

# Exploring the Impact of Exercise on Pain Alleviation in Patients with Chronic Venous Disorders: A Comprehensive Systematic Review



**Fatima Hamza<sup>1</sup>, Sabika Minhaj<sup>1</sup>, Iqra Salahuddin<sup>1</sup>**

*College of Physical Therapy, Faculty of Allied Health Sciences, Ziauddin University<sup>1</sup>*

## Abstract

**Background:** Pain due to venous insufficiency can be crippling. Management of Chronic Venous Insufficiency (CVI) with various exercise modalities has gained immense acknowledgement in recent decade. However, the conflicting reports and lack of quality evidence hinder informed decision making. The aim of this review is to overview and summarize the current literature to establish the role of exercise in managing pain symptoms in patients with CVI.

**Methods:** For comprehensive review search was made on the online databases like PubMed, Google Scholar, Cochrane library and Web of Science. The outcome measure of interest was pain. Total 10 studies were included which were systematically analysed to determine the effectiveness of exercise in reducing pain in patients with CVI.

**Results:** The study was conducted on patients who had CVI without formation of ulcers with less than 3 CEAP (clinical, etiological, anatomical and pathophysiological) score. The significance of the exercise therapy was estimated by reduction in pain symptoms at the end of the protocol.

**Conclusion:** It was concluded after comprehensive review that therapeutic exercise has proven to be significantly effective in reducing pain in patients with CVI irrespective of type of exercise.

**Keywords:** *Chronic venous insufficiency, Exercise, Pain, Varicose veins*



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## Introduction

Healthy veins are integral for overall fitness and quality of life<sup>1</sup>. Nevertheless, venous disorders pose a threat to millions around the globe due to unavoidable work conditions<sup>2</sup>. Western countries are more affected in this regard, while the Middle Eastern and African countries show less prevalence, though they are still strained by these conditions<sup>3-4</sup>. The annual prevalence of chronic venous disorders has shown to be 2.6 % in females and 1.9% in males. Additionally, it is more prevalent in females, with 3 to 1 female predominance<sup>5</sup>. Venous insufficiency is caused by compromised venous function due to multiple disorders. These conditions cause the veins to become dilated and twisted, preventing them from efficiently carrying the blood back to the heart predominantly from the lower limb<sup>6</sup>. In addition to being aesthetically unpleasant, these conditions cause pain, irritation, low quality of life and many other problems<sup>7-8</sup>.

Additionally, if left untreated, they may form ulcers in most advanced cases<sup>9</sup>. Many risk factors can lead to venous disorders, such as obesity, extended standing or sitting hours, hormonal changes, ageing and genetics<sup>10</sup>. Management of these advanced cases of chronic venous diseases has been surgical or pharmacological; however, in the past few decades, conservative physical therapy management has gotten more attention<sup>11-12</sup>. Physiotherapy is a potential method for addressing the signs and underlying causes of venous problems because it is non-invasive and conservative<sup>13</sup>. Improvement in pain, edema and overall quality of life can be attributed to various physical therapy techniques such as exercise regimens, manual therapy, massage, lifestyle changes, compression therapy, yoga, and dance therapies, few to mention<sup>14</sup>. This review attempts to evaluate the effectiveness of multiple physical therapy procedures in alleviating pain symptoms caused by venous disorders, specifically pain. A review of the current evidence is of utmost importance to shed light on the advances in physical therapy techniques and assess their efficacy in treating venous diseases to provide comprehensive evidence. This study is aimed at evaluating the role of exercise therapy in improving pain symptoms in chronic venous insufficiency patients. This information will help healthcare professionals, patients, and researchers make informed decisions by adding to the growing body of knowledge.

## Materials and Methods

A comprehensive literature search was carried out through a methodological approach using electronic databases such as PubMed, Google Scholar, Cochrane library and Web of Science. Studies from the past 05 years were included proceeding from 2019. MeSH subject heading used were “chronic venous insufficiency AND exercise” “varicose veins AND exercise” “chronic venous diseases AND exercise”. Filters were applied for search including duration and preferred language of the study.

### *Inclusion/Exclusion Criteria*

The studies using exercise as the management of the chronic venous disorders like varicose veins and chronic venous insufficiency were included in the study irrespective of the study design.

Improvement in the pain symptoms of venous disorders after physical therapy intervention was the primary outcome of interest. Studies using surgical or pharmacological management as the main intervention or studies conducted before 2019 were excluded from the study. Furthermore, studies consisting of the advanced stage venous disorders with venous ulcers were also excluded. Moreover, studies in languages other than English and for which complete text was not available were excluded.

