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Global prevalence and risk factors of varicose veins among health care workers: a systematic review and meta-analysis

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Abstract

Aims To explore the global prevalence of varicose veins among healthcare workers and their associated risk factors.

Background Varicose veins are a common occupational disease among healthcare staff. To enhance the occupational health of this population, it is necessary to understand their prevalence and risk factors.

Methods We searched databases including Embase, PubMed, Web of Science, and CINAHL. We used random-effects meta-analyses to estimate the pooled prevalence of varicose veins and associated risk factors (odds ratios) and conducted a narrative synthesis.

Key findings A meta-analysis comprising 9 studies revealed that the global prevalence of varicose veins among healthcare workers is 25% (95% CI, 18–31%). Subgroup analyses indicated that the highest prevalence, at 28% (95% CI, 9–47%), was in Middle East and North Africa. Compared with other methods, detection methods that include Doppler ultrasound examination and physical examination using the CEAP classification, along with questionnaire surveys, have both reported a higher prevalence rate of 28%. Additionally, the prevalence in developing countries, at 29% (95% CI, 19–38%), exceeds that in developed countries. The identified risk factor associated with the development of varicose veins among healthcare workers include female (OR = 3.29, 95%CI, 1.77–6.13), family history (OR = 1.86, 95%CI, 1.53–2.58) and being parous (OR = 1.75, 95%CI, 1.21–2.53).

Conclusion Healthcare workers have a high prevalence of varicose veins, and hospital managers can take proactive measures against the identified risk factors to reduce the risk of disease and ensure the safety of medical care.

Clinical trial number Not applicable.

Keywords Health care workers, Prevalence, Varicose veins, Risk factors, Meta-analysis

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Introduction

Varicose veins (VVs) are enlarged, lumpy, and visible veins resulting from blood reflux in the leg's superficial veins, and they are characterized by abnormally dilated, twisted, and elongated veins that have permanently lost their valvular function [1, 2]. They are a major health problem affecting quality of life, impacting 10–30% of the world's population and imposing a significant cost burden on healthcare systems [3, 4]. As the global population ages, the prevalence of VVs and Chronic Venous Insufficiency (CVI) is expected to rise significantly, leading to unsustainable increases in healthcare resources and costs required to treat VVs in the future [5]. VVs are not merely cosmetic concerns; neglecting them can result in severe complications, including edema, thrombophlebitis, external bleeding, lipodermatosclerosis, dermatitis, skin pigmentation or discoloration, and induration [6–8]. Another study indicated that patients with varicose veins experience significant deterioration in health-related quality of life, encompassing both physical and mental health aspects [9].

There is a well-established association between the development of varicose veins and occupations that involve prolonged standing [10]. Some studies have shown an increased prevalence of varicose veins among professionals who stand for extended periods, such as hairdressers, hospital staff, and particularly nurses [11–13]. Nurses with occupational diseases like varicose veins frequently report job dissatisfaction, consistent with research evidence [14]. Multiple occupational illnesses among nurses lead to decreased physical function, reducing work efficiency. This efficiency decline affects job satisfaction and negatively influences the career planning and development of nursing professionals. Similarly, varicose veins are common among surgeons, with prolonged time in the operating room adversely affecting the lower extremity veins [15].

To date, only one recent scoping review has conducted a narrative summary of the prevalence of chronic venous disease among healthcare workers [16]. However, no meta-analysis has been conducted on the prevalence of varicose veins and risk factors among healthcare workers worldwide.

This systematic review sought to assess the global prevalence of lower extremity varicose veins among clinical staff and identify associated risk factors. It explores regional variations and the effects of different measurement tools, providing comprehensive insights into these conditions. These finding are meant to guide medical practices and policy-making, aiming to enhance the work setting and improve the professional well-being of healthcare personnel.

Methods

Search strategy and selection criteria

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. Ethics review was not required for the study. We searched PubMed, Web of Science, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Embase, from their inception to November 11, 2024. The research question was translated into a modified PEO (Population, Exposure, and Outcome) framework. Specifically, the study focused on healthcare workers as the population of interest, with varicose veins as the primary exposure. The key outcomes examined were the prevalence of varicose veins and the identification of associated risk factors. The English language restriction was applied, and reviews and comments were excluded. Free-text search terms included ("Physicians" OR "Doctors" OR "Healthcare Workers" OR "Dentists" OR "Registered Nurses") AND ("Varicose Veins" OR "Chronic Venous Disease" OR "Venous Valvular Insufficiency") AND ("Prevalence" OR "Frequency" OR "Epidemiology") Similar medical subject headings were applied to all databases, permitting medical subject heading search strings.

The following inclusion criteria were applied: (1) the participants were any type of health care worker; (2) the studies reported the prevalence of health care workers; (3) the studies were written in English; and (4) the studies were cross-sectional.

The exclusion criteria were as follows: (1) studies that provided no health care workers' data; (2) studies that reported a high-risk prevalence rather than a high prevalence of varicose veins; (3) duplicated studies; and (4) case studies, guidelines, or reviews.

Data extraction

Following the predefined search strategy, two qualified investigators independently performed literature searches. The literature was first imported to EndNote X9 for de-duplication. Titles and abstracts of the literature were then screened to exclude irrelevant studies. Subsequently, full texts were screened to determine the final included studies. The literature selection process strictly adhered to predefined inclusion and exclusion criteria.

Data on prevalence, risk factors, and study characteristics were independently extracted by two researchers using a standardized form.

