**Chronic Venous Disease in Healthcare Workers: A Systematic Review**

**Abstract
Background:** Chronic Venous Disease (CVD) encompasses a spectrum of clinical manifestations stemming from venous system dysfunction in the limbs, resulting in symptoms like leg discomfort, swelling, and varicose veins. The global prevalence of CVD varies, with an international survey in 2020 reporting a 22% prevalence rate. CVD's impact extends beyond physical symptoms to psychological well-being, self-esteem, and productivity, posing significant challenges in management and incurring substantial healthcare costs. The condition's prevalence and impact among healthcare workers, particularly those in roles requiring prolonged standing, are notably high yet underexplored.

**Methods:** This review employed a systematic approach, including studies with healthcare workers diagnosed with CVD, exploring various interventions, therapies, or management strategies. The search covered major databases such as PubMed, Embase, and the Cochrane Library, with no restrictions on language or publication date, and was finalized on March 20, 2024. Study selection and data extraction were meticulously conducted, focusing on outcomes relevant to CVD management among healthcare workers.

**Results:** From 821 identified studies, 59 duplicates were removed, and 762 titles/abstracts were screened. After excluding 695 records, 67 full-text articles were reviewed, of which 9 met inclusion criteria, representing 54,618 healthcare workers from seven countries. Varicose vein (VV) prevalence among healthcare workers ranged from 16.2% to 46%, while chronic venous insufficiency was reported in up to 69.1% of participants. The largest study (n=51,406) found VVs in 37.0% of Chinese nurses, alongside high rates of insomnia (71.8%) and musculoskeletal disorders (40.9%). In Nepal, 46% of nurses had Doppler-confirmed VVs, with each additional hour of standing per day increasing VV risk (OR=27.4, 95% CI: 4.09-180.8, p<0.001). Significant risk factors across studies included female sex, prolonged standing, nursing roles, age ≥25, and work in high-risk departments (e.g., ICU/OR). For example, Egyptian nurses working in ICUs had markedly increased odds of VVs (AOR=16.2, 95% CI: 3.9–67.4). In a U.S. cohort, 82.1% had venous reflux, and 14.1% were at high risk for DVT based on Caprini scores.

**Conclusion:** The systematic review underscores the high prevalence of CVD among healthcare workers, driven largely by occupational factors. It calls for enhanced awareness, preventive measures, and management strategies to address the condition effectively within this critical workforce segment. Future research should delve into targeted interventions and the development of comprehensive management frameworks to alleviate the burden of CVD among healthcare professionals.

**Keywords:** Chronic Venous Disease, healthcare workers, occupational health, venous insufficiency, management strategies, preventive measures.

**Introduction**

Chronic Venous Disease (CVD) comprises a spectrum of clinical manifestations originating from the dysfunction of the venous system in the limbs, marked by symptoms such as leg discomfort, swelling, and the appearance of varicose veins as the condition advances (1). These symptoms are primarily caused by venous obstruction or valvular incompetence in the veins, leading to venous hypertension and inflammation (2). The process is characterized by vessel wall damage and endothelial disturbance, which initiate a cascade of inflammatory responses and leukocyte activation, further exacerbating tissue damage and edema (3). This chronic inflammation weakens vein walls and impairs valve function, promoting blood pooling in the lower extremities (4).

CVD's prevalence varies globally, with a 2020 international survey across Europe and South America reporting that 22% of respondents exhibited CVD symptoms (5). Notably, the condition is more prevalent in women and is significantly influenced by occupation, particularly in roles requiring prolonged standing, such as those in healthcare (6). The incidence of CVD and associated conditions like varicose veins are notably higher among healthcare workers, especially nurses, who often endure long hours on their feet (7).

