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Research Article

Determinants of Lower Limb Varicose Vein among Adult Patients in Wolaita Sodo University Comprehensive Specialized Hospital at Wolaita Zone, Southern Ethiopia: An Unmatched Case-Control Study

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Abstract

Background: Varicose veins are dilated, tortuous, and stretched subcutaneous veins of the lower leg and are the most frequently reported medical condition. The etiology of varicose veins has only been partially understood and very little is known about the determinants of varicose veins in the study area. This study aims to identify determinants for the development of lower limb varicose veins in Ethiopia.

Objectives: This study aims to identify determinants of varicose veins among adult patients in Wolaita Sodo University's comprehensive specialized hospital.

Methods: A facility-based unmatched case-control study was carried out at Wolaita Sodo University comprehensive specialized hospital among 354 study participants from August 1 to November 3, 2022. A systematic random sampling technique was used to select control groups. Data were entered using Epi data Version 4.6 and then analysis was carried out using SPSS Version 25. First descriptive statistics were computed to describe study participants. Then bivariate logistic regression analysis was used to identify candidate variables, those variables p- values <0.25 were candidate variables for multivariate analysis. Finally, multivariable logistic regression analysis was carried out, and those variables p- value <0.05 were declared as determinants of lower limb varicose veins.

Results: Lifting heavy objects (AOR 5.53, 95% CI [1.99, 14.37]), smoking a cigarette (AOR 5.19, 95% CI [1.338, 20.14]), drinking water <5 cups/day (AOR 4.49, 95% CI [1.435, 14.06]), irregularity of defecation (AOR 8.44, 95% CI [1.422, 50.15]), family history of the varicose vein (AOR 28, 95% CI [7.827, 100]), consumed dairy product (AOR 13, 95% CI [26.11, 68.28]). Additionally, consumed cereal foods (AOR 0.158, 95% CI [0.032, 0.787]) were determinants of lower limb varicose veins.

Conclusions: In this study, smoking a cigarette, lifting a heavy object, consuming cereal food, consuming a dairy product, drinking less than 5 cups of water/day & irregularity of defecation in addition to this family history of varicose vein in first-degree relatives were determinants of lower limb varicose vein. These findings provide a basis to design an evidence-based low-cost strategy for the prevention of LLVV in the study area.

Keywords: Determinants; Ethiopia; Varicose vein

Abbreviations

BMI: Body Mass Index; CEAP: Clinical Etiologic Anatomic Pathophysiologic; CVD: Chronic Venous Disease; DVT: Deep Venous Thrombosis; ECSA: Ethiopia Central Statistics Agency; GBM: Gradient Boosting Machine; GWAS: Genome-Wide Association; LLVV: Lower limb Varicose Vein; TBHD: Thrombomodulin; VVs: Varicose veins; WHO: World Health Organization; WHR: Waist-Hip Ratio

Introduction

Varicose veins are dilated tortuous superficial veins that result from the defective structure and function of the valve of the saphenous vein, intrinsic weakness of the vein wall, high intramural pressure, or due to arterio-venous fistula [1]. Varicose veins of the lower limbs are dilated subcutaneous veins ≥3 mm in diameter measured in an upright position [2]. Synonyms include varicosities, varices & varix [2]. The etiology of the varicose vein has only been partially understood & the occurrence may be due to primary or secondary causes. Primarily due to internal biochemical or morphological abnormality of the veins wall. Secondarily due to obstruction of a deep vein, arterio-venous fistula, superficial thrombophlebitis, or due to tumor [2].

American Venous Forum & Society for Vascular Surgery developed Clinical practice guidelines for the care of patients with varicose veins of the lower limbs and pelvis. The document includes recommendations on the management of superficial and perforating vein incompetence in patients with associated, more advanced Chronic Venous Diseases (CVDs), including edema, skin changes, or venous ulcers. Recommendations of the Venous Guideline Committee based on the Grading of Recommendations Assessment, Development, and Evaluation system [2].

The prevalence of varicose veins is estimated to be <1% to 73% among women & <2 to 56% among men [3]. Studies conducted in Ethiopia show the prevalence was 5.1 to 5.5% [4,5]. The factors influencing varicose vein formation have not been fully understood. Epidemiological studies have established multiple risk factors such as

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age, female sex, pregnancy, obesity & prior DVT, but several other putative factors remain unconfirmed [6-10]. Globally, according to Davies [11] review, recent evidence supports trends of varicose vein case rate of 51.9 cases per 1000 women & 39.4 cases per 1000 men. It also shows that the prevalence of CVD & varicose veins varies widely by region through highest in western countries. It is estimated that more than 30 million adults in the United States of America have varicose veins with intervention consuming more than $1 billion in direct healthcare resources per year [12]. In eastern Africa, the prevalence of varicose veins ranges from 5.1% to 51% among the general population [4,5,13,14]. However, in Ethiopia, only a few studies reviled that the prevalence of varicose vein cases among vascular surgical units was around 5.1 to 5.5%.