The extraction sheets were cross-checked for consistency, and any discrepancies were resolved through discussion among the study authors. When reported methodological details were unclear, corresponding authors were contacted for clarification. To avoid sample duplication, when multiple publications from the same

study population were available, we gathered data on prevalence and risk factors solely from the most exhaustive investigation. Due to some articles reporting on chronic venous disease (classified as C1-C6 according to the CEAP classification), we extracted the number of individuals at C2 level and above and recalculated the prevalence of varicose veins.

Extracted data from each study were as follows: study details (author, publication year, study design, country); participant information (sample size and age); Varicose Veins diagnosis (diagnostic tools); Varicose Veins prevalence data and risk factors.

Quality appraisal

The quality of the included studies was assessed independently by two researchers utilizing the Agency for Healthcare Research and Quality (AHRQ) criteria [17]. This evaluation framework comprises 11 items, with scores categorized as follows: 8–11 for high quality, 4–7 for moderate quality, and 0–3 for low quality. In instances where the researchers disagreed on the evaluation outcomes, a third researcher was consulted to arbitrate and reach a final decision.

Data analysis

Quantitative synthesis

To determine prevalence, effect sizes were calculated as the proportion of study participants with varicose veins, utilizing the generic inverse variance method to compute the aggregated effect size [18]. The meta-analysis was conducted using Stata 11.0 software.

Risk factors for varicose veins were represented as odds ratios (ORs) with 95% confidence intervals. The ORs of these factors, extracted from the multivariate logistic regression analyses in the original studies, were collected. A meta-analysis was performed using Stata 11.0 software whenever three or more studies reported the same risk factor.

Both Cochran's Q statistic and I^2 statistics were used to assess heterogeneity between the studies [19]. An I^2 value of 0–25% indicated low heterogeneity, 26–50% indicated moderate heterogeneity, and 51–100% indicated high heterogeneity [20]. The source of heterogeneity was evaluated through subgroup analysis and publication bias was assessed using Begg's [21] and Egger test [22]. When the number of studies related to prevalence or risk factors exceeds ten, funnel plots are generated using Stata 11. Publication bias was assessed by visual inspection of the symmetry in a funnel plot. Predefined subgroup analyses were conducted to explore the heterogeneity across studies, categorized by geographical region, national development status and measurement tool, to evaluate their impact on the prevalence of varicose veins among healthcare workers. The geographical grouping followed the World Bank Group's classification system. Additionally, due to the diverse methods used to assess prevalence, a subgroup analysis based on the assessment methods was conducted.

Narrative synthesis

Conforming to the guidelines for systematic reviews, a narrative synthesis was undertaken. Through our comprehensive data extraction sheet, we identified several factors that were only reported in one or two studies [23]. These included years of employment, age, weight, education level, duration of standing or sitting, workplace, night shift frequency, and smoking status. These factors were deemed more suitable for narrative analysis rather than meta-analysis.

Results

Literature search results

After eliminating duplicates, 246 records were selected for initial screening of titles and abstracts. Among these, 206 were discarded for not meeting the eligibility criteria, leaving 40 articles for secondary full-text assessment. Additional screening excluded 31 more studies. The selection method produced an ultimate variety of 9 articles to be included in the review. The literature screening process is illustrated in Fig. 1.

Characteristics of the included studies

Table 1 summarizes the study characteristics of the included articles. All studies had a cross-sectional design. Out of 9 studies, 9 investigated the prevalence of varicose veins among healthcare workers, while 7 explored the risk factors associated with varicose veins in this population. Table 2 provides detailed information on the risk factors. These studies encompassed data from 9 different countries, with 2 from Europe, 5 from Asia, 1 from North America, and 1 from Africa (Fig. 2). The mean (range) quality index score for studies was 6.6 (5-7). Various methods and tools used to estimate the prevalence of varicose veins were utilized in individual studies, including Self-reported questionnaire, Doppler examination and Physical examination.

Prevalence estimates

Nine studies [24–32] reported the prevalence rates of varicose veins. The meta-analysis indicated significant heterogeneity across the studies. Therefore, a random effects model was employed for the analysis. The pooled prevalence from a random-effects meta-analysis of 9 studies revealed a pooled prevalence rate of 25% (95%CI, 18-31%) with high heterogeneity ($\chi^2 = 158.46$, $p < .001$, $I^2 = 95.00\%$) (Fig. 3a). Begg's test ($z = 1.25$, $p = .211$) and Egger's test ($t = 0.12$, $p = .091$) indicated that there was no obvious publication bias among these included studies. The

