INTRODUCTION

Chronic venous disorders of the lower limbs rank among the most common conditions affecting mankind (1). These disorders comprise a wide spectrum of clinical severity, varying from minor symptoms to disabling disease, and include asymptomatic venous incompetence, telangiectasis, reticular varices, trunk varices, and, in its gravest form, stasis skin changes and ulceration. In contrast to many other chronic conditions, patients and physicians alike often trivialize the presence and severity of venous disorders. There seems to be a high level of acceptance among affected persons of complaints of the legs stemming from venous disorders (2). This might be due to the fact that varicose veins are slowly progressing conditions and are common in the population.

SOCIOECONOMIC IMPORTANCE

There is an increasing understanding that chronic venous insufficiency is a disorder of socioeconomic significance. In western Germany, costs stemming from venous disorders were estimated at DM 1.8 billion in 1986 (3), and the cost of leg ulcers in Great Britain was estimated at £600 million in 1992 (4). In Great Britain in 1987, more than 50,000 persons were admitted to hospital for the treatment of varicose veins (almost twice as many as in 1975) (5). Aging of the population may contribute to this increase.

In Germany, approximately 2 percent of all people with varicose veins deemed themselves unfit to work for several weeks each year because of complaints related to their condition. Approximately 2.5 percent of these individuals felt permanently disabled for this reason (6). In western Germany, the total lost income due to venous disorders was estimated at DM 41.8 million in 1980 (3).

BIOLOGY

The venous system of the lower extremities falls into two categories, that which lies within the muscular system and that which is superficial to it. Almost 90 percent of all venous blood leaves the legs through the deep veins aided by muscular compression (7). This system is referred to as the calf muscle pump or peripheral heart (8). The deep venous system is connected by numerous channels to perforator veins and superficial veins. The deep veins draw blood from the superficial veins through the perforator veins. Dysfunction of any one of these components can result in dysfunction of the others. When the superficial veins are put under excessive pressure, they dilate and elongate. The tortuous appearance this excessive pressure produces is called varicose, derived from the Greek word for “grape-like.” Venous dysfunction may result from congenital or acquired processes such as venous thrombosis.

An increase in deep venous pressure can be caused by post-thrombotic or other damage of the vessels and valves, or by outflow obstruction (pelvic tumors) or increased abdominal pressure (straining during defecation). When an individual is standing still and upright, venous pressure is equal to the hydrostatic pressure corresponding to the height of the column of blood to the heart (9). Normal veins do not have valves and venous pressure reduces as the result of intermittent contraction of the calf muscle pump (9–11). Venous valve dysfunction results in the inability to reduce venous pressure during exercise, causing sustained venous hypertension (11). Raised venous pressure causes an increased capillary filtration pressure and, hence, increased flow through the capillary membrane into the interstitial space (12), and the equilibrium between inflow and outflow is disturbed. This eventually results in interstitial edema, inflammation, and, finally, necrosis of the surrounding tissues. The term chronic venous insufficiency refers to the complex of symptoms resulting from sustained excessive venous pressure.
CLINICAL PICTURE AND EXAMINATION

Subjective complaints of varicose veins and chronic venous insufficiency are often described as a feeling of heaviness and pain, a sensation of swelling of the legs, nighttime calf cramps, and restless legs. Complaints increase during the course of the day, especially after prolonged standing. In the Basel, Switzerland, study, these complaints were reported by 44 percent of the men and 70 percent of the women, and almost twice as frequently in the older age group as in the younger (13). Leg complaints were reported by about three-fifths of the subgroup with medically significant varicose veins, but also by one-third of healthy persons. In a study of male workers in the Netherlands who must stand as part of their work, leg complaints (feelings of fatigue or pain) were reported by 81 percent of the workers with chronic venous insufficiency, but also by 63 percent of those with no diagnosed venous disease (2, 14). Leg complaints are more frequent and more severe in subjects with varicose veins and chronic venous insufficiency, but these were neither sensitive nor specific indicators (2, 13).

