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Original Article

Factors affecting the intensity of nurses' lower limbs' varicose veins in the hospitals of North Khorasan, Iran, in 2016

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ABSTRACT

Background & Aim: Varicose vein (VV) is known as the most prevalent venous disease which has many complications. Since this is a hard healing disease which imposes a large burden on individual and society, and also has high mortality, many studies begin to assess risk factors in their population.

Methods & Materials: Participants were examined by a cardiovascular specialist and their VVs were graded by CEAP criteria. The patients filled a four-part researcher-made questionnaire of demography, occupation, quality of life (QOL), and lifestyle. Data were analyzed by SPSS software.

Results: We found that sex, age, pregnancy, child number, family history, standing, sitting, walking, weight, body mass index (BMI), overtime, and work experience have significant effects on VV intensity. Multiple logistic regression shows that standing (OR = 13.850), sitting (OR = 4.850), pregnancy (OR = 2.002), age (OR = 1.219), and overtime (OR = 1.029) are the most effective demographic and occupational factors. Age and sex adjusted demographic and occupational factors show that only pregnancy factor is affected. Life style factors show that physical activity (OR = 4.038), as well as weight control and nutrition (OR = 3.760) have significant effect on VV intensity. It is also found that symptoms intensity have significant relationship with VV intensity (OR = 4.048). It means that increasing VV intensity causes a 4-fold decrease of QOL.

Conclusion: It is revealed that most of the effective factors on VV intensity are secondary factors which are preventable.

Introduction

Varicose veins (VVs) and chronic venous insufficiency (CVI), known as the most prevalent vein diseases in adult population, mostly occur in lower limbs and are defined as abnormal large and tortuous veins. Pathophysiology of VVs is well known and related to congenital or acquired abnormalities of proximal/distal increased deep venous pressure, valvular incompetence, and vein wall weakness (1-3). Clinical manifestations of VVs are various among patients. Some are without symptoms and some have limited symptoms around the VVs. However, in severe phases, the disease may be extended all over the lower limbs (4). General symptoms of VVs are feet pain, heaviness and fatigue of evolved foot, and feelings of irritating and itching. Pain is one of the complications of VVs that increases in disease process (5).

Prevalence of VVs is much studied among various societies and predisposing occupations.

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Approximately, one quarter of American adults have VVs which is more common in women and older adults. VVs are two-fold in women of 40 to 80 years old comparing to men (6). The latest systematic search of recent studies concerning epidemiology of chronic venous diseases (CVDs), showed a prevalence of 60-70 percent for C0-C1, 25% for C2-C3, and 5% for C4-C6. The incidence of VVs is approximately 2% per year (3). High prevalence of VVs and financial cost of treatment of late complications like chronic ulcers have imposed a large burden on health care systems (7). VVs, even without major complications of CVI, affect patients' quality of life (QOL) (8).

There are several risk factors enumerated for VVs. Gender and age are the most effective risk factors of VVs. Women, without age effect, significantly predispose to VV more than men. One of the most important risk factors of VVs in women is consumption of contraceptive drugs. Women with VVs compared with women without VVs are more obese, older at menopause, have less physical activity, and higher blood pressure (9). Heredity is also a very important risk factor in VVs, after adjusting age and gender in both parents. Long-lasting sedentary position increases its incidence compared with a few hours activity in both gender. Researches show that physical activity and control of weight can decrease VV risk in adults (4, 9).

This study will assess the effective risk factors on intensity of VVs among nurses of Bojnurd hospitals, North Khorasan, Iran, in 2016.

Methods

In this cross-sectional descriptive study, after getting introduction letter from Iran University of Medical Sciences, Tehran, Iran, and offering it to the hospitals of North Khorasan, we sampled nurses with VV. Participants were selected on the basis of volunteered sampling by installation declaration in 2016. Inclusion criteria were patients of 20-60 years old with at least two years of work experience who had C1-C4 grades of VVs. Exclusion criteria were quitting the study, pregnancy, and having C5-C6 grades of VVs.

