life, ability to exercise, and cardiac output while also relieving their symptoms and dyspnea [4]. Alternatively, hydrotherapy can be used as an alternative to enhance physical activity in patients with functional disabilities. One of the main treatment modalities in natural medicine is hydrotherapy, also known as water therapy, aquatic therapy, pool therapy, and balneotherapy. The body's systems may be affected differently by the consumption of water in different forms and temperatures. Possible physiological responses to superficial cold exposure include a decrease in local metabolic function, local edema, nerve conduction velocity (NCV), muscular spasms, and an increase in local anesthetic effects [5]. Hydrotherapy can be used in patients with cardiac diseases and heart failure, but its efficacy and safety remain controversial [6].

Because hydrostatic pressure might result in an increased venous return, hydrotherapy may be unsafe for patients with heart failure. However, it has been demonstrated that hydrotherapy improves cardiac function by lowering heart rate and enhancing early diastolic filling, which increases the stroke volume and ejection fraction. Thus, water therapy is an alternative treatment for patients with heart failure [7-9], but

more studies are required to determine its beneficial effects.

The evidence currently available about the impact of hydrotherapy on patients with chronic heart failure is inconclusive because prior systematic reviews on the effects of hydrotherapy on quality of life and exercise capacity found outcomes varying from poor to moderate [10, 11]. Another systematic review showed hydrotherapy is effective in reducing exercise capacity, total body strength, peak power output, and fat mass in male patients with coronary artery diseases (CAD), but the sample size was small. Furthermore, no study included quality of life as an outcome metric, and only two studies used small sample sizes to detect differences in exercise capacity. larger RCTs comparing hydrotherapy and exercise in different genders and were required to provide high-quality evidence because the studies included in this previous systematic review had different outcomes and were very low to low quality based on Grading of Recommendations Assessment, Development, and Evaluation (GRADE) [12]. A recent systematic review showed that hydrotherapy improves exercise capacity and hemodynamic parameters in heart failure patients only in the short and acute stages [13], but these effects need to be investigated in other cardiac patients and for long-term effects. Also, a recent systematic review did investigate the quality of life as an outcome. Moreover, the effects of hydrotherapy on other outcomes such as blood pressure, heart rate, cardiac output, relieving symptoms of cardiac diseases, biventricular function, stroke volume, peak oxygen, and work rate have not been investigated, and there is no systematic review investigating these effects in other cardiac diseases such as coronary artery diseases and valve heart diseases in females. Therefore, this scoping review aimed to investigate the effect of hydrotherapy on exercise capacity and quality of life in patients with heart diseases.

Materials and methods

Study design

A scoping review was conducted between 2015 and 2026 to investigate the effectiveness of hydrotherapy on patients with cardiac diseases based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [14]. The main outcomes were quality of life and exercise capacity, while the secondary outcome was cardiac output.

The search included the following terms: hydrotherapy [MeSH], hydrotherapy, water exercise therapy, aquatic exercise therapy, [MeSH], cardiac diseases, heart diseases, Search filters were used: search keywords (abstract and title), article type (Clinical Trial, Randomized Controlled Trial), species (Humans), language (English), and year (2015-2026).

Eligibility criteria

RCTs published in English that examined the impact of hydrotherapy on patients with heart conditions in comparison to matched controls met the inclusion criteria, as well as those studies in which participants complained of heart problems due to trauma such as blunt force trauma (traffic accidents) or penetrating (right and left ventricle) and atrial or multi-chamber heart failure, or those complaining of non-traumatic heart problems such as arrhythmia, ventricular tachycardia, ventricular fibrillation, pulse, myocardial infarction, heart failure, or valve diseases. Studies that did not include the effect of hydrotherapy only on cardiac problems or cardiovascular patients, or those written in languages other than English, were not included.

Search strategy

Two independent reviewers searched PubMed, the Physiotherapy Evidence Database (PEDro), EBSCO, Scopus, and Google Scholar for relevant literature. After screening the abstracts and titles, the complete text was read if needed to assess its applicability. Additionally, a manual search was conducted for pertinent material in the reference lists.