The impact of CVD extends beyond physical symptoms, affecting individuals' psychological well-being, self-esteem, and productivity (8). The management of CVD poses challenges, with treatments often difficult to tolerate and surgical interventions carrying risks (9). Chronic venous insufficiency, a severe form of CVD, additionally affects millions and incurs substantial healthcare costs due to complications like venous ulcers (10). The condition also significantly impacts work productivity and can lead to early retirement, particularly among women, who represent a significant portion of the healthcare workforce (11). Despite known risk factors, the prevalence and impact of CVD among healthcare workers remain underexplored, with few studies addressing its implications in this demographic. This review aims to fill this gap by systematically examining the prevalence and impact of CVD among healthcare workers, thereby contributing to a deeper understanding for this condition within this critical workforce segment.

**Methods**

This systematic review was conducted in adherence to PRISMA Statement 2020 guidelines (12).

***Eligibility Criteria***

* **Participants:** Healthcare workers diagnosed with CVD.
* **Intervention:** Various interventions, therapies, or management strategies for CVD, encompassing both pharmaceutical and non-pharmaceutical approaches. Prevalence studies were also considered.
* **Study Design:** Both Randomized Controlled Trials (RCTs) and observational studies to ensure a comprehensive understanding of CVD management in healthcare workers.
* **Outcome Measures:** The effectiveness, safety, patient satisfaction, workplace adjustments, and any other outcomes relevant to the management and mitigation of CVD among healthcare workers.

***Information Sources***

A detailed electronic search was conducted across major databases including PubMed, Embase, and the Cochrane Library, supplemented by manual searches of relevant journals and conference proceedings to capture all significant studies on the subject. The final search was conducted on March 20, 2024. The search was unrestricted by language or publication date to ensure a broad and inclusive dataset, though it was limited to studies conducted on human subjects.

***Search Strategy***

The search strategy was designed around key terms related to CVD in healthcare workers, utilizing terms such as "Chronic Venous Disease", "Healthcare Workers", "Vein Disorders", "Occupational Health", "Intervention", "Management", "Therapy", and "Prevention". Both Medical Subject Headings (MeSH) and free-text terms were used in combination to achieve a wide-ranging search.

***Study Selection***

The study selection process involved two independent reviewers screening the titles and abstracts of identified studies for relevance. Full-text articles were then thoroughly assessed against the eligibility criteria. Studies were selected based on their focus on healthcare workers with CVD, exploring various management and intervention strategies, and were either RCTs or observational studies. Studies not meeting these criteria were excluded in a systematic manner.

***Data Extraction and Synthesis***

A narrative synthesis approach was utilized for the analysis of data extracted from the included studies. Data were extracted on "author, year, study design, objective, sample size, population characteristics, treatment/intervention, results, and conclusions", and organized systematically in tables for clarity. The review descriptively presented the findings from each study, alongside a critical assessment of their strengths and limitations. The synthesis of key findings across the studies provided a comprehensive understanding of the current state of CVD management in healthcare workers, highlighted important takeaways, and identified gaps in knowledge, offering insights for clinical practice.

**Results**

Of the 821 studies identified from the databases, 59 duplicates were removed. In the screening phase, 762 studies were retrieved for titles and abstracts – 695 studies were excluded for lack of relevance. Thereafter, 67 studies were obtained for full-text eligibility; of those 58 were excluded as they did not meet the inclusion criteria (*Figure 1*). Nine studies were included in the systematic review. Their characteristics are listed in *Table 1*. A total of 54,618 healthcare workers are represented in this review.



