



Prevalence and Risk Factors of Chronic Venous Disease among Females in Riyadh City, Saudi Arabia

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Abstract

Background: Varicose veins are one of the most common chronic venous disorders of the lower limbs. It occurs frequently in most populations which causes considerable morbidity and imposes high cost at therapeutic, occupational and social levels.

Methods: This study aimed to measure the prevalence, demographic variables and risk factors associated of Varicose Veins in the adult female population in Riyadh, the capital city of Saudi Arabia. This cross-sectional study was conducted in different setting areas in Riyadh city.

Results: A total 380 adult females, aged 18 to 65 years were included. The prevalence of Varicose Veins among the study participants was 181 (47.6%). Using Clinical, Etiological, Anatomical, Pathophysiological classification (CEAP), most participants were C0 (199, 52.4%) and C1 (129, 33.9%). Chi Square test revealed a positive relationship between age, educational level, marital status, positive family history, body mass index <0.001 and use of oral contraceptives 0.002. Study participants reported pain (35%) and restlessness (33.4%) as the most frequent leg symptoms. Multivariate regression analysis showed a significant association between age and positive family history of Varicose Veins with the presence of Varicose Veins with odds ratio above 1.

Conclusion: This study is the first to report the prevalence of Varicose Veins in the female population of Saudi Arabia. It showed a high prevalence of Varicose Veins with increasing age and positive family history as significant associated factors.

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Keywords: Chronic venous disease; Varicose veins; CEAP classification; Chronic venous insufficiency; Prevalence; Risk factors

Introduction

Chronic Venous Insufficiency (CVI) in Chronic Venous Disease encompasses morphological and functional abnormalities within the lower limb in which venous returns system is impaired by reflux, obstruction or muscular pump failure [1]. Venous return from the lower limb is carried by the superficial and deep venous systems, named according to their close relation to the deep fascia of the lower limbs. The superficial and deep venous systems are connected to each other through venous perforators. Effective venous drainage is achieved through unidirectional blood flow, by means of mechanical valves. Different causes can lead to valves dysfunction which may lead to formation of varicose veins. Valvular dysfunction causes a continuous rise in endovascular osmotic pressure followed by a cascade of pathological events that manifest clinically as varicose veins. In addition to the valvular dysfunction mechanism, there are many mechanisms that can lead to this condition such as venous hypertension, changes in veins structure, inflammation and sheer stress, venous outflow obstruction or calf pump failure [2-3].

Varicose veins are one of the most common chronic preventable disorders. Apart from being a common cosmetic problem, it can cause some serious conditions if left untreated. It occurs frequently in most populations which causes considerable morbidity and imposes a high cost at therapeutic, occupational and social levels. The clinical presentation of varicose veins is highly variable ranging from mild telangiectasia (vein diameter smaller than 1 mm) to reticular veins (vein diameter ranges from 1 mm to 3 mm) that ultimately lead to tortuous edematous veins, severe venous pigmentation and consequently ulcerations [2-7]. Patients with varicose veins experience different symptoms that interfere with their daily functionality. Those symptoms are heaviness, tightness, and swelling, skin irritation, pitting ankle edema, pigmented dermatitis, lipedema, and sclerosis and leg ulcers. Pain can manifest as continuous or intermittent, after standing or sitting

and/or pain exacerbated by walking. Other symptoms include muscle cramps, itching, and restless legs [8,9].

Several studies have measured the epidemiology of chronic venous insufficiency. One study estimated the global prevalence of varicose veins as relatively high, ranging from 2% to 56% in men and 1% to 73% in women [10]. A prospective study aimed to collect a global data on the prevalence of chronic venous disorders in Europe and Middle East reported 83.6% to 63.9% of subjects have stage one to stage six Chronic Venous Disorders (CVD) according to CEAP classification (Clinical-Etiological-Anatomical-Pathophysiological) [11]. In the Middle East, a limited number of studies have investigated the prevalence of varicose veins. A survey in western Jerusalem have reported prevalence rate of 29% in females and 10% in males from a diverse population aged 15 and more with the rate increasing with age [12]. Several risk factors are associated with development and progression of varicose veins. Modifiable risk factors include obesity, smoking, prolonged orthostatism and other occupational factors. Non-modifiable risk factors include gender, age, genetic makeup and chronic disease such as diabetes mellitus, hypertension, hyperlipidemia, cardiovascular disease and positive family history of chronic venous disorders [4-6,13-14]. One study in Kuwait found that presence of a positive family history of varicose veins is related to 21% of the study subjects and standing for a long period of time was a risk factor in 51% of the patients [15]. Multiple studies have examined the correlation between obstetric history and high prevalence rate of venous insufficiency especially varicose veins. Recent data have proven that increased mechanic pressure on the inferior *vena cava* and elevated estrogen and progesterone levels during pregnancy could attribute to valvular damage and dilation of veins mainly in lower extremities resulting in formation of varicose veins. Several other factors related to the obstetric history that might lead to development of varicose veins in females of reproductive age; those factors are number of successive pregnancies, use of oral contraceptives, full term delivery and number of children [4-7,16-17].