Data extraction

One independent reviewer extracted the following data: study details, study design, participant characteristics, outcome measures, and main findings, while the second reviewer checked all eligible studies. If the two reviewers' findings differed, a third reviewer was consulted during the meeting.

Quality assessment

One study was excellent quality, eight were of good quality, and two were of poor quality (**Table 1**), according to two reviewers' indepen-

Table 1. PEDro scale

Pedro scale	Michalesenet al., 2003	Cider et al., 2003	Sveälv et al., 2009	Schmid et al., 2007	Haglund et al., 2017	Cider et al., 2012	Cider et al., 2006	Tokmakidis et al., 2008	Volaklis et al., 2007	Mourot et al., 2009	Teffaha et al., 2011
1. eligibility criteria were specified	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. subjects were randomly allocated to groups	Yes	Yes	Not clear	Not clear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. allocation was concealed	Yes	Yes	Not clear	Not clear	Yes	Yes	Not clear	No	No	Yes	Not clear
4. the groups were similar at baseline regarding the most important prognostic indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. there was blinding of all subjects	No	No	Yes	No	No	No	Yes	No	No	No	No
6. there was blinding of all therapists who administered the therapy	No	No	Yes	No	No	No	Yes	No	No	No	No
7. there was blinding of all assessors who measured at least one key outcome	No	No	Yes	No	No	No	Yes	No	No	No	No
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by “intention to treat”	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10. the results of between-group statistical comparisons are reported for at least one key outcome	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11. the study provides both point measures and measures of variability for at least one key outcome	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

PEDro scale: Physiotherapy evidence database scale.

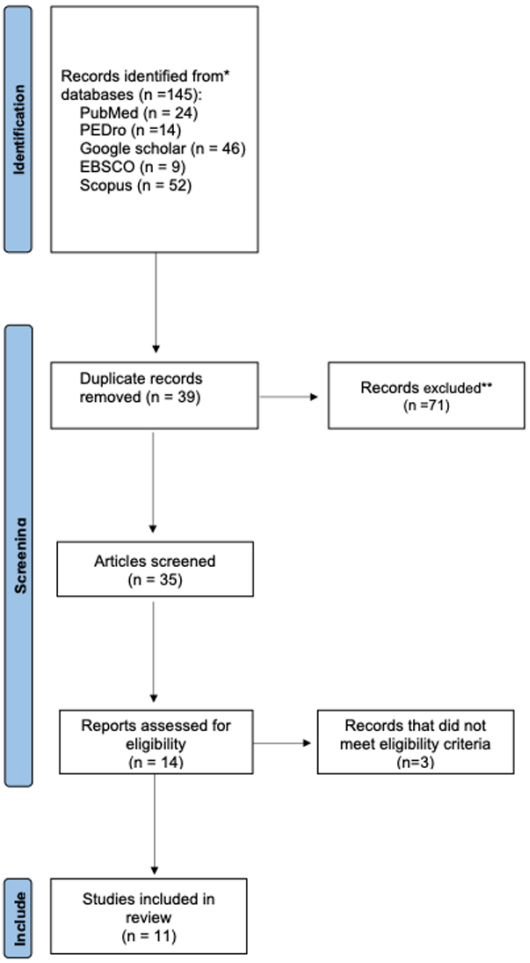

Figure 1. Flow diagram of the search strategy.

dent evaluations of the included studies using the PEDro scale [15]. If the two reviewers' findings differed, a third reviewer was consulted during the meeting.

Results

After 145 studies were found and duplicates were eliminated, 35 studies were examined, and 11 pertinent studies with 245 patients were found. **Figure 1** illustrates the study selection procedure, and **Table 2** provides an overview of the included research.

The benefits of hydrotherapy included improving overall physical capability and muscular staying power, elements crucial in dealing with and enhancing the quality of life of patients with CHF [16]. In another RCT with 18 chronic heart failure patients, only twelve finished eight weeks of hydrotherapy twice weekly, but the results advocated an acute, high-quality cardiovascular response to hydrotherapy. This may mean that a longer period of interventions or the interaction of other variables is necessary for sustained long-term effects [9].