Intensity of VVs is measured on the basis of CEAP criteria and confirmed by a specialist. CEAP, on the basis of the last revision in 2004, is a descriptive criterion classifying the VVs on the basis of clinical, etiologic, anatomic, and pathophysiologic factors. Clinical manifestations score from 0 to 6 which present no VV to active ulcers. Etiologic agent can have congenital, primary, or secondary disposition. Anatomic classification shows that whether VVs are superficial, deep, or perforating. Pathophysiologic factor identifies the presence or absence of reflux or obstruction in superficial, deep, or perforating veins (10, 11).

A four-part researcher-made questionnaire of demography, occupation, QOL, and lifestyle was filled by patients. Demographic factors included age, sex, weight, body mass index (BMI), pregnancy time, number of children, contraceptive consumption, hormone therapy, menopause, family history, and defecation status. Occupational factors were activity level in work place including walking, sitting, and standing time, overtime in month, work experience, and night shift time in month. Part 3 defines relationship between VV intensity with QOL and health level which is retrieved from Aberdeen Varicose Vein Questionnaire (AVVQ). AVVQ is a 13-question survey which includes physical symptoms like pain, ankle edema, ulcers, and social issues like compression therapy, and effect of VV on daily activities. It is scored from 0 to 100 indicating that VV has no effect on patient to the most severe effect on patient (12, 13). Part 4 is lifestyle questionnaire (LSQ) including 5 factors of physical health, exercise and fitness, weight control and nutrition, psychological and spiritual health, social health and drug and alcohol avoidance (14).

Data were analyzed by chi-square, fisher's exact, and logistic regression tests using SPSS software (version 20, IBM Corporation, Armonk, NY, USA); and significance level was considered as $P < 0.05$.

Results

Demographic and occupational factors and VV intensity: Among 235 patients of

25-50 years old, 44 men (100% mild VV) and 191 women (62.3% mild VV, 33.5% moderate VV, and 4.2% severe VV), 69.4% had mild VV, 27.2% moderate VV, and 3.4% severe VV (P < 0.001). The results showed that there is a significant relationship between sex and VVs intensity (Figure 1). Results of chi-square and fisher's exact tests of quality factors show that there are also significant relationship between pregnancy (P < 0.001), walking time (P < 0.001), sitting time (P < 0.001), standing time (P < 0.001), night shift (P = 0.004), family history of VVs (P = 0.022), and VV intensity. On the other hand, there are no relationship between contraceptive consumption (P = 0.114), menopause status (P = 0.114), height (P = 0.180), hormone therapy (P = 0.458), defecation status (P = 0.051), and VV intensity. All classification of these factors is presented in table 1.

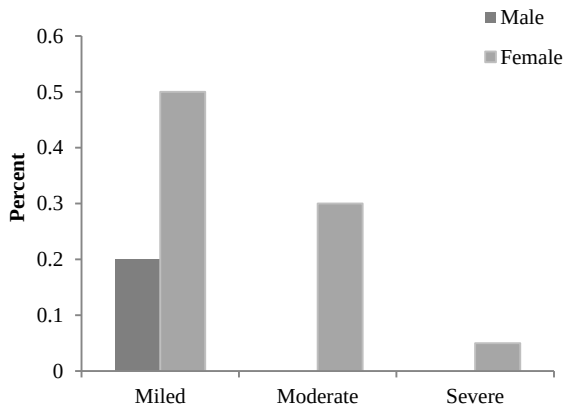

Figure 1. Percentage of sex on the basis of CEAP grade

Table 1. Significance level of quality factors related to varicose veins

Demographic and occupational factors	N	Mild VV (n = 163)	Moderate VV (n = 64)	Severe VV (n = 8)	P-value
Sex					< 0.001
Men	44	44	0	0	
Women	191	119	64	8	
Pregnancy					< 0.001
Zero	8	8	0	0	
One	27	21	6	0	
Two	86	60	25	1	
More than two	43	18	18	7	
Children number					0.032
Zero	22	15	5	2	
One	31	25	6	0	
Two	85	56	26	3	
Three	25	10	12	3	
Walking time					< 0.001
Less than 4 hours	64	64	0	0	
More than 4 hours	167	97	62	8	
Sitting time					< 0.001
Less than 4 hours	175	142	33	0	
More than 4 hours	55	18	29	8	
Standing time					< 0.001
Less than 4 hours.	78	74	3	1	
More than 4 hours.	153	87	59	7	
Family history of VV					0.022
Yes	160	103	49	8	
No	75	60	15	0	
Defecation status					0.051
Regular	11	9	2	0	
Rather regular	161	112	47	2	
Irregular	61	40	15	6	
Menopause status					0.114
Yes	12	7	3	2	
No	140	94	40	6	
Contraceptive consumption					0.114
Yes	117	68	41	8	
No	21	17	4	0	
Hormone therapy					0.458
Yes	67	46	19	2	
No	82	51	25	6	