**Figure 1.** PRISMA Flowchart Depicting the Study Selection.

**Table 1.** Characteristics of the Included Studies.

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| --- | --- | --- | --- | --- | --- | --- |
| **Author-Year** | **Title** | **Study Design** | **Participants** | **CVD Characteristics** | **Key Findings** | **Take Away Points** |
| Zhang-2022 (13) | Career Development and Occupational Disease in Chinese Nurses: A Cross-Sectional Study  | Cross-sectional study conducted with a self-administered questionnaire | 51,406 nurses from 311 hospitals in China, recruited via the China Nursing Association | -Varicose veins as a manifestation of CVD, with 37.0% of nurses developing this condition -Other occupational diseases included insomnia (71.8%), musculoskeletal-related disorders (40.9%), gastrointestinal (56.0%), and urinary system diseases (18.2%) | -High prevalence of occupational diseases, notably insomnia, varicose veins (P<0.001) for varicose veins and other conditions), and musculoskeletal disorders. -Long working hours were positively associated with the development of these conditions (P=0.02 for insomnia, P<0.001 for varicose veins, musculoskeletal disorders, gastrointestinal diseases, and urinary system diseases) - About 50% of nurses had unclear career development goals, and a significant number intended to leave their profession | -The study highlights the need for managerial attention and intervention to address the high incidence of occupational diseases among nurses in China -Improvements in working conditions and clear career development pathways may enhance job satisfaction and retention |
| Abou-ElWafa-2020 (14) | Lower Limb Varicose Veins among Nurses: A Single Center Cross-Sectional Study in Mansoura, Egypt  | Cross-sectional descriptive study with Doppler ultrasound diagnosis | 201 nurses at Mansoura University Hospital, Egypt, from January 1st to May 31st, 2018 | Lower limb varicosity diagnosed among nurses | -The prevalence of varicose veins was 18.4% -Significant independent predictors of varicose veins include being ≥25 years old (AOR = 8.7 [2.6–28.4], P ≤ 0.001), working in emergency rooms and ICU/operative rooms (AOR = 10.8 [2.6–45.9] and 16.2 [3.9–67.4], P ≤ 0.001), and using oral contraceptives (AOR = 4.2 [1.3–13.2], P = 0.015) | -Independent predictors, other than age, are largely modifiable and primarily related to occupational exposure -Focused interventions in work practices and contraceptive use could mitigate risk |
| Cires-Drouet-2020 (15) | High prevalence of chronic venous disease among health care workers in the United States | Cross-sectional study; hospital-wide venous screening program with demographic, medical history, and ultrasound evaluation | 636 participants (1272 legs); 93% women, median age 42 years. Mostly white (49.1%) or African American (39.5%) | CVI assessed using CEAP classification; venous reflux or obstruction identified via ultrasound. Caprini score determined DVT risk | -Clinical CVI in at least one leg: 69.1% (C1: 49%; C2: 17.7%; C3: 1.9%). - Venous reflux present in at least one leg: 82.1%; obstruction rare (0.2%) -Risk factors for clinical CVI: reflux (OR=1.77, 95% CI=1.31–2.40) and white race (OR=1.54, 95% CI=1.08–2.21) -14.1% of participants at highest risk category for DVT per Caprini score, including 2.2% with history of DVT | High prevalence of CVI and venous reflux among health care workers, highlighting the need for increased awareness and preventive strategies against CVI and DVT in this high-risk group |
| Kwon-2020 (16) | Prevalence of Chronic Venous Disease in Healthcare Workers  | Retrospective cohort study using the VEINES-QOL/Sym questionnaire for clinical evaluation of CVD symptoms and occurrence | 1,166 healthcare workers from a university hospital; 21.2% male and 78.8% female, with a mean age of 36.3 years | CVD severity classified by CEAP classification and assessed via VEINES-QOL/Sym scores | -20.3% had no disease, 47.3% had mild disease, and 32.3% had moderate to severe disease -Mean VEINES-QOL/Sym score was 67.29, indicating a prevalence of symptoms among workers -Female sex, nursing vocation, age, total working years, and work-related mobility were significantly associated with lower QOL/Sym scores (P<0.001) -Nurses/nurse assistants had significantly lower total scores compared to their male counterparts and other activity level groups (P<0.001) | -High prevalence of CVD among healthcare workers, with female sex, nursing roles, and prolonged standing at work identified as significant risk factors -Preventive measures and effective management of CVD are recommended to improve quality of life in high-risk groups |