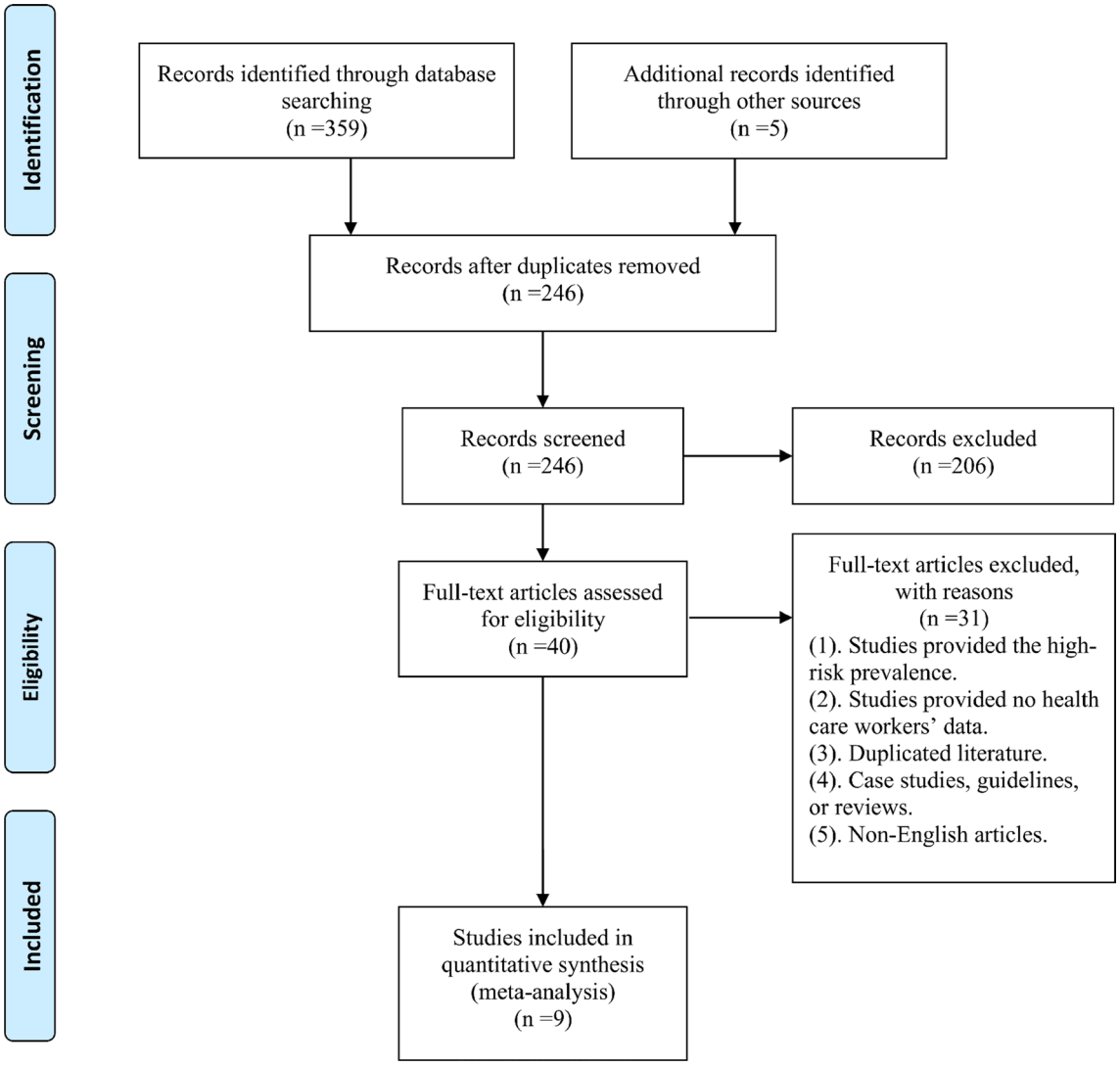

Fig. 1 Flow diagram describing the process of study selection

funnel plot for the articles reporting prevalence showed exhibited noticeable asymmetry (Fig. 4a). Sensitivity analysis indicated the results were not robust (Fig. 4b).

Subgroup analyses

In subgroup analysis by level of national development, the varicose veins prevalence was 20% (95%CI, 12-29%, I^2 =91.6%, p <.001) in developed countries and 29% (95%CI, 19-38%, I^2 = 95.6%, p <.001) in developing countries (Fig. 3b). The differences among the two subgroups are statistically significant.

In geographical regions subgroup analysis, the regions were categorized into three distinct subgroups. Among these, the Middle East and North Africa exhibited the highest prevalence rate at 28%. East Asia and Pacific region and Europe and Central Asia followed with the same prevalence rate of 21% (Fig. 3c). North America and South Asia were represented by only one study each, with prevalence rates of 20% and 46%, respectively, and thus were not included in the analysis.

In measurement instrument subgroup analysis, the varicose veins prevalence was 28% (95%CI, 11-45%, I^2 = 96.1%, p <.001) in the 3 studies using Physical examination with CEAP classification and questionnaire; Using Physical examination and Questionnaire survey along with Doppler ultrasonography were represented by only one study each, with prevalence rates of 11% and 18%, respectively; 28% (95%CI, 19-37%, I^2 =94.6%, p <.001) in the 4 studies using Questionnaire, Physical examination with CEAP classification and Doppler examination (Fig. 3d).

Risk estimate

A meta-analysis of three risk factors revealed that parous (OR = 1.75, 95%CI, 1.21–2.53), female (OR = 3.29, 95%CI, 1.77–6.13) and family history (OR = 1.86, 95%CI,

Table 1 Characteristic information of the included studies

Author (year)	Time period	Age	Country	Sample size	Female	Study design	Prevalence	Study population	Examination method	Quality scores
Ziegler et al., 2003 [27]	NA	mean age: 38 years (range 19 to 60 years)	Austria	209	76.60%	cross-sectional study	34.00%	71 doctors and nurse	Physical examination using CEAP classification and questionnaire	7
Nia et al., 2015 [34]	2010	NA	Iran	203	71.40%	cross-sectional study	36.95%	203 nurses	Self-reported questionnaire using CEAP classification and physical examination	7
Diken et al., 2016 [26]	2013	mean age: 34.68 ± 8.0 years.	Turkey	232	79.30%	cross-sectional study	11.20%	232 nurses	Physical examination using CEAP classification	7
Cires-Drouet, Rafael S et al., 2020 [53]	2016	22–73 years	the United States	636	93.00%	cross-sectional study	20.00%	636 health care workers	Questionnaire, Physical examination using CEAP classification and Doppler examination	6
Shakya et al., 2020 [29]	2017	mean age:25.6 years (range 19 to 52 years)	Nepal	181	100%	cross-sectional study	46.00%	181 nurses	Structured questionnaire, Physical examination using CEAP classification and Doppler ultrasonography	7
Abou-Elwafa et al., 2020 [31]	2018	NA	Egypt	201	84.10%	cross-sectional study	18.40%	201 nurses	Questionnaire survey and Doppler ultrasonography	7
Prakaydao et al., 2020 [32]	2013	mean age:44.36 ± 9.57 years	Thailand	222	94.10%	cross-sectional study	12.70%	222 nurses	Physical examination using CEAP classification and questionnaire	5
Avcı Işık et al., 2024 [28]	2023	mean age:31.14 ± 8.12 years	Turkey	100	84.00%	cross-sectional study	17.00%	100 nurses	Questionnaire, Physical examination using CEAP classification and Doppler examination	7
Xiang et al., 2024 [30]	2021–2022	The median age:30 years	China	1606	97.50%	cross-sectional study	29.00%	1606 nurses	Electronic questionnaires and physical examination using CEAP classification	6