VV: Varicose vein

Table 2. Mean ± standard deviation and significance level of quantity factors related to varicose veins

Factors	Mild VV	Moderate VV	Severe VV	P-value
Age	35.84 ± 3.95	38.70 ± 5.20	40.62 ± 5.29	< 0.001
Weight	66.96 ± 6.72	68.51 ± 6.71	70.66 ± 1.97	< 0.001
Height	163.62 ± 5.48	162.81 ± 6.09	162.12 ± 2.41	0.180
BMI	25.00 ± 2.26	25.84 ± 2.15	26.89 ± 1.27	0.002
Overtime	53.43 ± 20.77	66.67 ± 16.89	74.16 ± 9.17	< 0.001
Work experience	10.39 ± 3.64	12.72 ± 5.10	13.75 ± 5.36	0.002
Night work	7.11 ± 2.12	6.36 ± 2.71	5.75 ± 1.28	0.004

VV: Varicose vein; BMI: Body mass index

Relationship assessment of quantity factors with VV intensity due to non-normal distribution of variables was done by nonparametric Kruskal-Wallis test (Table 2). It shows that there are significant relationships between age, weight, BMI, overtime, night shift, and work experience with VV intensity but not about height.

The concurrent effect of demographic and occupational factors on VV intensity was evaluated by multiple logistic regressions. Variables entered separately by backward stepwise way. Variables which did not have effect on model were emitted and only effective variables remained, as presented in table 3. It was shown that age, pregnancy, standing time, sitting time, and overtime amount have significant effect on VV intensity. Although height is not significant, it is presented in the model due to its little effect (Table 3).

Table 3. Relationship between demographic and occupational factors with varicose vein intensity

Variable	OR	95% CI	P-value
Age	1.219	1.09-1.36	< 0.001
Pregnancy	2.002	1.057-3.79	0.033
Standing time	13.850	2.649-72.47	0.002
Overtime amount	1.029	1.003-1.055	0.027
Sitting time	4.850	1.63-14.48	0.005
Height	0.913	0.827-1.009	0.075

OR: Odds ratio; CI: Confidence interval

Age and sex-adjusted demographic and occupational factors were assessed by multiple logistic regression. Variables of sitting, standing, and overtime are significant with and without sex and age factors. Height factor also is not significant with or without sex and age factor. It means that sex and age do not affect these variables. While pregnancy is significant without age and sex effects ($P < 0.001$), but it is not significant with sex and age effect ($P = 0.069$). It means that sex and age affect the significance of pregnancy. Emitted variables in this model may be deleted because of collinear effect with other variables (Table 4).

Lifestyle and VV intensity: Relationship of LSQ with VV intensity is assessed by logistic regression. VV intensity is defined as two-states: mild/moderate and severe. Results of odds ratio (OR) and 95% confidence interval (CI) are presented in table 5. It shows that physical health, and weight control and nutrition significantly affect VV intensity when every factor separately entered in model. The more increase in these two factors (deteriorating health), the more increase in VV intensity.

By using multiple logistic regressions, the concurrent effects of LSQ variables on VV intensity were assessed.