Up to our knowledge no specific studies done before in the Gulf Countries or Saudi Arabia particularly that are measuring the prevalence and risk factors of Varicose Veins. One study carried out through primary health care centers in the three main cities of Saudi Arabia: Riyadh, Jeddah and Dammam. It has measured the general prevalence of chronic venous insufficiency, which was high among the study population, accounting for 45.2% [17]. The aim of this study was to estimate the prevalence of varicose veins among adult females in Riyadh city and to determine the association between different demographic variables and risk factors associated with this condition.

Methods

Study design and settings

The study design is cross-sectional; data were collected one point at a time and conducted in different setting areas. Riyadh city, the capital of Saudi Arabia, is divided into four regions (south, north, west and east). Those sitting areas are geographically and socioeconomically distributed and cover all regions of the city, in respect of all age ranges targeted in this study. A list of different well-established settings from each region was made and entered into a selection system and the selection process of those setting areas was randomized based on this computerized generator (Figure 1). The study included two main hospitals; King Saud Medical City (KSMC) and King Abdul-Aziz Medical City in National Guards Health Affairs (KAMC-NGHA), three primary health care centers in west (Alariega

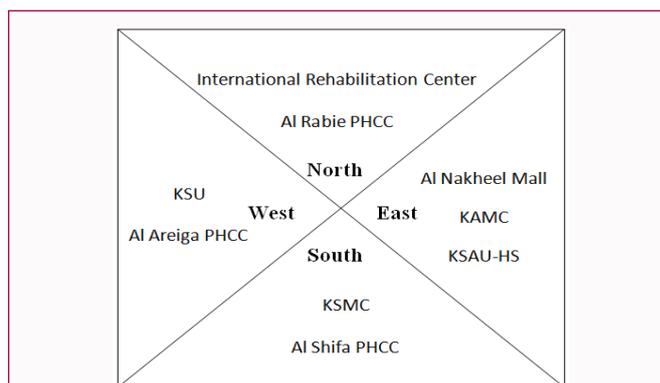


Figure 1: Distribution of Setting Areas.

PHCC: Primary Health Care Center; KSU: King Saud University; KSMC: King Saud Medical City; KAMC: King Abdulaziz Medical City; KSAU-HS: King Saud Bin Abdulaziz University for Health Sciences

Primary Health Care Center), south (AlShifa Primary Health Care Center II) and north (Alrabie Primary Health Care Center). Two governmental universities, King Saud University (KSU) and King Saud Bin Abdelaziz University for Health Sciences (KSAU-HS), one large shopping center (Al Nakheel Mall) and International Rehabilitation Educational Center. The selected locations receive visitors from the designated areas and all over the city on daily basis.

Selection of settings

A permission letter was written, signed by the research department of King Saud Bin Abdelaziz University for Health Sciences (KSAU-HS) and sent to each selected setting. A meeting was held with the head of the Ambulatory Care Center of King Abdul-Aziz Medical City in National Guards Health Affairs (KAMC-NGHA) to get a permission to use the main hall for data collection. With a bed capacity of 1501, KAMC is one of the largest medical cities in Riyadh which has been recognized as a distinguished health care provider [19]. We communicated with the students' affairs of female college of medicine at King Saud Bin Abdelaziz University for Health Sciences (KSAU-HS) to utilize the main lobby for data collection among students during break hours for two days. King Saud Bin Abdelaziz University for Health Sciences was established in 2005 and has been growing extensively since then [20]. A permission letter and data collection plan along with the Institutional Review Board (IRB) approval memo were sent to the events organizing department at Al Nakheel Mall which is located at eastern region of Riyadh and is considered one of the largest shopping centers [21]. We contacted the director of Alrabie Primary Health Care Center which is one of the main primary medical centers in north of Riyadh to arrange for a data collection visit. In addition [22], the principal of International Rehabilitation Educational center at Al Malqa district was contacted to collect data from teachers, mothers and caregivers [23]. King Saud University (KSU) is the first institute for higher education. It accommodates 30,000 female students [24]. A meeting was arranged between the research team and the campus administration office of KSU to arrange a visit for data collection at the main hall of the female campus. We visited the director of Alariega Primary Health Care Center which is considered the primary medical care center in that region [22].