The legs of the patient are examined with the patient standing erect. Special attention is paid to the presence of varicose veins, stasis skin changes, as well as signs of arterial disease. Edema, ankle flare, and corona paraplantaris phlebectatica (a wreath of intracutaneous vessels along the edge of the feet and ankles) are the first skin signs of chronic venous insufficiency. Subsequently, pigment changes, lipodermatosclerosis, white atrophy, or ulcers may develop. The distribution of varicose veins may indicate long saphenous incompetence (anteromedial side of the leg) or short saphenous incompetence (calf).

For the detection of reflux in the veins, continuous wave ("cw") Doppler ultrasonography is used. To generate flow in the veins, manual compression of the calf to stimulate muscle contraction is performed. In case of venous valve incompetence, retrograde flow will occur when compression is released. During a Valsalva maneuver, a reflux signal is a reliable sign of valvular incompetence. Tourniquet tests, used to detect long saphenous and valve incompetence, are often inaccurate.

Until recently, ascending phlebography was the gold standard for investigation of the deep venous system (15). The introduction of duplex scanning has allowed a noninvasive technique to measure reflux, including in deep and perforator veins.

Other tests of calf pump function, such as venous pressure measurements, light reflection rheography, strain gauge plethysmography, and foot volumetry during exercise, have little part to play in the investigation of varicose veins.

NATURAL HISTORY

Small intracutaneous or reticular veins are present in over half of the world's westernized population (6, 13, 16, 17). Even without treatment, only a minority of individuals will develop clinically relevant varicosity. Varicose veins and chronic venous insufficiency are slowly progressing conditions. Once the valves of the larger superficial vessels are affected, venous hypertension will increase and varices tend to spread through the system. This deterioration may be aggravated by complications, such as phlebitis or venous thrombosis, to which patients with varicose veins are particularly prone. Clinically-relevant varicose veins that give rise to complaints and complications are present in approximately 10 percent of the world's westernized population (18). This condition requires treatment, otherwise it can develop into a venous ulcer, a major complication. Approximately 1 percent of the population will suffer from leg ulceration at some point in their lives (19). It is stated that there is evidence of venous disease in 60 to over 90 percent of ulcerated legs (19, 20).

THERAPY

The aim of therapy is to normalize venous physiology. Deep venous insufficiency is usually treated with conservative compression therapy. Superficial varicose veins can be treated surgically, with sclero-compression therapy, with external compression therapy, or a combination of these treatments.

There is evidence in the literature that external compression therapy (bandages or stockings) will slow the progression of chronic venous insufficiency (21). The mechanism by which external compression acts on venous hemodynamics has never been demonstrated conclusively. Some investigators found that compression stockings improved ambulatory venous pressure and venous refill time, but this could not be verified by others (22-27). Furthermore, it has been argued that compression therapy facilitates restoration of venous wall elasticity, but this mainly benefits patients with early venous incompetence compared with those with severe venous diseases (28). Currently, there is a tendency to attribute the beneficial effects of external compression mainly to microcirculatory changes in the skin (11, 29).

Ambulatory sclero-compression therapy is indicated in cases of telangiectatic or reticular varicose veins and postoperative persistence or recurrence of varicose veins (30). It is a safe and simple way to treat this disease. Moreover, sclerotherapy of incompetent superficial or perforator varicose veins increases the efficiency of the calf muscle pump, resulting in the
improved clearance of extravascular fluid (31) and
venous hemodynamics (32).

Surgical intervention can be chosen in cases of
large-stem varicosities, sapheno-femoral or sapheno-
popliteal reflux, or insufficiency of the perforator
veins. Saphenous vein ligation alone results in persis-
tent reflux in a high proportion of cases (33). Signif-
ificant varicose recurrence is reduced if the saphenous
vein is stripped (34). Mini-phlebectomies of reticular
varicose veins can be done surgically through inci-
sions of 1–2 mm in length, extracting the vein with a
small hook (35, 36).