Patients with varicose veins present with no symptoms except for those of cosmetic concern, which have a psychological impact that may reduce patients' quality of life. Other patients report symptoms related to varicose veins such as tingling, aching, burning, pain, swelling, a sensation of heaviness, restless legs, leg tenderness& fatigue [10]. Studies show different risk factors for the development of varicose veins such as advanced Age, Obesity, Pregnancy, Physical inactivity, sex (female), oral contraceptive, prior DVT, Smoking, Constipation, working posture, Hormone replacement therapy, Family history of varicose vein & history of leg trauma or surgery are established well [13-25].

However, those studies did not measure such variables climate condition of participants resides & indigenous dietary habits, which this study attempted to address. On the other hand, those conducted studies are cross-sectional & case-control studies they select cases due to CEAP classification but all cases of clinical classification of chronic venous disease were included from class 1 to class 6 as cases that may mask the direct causes of varicose veins. This study aims to improve case selection ascertainment by including only clinical classification class 2 of CEAP classification, which helps to identify determinants of varicose veins & reduce bias and includes weather (climate) condition of participant's reside & indigenous dietary habits will be additional variables.

There is a clear lifestyle difference between western countries & Sub-Saharan African countries. The incidence & prevalence of varicose vein was higher in western countries but the prevalence of VVs is increasing in Ethiopia while the causes are not established. Hence, a varicose vein has been considered a problem with substantial psychological, physical, and financial impacts because they affect work efficiency & lead to increases in disability & costs of treatment. A need exists to distinguish risk factors for the development of varicose veins. Particularly risk factors specific to lower limb varicose vein has not well known, and to our knowledge, no study retrospectively tracked for development of lower limb varicose veins in the study area. Therefore, the primary aim of this research is to answer a simple yet extremely complex clinical question: in a patient presenting with signs and symptoms of lower limb venous disease, what are the determinants for the development of lower limb varicose veins? Once these potential risk factors have been elucidated, appropriate interventions will then be pursued. This may use as an input for healthcare workers in the early prevention of modifiable risk factors and may use as an input for studies related to lower limb venous disease.

Materials and Methods

Study area & period

This study was conducted at Wolaita Sodo University comprehensive specialized hospital from August 1 to November 3, 2022. Wolaita Sodo University comprehensive specialized hospital was located in Wolaita zone Sodo town, 329 km south of Addis Ababa and 151 km far from Hawassa. Wolaita Sodo University, College of Health Sciences and Medicine with its former name, Wolaita Sodo Hospital, which has established by Sudan Interior Mission (SIM) in 1927. It was a primary hospital for 50 years and a general hospital for 30 and later it became a Teaching and Referral Hospital since it has incorporated into Wolaita Sodo University in 2011. As of 22 September 2021, the Minister of Health in Ethiopia assessed and promoted our hospital to "Wolaita Sodo University Comprehensive Specialized Hospital'. The hospital has 1198 clinical staff and 570 administrative staff. The hospital HMIS report shows the hospital serves 450 to 500 patients per day & annually Serves 2 million patients/per year from the catchment area, the hospital has 20 outpatient departments out of 20 OPDs 3 are surgical OPD. Surgical OPD's monthly average patient flow is 300 in each OPDS.

Study design

A facility-based unmatched case-control study was conducted.

Source population

Wolaita Sodo University Comprehensive Specialized Hospital surgical outpatient department patients from August 1 to November 3, 2022.

Study population

For cases, Cases defined as "Clearly visible, dilated tortuous and possible prominent subcutaneous vein of the lower extremity which is ≥ 3 mm in diameter upright position". "Visible" was added to help the subjects rule out any visible leg complaints. The definition corresponds to the 2nd class in the Clinical-Etiological-Anatomic-Pathophysiologic (CEAP) classification system of the American venous forum [2,16]. The patients were selected & examined by a surgical Doctor in a warm room by inspection of lower extremities & Trendelenburg test done to verification of cases. Those patients were selected from the surgical outpatient department diagnosed as varicose veins. For control, those patients selected from surgical OPD who have no clearly visible vein in the lower extremity by physical examination & Trendelenburg tests for verification of free of disease by the same consultant surgical doctor.

Inclusion criteria for cases: Those patients with visible dilated veins in the lower limb, which is ≥ 3 mm in diameter, included using Doppler ultrasound.

Patients ages >18 years.

Exclusion criteria for cases: Patients with a dilated vein in the lower limb < 3mm in diameter Doppler ultrasound.

Patients severely ill and age <18 years

Inclusion criteria for controls: Patients who have no dilated visible vein in the lower limb were included

Exclusion criteria for control.

Patients who were severely ill were excluded.

Sample size determination

The sample size was calculated using open Epi version 3.01. Sample size shows, the list difference of 16.61% between case & control will give the minimum 107 cases by assuming a confidence Interval of

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95%, the proportion of controls exposed to physical inactivity is 46.8, Odds Ratio (OR) among cases 1.97 & case to control ratio 2 (Table 1).

