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Influencing factors for lower extremity varicose veins in female nurses in East China.

Li Erding[1], Cao Shuyan[1], Zheng Weiwei[2], Yin Ying[1*]

[1]Department of stomatology, Nanjing General Hospital of Nanjing Military Area Command, PLA, Jiangsu Province, Nanjing 210002, PR China

[2]First Department of Geriatrics, Nanjing General Hospital of Nanjing Military Area Command, PLA, Jiangsu Province, Nanjing 210002, PR China

Abstract

Objective: This research was aimed to find the influencing factors and preventive methods of lower extremity varicose veins in female nurse's population working in 3A grade hospitals in east china.
Methods: A questionnaire survey was carried out in 1198 nurses randomly selected from three 3A grade hospitals through multiple stages sampling in east china. Descriptive statistically analysis was performed to describe the current situation of lower extremity varicose veins in nurses. Univariate and multivariate logistic analysis were used to explore the main risk factors of lower extremity varicose veins in female nurses.
Results: Logistic regression analysis showed that age (OR=1.317, 95%CI: 1.196-1.450), standing time (OR=1.712, 95%CI: -2.423 1.209) and family medical history (OR=2.706, 95%CI: 1.444-5.073) were main risk factors. Elastic stockings (OR= 0.052, 95%CI: 0.025-0.107), legs-raising (OR=0.201, 95%CI: 0.095-0.425) and physical exercise (OR=0.141, 95%CI: 0.072-0.274) were main protective factors. What's more, age (r=0.47, P < 0.01) and working years (r=0.51, P<0.01) were linearly related to lower extremity varicose veins in nurses population respectively.
Conclusion: Age, standing time and family medical history are risk factors of varicose veins among female nurses in east china hospitals. Protective factors include stretch socks, legs-raising, physical exercise, no cross-legged sitting, legs massage, eating few high-fat foods, wearing flat shoes and knowing the risk factors of varicose veins.

Keywords: Varicose veins, Nurse, Standing for a long time, Occupational diseases.

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Introduction

Varicose veins of lower limb refer to veins of lower extrimity that have become enlarged, twisted, and touched which are usually greater than 3 mm [1]. It not only accompanied by discomfort but also affects beauty, and the severe can threaten the lives of patients [2,3]. In foreign countries, 30% of women have suffered from varicose veins and 20% of men have got it [4,5]. The American clinical guidelines for varicose veins care points out that 23% of American have varicose veins [6]. A cross sectional study in North-east of Iran showed the prevalence of varicose veins was 47.7% among female hairdressers [7]. However, there is no national data about it in China. In Shanghai, Anhui, Shangdong, etc., its incidence in the individuals over 15 years old is 9.26% and that in those over 40 is 16.38% [7].

Due to the specificity of their work, nurse have to stand for a long time with both legs bearing weight, and most of them are female, so that they are at greatly increasing risk of varicose veins, whose incidence is 60% higher than the common people [8]. The incidence of varicose veins in the nurse who work in 3A grade hospitals of Ningxia is 31.9% [9]. Long-time standing, overtime work, and too high BMI are the major risk factors of nurses' varicose veins [10], which may be associated with lower extremity venous hypertension, chronic inflammatory response, venous microcirculation damage, genetic susceptibility, and the like [11,12]. And some literature suggests that the relationship between long time standing, obesity and varicose veins is unclear [13].

Therefore, the risk factors of varicose veins in the female nurses remain to be further determined. This study is conducted in three 3A grade hospitals in Nanjing, Suzhou and Xuzhou, we aimed to confirm the influencing factors of lower extremity varicose veins in female nurses working in 3A Grade Hospitals in east China through a cross-sectional study.

Subjects and Methods

Subjects

A total of 1198 female nurses working in three 3A grade general hospitals in east China were enrolled in the study. Case-control study was conducted to explore the influencing factors of lower extremity varicose veins in female nurses working in 3A Grade Hospitals. Of them, 388 diagnosed varicose veins patients were enrolled in the case group and 810 healthy controls were recruited. The inclusion criteria were follow up: female; having registered nurse certificate of the People's Republic of China; engaging in clinical care in the hospital for one year and above; aged 18 or more; volunteered for this study with understanding and support. The exclusion criteria were following: refresher nurses from other hospitals; probationer nurse; pregnancy [14] (Figure 1).

Methods

Investigation tools: We made a questionnaire for investigation. The investigation indexes included: 1) General data, such as age, marital and childbearing status, working years, educational background, positional title, number of night shift, and standing time. 2) Condition and symptoms of varicose veins of lower extremity. 3) Knowledge of varicose veins of lower extremity and its related healthy behaviors, including whether to know its risk factors and what specific preventive measures they had taken.