CLASSIFICATION

The lack of a precise and reliable description is a
drawback in any epidemiologic study, but it is espe-
cially true for venous disorders. The subject is often
categorized according to anatomic region (such as
superficial versus deep venous system) or by clinical
severity (37). Recently, however, a more precise form
of classification has been put forward by the ad hoc
committee at the American Venous Forum (38). The
CEAP classification uses clinical, etiologic, anatomic,
and pathophysiologic characteristics of chronic venous
disorders, providing a uniform basis in which to
present diagnostic and treatment results (table 1). It is
meant to describe the individual patient, and is less
useful for epidemiologic research because many sub-
groups are distinguished using this classification. In
epidemiologic surveys, three types of chronic venous
disorders are often distinguished, varicose veins,
chronic venous insufficiency, and venous ulcers.

Definition of varicose veins

An often-cited definition of varicose veins was in-
troduced by Arnoldi (39) as ‘any dilated tortuous and
elongated subcutaneous veins of the leg.’ Alexander
(40) defined the varicose vein as ‘one which shows a
persisting and incongruous increase of one or both
dimensions beyond the peak needs for physiologic
function.’ Other definitions range from ‘any promi-

<table>
<thead>
<tr>
<th>TABLE 1. CEAP classification of chronic venous disease in the lower limbs*</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
</tr>
<tr>
<td>E</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>P</td>
</tr>
</tbody>
</table>

* From Beebe et al. (38).

Definition of chronic venous insufficiency

The most commonly-used classification of chronic
venous insufficiency, the Widmer classification, is
based on skin disorders—ankle flare, corona paraplan-
taris phlebectatica, pigment changes, induration,
edema, or ulcers (42). Grade III refers to either an
active or cured ulcer. In some cases, grade IV is added
to distinguish active ulcers at the time of investigation.
Table 2 shows the Widmer classification and the grad-
ing scheme accepted by the Society for Vascular Sur-
gery in 1988 (43). The Widmer classification is based
on skin and subcutaneous disorders only, while the
Society for Vascular Surgery also takes subjective
complaints into account.

It is striking that, in both these classifications, noth-
ing other than clinical criteria were used. All of the
criteria here are subjective, as they involve assessment
by questionnaire or inspection of the leg without in-
struments. Few, if any, classification systems have
used objective measurements such as Doppler ultra-
sonography.

Definition of venous ulcer

There has been considerable variation between stud-
ies as far as what is considered a chronic leg ulcer,
either in terms of site or duration of the ulceration
(19). Some studies have included any vascular wound
of the limb, whether on the foot, toes, or leg, while
other studies have excluded foot lesions—in particu-
lar, diabetic and arterial toe and forefoot lesions. The
duration required to qualify as chronic leg ulceration
also varies between studies, ranging from the inclusion
of any wound or ulcer to the limitation of ulcers
present for a minimum of 6 weeks. A further discrep-
ancy is that some studies only include active ulceration
at the time of the survey while others include any
person with a history of ulceration.

DIAGNOSTIC PROCEDURES

It has been noted in the literature that the use of
self-assessment questionnaires leads to the lowest
prevalence, interviewer assisted questionnaires result

in higher prevalence, while the use of physical examination leads to the highest values (44). For example, in the Basel study, only one-third of the persons with evident stem varicosity gave a positive answer when asked about venous diseases. Only one-tenth of the subjects with reticular varices and hyphen webs said they had venous problems (45).

**Questionnaires**

The high acceptance for varicose veins could be caused by the fact that it is such a widespread disease and, in most of the patients, is only a slowly progressing condition. The disease’s inconspicuous development is a probable reason for its underreporting in questionnaires. Questionnaires are also unreliable in the investigation of family history; people with varicose veins may be better informed about their parents’ varicose veins than people without varicose veins. This can be illustrated by a family study performed by Weddell (17). In this study, the investigator took a family history and performed a physical examination of the family members. In those families where varicose veins were present, 48 percent of the observations by other family members proved to be incorrect. Subjects with early onset of varicosities are more likely to know their family history accurately than those with late onset of varicosities. In the past it was uncommon to see relatives unclothed, and today’s “beach culture” reveals more than in earlier decades.

