

Incidence of Varicose Veins and Edema among Female Nurses in Islamabad: A Comparative Study

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ABSTRACT

Background: Varicose veins (VV) and edema are common chronic venous disorders affecting quality of life. Female nurses are at greater risk because of long hours standing and pregnancy, but incidence data available on these conditions in Pakistan is scarce. This study was aimed to compare the incidence of VV and edema among female nurses in Islamabad and to identify associated risk factors.

Methods: This descriptive, comparative, and cross-sectional study recruited 356 female nurses from government, semi-government, and private hospitals in Islamabad, selected through stratified random sampling from a pool of 4297 female nurses. Information was obtained using a validated questionnaire covering demographic data, disease status, family history, pregnancy, and risk factors, with edema graded on a pitting scale and VV classification based on the CEAP system. Descriptive statistics and Chi-square test ($p < 0.05$) were used for analysis in SPSS version 22.

Results: Among 356 nurses, 51 (14.35%) were unaffected. Of the remainder, edema alone was found in 161 (52.8%), VV alone in 52 (17.0%), and both conditions in 92 (30.2%). Prolonged standing (35.1% and 18.7% respectively) was the most common risk factor for both edema and VV. Significant associations with disease occurrence were found for pregnancy ($\chi^2 = 12.046$, $p = 0.017$) and family history ($\chi^2 = 19.123$, $p = 0.004$), with 45.9% of affected nurses not receiving treatment.

Conclusion: VV was found to be less frequent than edema in female nurses of Islamabad. Family history, pregnancy, and prolonged standing were identified as major risk factors, underscoring the importance of screening and ergonomic modifications for nurses.

Keywords: Edema, Nurses, Occupational Risk Factors, Pregnancy, Prevalence, Varicose Veins.

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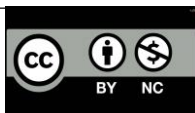
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INTRODUCTION

Varicose veins (VV) are a common chronic venous disorder characterized by dilated, tortuous subcutaneous veins of the lower limbs and represent a substantial cause of morbidity that adversely affects patients' quality of life, occasionally with serious complications^{1,2}. Left untreated, chronic venous disease may progress to venous ulceration and other manifestations of chronic venous insufficiency¹. Guidelines from the European Society for Vascular Surgery similarly identify chronic venous disease as a common and progressive systemic disorder of the venous circulation³. Pregnancy has been

identified as an important contributing risk factor for VV, given the comparatively low prevalence of the disease among non-pregnant women⁴.

Edema, defined as the abnormal accumulation of fluid within body tissues, most commonly affects the legs and feet and may result from excessive fluid retention, poor venous drainage, prolonged standing, or vasodilating medications, as well as systemic causes such as heart failure, pulmonary hypertension, renal sodium retention, and pregnancy⁵. Atypical presentations, including pelvic congestion, are also recognized among the clinical spectrum of venous disease, arising



principally from valvular incompetence of the ovarian veins and associated venous reflux^{6,7}. Edema occurring in this context is generally self-limited and predominantly affects pregnant and older women, and is managed with a combination of conservative and surgical approaches⁸.

Prolonged standing at work has been linked to a range of adverse health outcomes, including low back and leg pain, cardiovascular strain, fatigue, and lower-limb edema, particularly among non-pregnant women⁹. Epidemiological estimates of VV prevalence vary considerably by population and geography. A global systematic review with pooled prevalence analysis reported VV (CEAP C2) in 19% of the adult population, with prevalence highest in Western Europe¹⁰. In Saudi Arabia, a prevalence of 42% has been reported among teachers, the majority of whom were female¹¹. Among pregnant women, lower-limb VV have been reported in 20–40% of cases¹², with pregnancy reported to exacerbate pre-existing disease in around 11% of affected women and to precipitate initial symptoms in as many as 67%; the disease most frequently first becomes evident during the second trimester, reflecting the influence of hormonal change on venous tone⁷.

Circulatory disorders continue to be one of the most important medical and social issues around the world due to their high prevalence, clinical impact, and repercussions on the quality of life⁷. The systemic nature of varicose disease means that its occurrence during pregnancy can complicate labor, delivery, and the postpartum period, contributing to increased maternal morbidity¹³. Lower-limb edema in this context, though also caused by lymphatic, traumatic, inflammatory, or malignant processes, is frequently one of the principal symptoms experienced by women in the third trimester as a consequence of venous insufficiency⁸.