Table 4. Age and sex-adjusted of demographic and occupational factors

Variables	Adjusted by age and sex		Unadjusted by age and sex	
	OR	P-value	OR	P-value
Sitting	5.310	0.002	5.307	0.001
Standing	6.961	0.003	5.549	0.004
Overtime	1.031	0.015	1.027	0.019
Pregnancy	1.821	0.069	2.516	0.001
Height	0.924	0.110	0.910	0.046
Age (year)	1.236	0.000	--	--
Sex	669244560.896	1.000	--	--

OR: Odds ratio

Table5. Relationship between life style questionnaire (LSQ) and varicose vein intensity

LSQ factors	Mean ± SD	Logistic regression			Multiple logistic regression		
		OR	95% CI	P-value	OR	95% CI	P-value
Social health	1.56 ± 0.44	1.510	0.81-2.81	0.197	0.464	0.201-1.070	0.072
Physical health, exercise and fitness	1.47 ± 0.44	5.720	2.820-11.587	< 0.001	4.038	1.77-9.22	< 0.001
Psychological health, spiritual health	1.20 ± 0.39	1.820	0.89-3.75	0.102			
Drug and alcohol avoidance	0.35 ± 0.51	0.998	0.579-1.719	0.993			
Weight control and nutrition	1.57 ± 0.53	4.780	2.54-8.99	< 0.001	3.760	1.81-7.80	< 0.001

LSQ: Life style questionnaire; SD: Standard deviation; OR: Odds ratio; CI: Confidence interval

Variables were entered in the regression model by backward stepwise way. As it is shown in table 5, psychological health, spiritual health, and drug and alcohol avoidance were emitted from the model. Two variables, physical health, and weight control and nutrition, also significantly affect VV intensity in this model (Table 5).

QOL and VV intensity: QOL (OR = 4.048, 95% CI: 2.03-8.08) also is significantly related with VV intensity (P < 0.001). OR of 4.048 shows that increasing of one unit of symptoms intensity leads to a 4.048-fold increase in VV intensity. It means the more increasing of symptom intensity or worsening of health status, the more intensifying of VV and lower QOL.

Discussion

Many studies have shown more prevalence of VV in women (9, 24, 32, 36, 38), but sometimes no difference is reported between men and women prevalence (65).A large international epidemiological study on CVD shows that C1-C3 grade is the most frequent between women, but C4-C6 has no difference between men and women whatever the age and country is (15). While Burleva and Burleva have been shown that stages C1 and C2 were more common in women, and the C4-C6 stages were more common in men (16). In an Italian cross-sectional survey in 24 cities in northern, central, and southern Italy, women were represented at a disproportionately high rate of 86% and were four times more likely to develop telangiectasia, while southern women tend to develop CVI two times more, which was related to their more and earlier pregnancies (17). In the current study, we found that VVs are more prevalent in women than men, and also women are more predisposed to getting severe grades of VVs comparing to men. One of the probable hypotheses expressed is hormone differences, especially in pregnancy. It is shown that estrogens and their receptors have an important role in major prevalence of CVD in women. Expression of estrogen receptors increases by aging and intensity of CVD (18). Asbeutah et al. showed that vein diameter and valve closure time (VCT) of lower limbs' veins increase in menstrual cycle and first pregnancy (19, 20). However, incidence of VVs enhances by increasing progesterone, especially in the first three months of pregnancy (21). Parity is also a significant factor in getting varicose in women; so that VV is more prevalent in multiparous women than in nulliparous ones (22).These can predispose women, rather than men, to VVs.

Pregnancy is an important risk factor for VV intensity in this study. It is also shown that when pregnancy is adjusted by age, then there is no significant relationship, which means that pregnancy increases VV intensity by increasing age. A recent meta-analysis shows that the possibility of developing VVs among women with a history of pregnancy is 82% (OR = 1.82, 95% CI: 1.43-2.33) in different populations (23). It is shown that progesterone in first pregnancy of women with VV is higher than women without VV. It confirms the role of female hormones in VVs (24). With increasing the number of childbirth, age-adjusted odds ratio of VVs also increases, so that there is a steady increase in prevalence of VV from 32% to 59% in none to more than four births, respectively (25).

Hormonal changes in pregnancy and menopause can change estrogen receptor β (ER-β) expression on the vein walls which is correlated with hypertrophy of smooth muscle cells layer. It is shown that this hypertrophy in vein walls can develop VVs (26, 27). In this study, it is shown that menopause cannot

significantly affect VV intensity. This result can be because of known role of hormone replacement therapy (HRT) as a VV protective factor (28, 29), since women at the age of menopause often are treated with HRT.