Since hydrotherapy has been demonstrated to enhance heart function, muscular function, exercise capacity, and health-related quality of life, it is a safe and alternative treatment for CHF patients. It also improves cardiac output, left ventricle ejection fraction, and heart rate [7-9, 17, 18]. This body of evidence was supported by Schmid et al. demonstrated a relative increase in cardiac index in patients with CHF and CAD [19]. These findings highlight the ability of hydrotherapy to improve cardiac hemodynamics, enhancing cardiovascular function in patients with CHF and CAD. Furthermore, Hägglund et al., [20] examined the consequences of hydrotherapy and yoga on exercising potential, first-rate life, and signs and symptoms of anxiety and melancholy in heart failure patients (n = 60), confirming that both hydrotherapy and yoga had similar outcomes on workout potential, first-class lifestyles, and signs and symptoms of hysteria and depression. Hydrotherapy also revealed improvements in peak power output, total body strength, and exercise capacity in CHF and male CAD patients [21-25]. It is challenging to perform a forest plot and a meta-analysis due to the clinical heterogeneity in outcomes and interventions in the included studies.

Discussion

This is the first scoping review to investigate the impact of hydrotherapy on patients with heart conditions, such as coronary artery disease and chronic heart failure. The results demonstrate that the therapeutic effects for hydrotherapy were improving exercise capacity, quality of life, blood pressure, heart failure-related symptoms, cardiac output, heart rate, stroke volume, ejection fraction, and peak oxygen in cardiac patients, particularly those with chronic heart failure [16-21], and for improving peak power output, total body strength, and exercise tolerance in male patients with coronary artery disease and CHF [21-25]. Nevertheless, research on the impact of quality of life on CAD patients remained lacking.

Table 2. Summary of the included studies

Study	Participants	Outcomes measures	Main findings
Michalsen et al., 2003 [16]	15 patients (5 men; 10 women) with mild CHF	Quality of life; heart failure-related symptoms; blood pressure	Improvement in 3 of 6 dimensions of quality of life ($P \leq 0.05$) and a significant reduction in heart failure-related symptoms but blood pressure decreased non-significantly at rest and during exercise
Cider et al., 2003 [17]	25 patients with CHF (age 72.1±6.1): one group underwent 8 weeks of hydrotherapy (n = 15) and one group was a control group (n = 10)	Maximum exercise capacity; isometric endurance in knee extension; performance of heel-lift, shoulder abduction, and shoulder flexion	The hydrotherapy group increased their maximal exercise capacity ($P = 0.001$) and isometric endurance in knee extension ($P = 0.01$), with improved heel lift ($P \leq 0.01$), shoulder abduction ($P = 0.01$) and shoulder flexion ($P = 0.01$) compared to the control group
Grüner Sveälv et al., 2009 [9]	18 stable chronic heart failure patients (aged 69±8 years: 12 completed and 8-week control period followed by 8 weeks of hydrotherapy twice weekly	Cardiac output; heart rate; mean arterial pressure; systemic vascular resistance	During the acute stage, cardiac output increased from 3.1±0.8 to 4.2±0.9 L/min; heart rate ($P < 0.0001$), mean arterial pressure ($P < 0.01$), and systemic vascular resistance ($P < 0.0001$) decreased but there was no change in cardiac output or heart rate after 8 weeks of hydrotherapy
Cider et al., 2006 [8]	13 CHF patients (two women) and 13 healthy subjects underwent echocardiography on land and underwater	Heart rate; stroke volume; blood pressure; cardiac output	Heart rate reduced (CHF, $P = 0.01$; control, $P = 0.001$) and stroke volume increased (CHF, $P = 0.01$; control, $P = 0.001$) during water immersion, with no change in systolic or diastolic blood pressure
Schmid et al., 2007 [19]	10 patients with compensated CHF, 10 patients with CAD, and 10 healthy controls	Cardiac index including cardiac output	The cardiac index increased by 16% in patients with CHF, 21% in patients with CAD, and 19% in healthy subjects
Hägglund et al., 2017 [20]	40 patients (30% women aged 64.9±8.9 years) with heart failure randomised to an intervention of 12 weeks, either performing yoga or hydrotherapy for 45-60 minutes twice a week	Health-related quality of life; 6-minute walk test; sit-to-stand test	Hydrotherapy and yoga had the same effect on exercise capacity, quality of life, and symptoms of anxiety and depression Exercise capacity significantly increased (yoga $P = 0.008$; hydrotherapy $P = 0.02$) and symptoms of anxiety decreased (yoga $P = 0.01$; hydrotherapy $P = 0.03$)
Åsa et al., 2012 [21]	20 patients (4 women) with stable CHF and type 2 diabetes mellitus	Work rate; VO_2 peak; walking capacity	Aquatic exercise is safe and effective for improving physical and metabolic function in patients with CHF Work rate, walking capacity, and peak oxygen uptake significantly improved in the hydro group ($P = 0.01$)
Tokmakidis et al., 2008 [22]	21 men with CAD: hydrotherapy (n = 11) or usual care (n = 10)	Exercise tolerance; VO_2 peak; stress test time; total body strength	The exercise group improved their exercise tolerance, VO_2 peak, stress test time, and total body strength ($P < 0.05$)
Volaklis et al., 2007 [23]	34 men with CAD: hydrotherapy (n = 12), exercise (n = 12), or usual care (n = 10) for 4 months	Exercise tolerance; total body strength; blood lipids; stress test; body composition	Improved exercise tolerance, stress test time, blood lipids, and total body strength in both hydrotherapy and exercise groups compared to the control group
Mourot et al., 2009 [24]	24 men with CAD: hydrotherapy (n = 12) or exercise (n = 12) 24 men with CHF; hydrotherapy (n = 12) or exercise (n = 12)	Peak power output	Improved peak power in both groups
Teffaha et al., 2011 [25]	24 men with CAD: hydrotherapy (n = 12) or exercise (n = 12) 24 men with CHF; hydrotherapy (n = 12) or exercise (n = 12) for 3 weeks of rehabilitation	Peak power output; heart rate; peak VO_2	Improved in peak power output, heart rate and peak VO_2