By adding non-response 10%, the final sample size was 354. Cases 118 and 236 controls. The total sample size was rechecked via Epi info version 7.2.4.0 which is similar to the sample size calculated by Open Epi.

Sampling method

The systematic random sampling method was used to select the control group. Controls of 236 participants were selected for every 4th patient. The first patient was selected after a random start through the lottery method. K=N/n 900/236 = 3.82 ≈ 4. Cases of 118 patients were sampled purposively until the sample size was reached. Controls were selected from the source population (N), which is 900. It is a baseline count data from the surgical OPD registration book for the past 6-month's average patient flow (Figure 1).

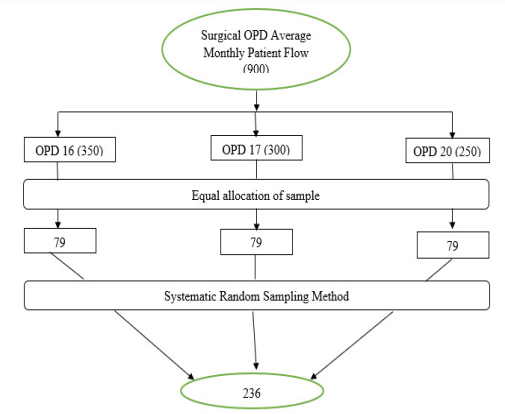

Figure 1: Study participant recruitment flow diagram, 2022.

Data collection procedures

Interviewing data collection technique used for data collection. The data was collected through a structured standard data collection tool, which is first prepared in English & then translated into Amharic to increase consistency & questioner were coded before data collection & 5% of the questioner were pretested in St. Marry catholic primary hospital (Dubbo) to check the appropriateness of the questioner, then some modification was made on tool.

The scale was used to weigh the respondent's weight the weighing device will be calibrated before measuring every respondent by making the measuring device zero after every measurement. The height of respondents was measured at a standing position through standard calibrated tool. A medical chart was used to obtain the diagnosis and Doppler ultrasound result. The data was collected by 3 female BSc nurses after a briefing on the data collection tool for 1day and supervision was done by me. The data was collected from Wolaita Sodo University Specialized Comprehensive Hospital. Data were collected from August 1 to November 3, 2022.

Operational definition

Varicose vein: measured through dichotomous response (yes or no). A positive ("yes") response is clearly visible dilated tortuous subcutaneous vein of the lower extremity, which is ≥ 3 mm in diameter in an upright position [1,17,18].

Physical inactivity: Defined as not Meeting the WHO recommendation to perform at least 150 minutes of moderate-intensity physical activities per week or equivalent" [23].

Smoking: the inquiry was made into smoking habits & participants were classified as current smokers (still smoking at least one cigarette daily as long as 1 year), ex-smoker (quit smoking at least 6 months before the study time), non-smoker (never smoked or smoked less than one pack per month or 20 packs in his/her whole life) [12]. Among smokers, the Smoking Index (SI) will be calculated by multiplying the number of cigarettes smoked by the lifelong duration of smoking in a year. Smokers are classified according to their SI light smoker (SI <200), moderate smoker (SI 200 - 400) & heavy smoker (SI 400) [21]. Constipation (irregularity of defecation): defined as a stool frequency of less than three per week [1].

Data management analysis

The collected data were checked for completeness and consistency, then entered into Epi-Data version 4.6 then data exported to SPSS version 25 for further analysis. Descriptive statistical analysis, such as proportion, mean & standard deviation, is used to describe the study participants. Then bivariate logistic regression analysis was carried out and candidate variables were selected at a p-value of <0.25. Multivariate Logistic regression analysis was done after testing multi-collinearity by using the Variance Inflation Factor <5. The independent determinates of lower limb varicose veins were identified at a p-value of 0.05 along with a 95 % CI. While the model fitness of the study was assessed using Hosmer and Lemshow model fitness test (p-value =0.25) & classification table, the results were finally presented using the table.

Self-response measurements (variables):

1. Lifting heavy objects differs from respondent to respondent due to no standard agreed definition for heavy. Therefore, the measurement is subjective.
2. Family history of varicose veins in first-degree relatives is also subjective.

Table 1: Parameters used to calculate sample size, 2022.

No	Variables	Confidence Interval (CI %)	Power (%chance of detecting)	The proportion of Cases with Exposure	The proportion of controls with exposure	The ratio of Controls to Cases	Adjusted odds ratio (AOR)	No of Cases	No of Controls	Total Sample Size
1	Frequently heavy lifting (15)	95	80	29.64	0.7	2	59.79	14	27	41
2	Smoking cigarettes (15)	95	80	35.17	18	2	2.53	69	137	206
3	Irregularity of defecation habit (15)	95	80	54.89	26.7	2	3.34	40	79	119
4	Female sex (23)	95	80	86.42	56	2	5	31	62	93
5	Physical inactivity (4)	95	80	63.41	46.8	2	1.97	107	213	320
6	Standing >4 hrs./ day (15)	95	80	59.3	17.3	2	3.65	41	81	122

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3. Water drunk/per day is measured by the glass of water drank daily but locally, peoples use other equipment to drink plenty of water. Therefore, the measurement is subjective to respondents.

