

An Observational Study on Varicose Veins and Coexisting Hypertension: Prevalence, Risk Factors, Management, and Defined Daily Dose (DDD) Analysis in a Tertiary Care Hospital

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ABSTRACT

Varicose veins are a common chronic venous disorder resulting from venous valve incompetence and reflux, leading to pain, edema, and progressive tissue changes. This prospective observational study was conducted among 400 patients at the Prathima Institute of Medical Sciences to evaluate prevalence, risk factors, CEAP-based severity, and drug utilization patterns using WHO ATC/DDD methodology. Prolonged standing (>6 hours/day) was the most prominent risk factor (52.5%), followed by family history, pregnancy-related factors, obesity, and smoking. Most patients presented in CEAP class C2 and C3, highlighting moderate severity at diagnosis. Venoactive drugs were widely prescribed along with NSAIDs, although DDD analysis indicated a tendency toward NSAID overuse. Compression therapy and lifestyle modification were frequently advised but poorly adhered to due to low awareness and affordability constraints. The study emphasizes the need for early detection, occupational risk modification, rational pharmacotherapy, and structured patient counseling to prevent progression and complications. Improving adherence to compression therapy and promoting awareness can significantly reduce long-term morbidity.

1 INTRODUCTION

Varicose veins are one of the most prevalent venous disorders globally, including in India, and arise due to structural or functional failure of venous valves leading to reflux, venous hypertension, and chronic venous insufficiency. They appear as dilated, tortuous superficial veins of the lower limbs and can cause symptoms such as pain, heaviness, swelling, skin changes, and ulceration if left untreated. In India, lifestyle factors such as prolonged standing, obesity, sedentary habits, and occupational exposure significantly contribute to the rising prevalence. Population-based studies estimate that chronic venous disease affects 20–35% of Indian adults, with varicose veins particularly common among workers who stand for long hours, such as teachers, police personnel, and healthcare staff. Additional risk factors include advancing age, male predominance in certain Indian studies, family history, pregnancy, hormonal influences, prior deep vein thrombosis (DVT), and obesity.

The pathophysiology primarily involves valve incompetence, resulting in venous reflux, progressive vein dilation, and microcirculatory changes leading to edema and tissue damage. Management strategies depend on severity and range from lifestyle modification and weight

control to compression therapy, which remains the cornerstone of conservative treatment. Pharmacological options include venoactive drugs such as micronized flavonoids, rutosides, and horse chestnut seed extract, which improve venous tone and microcirculation. Other agents like pentoxifylline, NSAIDs, diuretics, and anticoagulants are used for symptomatic relief and complication prevention. Interventional approaches, including endovenous laser therapy, radiofrequency ablation, and sclerotherapy, offer effective minimally invasive alternatives. Pharmacists play a vital role in patient education, medication counseling, adherence monitoring, and timely referral, thereby strengthening comprehensive varicose vein management in tertiary care settings

2. METHODOLOGY

Study Design

Prospective observational study.

Study Site

Prathima Institute of Medical Sciences, Telangana – Departments of Surgery, Dermatology, and General Medicine.

Duration

6 months (January 2024 to June 2024).

Sample Size

400 patients (inpatients and outpatients with confirmed diagnosis of varicose veins).

Inclusion Criteria

- Patients aged 18 years and above.
- Both genders.
- Diagnosed with primary or secondary varicose veins.
- Willing to provide informed consent.

Exclusion Criteria

- Pregnant women.
- Patients with severe co-morbidities (e.g., end-stage renal disease).
- Non-consenting individuals.

Data Collection Tools

- Patient case sheets
- Structured questionnaire
- Patient interviews
- Doppler ultrasound reports
- Physician prescription records

Data Collected

- Demographics (age, gender, occupation, BMI)
- Risk factors (standing hours, family history, obesity, smoking, pregnancy, etc.)
- Type of varicose vein (CEAP classification)
- Treatment given (compression therapy, pharmacological agents like flavonoids, surgical procedures like sclerotherapy or ligation)
- Patient awareness and compliance

2.1 Defined Daily Dose (DDD) Study in Inpatients

A specific component of the study will focus on evaluating the utilization of pharmacological agents for varicose veins in the inpatient setting using the Defined Daily Dose (DDD) methodology.