King Saud Medical City (KSMC) is the oldest medical center in Riyadh that was established in 1956. It has a bed capacity of 1400 and is recognized as one of the most vital tertiary hospitals [25].

Data collection was done at the outpatient and waiting areas after the approval of the head director of the outpatient department. Arrangement was made with AlShifa Primary Health Care Center II at southern region. Data were collected from visitors and staff at a single visit [22].

Identification of study participants

According to the Saudi Arabia's General Authority for Statistics (GaStat) [26], the total population count of females in Riyadh in 2010, including Saudi and non-Saudi females was 2141943. Which accounts for 40.9% of the total population of Riyadh city. With confidence level of 95% and margin of error of 5%, the estimated sample size was 377 as calculated by Raosoft program [18]. The study used a convenience sampling technique. Any available female who aged from 18 to 65 years and agreed to participate was selected.

Data collection process

Following the Institutional Review Board approval by King Abdullah International Medical Research Center KAIMRC, a self-administered questionnaire consisting of 10 questions adapted from Southern Vascular Institute was utilized [27]. The questionnaire was modified and translated to Arabic. The translated questionnaire version was pilot tested on 30 females, content validity was taken using experts' opinion of four specialists in vascular surgery and reliability analysis test was performed using Statistical package for social sciences SPSS to calculate Cronbach's alpha (α coefficient). The questionnaire included demographic variables and personal history (age, level of education, monthly income and marital status and smoking). Obstetric history included number of pregnancies -including miscarriages- and use of oral contraception. Daily activity represented in the most frequent orthostatic position of the legs (standing up or sitting down. Experienced leg symptoms such as pain, tiredness, itching, swelling, heaviness, burning, cramping, throbbing and restless leg, as well as family history of varicose veins. All questions of the questionnaire were close ended. CEAP Clinical Classification System was utilized in the physical examination of the study to classify the severity of varicose veins; it consisted of seven categories as shown in Figure 2. The validity and reliability of this scoring system was measured by means of experts' opinion and supporting studies. As in most studies done to measure the prevalence of varicose veins, other components of the system were not utilized as they need special diagnostic measures and tools. A special corner was used during data collection at all selected areas and females passing by were invited to participate in the study. After obtaining the consent and filling out the survey, the height and weight of the participants were measured to calculate the BMI. The participants were asked to remain in a standing position for a minimum of two minutes to increase the intravascular pressure before the physical examination. The physical examination consisted of inspection of the legs from anterior and posterior views to observe any signs of Chronic Venous Disease (CVD). As in the Basle study [28], photographs of some subjects' legs were taken after verbal and written agreement and then analyzed by the principal investigator to increase the accuracy of our data.

Data analysis

Statistical analysis was performed using Statistical Package for the Social Science version 22 (SPSS Inc., Chicago, IL). Frequencies and percentages were used to describe categorical variables while mean and standard deviation were used to describe continuous variables. P value <0.05 was considered significant. The height and weight of the subjects were measured to calculate the Body Mass Index (BMI)

Clinical Classification	
C0;	No visible or palpable signs of venous disease
C1;	Telangiectasia or reticular veins
C2;	Varicose veins
C3;	Edema
C4;	Pigmentation and/or atrophy
C5;	Healed venous ulcer
C6;	Active venous ulcer

Figure 2: CEAP: Clinical, Etiological, Anatomical, Physiological Classification.

using SPSS. To test the association between the outcome variable; statuses of varicose veins with any other categorical risk factor e.g. use of contraceptive methods; Chi Square 2 test was performed. In case of any sparse data, Fisher's exact test was used. Multivariate regression analysis was used to adjust for confounding and test the association between different variables. Confidentiality and anonymity were maintained throughout the study and no name or medical record number was taken from the study subjects. Only the research team had access to the data during the study and after completion. A consent form was distributed to all participants prior to data collection.