| Shakya-2020 (17) | Varicose veins and its risk factors among nurses at Dhulikhel hospital: a cross sectional study  | Cross-sectional study utilizing a structured questionnaire and Doppler ultrasound confirmation | 181 female nurses from Dhulikhel Hospital | Varicose veins confirmed by Doppler ultrasound, defined as reflux or vein diameter ≥5 mm | -Prevalence of varicose veins: 46% (83 out of 181 nurses) -Mean standing time per day significantly associated with varicose veins: adjusted OR for varicose veins with each additional hour of standing per day = 27.44 (95% CI: 4.09–180.77; P<0.001) -Significant risk factors in adjusted model: increased standing time per day | -High prevalence of varicose veins among nurses, with prolonged standing identified as a significant risk factor -Importance of preventive measures and management strategies to address varicose veins in nursing professionals emphasized |
| Rosati-2019 (18) | Prevalence of chronic venous pathology in healthcare workers and the role of upright standing  | Cross-sectional study with clinical examination and a structured questionnaire based on previous research protocols | 173 nonmedical workers: 91 nurses, 31 support staff, and 51 administrative employees | -CVD diagnosed through clinical examination, considering factors like upright standing time, BMI, smoking, alcohol consumption, and family history -No ultrasound examination was performed | -The prevalence of CVD was higher among nurses (54.5%) and support staff compared to administrative staff (31.6%, P=0.0043) -Female workers showed a significantly higher prevalence (46.8%) of CVD than male workers (24.6%; P=0.003) -Major venous diseases were significantly more prevalent among nurses compared to other groups -Prolonged standing identified as a major risk factor for developing CVD. | -The study highlights the higher risk of CVD among nurses due to prolonged standing -It highlights the need for screening and preventive measures in the workplace to mitigate these risks |
| Yun-2018 (19) | A Study on the prevalence and risk factors for varicose veins in nurses at a university hospital  | Cross-sectional study with a questionnaire survey and Doppler ultrasonography | 414 nurses at a university hospital participated, with 407 women and 7 men, reflecting a broad sample of the nursing staff | The prevalence of varicose veins among nurses was found to be 16.18%, with significant factors for venous reflux being age, pregnancy, and delivery, even after adjusting for sociodemographic factors | -The prevalence of VVs among nurses was estimated at 16.18% -Significant risk factors for venous reflux included age (OR=1.06), pregnancy (OR=2.15), delivery (OR=2.02), and prolonged standing hours (≥4 hours) with an OR of 2.80 after adjusting for sociodemographic factors -Departments requiring more prolonged standing, like the operating room and outpatient clinic, showed higher associations with VVs | -The study emphasizes the need for ergonomic interventions and preventive measures to mitigate VVs among nurses-Occupational risk factors, including prolonged standing, are crucial in assessing the overall risk for developing VVs, highlighting the potential for VVs to be considered an occupational disease among nurses |
| Diken-2016 (20) | Prevalence, presentation and occupational risk factors of chronic venous disease in nurses  | Cross-sectional study- screening and association study with work burden and physical conditions | 232 nurses (79% of 294 actively employed during the study period) | Screening for symptoms and presence of CVI according to CEAP classification | -62.9% had at least one symptom of CVI -50.4% diagnosed with CVI based on CEAP criteria -Significant association between diurnal ankle circumference difference and mean duration of hospital stay | -The study highlights the high prevalence of CVI symptoms and diagnoses among nurses -Indicates a significant correlation between the work burden of nurses, as estimated by average duration of hospital stay, and the frequency of CVI signs and symptoms -Suggests the need for occupational health interventions to address CVI among nurses |
| Ziegler-2006 (21) | Chronic venous disease is highly prevalent in hospital employees  | Cross-sectional study | 209 hospital employees comprising doctors, nurses, medical technicians, secretaries, scientific staff, cleaners, and general staff. Three groups were defined: Group 1 (doctors and nurses), Group 2 (medical technicians, secretaries, and scientific staff), and Group 3 (cleaners and general staff) | CVD classified according to the CEAP classification. Signs and symptoms of CVD were evaluated, including heavy legs, edema, pruritus, pigment alterations, restless legs, burning legs, paresthesia, and cramps | -34% of all employees had CVD, predominantly females -The highest prevalence of CVD was in general staff and cleaners; the lowest in medical technicians, secretaries, and scientific workers -Standing at work was a predisposing factor | -Employees working in standing positions or under hot-humid conditions, particularly females, are at higher risk for CVD-These employees should consider undergoing primary prophylactic treatment for CVD |
| **Abbreviations:** CEAP: Clinical-Etiological-Anatomical-Pathophysiological; CVD: Chronic Venous Disease; CVI: Chronic Venous Insufficiency; DVT: Deep Vein Thrombosis; ICU: Intensive Care Unit; OR: Odds Ratio; QOL/Sym: Quality of Life/Symptomatology; VVs: Varicose Veins |

