

The epidemiology of varicose veins

A survey in western Jerusalem

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SUMMARY The prevalence and correlates of varicose veins were investigated in a community survey in a neighbourhood of western Jerusalem in 1969–71. The prevalence was 10% among men and 29% among women aged 15 and over; it rose with age in each sex. In both sexes, significant associations were found with standing at work and with region of birth. Among women, varicose veins were associated with weight, the wearing of corsets, and having ever been pregnant. Among men, there was an association with inguinal hernia. The findings support the aetiological role of prolonged standing and raised intra-abdominal pressure. Varicose veins were relatively uncommon among North African-born men and women aged 45 and over. This finding, which was not accounted for by the other observed associations, is consistent with the possible aetiological role of experiences before immigration, such as behavioural patterns laid down in early life.

Varicose veins do not threaten life and are seldom disabling, but they cause a considerable demand for medical care. During one year in the United States of America one person per 100 of the population sees a doctor at least once because of varicose veins¹ and almost 100 000 excision and ligation operations are carried out, each causing an average stay of 6·4 days in hospital.² The possible role of varicose veins as a risk factor or, more plausibly, as a risk marker for deep venous thrombosis and pulmonary embolism, with which they are statistically associated,³ has not been fully appraised.

The prevalence of varicose veins varies markedly, and is highest in developed countries.^{4–8} Despite interest in this variation and its possible implications for aetiology and prevention, there have been few detailed population-based studies of the correlates of the disorder.

An opportunity to study the prevalence and correlates of varicose veins was provided by a community health survey conducted in 1969–71 by the Department of Social Medicine of the Hebrew University-Hadassah Medical School in a Jewish neighbourhood of western Jerusalem mainly populated by immigrants from central and eastern Europe, North Africa (especially Morocco), and Middle Eastern countries, and their offspring.⁹ These immigrants are drawn from Jewish populations that have been separated for centuries and differ in gene frequencies in various loci.

Methods

The study included all residents aged 20 or over and a 50% sample of those aged 15–19. The investigation comprised an interview at home and a subsequent examination by a physician, using standardised questions, procedures, and criteria. The study design and factors affecting response are described elsewhere; there was little evidence of non-response bias.⁹

The presence of varicose veins was recorded if distended and tortuous subcutaneous veins were clearly visible in the lower limbs, with the subject standing. Dilatation or tortuosity of very small veins (venectasias) was excluded.

Work posture was graded by asking how much time was usually spent sitting, standing, and walking during working hours, with fixed alternative responses (to each question) of 'almost all the time', 'more than half the time', 'about half the time', 'less than half the time', and 'almost not at all'. The questions were repeated if the replies were inconsistent, so as to reduce incongruities. The worker was classified as 'mainly sitting', 'mainly standing', or 'mainly walking' if one activity was reported to occupy at least half the time and occupied more time than either of the other activities. Allocation was made to a two-activity group if both activities occupied equal time, and the third less time. If the same reply was reported for all three activities the worker was placed in a three-activity group.

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Women were asked whether they wore stockings, garters, and corsets, including elastic 'roll-on' belts and boned corsets.

Age-standardisation was performed by the direct method, based on the age groups shown in Table 1, using the total examined population as the standard. Odds ratios were calculated by the Mantel-Haenszel method¹⁰ so as to control for age and, usually, sex. Analyses of variance were performed by the classic experimental approach of the SPSS.¹¹ Subjects with missing data on specific characteristics were excluded from the relevant analyses.

Results

The response rate for interviews was 89% and of those interviewed 89% were examined, giving a total response rate of 80%. Information on the presence of varicose veins was available for 4888 people; these included 86 pregnant women who are excluded from the analyses unless specifically mentioned.

The prevalence of varicose veins was higher among women (29%) than among men (10%) and rose with age in each sex, reaching 54% among women aged 65-74 and 39% among men aged 75+ (Table 1).

Table 1 Prevalence of varicose veins by sex and age

Sex	Age groups (years)								Total
	15-19	20-24	25-34	35-44	45-54	55-64	65-74	75+	
MALE									
No. examined	106	248	620	440	300	323	165	43	2245
Rate %	0	1.2	3.1	7.7	11.2	24.4	35.8	39.5	10.4*
FEMALE (non-pregnant)									
No. examined	148	362	688	459	377	307	153	63	2557
Rate %	1.4	8.0	21.2	36.4	38.7	45.3	54.2	42.4	29.5*

* Age-standardised. The rate among women was 29.3% when 86 pregnant women were included.