Results

Out of 380 participants included in this study, the mean BMI was 27.75 kg/m², the mean weight was 67.63 kg and the mean height was 158.17 cm. Age was categorized into 6 categories; 18 to 25 years (140, 38.8%), 26 to 35 years (129, 33.9%), 36 to 45 years (55, 14.5%), 46 to 55 years (33, 8.7%), 56 to 65 years (18, 4.7%) and older than 65 years (5, 1.3%). Educational level was categorized into five categories; uneducated (15, 3.9%), less than public education (45, 11.8%), high school graduate (124, 32.6%), bachelor's degree (188, 49.5%) and higher education (8, 2.1%). Monthly income was categorized into 4 categories; less than 5000 SAR (198, 52.1%), between 5000 to 10,000 SAR (116, 30.5%), 10,000 to 15,000 SAR (48, 12.6%), more than 15,000 SAR (18, 4.7%). Marital status was categorized into; single (196, 51.6%) and married (184, 48.4%). BMI was classified as underweight <18.5 kg/m² (20, 5.3%), normal weight 18.5 to 24.9 kg/m² (145, 38.2%), overweight 25 to 29.9 kg/m² (109, 28.7%), class 1 obesity 30 to 34.9 kg/m² (68 to 17.9%), class 2 obesity 35 to 39.9 kg/m² (25, 6.6%), class 3 obesity \geq 40 kg/m² (13 to 3.4%) Table 1.

253 participants had a negative family history of varicose veins representing 66.6% of the total sample and 127 participants with a positive family history representing 33.4% of the total sample. 288 participants who have not used oral contraceptive account for 75.8% and 92 participants who have used oral contraceptive account for 24.2% of the total sample. Smoking status was as follows; non-smokers (348, 91.6%) and smokers (32, 8.4%). Daily activity was divided into two levels; spending most of the day standing up (159, 41.8%) or spending most of the day sitting down (221, 58.2%). Number of pregnancies was classified into seven classifications; have never been pregnant (196, 51.6%), once (30, 7.9%), twice (28, 7.4%), three times (24, 6.3%), four times (27, 7.1%) and more than four times (75, 19.7%) Table 1.

Upon physical examination of our sample, the participants were classified according to CEAP clinical classification system where C0 indicates absence of varicose veins and C6 indicates the most severe form. The most frequent CEAP clinical classes were C0 (199, 52.4%) and C1 (129, 33.9%). Moderate to severe stages (C2-C4) were less observed among participants, C2 (39, 10.3%), C3 (12, 3.2%) and

Table 1: Demographic variables and personal history.

Variable	Total (n=388)
Age	
Between 18 to 25 years	140 (38.8%)
Between 26 to 35 years	129 (33.9%)
Between 36 to 45 years	55 (14.5%)
Between 46 to 55 years	33 (8.7%)
Between 56 to 65 years	18 (4.7%)
Older than 65 years	5 (1.3%)
Educational Level	
Uneducated	15 (3.9%)
Less than public education	45 (11.8%)
High school graduate	124 (32.6%)
Bachelor's degree	188 (49.5%)
Higher education	8 (2.1%)
Monthly Income	
Less than 5000 SAR	198 (52.1%)
Between 5000 – 10000 SAR	116 (30.5%)
Between 10000 – 15000 SAR	48 (12.6%)
More than 15000 SAR	18 (4.7%)
Marital Status	
Single	196 (51.6%)
Married	184 (48.4%)
BMI	
<18.5	20 (5.3%)
18.5 to 24.9	145 (38.2%)
25.0 to 29.9	109 (28.7%)
30.0 to 34.9	68 (17.9%)
35.0 to 39.9	25 (6.6%)
>= 40	13 (3.4%)
Family History of Varicose Veins	
No	253 (66.6%)
Yes	127 (33.4%)
Use of Oral Contraceptives	
No	288 (75.8%)
Yes	92 (24.2%)
Smoking	
No	348 (91.6%)
Yes	32 (8.4%)
Daily Activity	
Standing Up	159 (41.8%)
Sitting Down	221 (58.2%)
Number of Pregnancies	
Never been pregnant	196 (51.6%)
Once	30 (7.9%)
Twice	28 (7.4%)
Three times	24 (6.3%)
Four times	27 (7.1%)
More than four times	75 (19.7%)

Table 2: Prevalence of varicose veins and reported leg symptoms.