Not only can questionnaire items influence results, the wording of the questions themselves can have an effect. For instance, the literature indicates that the use of selective terms (such as “chronic”) will produce lower prevalence. Secondly, the way the list is presented plays a role. Differences in outcome have been found between self-administered and interviewer-administered questionnaires. The interviewers’ reading aloud the conditions one at a time led to a higher prevalence than when checklists were handed to respondents (46). Furthermore, detailed questionnaires result in higher prevalence.

**Physical examination**

Physical examination of the legs, although often only consisting of inspection or assessment of color slides, was a regularly-used method (47–50). Inspection of photos of the lower legs taken in a standardized procedure was used in the Basel studies and thereafter in other German studies (13). The strong point of this study was that the researchers tried to establish a reproducible interviewing technique and reliable documentation of varicosity and chronic venous insufficiency. For example, in venous disorders the body posture in which the patient is examined has important consequences for the results. Even though this is carefully standardized and described, it lacks essential information gained from palpation and ultrasonographic examination.

Even in standardized conditions, interobserver variability can occur. In the Paris, France, prospective study, the authors reported the possible influence of interpretation on the part of the physicians, even when a definition of varicosity was used (51). Among the physicians who examined the subjects, the observed prevalence of varicosity varied from 14 to 40 percent.

**Tests using instruments**

With function tests such as venous pressure measurements, Doppler ultrasonography, and plethysmography, venous insufficiency can be detected even when not yet visible to the eye. Although these tests have great value to an epidemiologic study, they have been seldom used. Venous pressure measurements are difficult to perform in epidemiologic studies because they are invasive. In the practice of phlebology, Doppler ultrasonography and plethysmography are routine examinations. However, they require special training.
on the part of the investigator and can be time-consuming. This might explain their limited use in epidemiologic surveys.

A totally different way of classifying venous disorders is according to social consequences. This approach was used in national health surveys where the severity of venous disorders was measured by the rate of disability or the need for medical care (41). In the Basel study, investigators made an attempt to draw a distinction between venous disorders and venous diseases (18). The authors maintained that the social importance of varicose veins depends on prevalence on one hand and on pain, incapacity, and mortality on the other. The presence of chronic venous insufficiency and certain well-defined subgroups of varicosity—such as pronounced trunk and reticular varices—qualified as disease, while the presence of hyphen webs or reticular varices only were defined as a disorder.

**METHODOLOGICAL CONSIDERATIONS**

In addition to the lack of uniform nomenclature, which has been notable, there are other methodological problems which have hampered the comparison of studies.

**Statistics**

Technical terms, such as prevalence and incidence, have often been used incorrectly. Point prevalence—the number of patients with a condition at a point in time—is the most common term used in epidemiologic studies of chronic venous insufficiency. In a chronic disease like chronic venous insufficiency, the point prevalence will be approximately the same as a period prevalence. Incidence—the number of new patients with a condition during a specific time period—is frequently not used in epidemiologic studies of varicosis.

**Design**

Apart from the type of investigation employed, the purpose of the study and the organization (whether retrospective or prospective) are important. In epidemiologic studies, higher prevalence was found when the type, purpose, and organization of the study were intended for the detection of venous disorders. In retrospective studies, records gained for another purpose (such as records from a medical health service) were used; it is almost certain that the direction would be toward a low count, because no special attention was paid to varicose veins and chronic venous insufficiency.

**Sampling**

A striking difference was found between the sampled populations. First, in most studies a minimum age of between 15 and 20 years has been chosen, but in some studies, only persons between the ages of 45 and 65 years were included. In other studies only a maximum age was used. Secondly, it was often unclear if the sample was drawn from the general population, a neighborhood population, a hospital, or an occupational population, and where occupational populations were the subject of study, occupation type was often not specified.

**EPIDEMIOLOGY**

To study the prevalence of varicose veins and chronic venous insufficiency in the general population, samples of both a country's population (through national health surveys) and a region's population (regional surveys) are used (table 3). Although regional surveys are limited to a specific neighborhood or city, they have proved to be of great value in epidemiologic research. In contrast to national health surveys, the majority of regional studies were designed primarily for investigating venous disorders.