Oral contraceptive and HRT have no significant relationship with VV intensity in this study. Krasinski et al. also rejected oral contraceptive factor as an effective factor on VV in women (30). In Hungarian and Finnish population neither oral contraceptives nor HRT are not risk factor for CVD (31, 32). In a German population, hormone intake has no effect on VV (OR = 0.90, 95% CI: 0.68-1.22) and negative effect on CVI (OR = 0.60, 95% CI: 0) (33, 34).

Aging and also high work experiences are shown as other significant risk factors of VV, which agree with many studies (22, 33-38). In a Finnish study on 40-60 years old population, incidence of VV increased by aging (25). This result also obtained in a France population (39). Increasing of superficial veins because of deterioration of calf muscles and weakness of vessel walls by aging is the most probable happening which can increase VV intensity.

High weight and BMI are also important factors which significantly increase VV intensity. Robertson et al. believed that BMI is an aggravating agent rather than a primary factor (40). Frequency of visible and functional vein disease increases with BMI (41), and overweight can increase skin changes and venous ulcer in CVD (42). Musil et al. expressed that BMI has positive correlation with frequency of venous reflux and also severity of CVD in whole population and women (43). An epidemiological survey in Greece shows that 63% of patients with CVD have BMI > 25. They interpret that obese people are more prone to CVD because of difficulty in walking and also spending more hours in standing and sitting positions (44).

Statistical analysis of this study shows that height has not significant effect on VV intensity even when adjusted with age and sex. Laurikka et al. showed that individuals with VVs had average higher height (men > 175 cm and women > 165 cm) (OR = 1.4), and it is more prevalent between men (14%) than women (4%) (25). The same result also is seen in Lee et al. Edinburgh study for men (OR = 1.50, 95% CI: 1.18–1.93), and women (OR = 1.26, 95% CI: 1.01–1.58) in trunk varicose (45). One of the reasons which can be expressed is the different sample volume of these studies with this study. But on the other hand, there are studies which agree with our results (46-48).

Overtime also significantly increased VV intensity in this study, even when adjusted with age and sex. Diken et al. showed that average work duration of nurses in hospital is associated with increased symptoms of CVI (49). Sharif et al. also show that overtime in nurses increases the risk of developing VV and VV severity by 1-2 percent (37). It seems logical that longer work time increases standing, walking, sitting, and other occupational factors which, in turn, increase VV intensity.

In this study, night shift has negative effect on VV intensity. It means the higher night shift hours in month, the lesser VV intensity. In a Spanish study on nurses population, night shift developed VV rather than day shift (46.6% vs. 36.4%; P = 0.008) which can be because of sleep disorders, appetite disturbance, and social and psychological issues (50). This difference of results can be because of decreasing of work pressure in the night shift for nurses of our study.

Family history has positive relationship with VV intensity in current study. In a study among women hairdressers in Iran, it was found that hairdressers with positive family history are exposed to increase severity of VV two times more than those with negative family history (51). Robertson et al. (40) in concordant with Scott et al. (52) study show that positive family history develops approximately a two-fold increase in C2 VVs but has no effect on developing of C3-C6 grades of VVs. Due to our limitation of getting the right answer for this factor, there are two important biases which existed in almost all studies: recall bias and self-reported bias (53). As other studies also expressed, it is a challenging factor and should be discussed with caution.

This study shows that nurses with more than 4 hours walking, standing, and sitting time develop VVs significantly, even when we adjusted with age and sex. It is concordant with

many studies of different societies (54-57). A Danish longitudinal study showed that hazard ratio (HR) of standing/walking more than 6 hours/day is 3.17 for men and 2.34 for women (57). The most important key reason in consecutive standing is static blood flow which enhances intravenous hydrostatic pressure and thrombosis formation. This mechanism happens less in walking because of existence of muscle pump, but when venous valves become incompetent, venous pressure increases because of blood flow reversal.