- **Data Source:** Physician prescription records and inpatient medication charts will be used to identify all pharmacological agents prescribed and administered to inpatients for the treatment or management of varicose veins and their associated symptoms.
- **Medications of Interest:** This will include, but not be limited to, flavonoids, analgesics, anti-inflammatory drugs, and any other medications used to manage pain, swelling, or complications like thrombophlebitis.
- **DDD Calculation:** The total amount of each drug consumed by inpatients during their hospital stay will be collected. This will be converted into DDDs using the latest Anatomical Therapeutic Chemical (ATC) classification system and DDD values published by the World Health Organization (WHO) Collaborating Centre for Drug Statistics Methodology.
- **Key DDD Indicators:**
 - **DDD per 100 Bed Days:** This indicator will be calculated to assess drug consumption intensity within the inpatient setting. The occupancy index of the hospital will also be considered in the calculation. According to WHO, "The figure 70 DDDs per 100 bed days of hypnotics provides an estimate of the therapeutic intensity and estimates that 70% of the inpatients receive one DDD of a hypnotic every day."
 - **PDD: DDD Ratio:** The Prescribed Daily Dose (PDD), which represents the average daily dose actually prescribed, will be calculated for relevant medications. This will then be compared to the DDD for each drug to understand prescribing patterns and identify any discrepancies. The WHO notes that "When there is a substantial discrepancy between the PDD and the DDD, it is important to take this into consideration when evaluating and interpreting drug utilization figures."
- **Data Analysis:** The calculated DDDs and PDD:DDD ratios will be analyzed to identify trends in drug utilization, assess the rationality of prescribing practices, and potentially inform interventions to optimize medication use.

2.2 Statistical Tools:

- Microsoft Excel & SPSS version 25.0
- Chi-square test for categorical variables
- Descriptive statistics (mean, SD, frequency, percentage)
- p-value < 0.05 considered statistically significant

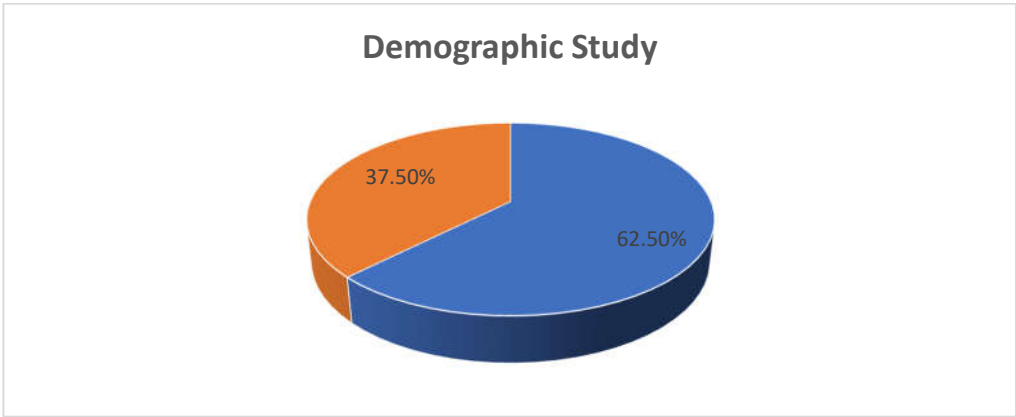
3 RESULTS AND DISCUSSION

3.1 Demographic Study

Out of 400 patients, 62.5% were male and 37.5% were female, indicating a higher prevalence of varicose veins among males. This may be due to occupational factors like prolonged standing or physical labor. Female cases were fewer, possibly influenced by hormonal or reproductive factors and healthcare access limitations.