Abbreviations: CEAP, Clinical-Etiology-Anatomy-Pathophysiology

1.35–2.58) were risk factors for varicose veins in healthcare workers (Fig. 5). Due to the limited number of articles included for each risk factor, publication bias tests were not conducted.

Narrative synthesis on risk factors

Sociodemographic and lifestyle

Three studies [28–30] have investigated age as a risk factor for the development of varicose veins among healthcare workers. Similarly, being married (OR = 5.0, 95%CI, 2.0-12.7) is also a significant risk factor [31].

Pregnancy and multiparity are significant risk factors for the development of VVs in women [29–31, 33]. also reports that the use of contraceptives is an independent predictor of VVs. Two studies examined overweight and obesity as a risk factor for varicose veins among healthcare workers in custody [34]. shows that obesity (OR = 3.3, 95%CI, 1.3–8.4) and overweight (OR = 2.7, 95%CI, 1.4–5.5) are significantly associated with varicose veins.

A study [25] mentioned that being white is a predictive factor for varicose veins (OR = 1.77, 95%CI, 1.31–2.40).

All historical life events studied were significant risk factors for varicose veins. DVT (Deep Vein Thrombosis) history (OR = 7.41, 95%CI, 3.34–16.45), irregular bowel movement (OR = 2.2, 95%CI, 1.1–4.2) and chronic constipation (OR = 3.1, 95%CI, 1.3–7.5) showed strong associations, as did Lack of exercise habits.

Workplace

Two studies reported on the impact of the workplace on varicose veins [33], mentioned that the prevalence of varicose veins was the highest among individuals working in the operating room (OR = 4.86, 95%CI, 1.98–11.97).

Table 2 Risk factors associated with varicose veins among global healthcare workers

Author (year)	Risk factor
Nia et al., 2015 [34]	Female: OR = 2.7(95%CI 1.4–5.1); Overweight: OR = 2.7(95%CI, 1.4–5.5); Obese: OR = 3.3(95%CI 1.3–8.4); Exercise: OR = 3.1(95%CI,1.6–6.3); Irregular bowel movement: OR = 2.2(95%CI, 1.1–4.2); Family history: OR = 2.1 (95% CI, 1.1–4.3);Sitting more than 4 h: OR = 3.2 (95%CI, 1.2-8.0); Standing more than 4 h: OR = 4.0(95%CI, 1.6–9.8)
Cires-Drouet, Rafael S et al., 2020 [53]	Venous reflux: OR = 1.77(95%CI, 1.31–2.40); White: OR = 1.54(95% CI, 1.08–2.21)
Shakya et al., 2020 [29]	Age: OR = 1.06(95%CI, 1.01–1.12) Parous: OR = 2.35(95%CI 1.05–5.28); Family history: OR = 3.37(95%CI, 1.50–7.60); Time spent in standing (hours/day): OR = 6.84 (95%CI, 3.85–12.18)
Abou-Elwafa et al., 2020 [31]	Older than 25 years: OR = 8.8(95%CI, 3.2–23.8) Married: OR = 5.0(95%CI 2.0-12.7) Obesity: OR = 4.4(95%CI 2.1–9.4) No Exercise: OR = 3.0 (95%CI, 1.2–7.1); Gravidity:3 and more OR = 7.9(95%CI, 2.8–22.7); OCP use: OR = 2.8(95%CI 1.3–6.2); Static standing: OR = 2.6(95%CI, 1.2–5.6); Daily working hours:>6 h OR = 2.6(95%CI, 1.2–5.2); Duration of work:5 years and more OR = 5.5(95%CI, 2.6–11.9); Workplace: Emergency rooms OR = 5.4(95%CI, 1.8–16.8); ICU/operative rooms: OR = 4.1(95%CI, 1.5–11.6); Chronic constipation: OR = 3.1(95%CI, 1.3–7.5)
Avcı Işık et al., 2024 [59]	Female: OR = 36.14 (95% CI, 3.835–340.54); Older than 26.5 years: OR = 7.68(95%CI, 2.33–25.32)
Xiang et al., 2024 [30]	Age:35 ≤ Age < 40 OR = 3.11(95%CI, 1.39–6.95); Age ≥ 40 OR = 3.68(95%CI, 1.61–9.41); DVT history: OR = 7.41(95%CI, 3.34–16.45); Family history: OR = 1.53(95%CI, 1.01–2.31); Parous: OR = 1.62(95%CI, 1.07–2.45); Work experience, years: 5 ≤ Work experience < 10 OR = 2.69(95%CI, 1.29–5.61); 10 ≤ Work experience < 15 OR = 3.36(95%CI, 1.57–8.18) Work experience ≥ 15 OR = 4.38(95%CI, 2.09–9.17); Standing ≥ 8 h: OR = 2.48(95%CI, 1.36–4.53); Night shift rotation, years: 5 ≤ Night shift rotation < 10 OR = 2.26(95%CI, 1.258–3.98); Night shift rotation ≥ 10 OR = 2.49(95%CI, 1.62–3.82)