### ***Ethical Approval***

Human or animal subjects are not a part of the study.

### ***Risk of Bias***

Risk of bias was analyzed using the Cochrane collaboration tools which comprise random sequence generation, allocation concealment, blinding of participants, blinding of personnel, blinding of outcome assessor, incomplete outcome data and selective reporting.

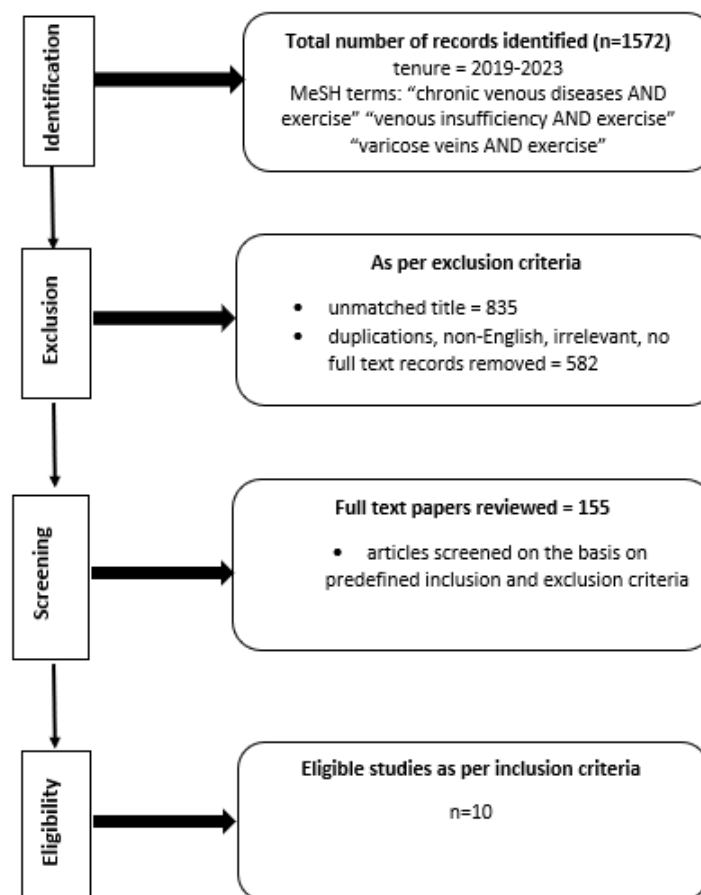
## **Results**

Digital databases such as PubMed, Google Scholar, Cochrane Library, and Web of Science were searched for this review. The literature search retrieved 1572 articles using the keywords “chronic venous diseases”, “chronic venous insufficiency”, “varicose veins”, and “exercise”. More than 1500 were recognized between 2019 and 2023. Out of these, 10 studies were included in the systematic review according to inclusion criteria including 265 patients, to evaluate the effects of various exercise interventions. All the studies measured pain as one of the outcome measures, while the rest were excluded on account of duplicity, unavailability of full text, incomplete data, different language and irrelevancy. Finally, ten studies were selected, Selection criteria are mentioned in Figure-1.

### ***Synthesized Findings***

Ten randomized controlled trials were included in the study. The synthesized results on the pain as measured after the intervention, along with the description of the studies and characteristics, are summarized in Table 1. It was observed that physiotherapy regimens of various types aid in reducing the symptoms of pain, oedema and discomfort while helping to improve the overall quality of life. Charsouei et al., 2021<sup>22</sup> reported significantly reduced pain intensity after eight weeks of hydrotherapy intervention ( $P=0.001$ ). In a similar study, Mallah et al., 2021<sup>23</sup> indicated a significant reduction in pain on the VAS scale after six weeks of lower limb exercises ( $p>0.05$ ). Chauhan et al., 2023<sup>15</sup> used yoga therapy and found a significant difference in results on the VAS scale. Yiğit et al., 2021<sup>18</sup> also observed improvement in pain as measured by a Visual analogue scale with ( $p > 0.05$ ) after six weeks of stretching and strengthening exercises. Moses et al., 2021<sup>19</sup> observed that aerobic and onshore exercises potentially reduce bodily pain  $p < 0.001$  along with other outcomes. Gürdal et al., 2021<sup>20</sup> reported the effects of aerobic, strengthening

and stretching exercises on pain and found it significantly reduced  $p=0.002$  after six weeks. In another study, Dogru et al., 2020<sup>24</sup> used dance therapy for five weeks; however, body pain was found to be significantly increased in the dance group as compared to control in patients with venous disorder ( $p < 0.05$ ). Sharifi et al., 2021<sup>21</sup> also reported improvement in the VCSS (Venous Clinical Severity Score) after eight weeks of aquatic exercises. Aydin et al. 2022<sup>16</sup> reported that pain was prominently improved in the group who performed calf muscle exercise, oedema, and venous filling time was also improved. Kamatchi et al., 2022<sup>17</sup> compared the effect of aerobic and Buerger's exercises. They stated that both types of exercises are effective  $p \leq 0.001$ , but Buerger's is more effective than regular aerobic exercises.