In some studies, outpatient populations were investigated, and these populations have been regarded as representative of the general population. Although many of these subjects were not visiting the outpatient clinic for venous disorders, the data obtained may very well be skewed and not representative of the general population.

**Europe and the United States**

The first major study of the epidemiology of varicose veins was carried out as a part of the United States National Health Survey in 1935–1936 (41). It was based on a house-to-house questionnaire survey of 2.8 million people. Varicose veins ranked seventh on the list of conditions surveyed, but a point prevalence was not mentioned. In 1961, an American national health survey estimated a point prevalence of 2.25 percent for “severe” varicose veins. “Severe” was interpreted as cases involving medical care, confinement to bed, or with specified degrees of limitation. In the 1940s and 1950s, national health studies were performed in Canada, England and Wales, Denmark, and the United States (41). In England and Wales, the monthly prevalence of varicose veins (causing incapacity or need for medical care) in 1951 was 1.4 percent for males and 3.7 percent for females. The lowest prevalence of varicose veins found in national health surveys was in Canada with a rate of 0.53 percent (41). However, the severity of the disease was
not indicated in this study. Differences found between countries remain unexplained, but both geographic and methodological differences in definition of the disease must be considered. The data from the national health surveys are acquired by the use of questionnaires; using these kinds of data, study prevalence is generally underrated (44) and does not represent the actual prevalence of varicose disorders in each population. However, these studies accentuated the importance of venous disorders as a disabling disease since they refer to the percentage of the population in need of medical care as a result of this problem. The percentages were estimated to be between 0.53 and 2.6 percent of the general, westernized populations.

Many regional surveys in Europe and the United States show a prevalence of varicose veins of between 5 and 15 percent in men and 15 and 30 percent in women. As a result of a better study design, these regional surveys show a more reliable, and a far higher, prevalence than the national surveys.

The Tecumseh Community Health Study, initiated in 1957 (52), was a longitudinal study in the United States of a total community. Medical interviews and physical examination of the lower legs were performed among approximately 8,000 persons. In males, a prevalence of varicose veins of 12.9 percent was found, and in females, the prevalence was 25.9 percent. Stasis skin changes were found in 3.0 percent of the males and 3.7 percent of the females. A varicose ulcer—whether active or healed—was present in 0.1 percent of the males and 0.3 percent of the females.

In Germany in 1979, almost all the inhabitants of the city of Tübingen were asked to undergo a thoracic radiographic examination (6). The study was not primarily designed for the detection of chronic venous insufficiency, but was broadened to cover a study of the legs. An epidemiologic study of varicose veins was done on 4,530 persons randomly selected from the Tübingen study. Photographs of all persons were taken using the color slide technique employed in the Basel study, and a researcher performed an interview. This revealed the presence of hyphen webs, reticular varices, stem and branch varicosities, chronic venous insufficiency, blowouts, lipodermatosclerosis, edema, and eczema. A total of 59 percent of all persons were found to have light varicosity, 15 percent had evident varicosity, and 12 percent had progressive chronic venous insufficiency. The design of this study allowed a small group of specialized researchers to study a large population. Inspection of the legs using slides seems to be an objective way of evaluation but provides less information compared with physical examination performed by an experienced examiner.
The aim of the Aachen, Germany, study in 1989 was to determine predictive factors (such as rheologic and angiologic parameters) for the development of thrombosis and thromboembolic diseases (44). Part of the study consisted of an interview and physical examination to investigate the presence of phlebologic disease such as varicosis, phlebitis, and thrombosis; subjects between the ages of 45 and 65 years were included. A sample of the general population consisting of 2,821 persons (1,112 women and 1,709 men) was studied. Varicosis was present in 571 subjects (20 percent).

The aim of the West London, England, study in 1992 was to find the prevalence of venous disease in patients aged between 35 and 70 years (53). A sample comprising every third patient was drawn from age and sex registers of three general practices in West London. Questionnaires were sent to 2,103 patients of which 1,338 replied (64 percent); 25 percent of the respondents reported having varicose veins, and 4 percent reported a sore ulcer of the leg either currently or in the past. The limited value of this study was threefold: only questionnaires were used, no further definition of varicosis was given, and the response was low.