Table: Demographic Study

Parameter	Frequency (n=400)	Percentage (%)
Male	250	62.5%
Female	150	37.5%

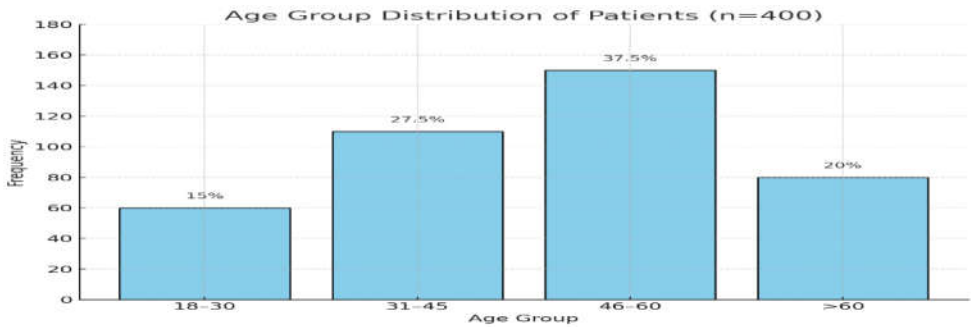


3. 2 Age group distribution of patients

The age-wise distribution of patients in the study revealed that the majority of individuals affected by varicose veins were in the middle-aged group (46–60 years), accounting for **37.5%** of the total study population. This was followed by the **31–45 years** age group, which comprised **27.5%** of patients. The elderly group (>60 years) contributed **20%**, while the youngest group (18–30 years) accounted for only **15%** of the cases.

Table: Age group distribution of patients

Parameter	Frequency (n=400)	Percentage (%)
Age Group		
18–30	60	15%
31–45	110	27.5%
46–60	150	37.5%
>60	80	20%

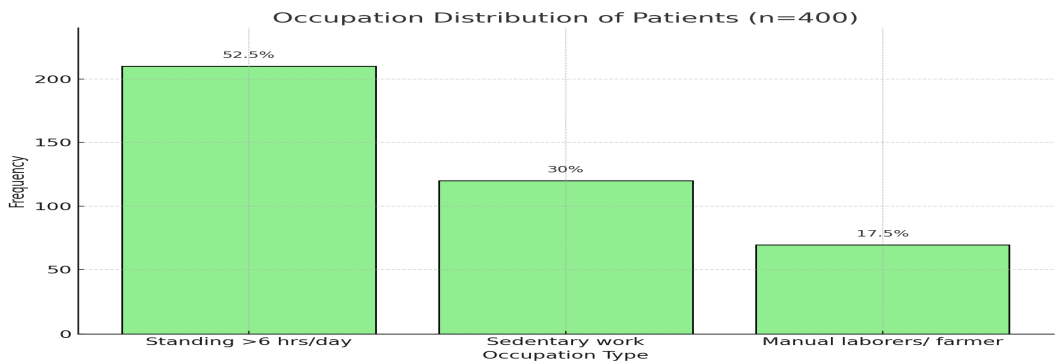


3.3 Occupancy wise distribution of patients

Among 400 patients, 52.5% had occupations requiring standing for over 6 hours daily, making it the leading risk factor. Sedentary workers accounted for 30%, while 17.5% were manual laborers or farmers. Prolonged standing significantly contributes to varicose vein development due to increased venous pressure in the lower limbs.