Variables	Categories	n (%)
Presence of Varicose Veins(n=380)	Yes	181 (47.6%)
	No	199 (52.4%)
Categories of Varicose Veins According to CEAP Classification (n=181)	C1	129 (33.9%)
	C2	39 (10.3%)
	C3	12 (3.2%)
	C4	1 (0.3%)
	C5	0 (0%)
	C6	0 (0%)
Presence of Leg Symptoms (n=380)	Yes	284 (74.7%)
	No	96 (25.3%)
Reported Leg Symptoms (n=284)	Pain	133 (35%)
	Tiredness	99 (26.1%)
	Itching	45 (11.8%)
	Swelling	67 (17.6%)
	Heaviness	67 (17.6%)
	Burning	64 (16.8%)
	Cramping	123 (32.4%)
	Throbbing	41 (10.8%)
Restlessness	127 (33.4%)	

C4 (1, 0.3%). Advanced stages (C5-C6) were not observed in our sample. Our study participants reported pain as the most frequent leg symptom (133, 35%). Other reported symptoms were restlessness (127, 33.4%), cramping (123, 32.4%) and tiredness (99, 26.1%), itching (45, 11.8%), swelling (67, 17.6%), heaviness (67, 17.6%), burning (64, 16.8%), and throbbing (41, 10.8%) Table 2.

Analytical Analysis

Statistical analysis using Chi Square test revealed a positive relationship between age, educational level, marital status, family history, use of oral contraceptives, number of pregnancies and BMI of participants with presence of varicose veins with P value <0.001.

However, there was no relationship between monthly income, smoking, standing up or sitting down with presence of varicose veins with P value of 0.280, 0.929, and 0.956, respectively.

Multivariate analysis was used to adjust the relationship of the previous risk factors associated with presence of varicose veins as reported by Chi square and Fisher Exact test. Logistic regression analysis revealed that the following variables were not associated with presence of varicose veins; educational level (OR=2.86; 95% CI 30.30 to 0.272), monthly income (OR=1.82; 95% CI 6.31 to 0.52), smoking (OR=0.42; 95% CI 1.05 to 0.17), marital status (OR=0.73; 95% CI 1.34 to 0.39), number of pregnancies (OR=0.55; 95% CI 1.58 to 0.19), use of oral contraceptives (OR=1.04; 95% CI 2.00 to 0.54), daily activity (OR=0.73; 95% CI 1.25 to 0.43), BMI (OR=1.31; 95% CI 5.27 to 0.32). Age was significantly associated with presence of varicose veins (OR=0.32; 95% CI 4.74 to 0.02); positive family history was significantly associated with varicose veins (OR=0.32; 95% CI 0.54 to 0.18) with P value <0.001 (Table 3 and 4).

Discussion

The aim of this study is to estimate the prevalence of varicose veins among females and to determine risk factors associated with

Table 3: Association between demographic variables and presence of varicose veins using chi square test.