Occupational studies among nurses specifically have highlighted a disproportionately high burden of venous disease in this workforce¹⁴. A UK-based community nursing survey similarly found chronic edema to be common, with risk strongly associated with an aging, increasingly obese population and comorbidities such as diabetes mellitus, heart failure, and reduced mobility, although distinguishing primary from secondary chronic edema remained a limitation of that work¹⁵. Despite this recognized occupational vulnerability, comparative data quantifying and contrasting the incidence of VV and edema, and

their associated risk factors among nurses in Pakistan are scarce. This study was therefore designed to compare the incidence of VV and edema among female nurses in Islamabad. The specific objectives were to determine and compare the incidence of the two conditions in this population, and to identify significant risk factors associated with their development.

METHODOLOGY

Study Design and Setting

A descriptive, comparative, cross-sectional study was conducted among female nurses employed in government, semi-government, and private hospitals across Islamabad, Pakistan. Data collection was carried out over six months, from May to October 2023, following approval of the research protocol. This study is reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for cross-sectional studies.

Study Population and Sample Size

The sampling frame comprised 4,297 female nurses drawn from 22 government, semi-government, and private hospitals in Islamabad. Using the Raosoft sample size calculator (95% confidence level, 5% margin of error, 50% response distribution), a minimum sample of 353 was recommended; a final sample of 356 female nurses was recruited.

Sampling Technique

Stratified random sampling was employed. Hospitals were first stratified by sector (government/semi-government and private), and nurses were further sub-stratified by clinical work area (emergency, general, and private wards). Of the total sampling frame, 1,633 nurses (38%) were employed in government hospitals, and 2,664 (61%) in private/semi-government hospitals; sample allocation to each stratum was made proportionate to this distribution. Within each stratum, participants were selected using simple random sampling from a numbered list of eligible nurses.

Inclusion and Exclusion Criteria

Female nurses currently working in clinical positions in public or private hospitals in Islamabad were eligible for inclusion. Male nurses, nurses unwilling to participate, and

nurses reporting conditions other than VV or edema were excluded.

Data Collection Tool and Clinical Assessment

Data were collected using a self-structured, interviewer-administered questionnaire developed specifically for this study and organized into four domains: (i) demographic characteristics (age, educational qualification, height, weight, BMI, marital status); (ii) disease and family history, including current treatment-seeking status; (iii) pregnancy status and occupational exposure variables (duration of sitting and standing, obesity, age); and (iv) symptom burden, including leg pain over the preceding four weeks, rated using a validated 0–5 pain-rating (faces/numeric) scale. The content validity of the questionnaire was assessed using Pearson correlation, and internal consistency was tested using Cronbach's alpha after pilot testing with 15 participants before the full-scale data collection; items with poor item–total correlations were revised before the final administration.

The depth and recovery time of the skin depression after digital pressure were used to assess edema clinically, and were scored from 0+ (no pitting) to 4+ (severe, 8 mm depression not resolving within 2 minutes). Intermediate scores of 1+ (mild, 2 mm, rapidly resolving), 2+ (moderate, 4 mm, resolving in 10–15 seconds), and 3+ (moderately severe, 6 mm, persisting up to 1 minute) were also recorded. To aid objective comparison, calf and ankle girth were also measured at four fixed points (mid-thigh or widest calf, below calf, smallest ankle, and base of toes).

The VV were evaluated and graded according to internationally accepted classification system (the CEAP system), which was applied at the clinical (C) level in this study: C0 (no visible or palpable signs of venous disease), C1 (telangiectasia or reticular veins), C2 (varicose veins), C3 (Edema of venous origin), C4 (skin changes like pigmentation, eczema or atrophies blanche), C5 (healed venous leg ulcer), and C6 (active venous leg ulcer). In addition, each incidence of VV was categorized by recurrence (primary vs. recurrent), anatomic distribution

(unilateral vs. bilateral), symptom status (symptomatic vs. asymptomatic), and presence of truncal venous reflux (present vs. absent), to provide a multidimensional clinical description of VV beyond prevalence alone.

Ethical Consideration

The study was reviewed and approved by the Ethical Review Committee (ERC Reference No: FMRL-IRB/2023/036) of Sarhad University, Peshawar, Pakistan. Informed consent was obtained from all participants before data collection, and participant information was kept confidential throughout the study.

Statistical Analysis

The data were coded and analyzed by SPSS version 22.0. All study variables were analyzed using descriptive statistics (frequencies and percentages). Associations between disease occurrence and pregnancy status and between disease occurrence and family history were evaluated using the Chi-square test, with *p*-values <0.05 considered statistically significant.