Study variables

Dependent variable

Varicose vein (Presences or Absences)

Independent variable

- Demographic variable

Sex, Age, Residence, Educational Status, Occupation, Weather Condition

- Life style-related variables

Smoking, Physical activity, Working Standing Posture, Sleeping Hours per Day, Drinking Water per Day, Lifting heavy objects, and dietary habits.

- Medical & Family History related variables

Family history of varicose vein, previous history of leg surgery, previous history of leg trauma, previous history of DVT, history of Diabetes mellitus, history of CHF.

- Obstetric Related Variables

Oral contraceptives, Parity.

- Anthropometric Assessment

Wight, Height, BMI.

Ethical consideration

Ethical clearance was obtained from Wolaita Sodo University Chief Research & Community Service Directorate with Reference number CRCSD 132/02/14, Project number CHSM/ERC/01/14 issued date 21/11/14. Informed consent was obtained from each of the study participants. This study obeyed respecting the autonomy of each participant through keeping privacy, confidentiality & voluntary participation free of coercion.

Dissemination of results

The result of this study will disseminate to the school of public health, school of medicine & Wolaita Sodo University's comprehensive specialized hospital surgical department. The result of this study will present in seminars, workshops & other platforms as much as possible.

Results

Descriptive statistic of variable

Socio-demographic related characteristics: According to this study, 354 participants were included, 236 were control groups & 118 were cases this makes the response rate 100%. Among 160 male participants, 107(45.3%) were controls & 53 (44.9%) were control. From 194 female participants 129(54.7%) was controls and 65(55.1%) were cases. Among 236 controls 135(57.8%) were living in urban & the rest 101(42.7%) lived in rural, and among 118 cases 60(50.8%) were live in urban and 58(49.2%) lived in rural. The mean age of the respondent among cases was 43 ± 14.8 & among controls was 41.7 ± 15.5 age.

The chi-square shows marital status a significant proportional difference among cases & controls (p = 0.045). Educational status of respondents shows a significant proportional difference among cases and controls (p = 0.020). The occupation of respondents shows a significant proportional difference among cases and controls (p = 0.003) (Table 2).

Life style related characteristics of variables: Lifting heavy objects, irregularity of defecation & smoking cigarette ever was shown significant proportional differences among cases & controls (p = 0.000), (p = 0.000) & (p = 0.014) respectively. How many cups of water did you drink/day was a significant mean difference among cases & controls (p = 0.018). Both sleeping hours/day & sleeping hours/day category was shown significant mean & proportional differences between cases & controls (p = 0.000) & (p = 0.000) respectively. Working hours/day & working hours/day category was shown a significant mean & proportional difference among cases & control groups (p = 0.000) & (p = 0.001) respectively. In addition, the working hours/week & working hours/week category were shown a significant mean & proportional difference among cases & control groups (p = 0.000) & (p = 0.000) respectively. The sleeping hour per day was shown a significant proportional difference specifically among participants sleeping <8 hours/day 57(48.3%) were cases & 43(18.2%) among controls with (p = 0.000). In addition, sitting hours/day showed a significant mean difference among cases & controls (p = 0.010). How much time did you standing/day & standing hours/day category were shows a significant mean & proportional difference among cases & controls (p = 0.000) & (p = 0.000) respectively (Table 3).

Nutritional (Dietary habits) related variables: Consuming cereal food was shown significant proportional difference among cases & controls 107(90.7%) & 228(96.6%) respectively with p-value 0.020. Participants who consumed roots & tubers food, meat & meat product were shown significant difference among cases & controls 94(79.7%) & 148(62.7%) with p-value 0.001 & 13(11.0%) & 50(21.2%) with p-value 0.018 respectively. There was a significant proportional difference among participants who consumed dairy products between cases & controls 94(79.7%) & 160(67.8%) with significant levels (p = 0.019). Morley, a significant proportional difference was shown among participants who consumed oil & fat contain food between cases and controls 89(75.4%) & 144(61.0%) respectively with the significance of (p = 0.007) (Table 4).

Medical & genetic related factors: Variables like family history of varicose vein & previous history of surgery in lower extremity & history of Hypertension were significant proportional differences with (p = 0.000), (p = 0.015) & (p = 0.004) respectively among cases & controls (Table 5).

Anthropometric & clinical-related factor: Body mass index was shown statistically insignificant mean differences with (p = 0.548) respectively among cases & controls (Table 6).

Determinants of lower limb varicose vein

To choose potential variables for multivariate analysis, variables were first examined using bivariate analysis. From socio-demographic factors such as Age category, marital status, educational status, occupation & weather conditions. From lifestyle-related factors such as lifting a heavy object, standing hours/day, smoking a cigarette, water drink/day, irregularity of defecation, working hours/ day, working hours/week, working posture, cereal food, dairy product, oil & fat, meat product, legumes category & fruits. Among medical and genetic-related factors history of leg trauma, history of surgery

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Table 2: Socio-demographic characteristics of studied patients attending surgical OPDs at Wolaita Sodo University comprehensive specialized Hospital, 2022 (n = 354).