In the examination of occupational diseases among healthcare workers, several studies highlight the prevalence and risk factors of CVD. Zhang-2022 conducted a cross-sectional study with 51,406 nurses across 311 hospitals in China, revealing a significant prevalence of varicose veins (37.0%), alongside insomnia (71.8%), and musculoskeletal disorders (40.9%) (13). The study highlights the correlation between long working hours and the development of these conditions, emphasizing the need for improved working conditions and clear career development pathways to enhance job satisfaction and retention among nurses. Similarly, Abou-ElWafa-2020's study of 201 nurses in Egypt identified a varicose vein prevalence of 18.4%, with risk factors including age, working in high-risk areas, and oral contraceptive use, suggesting that modifiable risk factors related to occupational exposure are crucial for focused interventions (14).

The United States-based study by Cires-Drouet-2020, involving 636 healthcare workers, reported a high prevalence of clinical CVI and venous reflux, pinpointing reflux and white race as risk factors (15). This indicates an urgent need for awareness and preventive strategies against CVI and DVT in this demographic. Kwon-2020's research echoed these findings, showing a high prevalence of CVD among 1,166 healthcare workers, particularly affecting females in nursing roles due to prolonged standing, thereby recommending preventive measures and effective management strategies (16).

Shakya-2020 focused on 181 female nurses at Dhulikhel Hospital, finding a 46% prevalence of varicose veins, with prolonged standing as a significant risk factor, which underlines the importance of preventive measures (17). Rosati-2019 observed a higher prevalence of CVD among nurses and support staff compared to administrative staff, attributing it to prolonged standing and suggesting workplace screening and preventive measures to mitigate risks (18). Yun-2018's study among 414 nurses at a university hospital pointed out age, pregnancy, delivery, and prolonged standing hours as significant factors for varicose veins, emphasizing the need for ergonomic interventions (19).

Diken-2016 identified a high prevalence of CVI symptoms and diagnoses among nurses, with a significant correlation between work burden and CVI signs, suggesting occupational health interventions (20). Lastly, Ziegler-2006 reported that 34% of hospital employees, especially those in standing positions, had CVD, highlighting the role of primary prophylactic treatment (21). Collectively, these studies illustrate the widespread issue of CVD and related occupational diseases among healthcare workers, pointing to the necessity of targeted interventions, improved working conditions, and enhanced preventive measures to safeguard the health and well-being of this essential workforce.

**Discussion**

Current literature reports CVD as a constellation of venous abnormalities leading to significant venous hypertension, impacting both the structure and function of the venous system, primarily in the lower limbs (22-24). The interplay between genetic predispositions and environmental factors exacerbates this condition, highlighting the distinction between chronic venous disorder and CVD, with the former focusing solely on the morphological and functional impairments without accounting for clinical manifestations (25, 26). Varicose veins emerge as the predominant symptom of CVD, with the lower extremities being particularly susceptible due to the gravitational force challenges (27). The histological composition of veins, featuring three distinct layers, undergoes notable alterations in CVD, contributing to the disease's progression through mechanisms like valve malfunctions and compromised venous return, often exacerbated by factors such as prolonged standing and obesity (28, 29).