Almost no epidemiologic cohort studies have been conducted which have considered varicose veins and chronic venous insufficiency. The Framingham Study (United States) is a longitudinal study that, since 1948, has followed more than 5,000 men and women biennially for the development of cardiovascular disease (48). Since 1966, the presence of varicose veins has been reported, appearing in 3,822 adults (1,720 men and 2,102 women). Follow-up has continued for 16 years. The 2-year incidence rate was 39.4/1,000 in men and 51.9/1,000 in women.

In the Basel Study III, a distinction was drawn between medically-significant varices and insignificant venous disorders. This was done by correlating types and severity of varices with the prevalence of chronic venous insufficiency and phlebitis (18). For this follow-up study, a proportion of patients selected from Basel Study I were investigated. Medically-significant varicose veins (that is, pronounced degrees of combined hyphen webs or reticular and stem varices) were observed in 12 percent of the persons examined. Pathologic varicosity (with pronounced chronic venous insufficiency) was observed in 3 percent of the patients examined. Approximately 0.4 percent of the people examined had leg ulcers. As noted earlier, the selection technique (slides) can cause underreporting, but the strong points of the Basel study are the solid design, specialized physical examination of a large study population, and the high response rate. For this reason the Basel study is recognized as a standard work.

In sum, the prevalence of varicose veins in studies in western Europe and the United States varies between 10 and 50 percent. These variable figures can be explained by methodological differences between the studies (6, 17, 44, 52–56). Several sources indicate, that if all types of varicose veins (including intracutaneous) are included, more than half of the world's westernized population is affected. According to the most reliable studies, approximately 10 percent of the population has medically-significant varicose veins for which treatment is indicated. The prevalence of severe chronic venous insufficiency (grades II or III) is estimated to be present in 2–5 percent of the population.

Sub-Saharan Africa

There is a general impression that the incidence of varicose veins among people of the developing countries of Africa is low; and occasional observations by general practitioners have contributed to this belief. In a survey in 1972, a group of 469 women from traditional villages in the Republic of Mali were examined for the presence of varicose veins using the Basel study technique (57). The prevalence rate of 10.9 percent was higher than expected from earlier reports, and even seemed similar to several European studies. However, a few years earlier, the same authors found very high prevalence in a study among European women—more than four times as high as in Mali women (50). Chronic venous insufficiency was not found in any of the Mali women.

In 1977, Richardson and Dixon (58) found a prevalence of varicose veins in Tanzania of 4.8 percent in men and 4.1 percent in women (n = 1,259). The two studies mentioned above are, to our knowledge, the only epidemiologic studies performed in sub-Saharan Africa. Both were carried out in a rural population. These data cannot be extrapolated to the whole of (sub-Saharan) Africa, but indicate that, although probably less frequent than in westernized populations, varicose veins are not uncommon.

Middle East and North Africa

Between 1969 and 1971, Abramson et al. (54) studied the prevalence of varicose veins in an area of western Jerusalem. The study design was modeled on the Tecumseh Community Health Study (52), and included residents aged 20 years or older and a sample of those aged 15 to 19 years. The neighborhood was mainly populated by Jewish immigrants from central and eastern Europe, North Africa, and Middle Eastern countries. The investigation was comprised of an interview and clinical examination by a physician. The
prevalence of varicose veins was 29 percent among women and 10 percent among men.

In Egypt, Mekky et al. (49) studied the prevalence of varicose veins in 467 female cotton workers by physical examination revealing a prevalence of 6 percent. Compared with the results of a parallel study in English cotton workers (32 percent prevalence) by the same authors, the prevalence of varicose veins was more than five times lower in Egypt than in England. It is interesting that in both studies several ethnic groups are compared within each study. In the Jerusalem study, a low prevalence was found in immigrants who had spent their childhood in North Africa compared with those from other parts of the world. In the cotton workers study, striking differences were found in the Egyptian women compared with the English women, giving strong evidence for a low prevalence of varicose veins in North Africa.