Variables	Categories	Lower limb Varicose Vein		P - value
		Controls (n = 236)	Cases (n = 118)	
Sex	Male	107(45.3%)	53(44.9%)	0.94
	Female	129(54.7%)	65(55.1%)	
Age	In years	41.74 ± 15.56	43.05 ± 13.44	0.054
Residence	Urban	135(57.8%)	60(50.8%)	0.257
	Rural	101(42.7%)	58(49.2)	
Marital status	Married	170(72.0%)	100(84.7%)	0.045
	Single	45(19.1%)	16(13.6%)	
	Divorced	4(1.7%)	1(0.8%)	
	Windowed	14(5.9%)	1(0.8%)	
	Separated	3(1.3%)	0(0%)	
Educational status	No education	48(20.3%)	30(25.4%)	0.02
	Primary education	72(30.5%)	50(42.4%)	
	Secondary education	84(35.6%)	25(21.2%)	
	More than secondary education	32(13.6%)	13(11.0%)	
Occupation	Governmental	65(27.5%)	16(13.6%)	0.003
	NGO	2(0.8%)	2(1.7%)	
	Farmer	64(27.1%)	52(44.1%)	
	Merchant	45(19.1%)	13(11.0%)	
	Student	21(8.9%)	13(11.0%)	
	Daily labor worker	39(16.5%)	22(18.6%)	
Weather condition	High land	114(48.3%)	48(40.7%)	0.087
	Low land	39(16.5%)	31(26.3%)	
	Intermediate	83(35.2%)	39(33.1%)	

Table 3: Descriptive statistics of lifestyle-related factors of patients attending surgical OPDs at Wolaita Sodo University comprehensive specialized Hospital, 2022 (n = 354).

Variables	Categories	Lower limb Varicose Vein		P - value
		Controls (n = 236)	Cases (n = 118)	
Physical exercise	No	120(50.8%)	60(50.8%)	0.925
	Yes	116(49.2%)	58(49.2%)	
Lifting heavy object	No	157(66.5%)	50(42.4%)	0
	Yes	79(33.5%)	68(57.6%)	
Lifting heavy object category	<4 hrs	70(88.6%)	45(66.2%)	0.001
	≥ 4 hrs	9(11.4%)	23(33.8%)	
Water drink/day	≥ 5 cups/day	176(74.6%)	77(65.3%)	0.67
	< 5 cups/day	60(25.4%)	41(34.7%)	
Irregularity of defecation	No	213(90.3%)	90(76.3%)	
	Yes	23(9.7%)	28(23.7%)	
Sleeping hrs./day category	≥ 8 hrs./day	193(81.8%)	61(51.7%)	0
	< 8 hrs./day	43(18.2%)	57(48.3%)	
Did you Smoke cigarettes ever	No	218(92.4%)	98(83.1%)	0.008
	Yes	18(7.6%)	20(16.9%)	
Irregularity of defecation	No	213(90.3%)	90(76.3%)	0
	Yes	23(9.7%)	28(23.7%)	
Working hrs./day category	< 8hrs	181(76.7%)	71(60.2%)	0.001
	≥ 8hrs	55(23.3%)	47(39.8%)	
Working hrs./week category	< 48 hrs./week	150(63.6%)	46(39.0%)	0
	≥ 48 hrs./ week	86(36.4%)	72(61.0%)	
Working posture	Sitting	117(49.6%)	29(24.6%)	0
	Standing	119(49.6%)	89(75.4%)	
Sitting hrs. /day category	<4 hrs./day	201(85.2%)	101(85.6%)	0.915
	≥ 4 hrs./day	35(14.8%)	17(14.4%)	
Standing hrs. /day category	<4 hrs./day	72(88.9%)	45(66.2%)	0
	≥ 4 hrs./day	9(11.1%)	23(33.8%)	

in the lower extremity, and family history of varicose vein chosen for multivariable analysis were all variables with a P-value of <0.25.

After potential confounders were taken into account in multivariate analysis, logistic regression revealed 7 variables, those are lifting a heavy object, smoking cigarettes, drinking <5 cups water/day, irregularity of defecation, consuming cereal food, consuming a dairy product, & family history of varicose vein in first degree relatives were determinants of lower limb varicose vein at a p-value of <0.05.

In this study, those who lift heavy objects have 5.35 times the odds of developing varicose veins compared with the odds in the control group AOR 5.35, 95% CI (1.996, 14.37). Participants who smoke cigarettes have 5.19 times higher odds of developing varicose veins as compared with the odds in the control group AOR 5.19, 95% CI (1.338, 20.142). Those who drink <5 cups of water/day have

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Table 4: Descriptive statistics of dietary habits of patients attending surgical OPDs at Wolaita Sodo University comprehensive specialized hospital, 2022 (n = 354).