Variable	Total	VV-Yes	VV-No	P-value
Age				
Between 18 to 25 years	140 (38.8%)	34 (18.8%)	107 (53.3%)	<0.001
Between 26 to 35 years	129 (33.9%)	57 (31.5%)	72 (36.29%)	
Between 36 to 45 years	55 (14.5%)	45 (24.9%)	10 (5.0%)	
Between 46 to 55 years	33 (8.7%)	29 (16.0%)	4 (2.0%)	
Between 56 to 65 years	18 (4.7%)	12 (6.6%)	6 (3.0%)	
Older than 65 years	5 (1.3%)	4 (2.2%)	1 (5%)	
Educational Level				
Uneducated	15 (3.9%)	11 (6.1%)	4 (2.0%)	<0.001
Less than public education	45 (11.8%)	32 (17.7%)	13 (6.5%)	
High school graduate	124 (32.6%)	52 (28.7%)	72 (36.2%)	
Bachelor's degree	188 (49.5%)	81 (44.8%)	107 (53.8%)	
Higher education	8 (2.1%)	5 (2.8%)	3 (1.5%)	
Monthly Income				
Less than 5000 SAR	198 (52.1%)	85 (47.0%)	198 (52.1%)	0.28
Between 5000 to 10000 SAR	116 (30.5%)	61 (33.7%)	116 (30.5%)	
Between 10000 to 15000 SAR	48 (12.6%)	26 (14.4%)	48 (12.6%)	
More than 15000 SAR	18 (4.7%)	9 (5.0%)	18 (4.7%)	
Marital Status				
Single	196 (51.6%)	65 (35.9%)	131 (65.8%)	<0.001
Married	184 (48.4%)	116 (64.1%)	86 (34.2%)	
Family History of Varicose Veins				
No	253 (66.6%)	101 (55.8%)	152 (76.4%)	<0.001
Yes	127 (33.4%)	80 (44.2%)	47 (23.6%)	
Use of Oral Contraceptives				
No	288 (75.8%)	122 (67.4%)	166 (83.4%)	<0.001
Yes	92 (24.2%)	59 (32.6%)	33 (16.6%)	
Number of Pregnancies				
Never been pregnant	196 (51.6%)	55 (30.4%)	141 (70.9%)	<0.001
Once	30 (7.9%)	15 (8.3%)	15 (7.5%)	
Twice	28 (7.4%)	19 (10.5%)	9 (4.5%)	
Three times	24 (6.3%)	13 (7.2%)	11 (5.5%)	
Four times	27 (7.1%)	19 (10.5%)	8 (4%)	
More than four times	75 (19.7%)	60 (33.1%)	15 (7.5%)	
Smoking				
No	348 (91.6%)	166 (91.7%)	182 (91.5%)	0.929
Yes	32 (8.4%)	15 (8.3%)	17 (8.5%)	
Daily Activity				
Standing up most of the day	159 (41.8%)	76 (42%)	83 (41.7%)	0.956
Sitting down most of the day	221 (58.2%)	105 (58%)	116 (58.3%)	
BMI				
<18.5	20 (5.3%)	0 (0%)	20 (10.1%)	<0.001
18.5 to 24.9	145 (38.2%)	55 (30.4%)	90 (45.2%)	
25.0 to 29.9	109 (28.7%)	59 (32.6%)	50 (25.1%)	
30.0 to 34.9	68 (17.9%)	45 (24.9%)	23 (11.6%)	
35.0 to 39.9	25 (6.6%)	14 (7.7%)	11 (5.5%)	
>= 40	13 (3.4%)	8 (4.4%)	5 (2.5%)	

BMI: Body Mass Index

Table 4: Multivariate logistic regression analysis for risk factors of varicose veins.

Variables	OR	CI		P-value
		Upper	Lower	
Age				
*Between 18 to 25 years				<0.001
Between 26 to 35 years	0.321	4.743	0.022	0.409
Between 36 to 45 years	0.67	9.376	0.048	0.766
Between 46 to 55 years	4.123	61.614	0.276	0.305
Between 56 to 65 years	4.626	76.14	0.281	0.284
Older than 65 years	0.91	11.821	0.07	0.942
Educational Level				
*Uneducated				0.666
Less than public education	2.869	30.304	0.272	0.381
High school graduate	1.887	12.18	0.292	0.504
Bachelor's degree	1.048	5.808	0.189	0.957
Higher education	1.055	5.586	0.199	0.95
Monthly Income				
*Less than 5000 SAR				0.553
Between 5000 – 10000 SAR	1.827	6.313	0.529	0.341
Between 10000 – 15000 SAR	1.222	4.249	0.352	0.752
More than 15000 SAR	1.357	5.216	0.353	0.657
Smoking				
*No				
Yes	0.426	1.054	0.172	0.065
Marital Status				
*Single				
Married	0.731	1.341	0.399	0.312
Number of Pregnancies				
*Not married				0.181
Never been pregnant	0.55	1.584	0.191	0.268
Once	2.221	7.476	0.66	0.198
Twice	3.394	13.557	0.85	0.084
Three times	2.14	9.04	0.507	0.301
Four times	2.56	12.364	0.53	0.242
More than four times	3.314	15.535	0.707	0.129
Use of Oral Contraceptives				
*No				
Yes	1.047	2.004	0.547	0.889
Daily Activity				
*Standing up most of the day				
Sitting down most of the day	0.739	1.25	0.437	0.259
BMI				
* <18.5				0.673
18.5–24.9	0.000	0.000	0.000	0.998
25.0–29.9	1.318	5.278	0.329	0.697
30.0–34.9	1.676	6.700	0.419	0.465
35.0–39.9	2.149	8.850	0.522	0.290
>= 40	0.996	4.992	0.199	0.996
Family History of Varicose Veins				
*No				<0.001
Yes	0.322	0.548	0.189	