Table: Occupancy wise distribution of patients

Parameter	Frequency (n=400)	Percentage (%)
Occupation		
Standing >6 hrs/day	210	52.5%
Sedentary work	120	30%
Manual laborers/ farmer	70	17.5%

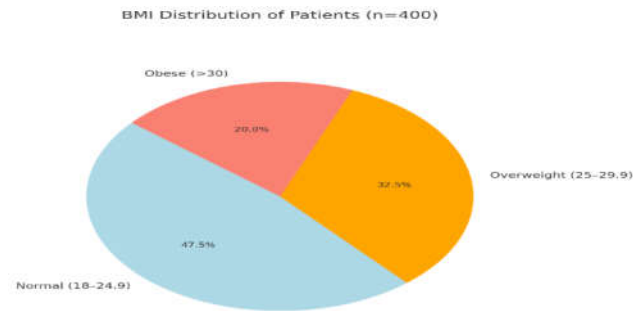


3.4 BMI wise distribution of patients

Of the 400 patients, 47.5% had normal BMI, while 32.5% were overweight and 20% were obese. The data suggests a notable association between higher BMI and varicose veins, as excess body weight increases venous pressure, impairs circulation, and contributes to the progression of chronic venous insufficiency.

Table: BMI wise distribution of patients

Parameter	Frequency (n=400)	Percentage (%)
BMI		
Normal (18–24.9)	190	47.5%
Overweight (25–29.9)	130	32.5%
Obese (>30)	80	20%

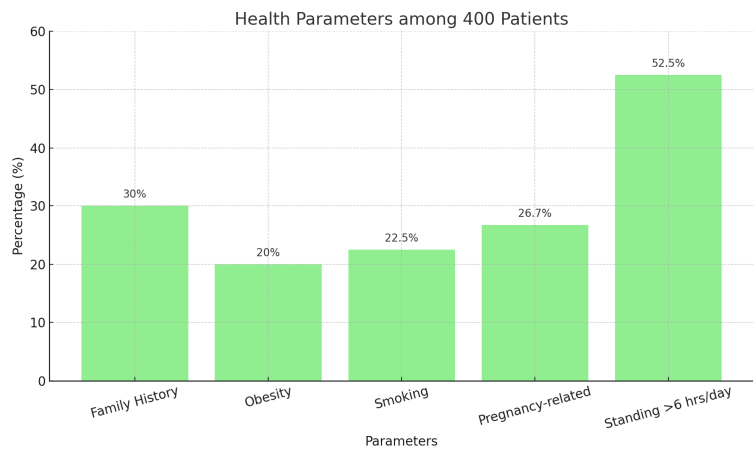


3.5 Risk Factors Identified (n=400)

Among 400 patients, prolonged standing (>6 hrs/day) was the most common risk factor (52.5%), followed by family history (30%), smoking (22.5%), pregnancy-related factors (26.7%), and obesity (20%). These findings highlight the multifactorial nature of varicose veins, with occupational and hereditary influences playing dominant roles.

Table: Risk Factors Identified (n=400)

Parameter	Frequency (n=400)	Percentage (%)
Family History	120	30
Obesity:	80	20
Smoking: 90 patients	90	22.5
Pregnancy-related	40	26.7
Standing >6 hrs/day:	210	52.5

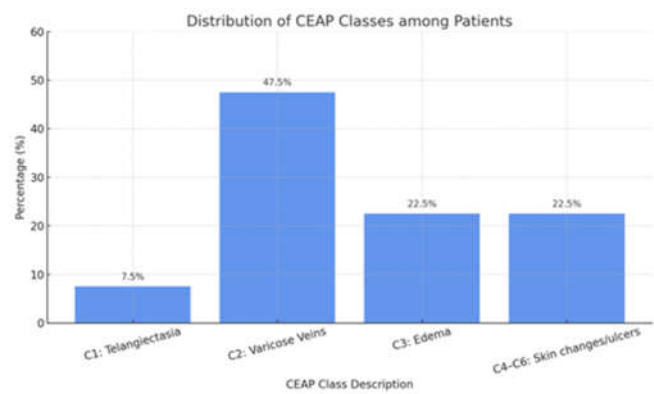


3.6 CEAP Classification Distribution:

According to CEAP classification, most patients (47.5%) were in C2 stage with visible varicose veins. C3 (edema) and C4–C6 (skin changes/ulcers) each accounted for 22.5%, while C1 (telangiectasia) was least common (7.5%), indicating that many patients presented at moderate to advanced stages of the disease.