Notes. (1) Physical examination with CEAP classification and questionnaire; (2) Physical examination using CEAP classification; (3) Questionnaire, Physical examination with CEAP classification and Doppler examination; (4) Questionnaire survey and Doppler ultrasonography

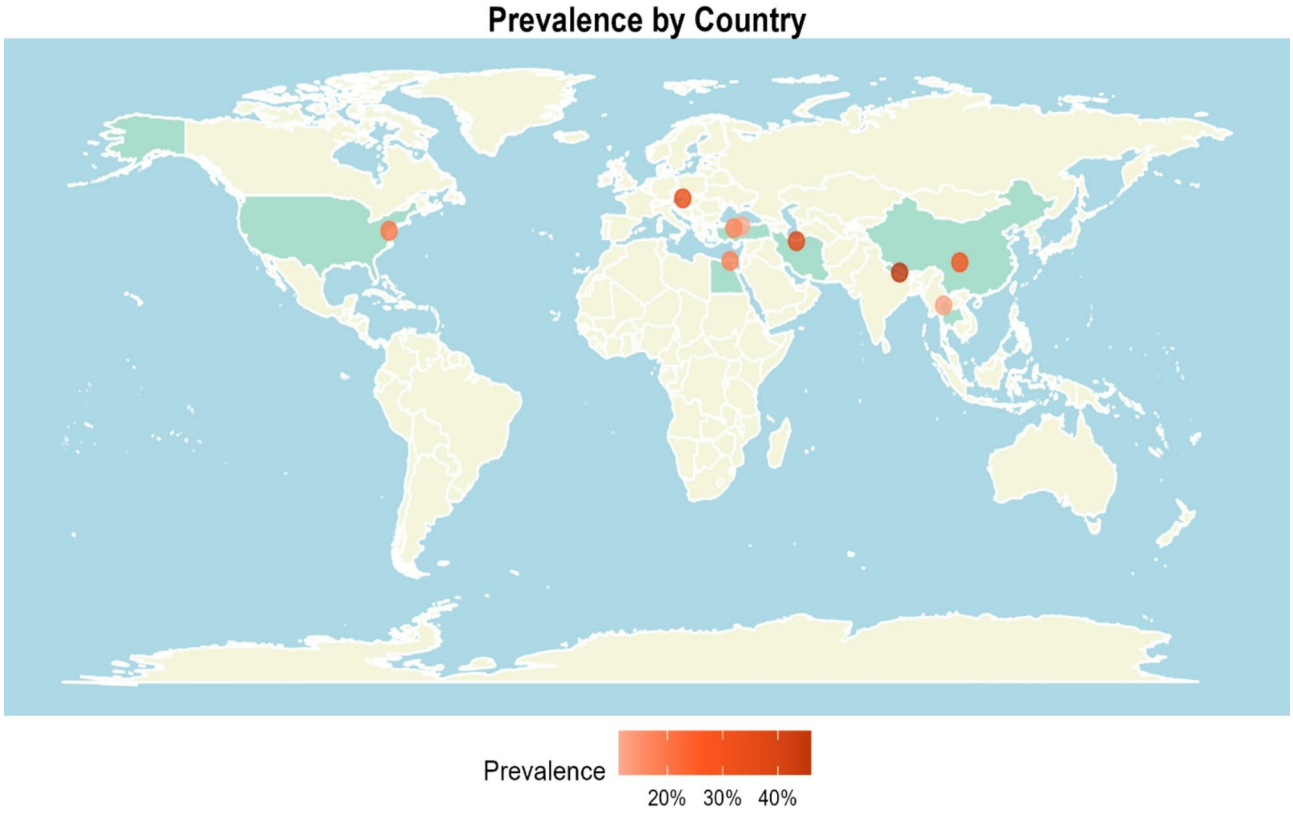

Fig. 2 The geographical distribution of the prevalences included in the studies

Another study [31] reported that similar significant effects were observed in the emergency rooms (OR = 5.4, 95%CI, 1.8–16.8) and intensive care units (OR = 4.1, 95%CI, 1.5–11.6).

Working hours and length of service

Some articles found risk factors related to the working hours as predictive of VVs [31]. reported that the probability of developing varicose veins for those working more than 6 h a day is 2.6 times that of the control group.