RCT: randomised control trial; CHF: chronic heart failure; WWI: warm water Immersion; CAD: coronary artery disease; VO_2 peak: oxygen uptake peak.

Because hydrostatic pressure increased venous return, hydrotherapy was initially thought to be dangerous for patients with heart failure. However, it has since been demonstrated to enhance cardiac function due to an increase in stroke volume and ejection fraction [7]. Hydrotherapy is a safe substitute for traditional exercise and an efficient technique for cardiovascular rehabilitation [21]. Because the buoyancy in the water supports their weight and makes movement simpler, overweight people are more likely to stick with a water-based exercise regimen. The water's hydrostatic pressure forces blood to the extremities, increasing cardiac output and stroke volume. As a result, the heart becomes considerably more effective at pumping more blood with each stroke. Blood flow to the muscles can rise by up to 250% during hydrotherapy, and increased blood flow to the brain improves alertness by supplying the brain with more oxygen and nutrients. When exercising in shallow water, heart rates are typically seven beats per minute (bpm) lower than when exercising at the same intensity on land; in deep water, where more of the body is submerged and under hydrostatic pressure, heart rates are typically 17-20 bpm lower than when exercising at the same intensity on land [26]. Hydrotherapy has been shown to be a safe, effective, and side-effect-free way to improve physical and metabolic performance in individuals with heart failure or heart diseases [7, 20]. The cardiac index, which includes cardiac output, improved by 16% in CHF patients, 21% in CAD patients, and 19% in healthy people, according to a study examining the impact of hydrotherapy on CAD and CHF patients [18]. Consequently, most patients who undertake a hydrotherapy program gain multiple benefits, including lowering their heart rate and improving the quality of their lives, as well as beneficial effects on some joints, such as the knee, because the water pressure makes blood vessels more supple. From the above studies, it was revealed that hydrotherapy is a safe alternative treatment for patients with heart diseases.

Patients with heart diseases need treatment when symptoms develop, tests show abnormalities, risk of complications is high, the disease progress, or for prevention in high-risk individuals [26]. Spa therapy is being used in the current clinical application as alternative treatment for exercises or prevention in the rehabilitation phase [26].