Diagnostic methods: We confirmed varicose veins based on patients' clinical and subjective symptoms, such as heavy legs, fatigue, swelling, cramps, tingling, itching, numbness and pain [6]. For those with visible varicose veins, we would verify, and if they were confirmed to truly have obvious twisting manifestations of veins, they could be diagnosed with varicose veins. The suspicious persons were given colour doppler ultrasonography for further inclusion or exclusion. If twisted and enlarged veins could be seen in the pass-by area of the great saphenous vein and small saphenous vein, we could make a diagnosis [15].

Ethical consideration: The study was carried out in compliance with the Declaration of Helsinki of the World Medical Association, and according to a protocol approved by Nanjing General Hospital of Nanjing Military Area Command, PLA, the approval number is 2015011. The objectives of the study were explained to the study participants and verbal consent was obtained before interviewing each participant.

Statistical analysis: T test was used for the comparison on demographic characteristics, linear regression analysis for the comparison on age and working years, chi-square test and multivariate logistic analysis for risk factors. $P<0.05$ was defined as statistical difference. Data entry was implemented with Excel2007 (Micro Soft Co., Limited, USA), and data analysis was performed via spss16.0 (IBM CO., Limited, USA).

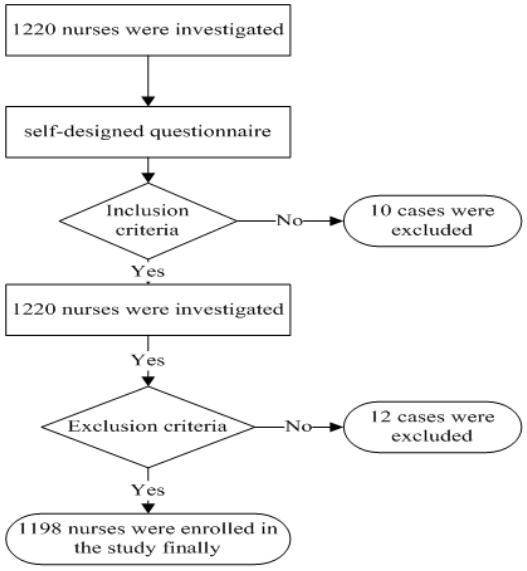

Figure 1: *Flow chart of study.*

Results

General data

1198 participants were 19-50 (22.46 ± 7.42) years old; about the marital and childbearing status, 378 participant married, 820 unmarried, 278 had children and 920 hadn't; about the educational background, there were 9 with technical secondary school degree, 533 with junior college degree, and 656 with bachelor degree; about the positional title, there were 611 nurses, 513 primary nurses, and 74 nurses-in-charge; about night shift per month, there were 209 participants with 0 night shift, 113 with 1~2 night shifts, 525 with 3~4 night shifts, 297 with 5~6 night shifts, and 54 with 7 night shifts at least; about standing time a day, there were 28 participants with 0~2 hours of standing, 29 with 2~4 hours, 168 with 4~6 hours, 541 with 6~8 hours, and 432 with more than 8 hours.

Risk factors of nurses' varicose veins of lower limbs

Compared with the control group, the nurses with advanced age ($t=-16.02$, $P<0.01$), marital and childbearing (OR=5.504, 95% CI: 4.219-7.181; OR=5.289, 95%CI: 3.973-7.040), long time of service ($t=-17.21$, $P<0.01$), low level of education (OR=1.560, 95% CI: 1.219-1.988), multiple night shifts (OR=1.343, 95% CI: 1.196-1.5080, family medical history (OR=1.788, 95% CI: 1.400-2.284), swollen legs (OR =1.539, 95% CI: 1.163-2.038), night convulsion, (OR=2.505, 95% CI: 1.947-3.223), itchy skin (OR=2.204, 95% CI: 1.653-2.9380), and cross-legged sitting (OR=0.274, 95%CI: 0.209-0.359) had a greatly higher risk of varicose veins,

Compared with the control group, the nurses with short standing time (OR=1.532, 95% CI: 1.312-1.789), knowledge

of the risk factors (OR=0.106, 95% CI: 0.079-0.141), elastic stocking (OR=0.093, 95% CI: 0.069-0.125), legs-raising (OR=0.140, 95% CI: 0.105-0.185), physical exercise (OR=0.110, 95% CI: 0.081-0.150), calf massage (OR=0.244, 95% CI: 0.188-0.317), foot bath in warm water (OR=0.241, 95% CI: 0.186-0.312), less fatty food (OR=0.202, 95% CI: 0.153-0.266), and flat shoes (OR=0.289, 95% CI: 0.222-0.377) had a much lower risk of varicose veins (Table 1).