Variables	Categories	Lower limb Varicose Vein		P - value
		Controls (n = 236)	Cases (n = 118)	
Did you eat Cereal _ foods?	No	7(3.0%)	10(8.5%)	0.022
	Yes	229(97.0%)	108(91.5%)	
Did you eaten Roots & tubers	No	84(35.6%)	24(20.3%)	0.003
	Yes	152(64.4%)	94(79.7%)	
Did you eaten legumes containing food	No	86(36.4%)	48(40.7%)	0.438
	Yes	150(63.6%)	70(59.3%)	
Consuming legumes food category	Irregular	109(71.7%)	63(88.7%)	0.005
	Regularly	43(28.3%)	8(11.3%)	
Did you eaten vegetable containing food	No	70(29.7%)	30(25.4%)	0.404
	Yes	166(70.3%)	88(74.6%)	
Did you eaten fruit & berries containing food	No	52(22.0%)	52(44.1%)	0
	Yes	184(78.0%)	66(55.9%)	
Consuming fruits category	Irregular	131(71.2%)	68(84.0%)	0.025
	Regularly	53(28.8%)	13(16.0%)	
Did you eaten Meat _ product	No	186(78.8%)	103(87.3%)	0.052
	Yes	50(21.2%)	15(12.7%)	
Did you eaten Dairy _ product	No	76(32.2%)	24(20.3%)	0.019
	Yes	160(67.8%)	94(79.7%)	
Oil & - fat containing food	No	92(39.0%)	29(24.6%)	0.007
	Yes	144(61.0%)	89(75.4%)	
Did you consume nonalcoholic drink	No	22(9.3%)	9(7.6%)	0.595
	Yes	214(90.7%)	109(92.4%)	
Did you consume alcoholic drink	No	193(81.8%)	97(82.2%)	0.922
	Yes	43(18.2%)	21(17.8%)	

Table 5: Descriptive statistics of genetic and medical-related factors of patients attending surgical OPDs at Wolaita Sodo University comprehensive specialized Hospital, 2022 (n = 354).

Variables	Categories	Lower limb Varicose Vein		P - value
		Controls (n = 236)	Cases (n = 118)	
History of surgery in lower limb	No	226(95.8%)	105(89.0%)	0.015
	Yes	10(4.2%)	13(11.0%)	
Did you have history of leg trauma	No	216(91.5%)	102(86.4%)	0.136
	Yes	20(8.5%)	16(13.6%)	
Family history of varicose vein	No	202(85.6%)	59(50.0%)	0
	Yes	34(14.4%)	59(50.0%)	
Did you have a history of DM	No	228(96.6%)	115(97.5%)	0.665
	Yes	8(3.4%)	3(2.5%)	
Did you have history of Hypertension	No	220(93.2%)	118(100.0%)	0.004
	Yes	16(6.8%)	0(0.0%)	
Did you have DVT in lower extremity	No	234(99.2%)	118(100.0%)	0.316
	Yes	2(0.8%)	0(0.0%)	
Did you have pulmonary embolism	No	236(100.0%)	118(100.0%)	.
	Yes	0(0%)	0(0%)	
Are you on permanent medication	no	200(84.7%)	101(85.6%)	0.833
	Yes	36(15.3%)	17(14.4%)	

Table 6: Descriptive statistics of anthropometric-related factors of patients attending surgical OPDs at Wolaita Sodo University comprehensive specialized Hospital, 2022 (n = 354).

Variables	Categories	Lower limb Varicose Vein		P - value
		Controls (n = 236)	Cases (n = 118)	
BMI Cat	Underweight	1(0.4%)	0(0.0%)	0.548
	Normal	154(65.3%)	84(71.2%)	
	Overweight	76(32.2%)	33(28.0%)	
	Obese	5(2.1%)	1(0.8%)	

4.49 times higher odds of developing varicose veins compared with the odds in the control group AOR 4.49, 95% CI (1.435, 14.06). The odds of exposure to the irregularity of defecation among cases of a varicose vein are 8.44 times as higher than the odds of irregularity of defecation among controls 95% CI (1.422, 50.15) (Table 7).

The odds of exposure to consuming cereal foods among cases were 0.158 times less as the odds of that exposure among controls. Therefore, those who consumed cereal food have 84.2% less of developing varicose veins compared with their counterparts AOR 0.158, 95% CI (0.032, 0.787). For those who consume dairy products foods among cases of varicose veins are 13.35 times as high as the odds of that exposure among controls. Therefore, those who consume dairy product foods have 13.35 times higher odds of developing varicose veins compared with the odds in the control group AOR 13.35, 95% CI (2.611, 68.28). Finally, the odds of exposure to a history of varicose veins in first-degree relatives among cases of a varicose vein are 28 times as higher as the odds of a history of varicose veins in first-degree relatives among controls. Therefore, those whom a family history of varicose veins in first-degree relatives have 28 times higher odds of developing varicose veins compared with the odds in the control group AOR 28, 95% CI (7.827, 100) (Table 3). The educational status of respondents was significantly associated with LLVVs on bivariate analysis & it becomes insignificant on multivariate analysis (Table 7).