Table 2 Associations with varicose veins: age-standardised rates of varicose veins and odds ratios adjusted for age and sex

Variable	Rate %		Odds ratio
	Men	Women	
Region of birth			0.66** ^a
North Africa	6.3 (331)	25.8 (386)	
Asia (other than Israel)	10.6 (338)	29.9 (398)	
Europe or America	12.8 (755)	31.7 (847)	
Israel	8.8 (714)	31.2 (773)	
Work posture (workers aged 20-64)			1.6** ^b
Much standing:			
Mainly standing	12.3 (222)	33.5 (149)	
Standing and walking	8.6 (319)	33.2 (219)	
Standing and sitting	9.5 (75)	27.3 (42)	
Standing, walking and sitting	8.7 (108)	28.4 (40)	
} 9.9		31.9	
Little standing:			
Mainly sitting	7.0 (750)	22.1 (515)	
Mainly walking	8.3 (177)	24.3 (108)	
Sitting and walking	5.7 (70)	20.8 (29)	
} 7.2		22.7	
Corset or roll-on ^c			1.4**
Worn	—	35.5 (593)	
Not worn	—	29.1 (1813)	
Stockings ^c			1.5**
Worn	—	41.2 (289)	
Not worn	—	30.1 (2115)	

Based on data for all subjects aged 20+ (unless otherwise stated). Denominators are shown in parentheses.

**p < 0.01 by Mantel-Haenszel test, controlling for age and (where applicable) sex.

^aNorth Africa compared with all other regions (combined). χ^2 value appraised at 3 df.

^b'Much standing' compared with 'little standing'. χ^2 value appraised at 6 df.

^c'Worn' = worn most of the year. 'Not worn' = seldom or never worn, or only in winter.

Varicosities were usually bilateral (76%); they were equally common on each side. Calf pain provoked by walking was reported by 9.1% of people with varicose veins and 4.8% of those without (odds ratio = 1.4, adjusted for sex and age; $p = 0.02$). There was no significant association with definite intermittent claudication as defined by Rose and Blackburn.¹² Definite pitting oedema was more prevalent in people with varicose veins (11.7%) than in those without (2.9%).

Previous medical treatment was reported by 27% of people with varicose veins—surgery or local injections by 10%, and other treatment by 17%. The proportion who reported treatment was 15% among men and 32% among women, and did not vary with age. Previous surgery or local injections for varicose veins were reported by 23 people without obvious varicosities.

Many people who were found to have varicose veins had not reported the condition in the interview. The sensitivity of the interview data was only 47% in men and 67% in women. Specificity was 95% in men and 85% in women.

ASSOCIATED CHARACTERISTICS

When age and sex were controlled, a number of variables were significantly related to varicose veins. As shown in Table 2, the prevalence was relatively low among people born in North Africa. It was relatively high among workers who reported that they spent much time standing, and among women who habitually wore corsets or stockings. There were no significant differences in prevalence between women who wore boned corsets and those who wore elastic 'roll-on' belts, or between women who wore stockings with or without garters. People with varicose veins tended to be taller (mean age- and sex-standardised difference, 1.4 cm; $p = 0.007$) and heavier (mean difference, 3.8 kg; $p < 0.00001$) and to have a higher Quetelet's index (mean difference, 0.09 g/cm²; $p < 0.00001$). In men, varicose veins were associated with inguinal hernia (odds ratio, 1.7;

$p = 0.0006$).¹³ In women only, weak and marginally significant associations were found with reported constipation (age-adjusted odds ratio, 1.2; $p = 0.042$), a low educational level ($p = 0.049$), and a low diastolic pressure (mean age-standardised difference, 1 mm Hg; $p = 0.02$).

Among women, when age was controlled there was a significant relationship with a history of at least one pregnancy (odds ratio, 1.7; $p = 0.0011$), but none with the number of previous pregnancies. The age-standardised prevalence of varicose veins was 24.0% in never-pregnant women aged 20+ and 31.7% in women with at least one previous pregnancy. This association was mainly accounted for by the findings in the 25–34 age group, and became non-significant ($p = 0.12$) when this age group was excluded. There was a significant association ($p = 0.0001$) with the number of previous pregnancies in the 25–34 age group only.