Table 1. *Demographic characteristics of the participants.*

Variables		Case N=388,%	Control N=810,%	t	P	OR (95%CI)
Age		29.35 ± 4.59	25.63 ± 3.29	-16.02	*	
Marriage	Yes	221 (58.47)	157 (41.53)		*	5.504 (4.219,7.181)
	No	167 (20.37)	653 (79.63)			
Childbearing	Yes	172 (61.87)	106 (38.13)		*	5.289 (3.973,7.040)
	No	216 (23.48)	704 (76.52)			
Working years		7.70 ± 5.26	3.52 ± 3.11	-17.21	*	
Educational background	Technical secondary school degree	0 (0)	9 (100)			
	Junior college degree	147 (27.58)	386 (72.42)		*	1.560 (1.219,1.988)
	Bachelor degree	241 (36.74)	415 (63.26)			
Positional title	Nurse	101 (16.53)	510 (83.47)		*	3.519 (2.826,4.318)
	Primary nurse	242 (47.17)	271 (52.83)			
	Nurse-in-charge	45 (60.81)	29 (39.19)			
Number of night shift	0	58 (27.75)	151 (72.25)		*	1.343 (1.196,1.508)
	1~2	36 (31.86)	77 (68.14)			
	3~4	129 (24.57)	396 (75.43)			
	5~6	129 (43.43)	168 (56.57)			
	≥ 7	36 (66.67)	18 (33.33)			
Standing time	0~2 h	0 (0.00)	28 (100.00)		*	1.532 (1.312,1.789)
	2~4 h	10 (34.48)	19 (65.52)			
	4~6 h	48 (28.57)	120 (71.43)			
	6~8 h	143 (26.43)	398 (73.57)			
	>8 h	187 (43.29)	245 (56.71))			
Family history	Yes	203 (39.73)	308 (60.27)		*	1.788 (1.400,2.284)
	No	185 (26.93)	502 (73.07)			
Spider web	Yes	223 (77.97)	63 (22.03)		*	16.025 (11.561,22.213)
	No	165 (18.09)	747 (81.91)			
Dilation	Yes	155 (63.01)	91 (36.99)		*	5.256 (3.901,7.081)
	No	233 (24.47)	719 (75.53)			
Itchy skin of calves	Yes	115 (46.94)	130 (53.06)		*	2.204 (1.653,2.938)
	No	273 (28.65)	680 (71.35)			
Swollen legs	Yes	300 (34.97)	558 (65.03)		*	1.539 (1.163,2.038)
	No	88 (25.88)	252 (74.12)			

Night convulsion	Yes	188 (45.97)	221 (54.03)	*	2.505 (1.947,3.223)
	No	200 (25.35)	589 (74.65)		
Having knowledge of risk factors	Yes	162 (18.66)	706 (81.34)	*	0.106 (0.079,0.141)
	No	226 (68.48)	104 (31.52)		
Elastic stockings	Yes	68 (10.76)	564 (89.24)	*	0.093 (0.069,0.125)
	No	320 (56.54)	246 (43.46)		
Legs-raising	Yes	85 (13.85)	541 (86.42)	*	0.140 (0.105,0.185)
	No	303 (52.97)	269 (47.03)		
Physical exercise	Yes	62 (10.78)	513 (89.22)	*	0.110 (0.081,0.150)
	No	326 (52.33)	297 (47.67)		
Calf massage	Yes	116 (18.38)	515 (81.62)	*	0.244 (0.188,0.317)
	No	272 (47.97)	295 (52.03)		
Cross-legged sitting	Yes	94 (17.74)	436 (82.26)	*	0.274 (0.209,0.359)
	No	294 (44.01)	374 (55.99)		
Foot bath in warm water	Yes	131 (19.24)	550 (80.76)	*	0.241 (0.186,0.312)
	No	257 (49.71)	260 (50.29)		
Leg massage	Yes	95 (17.03)	463 (82.97)	*	0.243 (0.185,0.318)
	No	293 (45.78)	347 (54.22)		
Eating less fatty food	Yes	87 (15.43)	477 (84.57)	*	0.202 (0.153,0.266)
	No	301 (47.48)	333 (52.52)		
Flat shoes	Yes	105 (18.75)	455 (81.25)	*	0.289 (0.222,0.377)
	No	283 (44.36)	355 (55.64)		