Discussion

This study identified important risk factors for the development

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Table 7: Bivariate & multivariate analysis on Determinants of Lower Limb Varicose Vein among Adult Patients in Sodo comprehensive specialized Hospital from August 1 to November 3, 2022.

Variables	Categories	Lower limb Varicose Vein		COR (95%CI)	AOR (95%CI)	p-value
		YES(n=118)	NO(n=236)			
Marital status	Single	16(13.6%)	45(19.1%)	0.604 (.325,1.125)*		
	Divorced	1(0.8%)	4(1.7%)	0.425(.047, 3.856)		
	Windowed	1(0.8%)	14(5.9%)	0.121(.016 ,0.937)*		
	Separated	0(0%)	3(1.3%)	0.000(.000 - .)		
	Never married	0(0%)	0(0%)	.		
	Married	100(84.7%)	170(72.0%)	1		
Educational status	Primary education	50(42.4%)	72(30.5%)	1.111(.621,1.988)	2.51(0619, 10.17)	0.197
	Secondary education	25(21.2%)	84(35.6%)	0.070(.252, 0.902)	0.430(0.093, 1.987)	0.28
	More than secondary education	13(11.0%)	32(13.6%)	0.650(.295,1.432)	1.440(0.309, 6.71)	0.642
	No education	30(25.4%)	48(20.3%)		1	
Occupation	NGO	2(1.7%)	2(0.8%)	4.062(.531,31.083)*		
	Farmer	52(44.1%)	64(27.1%)	3.301(1.709,6.374)		
	Merchant	13(11.0%)	45(19.1%)	1.174(.514,2.677)		
	Student	13(11.0%)	21(8.9%)	2.515(1.041, 6.074)		
	Daily labor worker	22(18.6%)	39(16.5%)	2.292(1.075 ,4.883)		
	Governmental	16(13.6%)	65(27.5%)	1		
Weather condition	Low land	31(26.3%)	39(16.5%)	1.888(1.057,3.371)*		
	High land	48(40.7%)	114(48.3%)			
	Intermediate	39(33.1%)	83(35.2%)	1.116(.671,1.856)		
Lifting heavy object	Yes	68(57.6%)	79(33.5%)	2.703(1.716,4.257)*	5.356(1.996, 14.37)	0.001
	No	50(42.4%)	157(66.5%)	1	1	
Sleeping hrs./day category	<8 hrs./day	57(48.3%)	43(18.2%)	4.194(2.571, 6.843)*		
	≥ 8 hrs./day	61(51.7%)	193(81.8%)	1		
Did you Smoke cigarette ever	Yes	20(16.9%)	18(7.6%)	2.472(1.252, 4.878)*	5.19(1.338, 20.142)	0.017
	No	98(83.1%)	218(92.4%)	1	1	
Water drink/day	<5 cups/day	41(34.7%)	60(25.4%)	1.562(0967, 2.522)	4.49(1.435, 14.06)	0.01
	≥ 5 cups/day	77(65.3%)	176(74.6%)	1		
Irregularity of defecation	Yes	28(23.7%)	23(9.7%)	2.881(1.575,5.271)*	8.44(1.422, 50.15)	0.019
	No	90(76.3%)	213(90.3%)	1	1	
Working hrs./day category	≥ 8 hrs	47(39.8%)	55(23.3%)	2.178(1.353,3.508)*		
	<8 hrs	71(60.2%)	181(76.7%)	1		
Working hrs./week category	≥ 48 hrs./ week	72(61.0%)	86(36.4%)	2.730(1.732,4.304)*		
	<48 hrs./week	46(39.0%)	150(63.6%)	1		
Working posture	Standing	89(75.4%)	119(49.6%)	3.017(1.847,4.929)*		
	Sitting	29(24.6%)	117(49.6%)	1		
Standing hrs./day category	≥ 4 hrs./day	23(33.8%)	9(11.1%)	4.088(2.132,5.371)		
	<4 hrs./day	45(66.2%)	72(88.9%)	1		
Did you eaten Cereal _ food	Yes	108(91.5%)	229(97.0%)	0.33(.133, 0.873)*	0.158(0.032, 0.787)	0.024
	No	10(8.5%)	7(3.0%)		1	
Did you eaten Roots & tubers	Yes	94(79.7%)	152(64.4%)	2.329(1.384,3.918)*		
	No	24(20.3%)	84(35.6%)	1		
Did you eaten legumes containing food category	Regularly	8(11.3%)	43(28.3%)	0.322(0.142,0.728*		
	Irregularly	63(88.7%)	109(71.7%)	1		
Consuming fruits category	Regularly	13(16.0%)	53(28.8%)	0.473(0.241,0.927)*		
	Irregular	68(84.0%)	131(71.2%)	1		
Did you eaten Meat product	Yes	15(12.7%)	50(21.2%)	0.55(0.290, 1.012)*		
	No	103(87.3%)	186(78.8%)			
Did you eaten Dairy _ product	Yes	94(79.7%)	160(67.8%)	1.860(1.101,3.145)*	13.35(2.611, 68.28)	0.002
	No	24(20.3%)	76(32.2%)		1	
Oil & - fat containing food	Yes	89(75.4%)	144(61.0%)	1.961(1.196,3.213)*		
	No	29(24.6%)	92(39.0%)	1		
History of surgery in lower limb	Yes	13(11.0%)	10(4.2%)	2.798(1.188,6.588)*		
	No	105(89.0%)	226(95.8%)	1		
Family history of varicose vein	Yes	59(50.0%)	34(14.4%)	5.941(3.560,9.914)*	28.00(7.827,100.2)	0
	No	59(50.0%)	202(85.6%)	1	1	