The first category from each variable is the reference. (not significant and not shown)

OR: Odds Ratio; CI: Confidence Interval; BMI: Body Mass Index

this condition. Upon searching, we found a limited number of studies measuring the prevalence and risk factors associated with varicose veins both globally and locally and most of those studies were either conducted few decades ago or did not estimate the prevalence of varicose veins in a larger population and rather focused on specific occupational groups [30, 31]. However, data of this study showed similar results to the existing evidence in which almost half of the study sample have varicose veins [32-35]. A study done by Bawakid et al. in Makah, Jeddah and Dammam showed an overall prevalence of chronic venous insufficiency of 45.6% in both males and females [17]. Additionally, a cross-sectional study conducted in primary health care centers in Qassim region of Saudi Arabia showed that the prevalence of varicose veins among men and women was 61.1% [29]. A recent questionnaire-based study coupled with Doppler ultrasonography was conducted in Republic of Korea reported less prevalence of varicose veins among female nurses (16.18%); this could be attributed to the fact of changes in lifestyle and advances in access to health care [36]. Among those with varicose veins, the most frequent CEAP class was C1 which indicates a mild form of the disease presenting as telangiectasia or reticular veins among females in our study. Likewise, two large cross-sectional studies done in Germany and Spain showed similar results in which majority of the study population had a mild degree of varicose veins [34,35]. Pain, tiredness, cramping and restlessness were the most common reported leg symptoms in our population. Similar findings were observed in an epidemiological study by Vuylsteke et al. in Belgium [10].

Age is a major significant risk factor that increases the likelihood of development and progression of varicose veins. Advancing in age is contributing to further skin trophic changes, increase in the endovascular pressure and incompetency of the superficial venous system. Multiple studies have proven a positive relationship between age and chronic venous insufficiency [31-33]. Our study findings support the existing evidence of higher prevalence of varicose veins among older adults. Positive family history of varicose veins is also considered a risk factor. Different studies showed a positive relationship between presence of varicose veins and family history in first-degree relatives [7,10,30,37]. Our results confirmed a significant association between varicose veins and positive family history consistent with findings of other studies.

Several studies reported a significant association between presence of varicose veins and demographic variables such as social class, marital status, educational level and daily activity. A recent study by Li Erding et al. in China have proven that higher educational level was associated with less prevalence of varicose veins [37]. Furthermore, occupational environment that requires a prolonged duration of standing up was considered as a significant risk factor of varicose veins as reported by different studies [30,37-39]. A recent study done by Masih AK proved that standing for a long period of time can increase the risk of development of varicose veins [31]. Data from several studies revealed that increased number of pregnancies is associated with increased severity of varicose veins [7,36]. A large cross-sectional study done in different locations of France reported that 72.7% of pregnant women have varicose veins [4]. Moreover, higher Body Mass Index (BMI) was related to more advanced stages of varicose veins [9,10,31,33]. In contrast, our study findings showed no association between the previously mentioned risk factors and presence or severity of varicose veins after using multivariate regression analysis. This could be attributed to multiple factors; one is recent changes in lifestyle and increased awareness about

varicose veins and its risk factors through easier access to health care specifically through social media. Other factors are related to the difference in the sample size, study designs and analytical tests used in our study compared to other studies. Currently, most existing studies are using a cross sectional design and targeting a specific population; occasionally healthcare workers with a smaller sample size. Therefore, increasing the possibility of selection bias and consequently not providing a stronger cause-and-effect relationship.

Our study has several limitations; one is the convenient sampling technique which could increase the selection bias. Moreover, the access to different setting areas to cover all regions of Riyadh was not possible as it required much more complex arrangements and coordination. In addition, participation among females in some of the settings was challenging in terms of consenting to proceed to the physical examination for different personal and cultural values. Lastly, more diagnostic modalities such as Doppler Ultrasonography were needed to increase the accuracy of CEAP classification system and avoid underestimation of superficial and occult varicose veins.

Conclusion

This study showed a high prevalence of varicose veins among females in Riyadh city. Risk factors such as age and positive family history were significantly associated with increasing prevalence of varicose veins using regression analysis model. More cohort studies with representative samples are needed to assess risk factors associated with development and progression of varicose veins in our population.

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