There are some researches which agree with positive effect of constipation on the presence of VV intensity (58, 59); however, there are no clear theories about how constipation develops VVs. Cleave found that the compression of iliac veins, as a result of constipation, obstructs the vein return (60). While Burkitt believes that intra-abdominal pressure causes dilation of leg veins (61). In contrast, there are studies, like the result of this study, which do not show that constipation is a risk factor for VV (62).

Demographic and occupational factors assessment with multiple logistic regression shows that standing, sitting, pregnancy, age, overtime, and height, respectively are more effective factors on VV intensity. Standing and sitting can develop approximately 14-fold and 5-fold increases in odds of intensifying VVs.

VV intensity also is related significantly to physical health, exercise and fitness, weight control and nutrition, and not to psychological and spiritual health, social health, and drug and alcohol avoidance.

Framingham study shows that individuals without VV compared with ones with VV have less daily physical activity (9). Carpentier et al. reported that lack of physical activity is a risk factor in men but not in women (39). In a study which was done on C3-C4 patients, it was revealed that an exercise to strengthen muscles of lower legs, twice a day for 60 days; promotes venous blood flow and outflow (63). Physical activity and exercise with improving calf muscle pump function, which is crucial reason for VV, can improve lower limbs blood flow and venous leg ulcers (52). This study also found that increasing one unit of physical activity can cause a 5.72-fold decrease in odds of intensifying VV.

In Edinburgh study, there is no relationship between fiber diets and VV in both sexes (45, 46). It is confirmed in Ducimetiere et al. study on men. They showed that there was a significant relationship between higher calorie diets and VV, but no relationship between VV and various lower calorie diets (64). In this study, it has been shown that weight control and nutrition have significant effects on VV intensity. It is also logical that high calorie intake causes higher BMI which positively affects VV. High weight cause pressure on lower limbs and accumulation of blood. This study also shows that weight control and nutrition increase 4.78-fold odds of VV intensity.

Few studies have been done on effect of social factor on VVs. In advanced countries, there is no relationship between income level and venous ulcers in patients and control groups. They show that genetics is an effective factor in severe types of varicose (65). Evans et al. showed that there is no relationship between social class (on the basis of occupation type) and age and sex-adjusted prevalence of trunk varicose and CVI, but it is more in hand workers compared with non-hand workers (34). Moffatt et al. showed that foot ulcers happen more in low social class than common population but not varicose ulcers (66). There is no relationship between social health and VV intensity in this study.

There is no study on relationship of psychological and spiritual health and VV intensity. This study also did not find any significant relationship between them. It can be because of pathophysiological nature of VV, in which primary factors like genetics, sex, etc. and physical factors like standing, sitting, etc. are more effective than social and psychological and spiritual health.

Relationship between alcohol intake and VV is assessed in many studies. In a case-control study in France, it is shown that high alcohol consumption increases CVI risk in lower limbs but it is not significant when adjusted by other risk factors (67). Other studies also did not find any relationship (68). Scott et al. study on smoking and non-smoking men revealed that VV is more likely in smoking men (68). There is

the same result of smoking men in Framingham study but not about women. On the other hand, there are many studies which do not agree with positive effect of smoking on VV (48, 69). This study also did not find any relationship between drug and alcohol consumption and VV. One of the most probable biases in this study is dishonesty of participants in their answers to these questions due to limitations that they feel.

The effect of CVD on QOL is expressed in many studies (70). In a cohort study on 137 patients, QOL of patients with VV was evaluated by two AVVQ and short form 36 (SF-36) questionnaires. AVVQ questionnaire shows higher correlation ($r = 0.74$, $P < 0.001$) with symptoms and concerns of patients which is indicative of higher validity. In this study, by evaluation of QOL with AVVQ questionnaire, it is found that symptoms intensity has significant relationship with VV intensity (OR = 4.048). It means increasing VV intensity leads to a 4-fold decrease in QOL.

Conclusion

The result of this study show that most important demographic and occupational factors in VV intensity of nurses are standing, sitting, pregnancy, age, overtime, lifestyle factors, physical activity, weight control, and nutrition. As it is appeared most of factors are preventable. Since VVs affect strongly the QOL of patients, exact schedule for training of nurses for opposition with risk factors and awareness of authorities for decreasing the risk factors is necessary.

Conflict of Interests

Authors have no conflict of interests.

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