Table: CEAP Classification Distribution

CEAP Class Description		Number of Patients %	
C1	Telangiectasia	30	7.5%
C2	Varicose Veins	190	47.5%
C3	Edema	90	22.5%
C4–C6	Skin changes/ulcers	90	22.5%

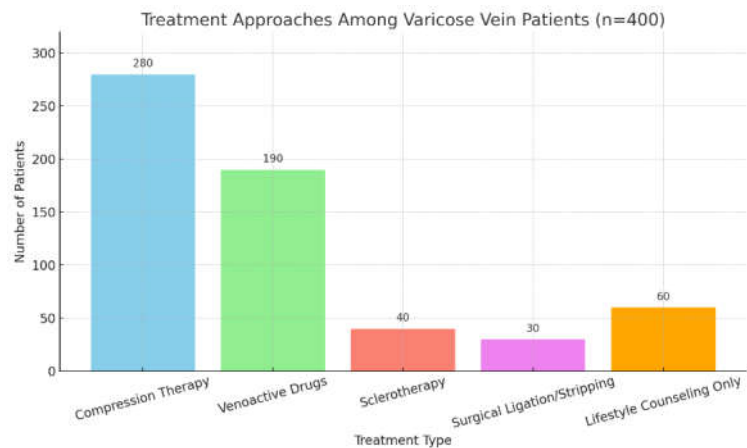


3.7 Treatment Approaches:

Among the 400 patients, compression therapy was the most common treatment (70%), followed by venoactive drugs like Daflon (47.5%). Sclerotherapy (10%) and surgical ligation/stripping (7.5%) were less commonly used. Lifestyle counseling alone was given to 15%, reflecting a preference for conservative over invasive management strategies.

Table: Treatment Approaches:

Treatment Type	Number of Patients	Percentage
Compression therapy	280	70%
Venoactive drugs (e.g., Daflon)	190	47.5%
Sclerotherapy	40	10%
Surgical Ligation/Stripping	30	7.5%
Lifestyle Counseling Only	60	15%

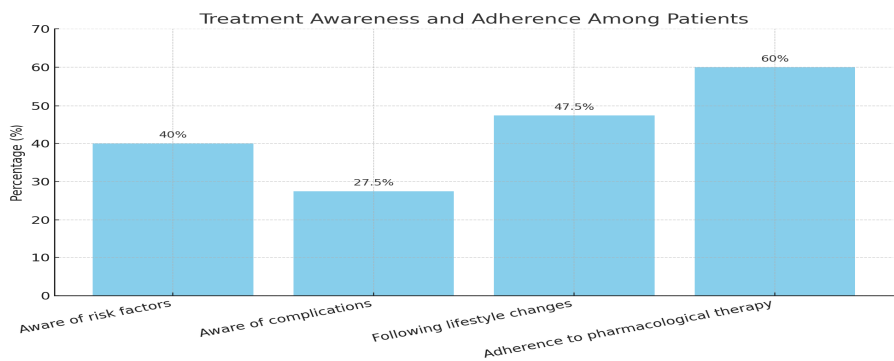


3.8 Patient Awareness:

Among the 400 patients, 40% were aware of risk factors and 27.5% knew potential complications. While 47.5% reported following lifestyle modifications, 60% adhered to prescribed pharmacological therapy. These findings emphasize the need for improved patient education and counseling to enhance disease understanding and promote better treatment compliance.

Table: Patient Awareness

Treatment Type	Number of Patients	Percentage
Aware of risk factors	160	40
Aware of complications	110	27.5
Following lifestyle changes	190	47.5
Adherence to pharmacological therapy	240	60



3.9 ATC classification and DDD for drugs used in varicose veins and other relevant medications

The following table presents the ATC codes and DDD information for the specified drug classes and specific drugs. It's crucial to understand that DDDs are a technical unit of measurement for drug utilization research and may not always reflect the actual prescribed daily dose (PDD).