Multivariate logistic regression analysis on risk factors of nurses getting varicose veins of lower extremity

Through multivariate logistic regression analysis, it was known that the risk factors of nurses suffering from varicose veins included age (OR=1.317, 95%CI: 1.196-1.450), standing time (OR=1.712, 95%CI: 1.209-2.423), genetic factors (OR =2.706, 95%CI: 1.444-5.073), varicose venules of lower extremity (OR=36.514, 95%CI: 15.826-84.243), itchy skin of calves (OR=3.835, 95%CI: 1.753-8.388), and swollen legs (OR=3.629, 95%CI: 1.724-7.638), and the protective factors comprised elastic stockings (OR=0.052, 95%CI: 0.025-0.107), legs-raising (OR=0.201, 95%CI: 0.095-0.425) physical exercise (OR=0.141, 95%CI: 0.072-0.274), none cross-legged sitting (OR=0.179, 95%CI: 0.088-0.363), leg massage (OR=0.073, 95%CI: 0.030- 0.173), eating less fatty food (OR=0.136, 95%CI: 0.066 -0.280), wearing flat shoes (OR=0.154, 95%CI: 0.072-0.330), and knowing the risk factors (OR=0.121, 95%CI: 0.055-0.263) (Table2).

Table 2: *Multivariate logistic analysis on risk factors of nurses getting varicose veins.*

Parameter	Degree of freedom	Estimate	Standard error	Wald chi-square	P	OR	95%CI lower limit	95%CI Upper limit
Age	1	0.2752	0.0490	31.5556	<.0001	1.317	1.196	1.450
Standing	1	0.5375	0.1773	9.1850	0.0024	1.712	1.209	2.423
Genetic factors	1	0.9955	0.3206	9.6428	0.0019	2.706	1.444	5.073
Elastic stockings	1	-2.9539	0.3666	64.9395	<.0001	0.052	0.025	0.107

Legs-raising	1	-1.6065	0.3833	17.5697	<.0001	0.201	0.095	0.425
Exercise	1	-1.9607	0.3391	33.4365	<.0001	0.141	0.072	0.274
None cross-legged sitting	1	-1.7192	0.3608	22.7030	<.0001	0.179	0.088	0.363
Leg massage	1	-2.6240	0.4446	34.8285	<.0001	0.073	0.030	0.173
Eating less fatty food	1	-1.9953	0.3685	29.3202	<.0001	0.136	0.066	0.280
Wearing flat shoes	1	-1.8683	0.3875	23.2413	<.0001	0.154	0.072	0.330
venules of lower extremity	1	3.5977	0.4265	71.1393	<.0001	36.514	15.826	84.243
Itchy skin of calves	1	1.3442	0.3993	11.3298	0.0008	3.835	1.753	8.388
Swollen legs	1	1.2890	0.3797	11.5275	0.0007	3.629	1.724	7.638
Knowing risk factors	1	-2.1148	0.3974	28.3195	<.0001	0.121	0.055	0.263

Correlation of age, working years, and varicose veins of lower extremity

Through linear correlation analysis, we knew that age (r=0.47, P<0.01) and working years (r=0.51, P<0.01) were linearly associated with nurses' varicose veins of lower extremity (Table 3). And age was low related to the varicose veins, but working years was moderately related to it.

Table 3: *Correlation of age, working years, and lower extremity varicose veins.*

Variable	R	P
Age	0.47	<0.0001
Working years	0.51	<0.0001

Discussion

Risk factors of varicose veins of lower extremity

Nurses have to stand for a long time at work and the majority of them are female, so they are at higher risk of varicose veins [1]. In this study, we find that the incidence of varicose veins in the female nurses working in 3A grade hospitals in east China is 32.4%. This value is close to the finding Jieqiong et al. [9] get (31.9%) in Yinchuan, and lower than the incidence of the nurses in Iran which is 31.9% according to the report conducted by Nia et al. [10], but much higher than the investigating result (9.26%) about the incidence of varicose veins in lower extremity in the group over 15 years old in China which is implemented by Leitian et al. [7]. In this study, the outcomes of univariate correlation analysis suggest that advanced age, having marital and childbearing history, long working years, low level of education, multiple night shifts, family medical history, swollen legs, night convulsion, itchy skin, cross-legged sitting, standing time, knowledge about the risk factors, wearing elastic stockings, legs-raising, physical exercise, leg massage, foot bath with warm water, eating less fatty food, and wearing flat shoes are related to nurses' varicose veins. Through further multivariate logistic regression analysis, we reveal that advanced age, long standing time, and genetic factors are the main risk factors of female nurses getting varicose veins in east China, which is in accordance with some researches [8,12,16]. That may be linked to that with the increase of age; blood gravity keeps acting on venous valves to raise the risk of varicose veins [17]. Long standing can increase the pressure of superficial venous system of lower extremity and burden veins so that varicose veins in lower extremity occurs [18]. The findings of a study performed by Vlajinac et al. [19,20] in Serbia indicate that if a person stands over 6 h, he will have a high risk of lower extremity venous disorders. Qiongxing et al. [10], spot that the varicose veins of lower extremity are transmitted as an autosomal recessive, namely, if the parents have varicose veins, their offspring will be at high risk of it. Some literature also points out that if parents have a history of chronic venous disorders, the incidence of their offspring will be up to 90%; for people with single parent getting the disorders, the incidence is 25%; for those without family history, the incidence is only 20%.