When age and sex were controlled, no significant associations were found with social class, smoking, the reported frequency of stools, the lifting or carrying of heavy weights, physical exertion at work, the number of emotional symptoms, parental consanguinity, systolic blood pressure, the palpability of pedal pulses, a history of haemorrhoids, or the presence of coronary heart disease, diabetes, or congestive cardiac failure. Among women there were no significant relationships (controlling for age) with menopausal status or pregnancy; the age-standardised rate of varicose veins was slightly lower among pregnant women.

ANALYSIS OF VARIANCE

Analysis of variance was used to examine the specific effects of age, weight, height, and region of birth, which together accounted for 13.4% of the variation in varicose veins in men aged 20+ and 10.7% in women. Age had a significant specific effect in each sex, weight had a significant effect in women only, and region of birth in men only (Table 3). When

Table 3 Associations with varicose veins. Analyses of variance: beta values^a

Main effect	All subjects aged 20+						Workers aged 20–64 ^b	
	MEN			WOMEN			MEN	WOMEN
	20–44	45+	Total	20–44	45+	Total		
Age	0.12***	0.22***	0.34***	0.22***	0.12**	0.26***	0.28***	0.20***
Weight	0.11*	0.05	0.05	0.13***	0.16**	0.13***	0.06	0.13**
Height	0.04	0.10	0.07	0.03	0.04	0.02	0.08	0.06
Region of birth	0.04	0.13**	0.08**	0.04	0.14**	0.06	0.08*	0.07
Work posture	—	—	—	—	—	—	0.07*	0.12**

Statistical significance based on F tests: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

^aBeta values are standardised partial regression coefficients, expressing the specific effect of each factor over and above what can be explained by the other factors examined.

^b1704 men and 1070 women.

separate analyses were carried out for people aged under and over 45, the specific effect of weight was significant among both younger and older women, and also among younger men; the effect of region of birth was significant in older people of each sex. Height had no significant specific effect in any age sex group. The age-specific analyses revealed no significant interactional effects.

When work posture was added to the analysis of variance, using data for gainfully employed people aged 20–64, this variable was found to have a significant specific effect in each sex, somewhat stronger among women (Table 3). The inclusion of work posture in the analysis of variance produced little change in the specific effects of the other variables. Its inclusion raised the proportion of explained variance (R^2) among workers aged 20–64 from 8.9% to 9.4% in men and from 9.1% to 10.4% in women.

To estimate the magnitude of the effects, adjusted prevalence rates were calculated by multiple classification analysis, controlling for the variables included in the analyses of variance (Table 4). At 45+ the adjusted prevalence of varicose veins was much lower among immigrants from North Africa than other immigrants. In each sex, the adjusted rate for workers classified as 'mainly standing' was over one and a half times as high as for workers who mainly sat.

Analyses of variance in which the habitual wearing of stockings and corsets were entered together with age, weight, and region of birth showed that both the former variables had small but significant specific effects, with *beta* values of 0.6 and 0.4 respectively. The specific effects of age, weight, and region of birth were not altered by the inclusion of these two variables. Since there was a significant interaction of corset-wearing and weight, adjusted rates by corset-wearing (controlling for age, height, and

stocking-wearing) were calculated for women of different weights. In each weight category below 80 kg, the adjusted prevalence of varicose veins was higher by 6–8 per 100 among women who wore corsets; in the relatively small group of heavier women, however, there was a reverse relationship.

Discussion

We have compared our findings only with data for Tecumseh,³ in Michigan, on the basis of age-standardised rates, calculated by using our study population as the age standard. The prevalence among women, including pregnant women, aged 20+ was very similar in the two populations: 30.8% in Jerusalem and 34.8% in Tecumseh. Among men, however, the rate was lower in Jerusalem (11.1%) than in Tecumseh (18.6%). The female : male ratio was 2.8 in Jerusalem and 1.9 in Tecumseh. This difference in sex ratio remained apparent when very slight varicosities were excluded from the Tecumseh data, the adjusted rates then being 22.7% for women and 10.8% for men (ratio, 2.1).