RESULTS

A total of 356 female nurses were enrolled in the study. Fifty-one participants (14.35%) reported neither VV nor edema; results are therefore reported for the remaining participants who had at least one of these conditions.

Demographic Characteristics

The average age of the respondents was 37.93±9.8 years. The largest proportion of nurses (33.1%) was aged 30–39 years, followed by 27.5% aged 20–29 years, 24.2% aged 40–49 years, and 14.75% aged 50–59 years. Nearly half (41.9%) held a Nursing Diploma, 37.3% held an FSc qualification, and 20.6% held a Matric qualification as their highest qualification. Regarding BMI, most respondents were overweight (68.2%), while 28.8% were of normal weight, 2.6% were obese, and 0.3% were underweight. The marital status of the majority of nurses (60.3%) was married, with 33.1% unmarried and 3.3% each widowed or divorced (Table 1).

Table 1: Demographic Characteristics of Respondents (n=356)		
Variable	Frequency	Percentage (%)
Age (years)		
20–29	84	27.5
30–39	101	33.1
40–49	74	24.2
50–59	45	14.75
Qualification		
FSc	114	37.3
Matric	63	20.6
Nursing Diploma	128	41.9
BMI		
Below 18.5 (Underweight)	1	0.3
18.5–24.9 (Normal)	88	28.8
25.0–39.9 (Overweight)	333*	10.8
40.0 & above (Obese)	8	2.6
Marital Status		
Married	184	60.3
Unmarried	101	33.1
Widowed	10	3.3
Divorced	10	3.3

*As recorded in the original dataset; authors should re-verify the frequency for the overweight BMI category prior to submission.

Prevalence and Family History of Disease

Of the 305 nurses who were determined to have at least one venous condition, 52.8% had edema, 30.2% had both VV and edema, and 17.0% had VV only. As for family history, 24.6% reported a family history of edema alone, 22.0% reported having a family history of both conditions, 8.2% reported a family history of VV alone, and 45.2% reported no family history of either condition. Fewer than half of affected nurses (45.9%) were

receiving no treatment for their disease, while 27.9% were being treated for edema, 15.4% for VV, and 10.5% for both. Only 16.7% of respondents reported being pregnant at the time of the study. The great majority of nurses (93.4%) reported leg pain within the previous four weeks, with pain severity most commonly rated as "hurts even more" (34.8%) or "hurts little more" (28.5%) on the pain-rating scale (Table 2).

Table 2: Prevalence, Family History, Treatment Status, and Pregnancy (n=305)		
Variable	Frequency	Percentage (%)
Disease Found		
Varicose Vein	52	17.0
Edema	161	52.8
Both	92	30.2
Family History		
Varicose Vein	25	8.2
Edema	75	24.6
Both	67	22.0
None	138	45.2
Currently Receiving Treatment For		
Varicose Vein	47	15.4
Edema	85	27.9
Both	32	10.5

None	140	45.9
Currently Pregnant		
Yes	51	16.7
No	253	83.0
Leg Pain (previous 4 weeks)		
Yes	285	93.4
No	20	6.6
Pain Severity		
Hurts a little bit	21	6.9
Hurts a little more	87	28.5
Hurts even more	106	34.8
Hurts a whole lot	64	21.0
Hurts worst	6	2.0

Risk Factors and Pitting Edema Severity

Prolonged standing was the most commonly reported risk factor for edema (35.1%), followed by prolonged sitting (20.7%), pregnancy (11.8%), age (8.2%), and obesity (6.6%). Among nurses

with edema, moderate pitting edema (2+) was most common (33.4%), followed closely by moderately severe pitting (3+) (31.5%); mild (1+) and severe (4+) pitting were seen in 14.1% and 2.6% of cases, respectively (Table 3).

Table 3: Risk Factors for Edema and Pitting Edema Grade

Variable	Frequency	Percentage (%)
Risk Factors for Edema		
Obesity	20	6.6
Age	25	8.2
Prolonged sitting	63	20.7
Prolonged standing	107	35.1
Pregnancy	36	11.8
Pitting Edema Grade		
Mild (1+)	43	14.1
Moderate (2+)	102	33.4
Moderately Severe (3+)	96	31.5
Severe (4+)	8	2.6

Clinical Variables of Varicose Veins

Among nurses with VV, prolonged standing was again the most frequently cited risk factor (18.7%), followed by prolonged sitting (10.2%), obesity (8.5%), age (7.5%), and pregnancy (5.9%). Disease was primary in 28.5% and recurrent in 23.3% of cases; involvement was unilateral in 27.2% and bilateral in 25.2%.