Furthermore, specific DDDs are not established by the WHO for all individual drugs, particularly within the phlebotonic class.

Drug Name	ATC Code	Common Use	DDD (mg/day)	Prathima Hospital
Micronized Purified Flavonoid Fraction (MPFF) (e.g., Diosmin + Hesperidin)	C05CA53	Chronic venous insufficiency symptoms (leg heaviness, pain, swelling), hemorrhoids	Not formally established by WHO for the combined product	Data collected
Oxerutins	C05CA04	Venous insufficiency, capillary fragility, varicose veins, edema	Not formally established by WHO	Data collected
Horse Chestnut Seed Extract (Hippocastani semen)	C05CX03	Chronic venous insufficiency symptoms (leg pain, swelling, cramps)	Not formally established by WHO for herbal extract	Data collected
Calcium Dobesilate	C05BX01	Vascular protectant, hemorrhoids, varicose veins, diabetic retinopathy	Not formally established by WHO	Data collected
Pentoxifylline	C04AD03	Peripheral vascular disease, intermittent claudication, improve blood flow	1 g (oral), 0.3 g (parenteral)	Data collected
Anticoagulants	B01A	Prevent/treat blood clots (e.g., DVT as a complication of varicose veins). heparins, vitamin K antagonists (warfarin), DOACs (rivaroxaban, dabigatran, apixaban, edoxaban),	Varies widely by specific drug (Refer to the WHO ATC/DDD Index for individual agents like warfarin, rivaroxaban, dabigatran, etc.).	

Drug Name	ATC Code	Common Use	DDD (mg/day)	Prathima Hospital
Antiplatelet Drugs	B01AC	Inhibit platelet activation/aggregation, used for prevention of cardiovascular events (potentially in high-risk varicose vein patients or patients with comorbid conditions). Includes aspirin, clopidogrel, ticagrelor, etc.	Varies widely by specific drug (e.g., aspirin 1 tablet)	Data collected
Diuretics	C03	Reduce edema/swelling associated with chronic venous insufficiency and other conditions like heart failure or hypertension	Varies widely by specific drug (Refer to the WHO ATC/DDD Index for individual diuretics like	Data collected

			furosemide, hydrochlorothiazide, etc.).	
NSAIDs	M01A	Pain and inflammation relief	Varies widely by specific drug (e.g., ibuprofen 0.8 g, naproxen 0.5 g).	Data collected
Antibiotics	J01 (Systemic), D06 (Topical)	Treat bacterial infections, including skin infections and venous ulcers. Examples include amoxicillin, flucloxacillin , mupirocin, and povidone-iodine.	Varies widely by specific drug (e.g., amoxicillin 1g, cefalexin 2g, ciprofloxacin 1g (oral) or 0.8g (parenteral)). No DDD for topical antibiotics.	Data collected
Sclerosing Agents	C05BB	Induce scarring and closure of varicose veins. Examples include polidocanol, sodium tetradecyl sulfate	No DDDs are assigned for sclerosing agents as they are typically administered based on the volume and concentration required for the specific vein being treated.	Data collected
Sulodexide	B01AB11	Improves microcirculation, anti-inflammatory, inhibits MMP-9 secretion, prevents damage to glycocalyx. Used for chronic venous disease, diabetic neuropathy, peripheral arterial disease.	500 LSU (oral), 500 LSU (parenteral).	Data collected