In the Jerusalem sample, varicose veins were positively associated with both weight and height. The associations with weight remained significant, except among older men, when height was controlled in the analysis, but the association with height became non-significant when weight was controlled (Table 3). The relationship with weight confirms findings in other populations,^{5, 8, 14} although in some of these the association with weight appeared weaker than that with height. The marked female preponderance of varicose veins in the Jerusalem sample may be related to the fact that the prevalence of overweight (body mass index 2.8 g/cm² or more) in our study population was 1.4 times as high among women as among men.¹⁵ In the USA the corresponding sex ratio is 1.1 if overweight is defined as 10% or more above standard weight and 1.7 if it is defined as 20% or more above standard weight.¹⁶

Our results support the notion that prolonged standing can contribute to the development of varicose veins. This is a widely and long-held belief for which little reliable and convincing evidence exists.⁴ Our findings resemble those in a study of women cotton workers in England, which revealed an association with standing after adjusting for the effects of age, weight, parity, and tight garments.⁵ Among men examined by civilian medical boards in England in the 1940s, prevalence was highest in boot and shoe factory workers, who stood all day, and lowest in clerical workers; age was controlled in this analysis.¹⁴ In a study of workers in a New York department store, in which confounding effects were not taken into account, prevalence was relatively high among women (but not men) who usually stood

Table 4 Adjusted rates* of varicose veins, by (a) region of birth and (b) work posture

Variable	Men	Women
(a) REGION OF BIRTH (ages 45+)		
North Africa	13.2 (122)	30.2 (136)
Asia (other than Israel)	22.4 (129)	39.7 (132)
Europe and America	26.9 (459)	48.8 (495)
Israel	14.9 (98)	47.7 (101)
(b) WORK POSTURE (ages 20–64)		
Mainly standing	13.6 (218)	31.4 (145)
Mixed, with standing as a main component	9.7 (500)	30.7 (295)
Mainly walking	8.9 (173)	24.0 (107)
Sitting and walking	7.4 (68)	18.8 (24)
Mainly sitting	7.2 (745)	20.4 (499)

* Rates per 100 people of specified age and sex, adjusted by multiple classification analysis, controlling for age weight, height and (for rates by work posture) region of birth. Denominators are shown in parentheses.

or walked while at work.¹⁷ In a small population study in Cardiff there was no apparent relationship with work involving long hours of standing.¹⁸

The association found with habitual corset-wearing may be of aetiological significance, despite the anomalous result in women weighing 80 kg or more. It confirms the results of Mekky *et al.*,⁵ who found that English cotton workers who wore corsets or roll-ons tended to have a high prevalence of varicose veins, after allowing for the effects of age, weight, parity, and working posture. This association, like the relationship between varicose veins and inguinal hernia among men,¹³ supports the aetiological role of raised intra-abdominal pressure.

Repeated pregnancy has long been believed to be a cause of varicose veins,¹⁹ but we can find very little epidemiological evidence for an association with parity when the effect of age is controlled. The association observed among young women in this study conforms with findings among English cotton workers, who displayed a relationship with parity in the 15–34 age-group only.⁵ In the South Pacific, associations between parity and the age-standardised prevalence of varicose veins were found in white and Maori New Zealanders but not in residents of Rarotonga Island.⁸

It appears likely that varicose veins can be partly prevented by avoiding obesity, abstaining from habitual prolonged standing, and eschewing tight foundation garments. Since close association between a Western style of living and a genetic predisposition to varicose veins is hardly likely, various behavioural and environmental explanations have been sought. Dietary causes, especially a low intake of fibre, have been suggested, the possible mechanisms including pressure by the loaded bowel on the external iliac veins,²⁰ transmission of pressure to the leg veins as a result of a need to strain at stool,⁶ and dietary influences on blood clotting and clotlysis.²¹ Other speculative causes include the use of raised toilets rather than squatting at stool,⁶ and the effect on the saphenous veins of sitting on chairs rather than the ground during childhood.²²

We cannot explain the differences observed in this study between people born in different continents, especially the low prevalence among those born in North Africa. The specific effect of region of birth was significant only among people aged over 45, most of whom had spent their childhood outside Israel. This supports the possible aetiological role of experiences in their countries of origin during early life, or of behavioural patterns laid down in early life.

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