Symptomatic disease (22.6%) was less common than asymptomatic disease (29.8%), and truncal reflux was demonstrated in 16.7% of affected nurses. On CEAP clinical grading, varicose veins (C2) and edema (C3) were each identified in 18.0% of cases, telangiectasia (C1) in 12.5%, eczema/atrophic blanche (C4) in 2.3%, and a healed venous leg ulcer (C5) in 0.3% (Table 4).

Table 4: Clinical Variables of Varicose Veins

Variable	Frequency	Percentage (%)
Risk Factors for Varicose Veins		

Obesity	26	8.5
Age	23	7.5
Prolonged sitting	31	10.2
Prolonged standing	57	18.7
Pregnancy	18	5.9
Recurrence		
Primary	87	28.5
Recurrent	71	23.3
Location		
Unilateral	83	27.2
Bilateral	77	25.2
Symptom Status		
Symptomatic	69	22.6
Asymptomatic	91	29.8
Reflux		
Truncal reflux	51	16.7
No truncal reflux	109	35.7
CEAP Clinical Grade		
C1 – Telangiectases	38	12.5
C2 – Varicose veins	55	18.0
C3 – Edema	55	18.0
C4 – Eczema/Atrophie blanche	7	2.3
C5 – Healed venous leg ulcer	1	0.3

Association of Disease with Pregnancy and Family History

A statistically significant association was found between pregnancy status and disease occurrence ($\chi^2=12.046$, $df=4$, $p=0.017$). Among

the 51 pregnant nurses, 2 had varicose veins, 31 had edema, and 18 had both conditions; among the 253 non-pregnant nurses, 50 had varicose veins, 130 had edema, and 74 had both conditions (Table 5).

Table 5: Relationship of Pregnancy with Disease Occurrence

Pregnancy Status	Varicose Vein	Edema	Both	Total
Pregnant	2	31	18	51
Not Pregnant	50	130	74	253
Total	52	161	92	305

Pearson Chi-Square = 12.046, $df = 4$, $p = 0.017$ (significant)

A significant association was also observed between family history and disease occurrence ($\chi^2=19.123$, $df=6$, $p=0.004$). Among nurses with a family history of VV ($n=25$), 6 had VV, 7 had edema, and 12 had both; among those with a

family history of edema ($n=75$), 4 had VV, 50 had edema, and 21 had both; among those with a family history of both conditions ($n=67$), 16 had VV, 29 had edema, and 22 had both (Table 6).

Table 6: Relationship of Family History with Disease Occurrence

Family History	Varicose Vein	Edema	Both	Total
Varicose Vein	6	7	12	25
Edema	4	50	21	75
Both	16	29	22	67
None	26	75	37	138
Total	52	161	92	305

Pearson Chi-Square = 19.123, $df = 6$, $p = 0.004$ (significant)

DISCUSSION

This comparative cross-sectional study found edema to be considerably more common than VV among female nurses in Islamabad (52.8% vs 17.0%, with a further 30.2% presenting both conditions concurrently), against an overall background prevalence of at least one condition in 85.65% of the sample. This distribution is similar to the overall literature reporting that chronic venous disease is highly variable, with a range of pooled estimates of VV and telangiectasia across different populations and diagnostic criteria³. Occupational surveys among nurses elsewhere have similarly documented a substantial burden of venous disease: a study in Mosul, Iraq, reported a VV incidence of 20% across occupational groups, with a comparable proportion of affected men (51%) and women (50%)¹⁶, while a clinical study of lower-limb VV reported a peak incidence of 62% among nurses aged 21–40 years, with limb heaviness the most common presenting symptom¹⁷.

The proportion of respondents with a family history of either condition (54.8% combined) and the statistically significant association demonstrated between family history and disease occurrence ($p=0.004$) support a hereditary predisposition to venous disease, echoing UK community-based data in which chronic Edema was similarly found to cluster with modifiable and non-modifiable comorbid risk factors, including diabetes, heart failure, obesity, and reduced mobility¹⁴. A global meta-analysis of healthcare workers, alongside occupational surveys of nurses in Saudi Arabia, Egypt, and Nepal, has likewise identified family history, alongside age, marital status, and physically demanding duties, as significant independent predictors of VV^{15,18,19,20}.