3.10 Drug Cost and DDD Table

Drug Name	ATC Code	DDD mg/day	Tablets/Year Based on DDD	Est. Cost/Tablet (₹)	1-Year Est. Cost (₹)	2-Year Est. Cost (₹)	3-Year Est. Cost (₹)
MPFF	C05CA 53	2 tablets (typical PDD) = 1000 mg	730	15.0 - 18.0 (for Daflon 500mg)	10,950 - 13,140	21,900 - 26,280	32,850 - 39,420
Oxerutins	C05CA 04	PDD ranges from 600-1200mg (e.g., 2 tablets/day)	730	6.4 - 29.1 (for 500mg tablets)	4,672 - 21,243	9,344 - 42,486	14,016 - 63,729
Horse Chestnut Seed Extract (HCSE) 500mg capsule	C05CX 03	1-2 capsules (typical PDD) = 500-1000 mg	365 - 730	3.8 - 22.1 (for 500mg/60 caps)	1,387 - 16,133	2,774 - 32,266	4,161 - 48,399
Calcium Dobesilate (500mg capsule)	C05BX 01	PDD varies, typically 500-1000 mg/day (e.g., 2 capsules/day)	730	10.2 - 194.5 (for 500mg caps)	7,446 - 141,985	14,892 - 283,970	22,338 - 425,955

Pentoxifylline (oral)	C04AD03	1 g (oral DDD) = 2 tablets of 400mg or 2 tablets of 500mg	730	5.3 - 27.0 (for 400mg tablets)	3,869 - 19,710	7,738 - 39,420	11,607 - 59,130
Pentoxifylline (parenteral)	C04AD03	0.3 g (parenteral DDD) = 1-2 vials/injections	Varies by duration of IV therapy	N/A	N/A	N/A	N/A
Anticoagulants (e.g., Rivaroxaban 10mg)	B01AE07	10 mg (DDD) = 1 tablet	365	40 - 50 (based on rough estimates, may vary widely)	14,600 - 18,250	29,200 - 36,500	43,800 - 54,750
Antiplatelet Drugs	B01AC06	75 mg (DDD) = 1 tablet	365	~1.0 - 2.0 (based on rough estimates)	365 - 730	730 - 1,460	1,095 - 2,190
Diuretics (e.g., Furosemide 40mg)	C03CA01	40 mg (DDD) = 1 tablet	365	0.8 - 1.3 (for 40mg tablets)	292 - 475	584 - 950	876 - 1,425
NSAIDs (e.g., Ibuprofen 400mg)	M01AE01	0.8 g (oral DDD) = 2 tablets of 400mg	730	0.5 - 1.5 (for 400mg tablets)	365 - 1095	730 - 2190	1095 - 3285
Flucloxacillin 250mg)	J01CF05	2 g (oral DDD) = 8 capsules of 250mg	7-14	10 - 20 (for 250mg capsule)	1120 - 2240	N/A	N/A

3.11 Statistical Analysis:

- Significant association between **occupation and varicose veins** (Chi-square = 22.8, $p < 0.05$).
- BMI also significantly associated with severity (Chi-square = 17.3, $p < 0.05$).
- Awareness improves treatment adherence (Chi-square = 19.2, $p < 0.05$).

4. CONCLUSION

Varicose veins represent a common chronic venous disorder with a considerable impact on quality of life. This prospective observational study among 400 patients at Prathima Institute of Medical Sciences evaluated prevalence, risk factors, CEAP-based clinical pattern, management strategies, and drug utilization using WHO ATC/DDD methodology. Prolonged standing (>6 hours/day) was the most frequent risk factor (52.5%), followed by family history, obesity, pregnancy-related hormonal influences, and smoking, highlighting the contribution of both occupational and lifestyle determinants. Most patients presented in CEAP C2–C3 stages, reinforcing the importance of early detection to prevent ulceration and advanced venous insufficiency.

Venoactive drugs such as MPFF, diosmin, and rutosides were the most prescribed agents, along with NSAIDs and, in selected cases, anticoagulants. DDD analysis indicated frequent NSAID overuse, suggesting the need for rational prescribing. Compression therapy, lifestyle modifications, and interventional procedures formed essential components of management, although adherence remained suboptimal due to cost and low awareness.

The study underscores the significance of multidisciplinary care, timely counseling, and pharmacist involvement in improving adherence and outcomes. Strengthening awareness, introducing structured screening in high-risk groups, and promoting guideline-based drug use can reduce disease burden. Further multicentric and policy-focused research is recommended.

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