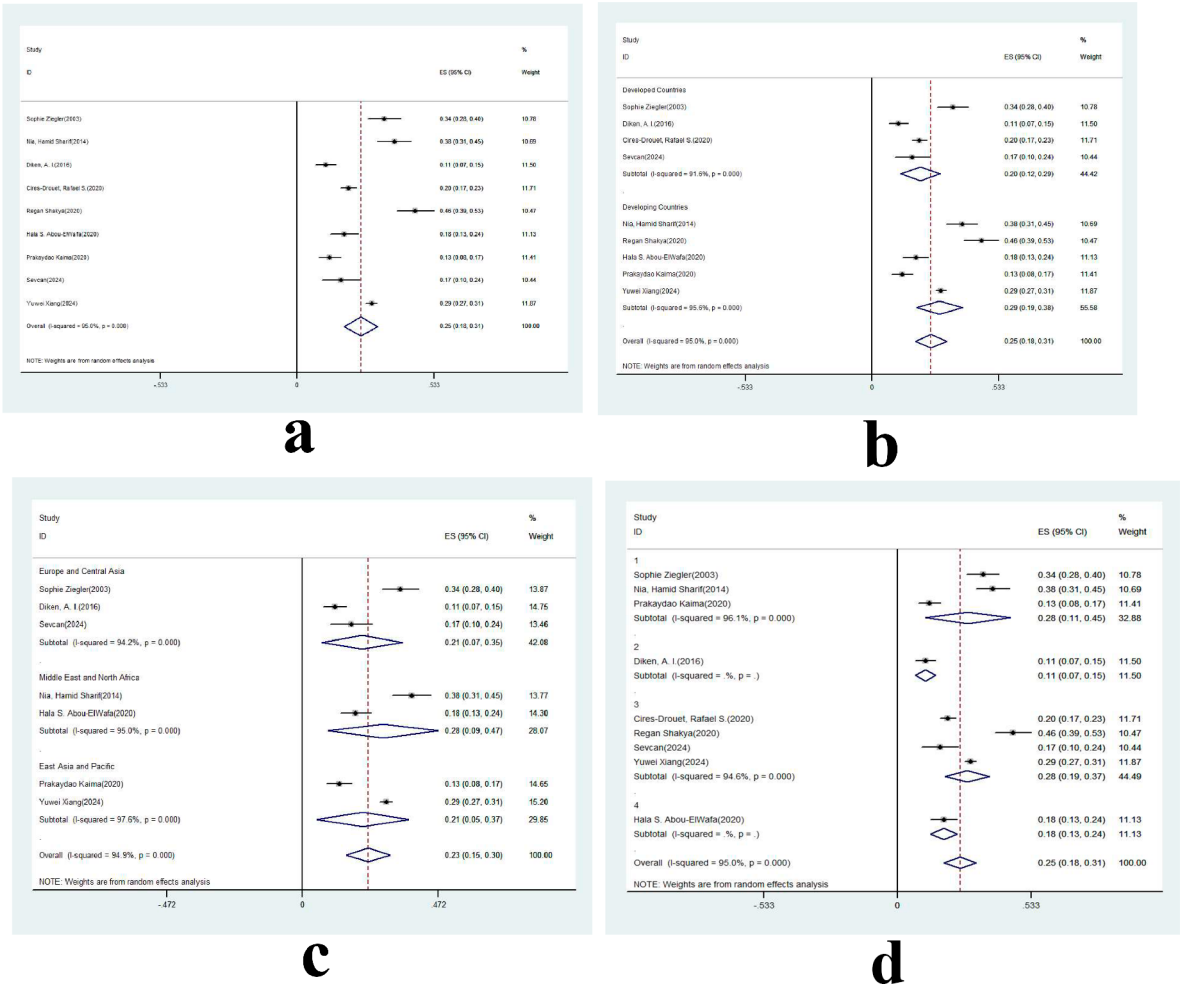

Fig. 3 (**a**) Forest plot of the prevalence of varicose veins among global healthcare workers. (**b**) Prevalence classified by level of development. (**c**) Prevalence classified by geographical region. (**d**) Prevalence classified by measurement tool

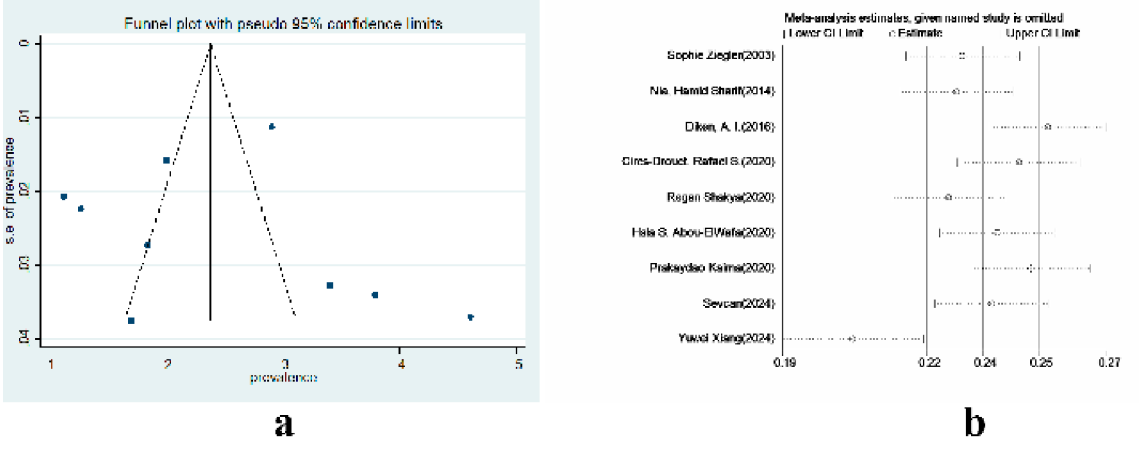

Fig. 4 (**a**) Funnel plot of varicose veins among global healthcare workers. (**b**) Sensitivity analysis of varicose veins among global healthcare workers