**Asia**

As early as 1913, after studying 10,000 Japanese and 50,000 German soldiers, Miyauchi (59) showed that the prevalence of varicose veins in the Japanese was 0.1 percent, almost seven times lower than in the Germans (0.67 percent). He attributed this to the fact that Germans are taller. Nambiar (60) also found that, in Singapore, varicose veins are very much less prevalent among Asians compared with Europeans. Using examination of the legs, he found a prevalence of 5 percent in barbers and up to 9 percent in trishaw riders. Age was not included as a confounder, making comparison with other studies difficult. Both studies are rather old; therefore, new studies are needed.

**South America**

In 1986 in Brazil (55), a total of 1,755 people over the age of 15 years who registered at the university health center at Botucatu for any reason at all were examined and interviewed. Although this study claimed to represent the general population, it could be biased because the patients came to the hospital for other than phlebologic disorders, so there was some degree of selection. Varicose veins of any type were detected in 48 percent of these people. The prevalence in men was 40 percent and in women 51 percent. The prevalence of severe varicose veins (a large number of very dilated and tortuous veins) or moderate varicose veins (scarce and/or poorly dilated) was 21 percent. The prevalence of an active or healed ulcer was 3.6 percent. No figures on the prevalence of chronic venous insufficiency were summarized but, in those with varicose veins without active or healed ulcers, edema was found in 20 percent, hyperpigmentation in 6 percent, eczema in 1.4 percent, and skin fibrosis in 0.6 percent. Based on these data, we estimate that the prevalence of chronic venous insufficiency according to the Widmer classification (table 2) was at least 14 percent. Authors point out that the prevalence of varicose veins and chronic venous insufficiency in this study is as high, or even higher, than the prevalence found in developed countries.

### TABLE 4. Risk factors for varicose veins†

<table>
<thead>
<tr>
<th>Location and/or population (reference no.)</th>
<th>Age</th>
<th>Sex</th>
<th>Race</th>
<th>Family anamnesis</th>
<th>Standing occupation</th>
<th>Sitting occupation</th>
<th>Parity</th>
<th>Obesity</th>
<th>Height</th>
<th>Smoking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aachen, Germany (44)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amsterdam, The Netherlands (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basel, Switzerland (13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bratislava, Czechoslovakia (16)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiff, United Kingdom (17)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cotton workers (49)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Framingham, MA, United States (48)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hanover, Germany (76)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jerusalem, Israel (54)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kiel, Germany (56)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Munich, Germany (78)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neuchatel, Switzerland (50)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New York, NY, United States (75)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paris, France (51)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tecumseh, MI, United States (52)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tübingen, Germany (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulm, Germany (62)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West London, United Kingdom (53)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† Key: +, statistically significant, positive correlation; *, positive correlation, not statistically significant; o, no correlation; blank space, not determined.
RISK FACTORS (TABLE 4)
Ethnicity and place of birth

Geographic differences in the prevalence of varicose veins and chronic venous insufficiency suggest a correlation with race; however, very few comparative studies have been carried out. The varying prevalence of varicose veins and chronic venous insufficiency in different ethnic groups was described in 1969 by Mekky et al. (49) who found a five-times greater incidence of varicose veins in English women than in Egyptian women. Guberan et al. (50) demonstrated that, among European women as a whole, the prevalence of varicose veins is significantly lower among the women of southern Europe (such as Italy and Spain) than among other countries (such as Switzerland, France, and those in central Europe).

The national health survey in the United States in 1961 (41) reported a 24.1 percent prevalence of varicose veins among whites and 10.4 percent among blacks. However, this questionnaire survey only evaluated the respondents’ subjective data. In Brazil, a large-scale study (55) \((n = 1,755)\) employing the Basel study technique showed a significant difference between the prevalence of varicose veins in the white population (49 percent) and nonwhite population (36 percent). It bears considering, however, that the color-slide technique might be less reliable in evaluating dark-colored skin than in evaluating light-colored skin.