**Figure-1. Represents conceptualization of the review process**

Table 1. Characteristics of the studies inducted

Sr. No	Author	Year	Study Design	Population	Sample Size	Intervention	Outcome Measure	Duration	Results
1	<b>Chauhan et al., 2021<sup>15</sup></b>	2023	randomized controlled trial	uncomplicated varicose vein C3 and C4 CEAP	46	Yoga and Naturopathy Vs Passive exercise and stretching	Pain, BMI, HR, CRP, BP	3 months	Yoga with naturopathy resulted in improvement of pain and other inflammatory markers.
2	<b>Aydin et al., 2022<sup>16</sup></b>	2022	Randomized control trial	patients with chronic venous insufficiency	32	Inspiratory muscle training + compression Vs Calf muscle exercise + compression Vs compression	QOL, pain, edema, ROM, strength and functionally mobility	NA	exercise training in patients with chronic venous sufficiency significantly improve symptoms
3	<b>Kamatchi et al., 2022<sup>17</sup></b>	2022	Randomized control trial	35-55-year-old female/male	1	Aerobic Vs Burger's exercise	Pain and endurance	12 Weeks	Both types of exercise reduce pain but Buerger's is more effective
4	<b>Yiğit et al., 2021<sup>18</sup></b>	2021	Randomized controlled trial	patients with Chronic Venous Insufficiency > 18 years of age	42	stretching and strengthening exercises Vs No exercise	Pain, Fatigue, Leg cramps, sleep quality	6 weeks	Pain intensity along with leg cramps was reduced in the intervention group
5	<b>Moses., 2021<sup>19</sup></b>	2021	Experimental study	35 females, 35-55 years age	35	Aerobic Vs onshore exercise	Pain, QOL	8 weeks	Onshore exercises are more effective in improving pain symptom
6	<b>Gürdal et al., 2021<sup>20</sup></b>	2021	double blinded, randomized controlled trial	18-75 age, diagnosed with primary superficial and/or deep	24	aerobic, strengthening and stretching	Pain, Endurance, Hand grip force,	6 weeks	Exercise therapy in addition to compression therapy is

				venous insufficiency		exercises Vs Compression	Circumference measurements		more effective in alleviating symptoms of CVI.
7	<b>Sharifi et al., 2021<sup>21</sup></b>	2021	Randomized control trial	Age < 85 years CEAP stage 2	201	Aquatic exercise Vs No exercise	Pain, endurance, level of physical activity	8 months	Aquatic exercise can be incorporated to improve QoL and Pain.
8	<b>Charsouei et al., 2021<sup>22</sup></b>	2021	randomized controlled clinical trial	postmenopausal women with multiple sclerosis	24	Hydrotherapy Vs control (no exercise)	Pain intensity	8 weeks	Pain intensity was reduced in the intervention group
9	<b>Mallah et al., 2021<sup>23</sup></b>	2021	randomized controlled clinical	Pregnant females	24	lower extremity exercises vs Control (no exercise)	Pain intensity, Quality of life and muscle pain	6 weeks	The pain intensity was found to be significantly reduced after the administration of exercise
10	<b>Dogru et al., 2020<sup>24</sup></b>	2020	Randomized control trial	patients that age between 18 and 60 years	40	Dance therapy Vs Control	Functional mobility, LL circumference, Pain, Strength and ROM	5 weeks	Dance therapy can potentially improve quality of life.