Main symptoms of varicose veins of lower extremity

Female nurses are the essential part of medical system. Leg discomfort and aesthetic requirements will seriously impact the quality of nursing work. Through the investigation, we find that the main manifestations of varicose veins of lower extremity in female nurses include: protruding venules of lower limb, itchy skin of calves, and swollen legs, which are similar to the finding of Nia [10] and Mallick et al. [21] also believe that apart from limiting the patients' lives, the manifestations of various vain also affect their leg beauty to badly hurt their mental health. Therefore, the leg health of nurses should be given enough attention.

Protective factors of varicose veins of lower extremity

Positive preventions are able to reduce the risk of varicose vein. In the study, we discover that the main protective factors of varicose veins consist of wearing elastic stocking, legs-raising, physical exercise, no cross-legged sitting, leg massage, eating less fatty food, wearing flat shoes, and having knowledge about the risk factors. Compression therapy can improve the pumping function of calf muscles and decrease the

reflux of venous valves, which is the basic and most common method for preventing and treating varicose veins of lower limbs [22]. Why elastic stocking can treat varicose veins? Because it compresses leg muscle, through the external pressure, to promote venous return. For mild varicose veins, the US Vascular Forum Steering Committee recommends that the pressure of elastic stockings is 20-30 mmHg [6]. Some articles claim that improper application of elastic stocking may give rise to skin rupture or necrosis [23], so the medical elastic stockings should be used under the guidance of doctors. Xuefeng et al. [24], conduct an investigation about nurses' awareness in preventing varicose veins of lower extremity which suggests that 50% of them raise their legs to prevent varicose veins. And in this study, we find that the nurses who raise their legs against varicose veins account for 52.3% of all participants. Nia et al. [10] hold that regular exercise is related to nurses' varicose veins of lower limbs; even it cannot cure varicose veins, but can promote venous blood return against its further development. Cross-legged sitting is also a risk factor of varicose veins, because the folding legs squeeze each other to hinder the blood circulation of legs so that varicose veins occur easily [25]. In addition, leg massage also can improve the blood circulation of lower limbs and wearing flat shoes can ease muscle fatigue so they all are the protective factors of nurses' varicose veins. Multiple studies [26-28] believe that obesity is a risk factor of varicose veins, and eating less fatty food can impactfully prevent obesity. Qiaorong et al. points out that lack of knowledge about preventing varicose veins is a vital reason why clinical nurses have high incidence of varicose veins so that enhancing their knowledge is the basic for improving the protection level [29,30].

Linear correlation between age, working years, and female nurses' varicose veins of lower limbs

Positive prevention and treatment for varicose veins of lower extremity is beneficial to nurses' long term career development. The findings of linear correlation analysis suggest that age and working years are associated linearly with female nurses' varicose veins of lower extremity, and age is low related to the varicose veins, but working years is moderately related to it, which accords with some researches [31,32]. That may be resulted from that with the increase of age, leg muscle is atrophy and vascular wall is aging [12,33,34].

Shortages

However, this study still has some shortages. This study is conducted in east China with 1198 samples which is only a small part of huge nurse team. We collect information through questionnaire instead of following and recording their lifestyles, protection measures, and so on, which is only a cross-sectional study, lack of a large-scale longitudinal investigation.

Conclusion

In The outcomes of this study reveal that the incidence of female nurses' varicose veins of lower extremity in east China is 32.4%, and age as well as working years have linear relationship with their varicose veins of lower extremity. Wearing elastic stockings, legs-raising, and physical exercise are the common preventive methods.

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***Correspondence to**

Yin Ying

Department of stomatology

Nanjing General Hospital of Nanjing Military Area Command

PR China