The therapeutic effects of hydrotherapy are supported by this scoping study, especially in males with CAD and heart failure [16-27]. According to a study, blood pressure dropped both at rest and during activity, heart failure-related symptoms decreased, and three of the six quality of life parameters improved [14]. The hydrotherapy group's maximum exercise capacity was higher than that of the control group [17].

Our review revealed that hydrotherapy improved cardiac output, exercise capacity, quality of life [20], VO_2 peak, total body strength [21, 24, 25], and left ventricle (LV) tissue velocity time in the acute stage and small sample sizes [9, 19], and only two studies with small sample sizes revealed that hydrotherapy improved total body strength and exercise tolerance in 4 month of exercise duration in patients with CHF and CAD. These findings are aligned with a new previous systematic review that demonstrated that hydrotherapy only improves hemodynamic indicators and exercise capacity in the short and acute stages of heart failure [13] and a recent systematic review showed that hydrotherapy improved functional capacity in patients with post-CABA (coronary artery bypass grafting) [28]. Therefore, studies need to investigate the effects of hydrotherapy in the long term. Moreover, according to the Pedro scale and the Downs and Black criteria, the general quality of the evidence was poor to moderate [10, 15]. A previous systematic review found differences in some outcomes between studies with very low to low quality of the included studies based on GRADE and small sample sizes [12]. Therefore, high-quality studies with large sample sizes and long-term effects need to confirm these findings.

According to a case study report, two patients' heart rates were unchanged, one patient's heart rate slightly increased, and the others' heart rates decreased in water [8]. Four research studies reported better endothelial dysfunction as demonstrated by a 1.7% increase in flow-mediated dilation (FMD) in 130 patients, while sixteen trials involving 506 patients revealed an overall improvement of 4.4% in left ventricular ejection fraction (LVEF) [11]. In CHF patients, the effects of yoga and hydrotherapy

on quality of life, exercise ability, clinical outcomes, and anxiety and depression symptoms were comparable [20]. As a result, hydrotherapy is a safe substitute for traditional exercise and an efficient cardiovascular rehabilitation technique [7]. Patients with both CHF and 2DM can safely and effectively improve their physical and metabolic performance by engaging in aquatic exercise [21]. Warm water immersion (WWI) reduces systemic vascular resistance and acutely increases cardiac output in CHF patients [18].

In some situations, hydrotherapy is not advised, and warnings, side effects, and limitations are provided. Hydrotherapy, for instance, is not advised for those with acute injuries that still have visible redness or a high body temperature. Extensive circulation is not recommended for those with kidney issues, cancer, or bleeding since the increased blood flow could strain the heart. Some individuals who use essential herbs and oils in their bath water may be more susceptible to an allergic reaction called “contact dermatitis” because of hydrotherapy. When someone spends too much time in a hot tub or pool, one of the most frequent side effects of hydrotherapy is overheating [27].

The available data, however, did not assess the impact of hydrotherapy on the quality of life in CAD patients. Therefore, there is not enough data to make a firm judgment about how hydrotherapy affects individuals with heart conditions such as myocardial infarction, valve problems, and heart transplants. Larger RCTs on patients with various heart conditions and genders are advised to produce high-quality data about the advantages of hydrotherapy and clarify the underlying mechanisms.

Limitations

This review has some limitations. Most studies were conducted on heart failure patients, and there was heterogeneity among studies regarding the types of patients and study outcomes, so a meta-analysis was not possible. Future research should investigate how hydrotherapy affects both genders, exercise ability, quality of life, and other cardiac outcomes in different cardiac patient populations, such as those undergoing heart transplants. Moreover, larger RCTs need to investigate the long-term effects of hydrotherapy.

Conclusion

Hydrotherapy is an effective, safe, and alternative therapy to exercise in heart failure and CAD patients. Hydrotherapy can therefore be utilized to improve the quality of life and exercise ability of individuals with heart failure and CAD.

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Address correspondence to: Alaa A Khushhal, Department of Physical Therapy, Department of Medical Rehabilitation Sciences, College of Applied Medical Sciences, Umm Al-Qura University, Makkah 715, Saudi Arabia. Tel: +966-12-550-1000; ORCID: 0000-0003-4690-1042; E-mail: aakhushhal@uqu.edu.sa

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