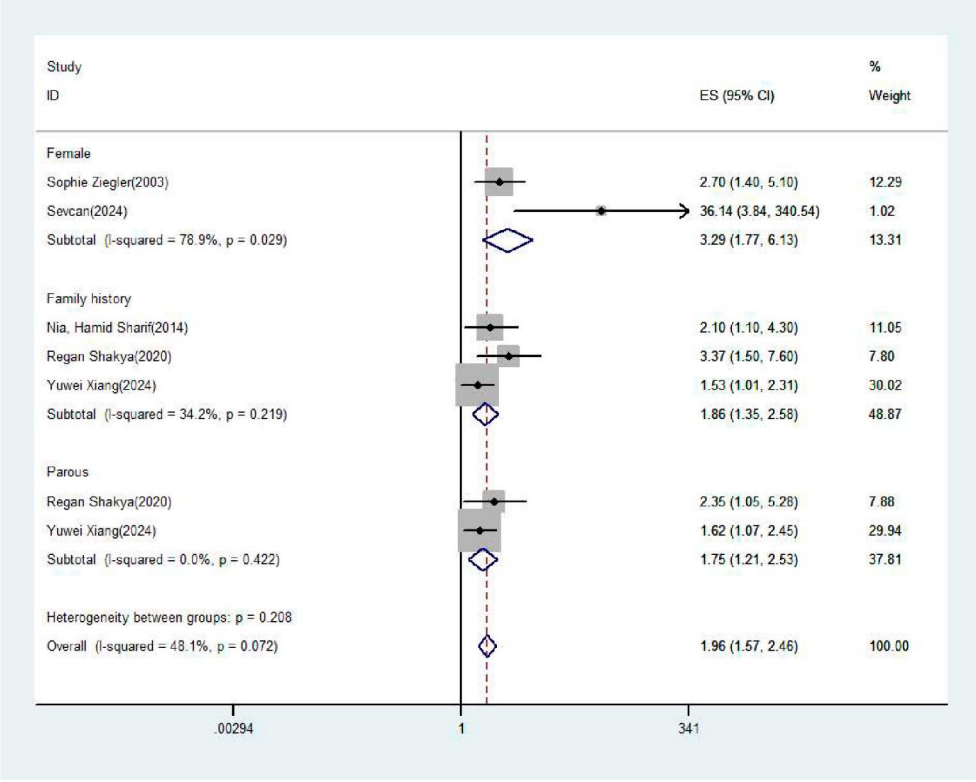

Fig. 5 Forest plot of risk factors for varicose veins among global healthcare workers

Seniority is also closely related to the risk of developing varicose veins. In a study [30], the odds ratios for different durations of employment were reported. Although the multivariable analysis did not show a statistically significant association, the univariate analysis results indicated potential trends. For employment durations greater than five years but less than ten years, the OR was 2.69 (95%CI, 2.09–9.17). For employment durations greater than ten years but less than fifteen years, the OR was 3.36 (95%CI, 1.57–8.18). For employment durations greater than fifteen years, the OR was 4.38 (95% CI 2.09–9.17). A study conducted in Egypt [31] reported that the probability of developing varicose veins was 5.5 times higher in individuals with a work duration of five years or more compared to the control group.

Standing time

A study [31] demonstrated a high correlation between static standing and the occurrence of varicose veins (OR = 2.6, 95%CI, 1.2–5.6) [24]. found that standing for more than 4 h per day is significantly associated with the occurrence of varicose veins (OR = 4.0, 95%CI, 1.6–9.8) [30]. reported that when standing time exceeds 8 h, the probability of developing varicose veins increases by 2.5 times. Another study [29] indicated that for each additional hour of standing per day, the likelihood of developing varicose veins increases by an astonishing 6.84 times.

Discussion

This systematic review and meta-analysis is the first to assess the prevalence and risk factors of varicose veins among healthcare workers worldwide. By conducting a thorough search across four databases, we identified and included nine studies related to healthcare workers. Most of the study participants were clinical nurses. Our findings reveal that the overall prevalence of varicose veins among global clinical medical staff is 25%, which is nearly identical to the 22.1% reported in a previous review [16]. The assessment of risk factors identified significant correlations between varicose veins and female, parous, family history, age, length of service, standing time, and others. This discovery offers specific guidance for clinical staff globally in preventing and managing lower extremity varicose veins.

The prevalence of VVs among healthcare workers worldwide shows significant variation depending on various study characteristics, such as geographical regions, levels of national development, and the measurement tools utilized.

The prevalence of VVs shows significant subgroup differences across various regions. Among the five geographical regions, a South Asian country exhibits the highest prevalence of varicose veins among nurses, affecting nearly half of them. Meanwhile, countries in the Middle East and North Africa have the second-highest

prevalence rate at 28%. Southeast Asian countries encounter various health workforce challenges, such as shortages and uneven distribution [35]. The shortage of human resources may be correlated with the high prevalence rate. The differences in national development levels between groups are also statistically significant. The prevalence rate in developing countries is slightly higher than that in developed countries. The reason for this difference may be that the health care systems in developed countries are more advanced [36], and their staff scheduling and rotation systems for medical personnel are more mature. In the subgroups using different measurement tools, the prevalence of varicose veins was 28% for both Doppler ultrasound and physical examination with CEAP classification combined with questionnaires, indicating no significant difference. More literature is needed to be included in the analysis to demonstrate the differences between various measurement tools.

Narrative synthesis and risk factor meta-analysis both emphasize several key factors for varicose veins among healthcare workers, which may appear at both the individual and work environment levels.

Individual risk factors

The current meta-analysis results indicate that female workers as a particularly high-risk group. This is consistent with existing literature reporting that the incidence of varicose veins is higher in females than in males [37]. The reason is that the onset and progression of cardiovascular diseases are significantly influenced by sex hormones, especially through their interactions with estrogen and progesterone receptors, predominantly affecting women [37, 38]. Varicose veins are also linked to higher expression of estrogen and progesterone receptors and lower expression of androgen receptors in different layers of the vein wall [39]. Furthermore, narrative summary and quantitative study have elucidated that pregnancy is a significant factor in increasing the incidence of VVs among women. A study from Egypt [31] indicates that women with three or more pregnancies have nearly eight times the risk of developing the disease compared to the control group. This is consistent with a previous meta-analysis on the risk factors for varicose veins in pregnant women [40]. A study from Hungary also indicates that the frequency of varicose veins among women who have had three or more deliveries is 9% higher than among nulliparous women [41]. Consequently, it is recommended that managers fully consider the physiological characteristics of postpartum female staff when arranging work by implementing appropriate job rotation and flexible working hours.