NB: 1= Reference; * = Significance; p-value < 0.05 on bivariate analysis; COR=Crude Odds Ratio; AOR= Adjusted Odds Ratio; CI= Confidence Interval; Model fitness info: Hosmer lemeshow = 0.246; Classification Table = 85.7; Model summary, Cox & Snell R square = 0.403; Nagelkerke R square = 0.568; The method used backward stepwise conditional.

of LLVV. Those are lifestyle-related factors like lifting a heavy object, smoking cigarette, drinking water <5 cups/day & dietary habits such as consuming cereal foods and consuming food containing dairy product was independent predictors for the development of varicose vein. Additionally medical & Genetic related factors such as the history of varicose veins in first-degree relatives & irregularity of defecation were statistically significant predictors for the development of lower limb varicose veins.

Smoking was an independent predictor of LLVV in the current

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study; smokers had 5.2 times greater risk to develop LLVV compared to controls. The study was similar to the study conducted in Egypt Elamrawy et al. [14]. Similarly, in a multicenter review and in other studies, the proportion of varicose veins cases with a history of smoking was 19.4%, and 45.6% [26,27], smokers had 1.8 times greater risk [28], and smoking pack-years significantly increases the odds of varicose veins by 1.12 [29]. Evidence on the association between smoking and varicose veins is inconsistent. Some studies observed an elevated risk of varicose veins in smokers compared with nonsmokers [6,20] whereas other studies failed to replicate this positive association [8]. A large cohort study reported a suggestive positive association between current smoking and varicose veins after adjustment for traditional risk factors and genetic ancestry [25,30]. This may be due to smoking leads to hypoxia, production of pro-inflammatory factors within the vessel wall, biochemical modifications on the venous endothelium that increases the vasomotor tonicity in the venous walls, and lengthening of scarring time that influence the trophic disorders associated with LLVV [28,31-36].

Regarding physical activity, lifting heavy objects was found to be an independent predictor of LLVV in the present study and studies conducted in Denmark [37] and Finland [7]. The venous pump is one of the determinants of venous flow; determined by muscular contraction. Lifting heavy objects results in an increased muscular contraction, which leads to increased venous hypertension that resulted in relaxed blood flow. The actual volume of refluxed blood in patients with venous insufficiency may be relatively small. However, when the superficial veins are already maximally distended, small increases in volume produce large pressure increases.

As regards dietary habits and intestinal motility, low dietary fiber intake, drinking less than 5 cups of water/ day, and irregular defecation were independent predictors of LLVV in the present study and in other studies [34,35,38], which proposed that constipation and increased intra-abdominal pressure contributed to obstruction of venous return. History of varicose vein in first-degree relatives was a significant predictor variable in this study which is similar to Scot [7,8,17,21,30,36], in contrary some other studies family history was an insignificant association [14,24], this may due to study design & variability of the study area. The pathophysiology was mutations in fork head box protein C2 (FOXC2), Thrombomodulin (THBD), and desmuslin (SYNM) may promote the development of varicose veins by altering vein function [25]. Previous history of leg trauma was a risk factor in bivariate analysis but it becomes a protective factor in multivariate analysis while other studies revealed that leg injury was a risk factor for the development of LLVVs [8].

On the other hand, contradictory reports on the association between education and varicose vein. This study showed educational status was no association with varicose vein development with was similar to other studies [39], in the contrary no education have a significant association with varicose veins in a study conducted in Egypt [14]. The level of education may reflect socioeconomic circumstances and access to healthcare & ability to obtain medical treatment. Individuals with higher education may be more inclined to seek and receive medical care for varicose veins, and thus receive a formal diagnosis [25].

Conclusion

In this study, smoking a cigarette, lifting heavy objects, consuming cereal food, consuming a dairy product, drinking less than 5 cups of water/day & irregularity of defecation in addition to this family history of varicose vein in first-degree relatives were found to be determinants of lower limb varicose vein. Family history of the varicose vein was still contradictory in other studies due to self-response of family history may increase among varicose vein a patient this may need further studies.

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