Table-2 Cochrane Risk of Bias Tool

S.No	Studies	Random sequence generation	Allocation concealment	Participants blinding	Outcome assessment blinding	Incomplete outcome data	Selective reporting
1	Chauhan et al., 2023 <sup>15</sup>	✓	✓	✓	✓	✓	✓
2	Aydin et al., 2022 <sup>16</sup>	✓	✓	✓	✓	✓	✓
3	Kamatchi et., 2022 <sup>17</sup>	✓	✓	X	?	✓	✓
4	Yiğit et al., 2021 <sup>18</sup>	✓	X	X	?	✓	✓
5	Moses., 2021 <sup>19</sup>	X	X	✓	?	✓	✓
6	Gürdal et al., 2021 <sup>20</sup>	✓	✓	✓	✓	✓	✓
7	Sharifi et al., 2021 <sup>21</sup>	✓	✓	X	✓	✓	✓
8	Charsouei et al., 2021 <sup>22</sup>	✓	✓	✓	✓	✓	✓
9	Mallah et al., 2021 <sup>23</sup>	✓	✓	✓	✓	✓	✓
10	Dogru et al., 2020 <sup>24</sup>	✓	X	X	?	✓	✓

✓ – indicates low risk of bias, x – indicates high risk of bias, ? – indicates that cannot ensure risk of bias

On the basis of authors' judgment for each study included in the review, risk of bias was calculated using Cochrane Risk of Bias Tool as shown in table and fig. number 2.

- Random Sequence generation**

Nine Studies<sup>15-18,20-24</sup> demonstrated low risk of bias by incorporating random sequence generation. However, one study (19) did not mention randomization.

- Allocation Concealment**

Seven studies<sup>15-17, 20-23</sup> have shown low risk of bias by practicing allocation concealment however 03<sup>18, 19 and 24</sup> studies didn't conceal the allocation demonstrating high risk.

- **Participants blinding**

Out of 10 studies 6 were low risk<sup>15,16,19, 20,22,23</sup> since there was participants blinding, four<sup>17,18, 21,24</sup> were high risk.

- **Blinding of outcome assessment**

Six studies<sup>15, 16, 20-23</sup> were low risk since the outcome assessor was blinded. However, 04<sup>17-19,24</sup> did not ensure bias due to blinding.

- **Incomplete outcome data and selective reporting**

All the included studies showed low risk of bias<sup>15 – 24</sup>.

## Discussion

This review studied ten articles that used exercise to manage venous disorders, including varicose veins and chronic venous insufficiency. The significance of various exercise techniques was assessed using the primary outcome measure of pain. The studies included in this paper provided significant evidence that exercise management can pronouncedly reduce the pain caused by venous insufficiency and other symptoms of discomfort such as oedema and irritation and improve the overall quality of life. As reported by Charsouei et al., 2021<sup>22</sup> and Sharifi et al., 2021<sup>21</sup>, aquatic exercises have proven to improve the symptoms of pain caused by compromised veins. In the same manner, Mallah et al., 2021<sup>23</sup>, Yiğit et al., 2021<sup>18</sup> Gürdal et al., 2021<sup>20</sup> documented positive effects of strengthening and stretching along with a range of motion exercises on the unpleasant symptoms of compromised veins, specifically pain. Similar findings have been reported by Chauhan et al. 2023<sup>15</sup> after using Yoga therapy. Dogru et al., 2020<sup>24</sup> used dance therapy and published that although body pain was increased in the dance therapy group, the overall symptoms were improved, and there was no hindrance in using this light type of exercise in patients with chronic venous disease. In an interesting study, Wnuk et al., 2023<sup>29</sup>, used a robot for the calf pump exercise and stated equally beneficial effects in improving the pain of venous disorders. Their study highlights that passive movements can also potentially improve symptoms in patients with CVI. All these findings are consistent with Orhurhu et al., 2021<sup>26</sup> who stated in their review that conservative management is the mainstay of the initial treatment for venous disorders.

Further, in a study by Bissacco et al., 2022<sup>27</sup>, therapies like aquatic exercises are effective in alleviating symptoms of chronic venous diseases and regressing complications. On the contrary, Silva et al., 2021 have declared that evidence to support exercise as the conservative management of venous insufficiency is insufficient, and more studies are needed to confirm this treatment method as the first treatment choice<sup>25</sup>. The same authors have also indicated the need for further evaluation in this regard to adopt a more peculiar approach towards CVI.



Similarly. Smith et al., 2018 while reviewing the efficacy of exercise in patients with ulcers due to chronic venous insufficiency, highlighted the need for further research to determine the correlation between venous insufficiency and conservative management due to low-quality evidence<sup>28</sup>. Therefore, further evaluation on the topic should be carried out for better clinical outcomes.

### Conflict of Interest

None.

### Grant Support and Funding Disclosure

None.

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**AUTHORS' CONTRIBUTION**

The following authors have made substantial contributions to the manuscript as under:

**Conception or Design: Hamza F**

**Acquisition, Analysis or Interpretation of Data: Hamza F**

**Manuscript Writing & Approval: Hamza F, Minhaj S, Salahuddin I**

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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