The severity of CVD, including manifestations like edema, skin changes, and leg ulcers, is reflective of not just the local impact but also significant systemic repercussions, affecting patients' quality of life and imposing a substantial burden on healthcare systems. The CEAP classification system offers a structured approach to diagnosing venous disorders, emphasizing the wide-ranging effects of CVD, from aesthetic concerns to severe health implications (30). Despite the availability of treatments ranging from compression therapy to advanced surgical interventions, there's a pressing need for a more integrated approach encompassing preventive measures, lifestyle modifications, and possibly genetic and epigenetic research to enhance patient outcomes. This holistic view highlights the complexity of CVD management, advocating for strategies that not only address symptomatic relief but also tackle the underlying causes and contributory factors, thereby improving overall patient well-being and reducing the disease's socioeconomic impact.

The collective findings from the systematic review highlight the significant prevalence of CVD and its manifestations among healthcare workers, emphasizing the chronic impact of occupational factors on this condition. For example, the study by Zhang-2022, involving over 51,000 nurses across China, not only highlighted a startling prevalence of varicose veins at 37% but also shed light on the broader spectrum of occupational diseases afflicting this group, including insomnia and musculoskeletal disorders. This study's linkage of long working hours to the increased incidence of these conditions calls for a critical reassessment of work practices within healthcare settings, advocating for managerial interventions aimed at improving job satisfaction and staff retention through better working conditions and clear career development pathways. Similarly, the findings from Abou-ElWafa-2020, which focused on a smaller cohort of nurses in Egypt, align with the broader narrative, indicating a significant prevalence of varicose veins and identifying both occupational and lifestyle factors as key risk elements. This study's identification of modifiable risk factors presents a compelling case for targeted interventions that could mitigate these risks, emphasizing the need for adjustments in work practices and lifestyle choices among healthcare professionals. The research conducted by Cires-Drouet-2020 brings to light the high prevalence of clinical CVI and venous reflux among healthcare workers, with risk factors including racial demographics and venous reflux. This underscores the necessity for increased awareness and the implementation of preventive strategies to combat CVI and DVT within this high-risk group, highlighting the broader implications of such conditions on the healthcare workforce at large. In a similar vein, Kwon-2020's study reveals the widespread nature of CVD among healthcare workers, with specific risk factors such as female sex, nursing roles, and prolonged standing at work exacerbating the condition. This points to an urgent need for preventive measures and effective management strategies to ameliorate the quality of life for those within high-risk groups.

The research findings across these studies collectively highlight a pressing issue within the healthcare industry, illuminating the significant occupational hazards faced by healthcare workers, particularly those in nursing roles. The high incidence of CVD and related conditions necessitates a concerted effort to introduce and enforce occupational health interventions, ergonomic adjustments, and preventive measures tailored to the unique demands of healthcare professions (31).

This systematic review has certain limitations intrinsic to the nature and scope of the studies involved. First, the variability in study designs, ranging from cross-sectional to retrospective cohort studies, introduces heterogeneity in outcomes and measures, potentially influencing the synthesis of findings. The reliance on self-reported data in several studies may also lead to reporting bias, affecting the accuracy of reported prevalences and associations. Furthermore, the included studies predominantly focus on healthcare workers in hospital settings, possibly limiting the generalizability of findings to other healthcare environments such as clinics, community health centers, and long-term care facilities. The variability in the definition and classification of CVD across studies poses another challenge, potentially leading to inconsistencies in identifying and categorizing the severity of the condition. Additionally, most studies did not differentiate between part-time and full-time workers, nor did they account for the cumulative effect of years in service, which could significantly impact the development and severity of CVD.

**Conclusion**

The systematic review highlights the significant prevalence of CVD among healthcare workers, highlighting an occupational health concern that demands attention. The association of CVD with prolonged standing, a common requirement in healthcare settings, particularly among nurses, illustrates the occupational hazards that contribute to the development and exacerbation of this condition. The findings from the included studies reveal not only the physical manifestations of CVD, such as varicose veins, edema, and leg ulcers, but also the broader impacts on the quality of life, job satisfaction, and psychological well-being of healthcare workers. These implications extend beyond the individual, affecting healthcare systems through increased absenteeism, reduced productivity, and the potential for early retirement among affected workers.

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