Prolonged standing emerged as the dominant risk factor for both Edema (35.1%) and VV (18.7%) in this cohort, consistent with occupational health evidence linking sustained standing posture to lower-limb pain, fatigue, and edema⁹. A cross-sectional study of nurses at Dhulikhel Hospital similarly found VV in 83% of participants, with each additional hour of daily standing increasing the odds of disease by 27-fold in adjusted analysis¹⁹. Physiological studies of prolonged static occupational posture provide a mechanistic explanation for this association, having demonstrated measurable increases in leg volume and venous pooling with sustained

standing, attributable to hydrostatic pressure effects on venous return²¹.

Pregnancy was reported by 16.7% of participants. It was significantly associated with disease occurrence ($p=0.017$), with pregnant nurses disproportionately affected by Edema (31/51) and by concurrent VV and Edema (18/51) relative to VV alone (2/51). This pattern mirrors evidence that lower-limb Edema, more than isolated VV, is a prominent feature of the third trimester as a consequence of venous insufficiency and mechanical compression from the gravid uterus,⁸ and aligns with reports that VV risk rises with each successive pregnancy, reaching as high as 37–38% by the third and fourth pregnancies⁷. A large multicenter analysis has similarly identified specific pregnancy-related factors, including multiparity and pregnancy complications, as significant contributors to the development of VV¹.

Only about half of the affected nurses in this study (54.1%) were receiving any treatment for their condition, a finding that raises concern about under-recognition and under-treatment of venous disease within this occupational group, consistent with broader observations that chronic Edema remains an under-recognized and undertreated health problem globally²². In addition, high prevalence of self-reported leg pain (93.4%) and moderate to moderately severe pitting edema (64.9% combined) further highlight the symptomatic burden of affected nurses' lives, and confirm that greater symptom burden in venous disease is associated with poorer HRQoL²³.

The clinical profile of VV observed in this study with the majority of cases falling within CEAP grades C1–C3 and truncal reflux demonstrated in only 16.7% of cases suggests that most disease in this cohort was at an early-to-moderate stage, offering a window for conservative and preventive intervention before progression to more severe manifestations such as skin changes or ulceration²⁴. Conservative measures, including structured patient education and hydrotherapy, have been shown to meaningfully improve both knowledge and symptom burden among patients with lower-limb VV²⁵, while compression therapy and activity-based approaches remain central to the non-surgical management of chronic edema²⁶.

This study has some limitations that should be considered when interpreting its findings.

Disease status was determined through a structured questionnaire and clinical grading rather than objective duplex or Doppler ultrasonographic confirmation, which may have introduced misclassification bias, and the cross-sectional design precludes causal inference regarding the identified risk factors; the study was also restricted to VV and edema, and published comparative data on edema incidence among nurses in Pakistan remain limited, constraining direct benchmarking of the present findings. Based on these findings, ultrasonographic confirmation of disease status is recommended for future studies, along with longitudinal designs to establish causal relationships. From a practice standpoint, activity-oriented anti-edema therapeutic approaches, graduated compression hosiery, and endovenous thermal ablation (EVLA/RFA) for symptomatic VV warrant consideration, alongside simple preventive measures such as avoiding prolonged standing or sitting, maintaining a healthy body weight, regular position changes and lower-limb exercise during shifts, and leg elevation during rest, particularly among nurses with a positive family history or who are pregnant.

CONCLUSION

The findings revealed that edema affected a significantly larger number of female nurses than VV, with almost one-third of the affected nurses having both edema and VV. Both family history and pregnancy were significant factors in the occurrence of both diseases, and prolonged standing was found to be the most important modifiable occupational risk factor for both diseases. Many of those affected were not receiving treatment, indicating a lack of treatment-seeking behavior in this occupation. Based on the findings of this study, targeted screening, ergonomic adjustments, and preventive health education programs could be implemented for nurses, particularly for pregnant women and those with a positive family history.

Author Contributions

Adn Tahir Chaudry conceived and designed the study, contributed to data collection, and supervised the research process. **Ameera Aamar** assisted in study design, data analysis, and interpretation of results. **Muhammad Haroon** contributed to the literature review, manuscript drafting, and critical revision. **Mohammad Suleman** assisted in data collection, manuscript editing, and final approval of the manuscript. All authors reviewed and approved the final manuscript.

Ethical Approval

The study was reviewed and approved by the Ethical Review Committee (ERC Reference No: FMRL-IRB/2023/036) of Sarhad University,

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None.

Conflict of Interests

None.

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