The narrative summary reported that age is a significant predictor of the prevalence of varicose veins. A multitude of reports have confirmed this viewpoint [42–45]. This is generally associated with years of work experience. With advancing age, the weakening of calf muscles and the reduced flexibility of venous valves can lead to an increased prevalence of VVs [42]. In our analysis, the included healthcare professionals had a mean age below 40, while general population - based epidemiological studies had a mean age above 40. This may be due to many of the studies we included are from developing countries, where the proportion of young workers is often larger. However, in the US, for example, the proportion of registered nurses over the age of 40 reached nearly 65% in 2022 [46]. This age difference may limit our ability to generalize our findings to older healthcare workers, highlighting the need for further research. Furthermore, marital status is also a risk factor, as married individuals have to undertake caregiving tasks and more housework after work. Therefore, to ensure the occupational health of older healthcare workers, comprehensive measures must be implemented. These include regular monitoring of lower limb health, the use of anti-fatigue mats, appropriate working table heights, and reasonable shift systems. Implementing these initiatives will safeguard their health and well-being.

In narrative syntheses, overweight, obesity, and lack of exercise habits have been reported to be significantly associated with the development of varicose veins. Previous studies have shown that the link between body mass index (BMI) and VVs is stronger in women than in men [47, 48]. Excess body weight leads to a relative increase in venous pressure, which may result in blood reflux in the lower legs [49]. Recent research [50] suggests that adapted physical exercise can bolster venous function and relieve symptoms. Therefore, clinical staff should rationally plan their work and rest schedules, control their weight, and establish scientific exercise plans and goals.

Our quantitative study indicates a strong connection between varicose veins and family history. A previous study also concluded that having a family history is a major risk factor for VVs in young populations [11]. Poor lifestyle habits can also lead to VVs, such as irregular bowel movements and smoking [51]. indicated that hemorrhoids have the potential to elevate intra-abdominal pressure, which in turn may lead to chronic venous insufficiency in the lower limbs. A French case-control study found that smoking over 10 cigarettes daily is linked to a higher prevalence of venous insufficiency [52]. This suggests that healthcare professionals should adopt healthy lifestyle habits, while managers need to prioritize employees with a family history by implementing protective measures for these vulnerable groups as early as possible.

In a study, the Caucasian race was reported as a risk factor for the development of varicose veins [53]. This is

consistent with a previous population-based study [54]. In summary, early identification of modifiable individual risk factors is crucial to prevent the further deterioration of varicose veins.

Work environment factors

From a broader perspective, varicose veins among medical staff can be seen, to some extent, as a byproduct of workplace environment issues. Healthcare workers, particularly nurses, face physically demanding job duties due to the inherent nature of their roles, which require them to stand and walk for extended periods. Our narrative synthesis results highlight that certain occupational factors significantly contribute to the risk of developing lower limb varicose veins among healthcare personnel. Specifically, standing for more than 8 h a day, working over 56 h a week, frequently undertaking night shifts, and specific wards are identified as key risk factors.

It is generally believed that varicose veins are associated with prolonged periods of standing [41, 55, 56]. During prolonged periods of upright work, increased intravascular hydrostatic pressure leads to impeded venous blood flow and continuous stasis in the lower limbs. Such stasis within the venous system is a key mechanism in the development of venous vascular diseases [57]. Additionally, the incidence of varicose veins is disproportionately high among medical staff in specific departments, such as the emergency room, Intensive and Critical Care Unit, and operating rooms. Due to the unique demands of their work, environments, and patient populations, medical staff in these departments have little time to rest. The occupational health of healthcare workers is an important responsibility of medical institutions. Therefore, medical institutions should reasonably allocate human resources based on the capabilities and needs of healthcare workers to ensure they have adequate rest time. For employees in high-risk departments, measures such as providing elastic stockings to combat VVs should be taken to reduce the risk of work-related varicose veins among healthcare workers. Adding foods such as broccoli, avocado, and blackberries to staff meals is also necessary, as these dark-colored fruits and vegetables have high antioxidant properties and contain flavonoids, which can strengthen capillaries and reduce the swelling of varicose veins [58]. At the same time, strengthen the training of healthcare workers in the prevention of varicose vein diseases.

Limitations

Our study has several limitations. Firstly, the inclusion of studies that employed various methods to estimate the prevalence of varicose veins, with some relying solely on self-reported questionnaires, may have led to inaccuracies in the prevalence estimates. Secondly, there is a scarcity of studies focusing on the prevalence of varicose veins among healthcare workers, particularly in countries in the Americas, which may impact the accuracy of the overall results. Furthermore, by including only articles published in English, we may have overlooked relevant studies in other languages.

Conclusion

The primary objective of this systematic review was to ascertain the global prevalence of varicose veins among healthcare workers, which affects approximately one in five (25%) of this population. The study also underscores the significance of various risk factors in the susceptibility of healthcare professionals to varicose veins.

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Author contributions
He Qi Fan and Wang Fang contributed to the study's design, conducted the statistical analysis, participated in most study steps, and prepared the manuscript. Cai Jing Yan and Cheng Min assisted in designing the study and helped interpret the results. All authors have read and approved the manuscript. Feng Su Juan and Lu Qing Yuan contributed to the revisions of the manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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