In a survey of 4,888 inhabitants of an area of Jerusalem, Abramson et al. (54) found there was a difference in the prevalence of varicose veins among people born on different continents. Specifically, there was a low prevalence among those born in North Africa. However, this specific effect of region of birth was significant only among inhabitants aged over 45 years, most of whom spent their childhood outside Israel. The authors suggested a possible etiologic role of lifestyle and circumstances in the countries of origin during early life, or of behavioral patterns laid down early in life. Ethnic or social factors, or the existence of diabetes, were postulated by other authors to explain racial differences. It has also been proposed that the habit of sitting in a chair (versus squatting) and food fiber intake are contributing factors in the relation between race and prevalence of varicose veins and chronic venous insufficiency (49, 61–65).

Age

Venous disorders occur frequently at all ages; they are by no means confined to the elderly. Relevant varicose veins can be present even in young children though, in the early stages, they are only detectable by Doppler ultrasonography. In a prospective study in Germany, children between and the ages of 10 and 12 years already showed a few cases of saphenous reflux (long saphenous vein, 2.9 percent; short saphenous vein, 0.2 percent), but no visible stem or branch varicosity (61). After 4 years, the same juveniles—now 14 to 16 years of age—had a much higher frequency of saphenous reflux (10.4 percent and 2.9 percent, respectively) plus a few stem or branch varices and some incompetent perforator veins. In 702 male soldiers between the ages of 18 and 22 years, varicose veins were observed in 23.6 percent, although very minor observations and hyphen webs or ankle flare were not taken into account (62). Advanced cases (evident and multiple tortuous veins) were found in 1.6 percent. In the Basel study, age proved to be the most important risk factor for the presence of varicose veins, especially for the presence of trunk varices (66).

The Framingham Study showed that, between the ages of 40 and 80 years, the incidence of varicose veins is the same for every age; in men the 2-year incidence rate was 39.4/1,000 and in women 51.9/1,000 (48). Therefore, the prevalence of this chronic disease will increase in linear correlation with age. This can be demonstrated by several surveys that studied the prevalence of varicose veins and chronic venous insufficiency at different ages (figure 1) (52, 55, 56). At the age of 20 years, the prevalence of varicose veins is estimated to be below 10 percent in women and men; at the age of 40 years, the prevalence is estimated at approximately 40 percent in women and 25 percent in men; and at age 80 years, the prevalence of varicose veins is over 70 percent in women and 60 percent in men. Chronic venous insufficiency is relatively rare in adolescents; the prevalence increases slowly after the age of 30 years in both sexes.

Sex

There is a considerable variation in the reported male-to-female prevalence ratios of varicose veins. Hormonal factors, pregnancies, and the fact that women report the presence of varicose veins more often than men play a role in this variation. In the 10- to 12-year-old children seen in the Bochum Study I \((n = 512)\), the prevalence of reticular varicose veins was approximately the same in boys (10 percent) and girls (11 percent), whereas a higher prevalence of saphenous reflux in girls was found using Doppler ultrasonography (4 percent in girls, 2 percent in boys) (61, 67). In the 14- to 16-year-old adolescents in the Bochum Study II, the prevalence of reticular varicose veins in girls (33 percent) was slightly higher than in boys (27 percent), and the prevalence of saphenous
reflux in girls (14 percent) was higher than in boys (8 percent).

In adult populations, prevalence of varices in women was reported in several studies to be up to three times higher in women than in men, but this was especially the case for the reticular varicose veins. The prevalence of more severe varicose veins and chronic venous insufficiency is estimated to be about the same in both sexes. For example, in the Basel study, women had 1.5 times more hyphen webs and reticular varicosis, but the same prevalence of trunk varices and chronic venous insufficiency (68). Commenting on the widespread opinion that there is greater prevalence of varicose veins among women, the authors suggested that, for cosmetic reasons, women report its incidence more often than men, and, therefore, undergo treatment about three times more often than men for the same clinical abnormality. The cosmetic aspects of varicose veins can contribute to a greater number of reports by women, especially in questionnaires. That does not alter the fact that there is evidence that prevalence of varicose veins is higher in women than in men. Hormonal factors are proposed for this higher incidence, as will be discussed below.

Heredity and family history

Many patients and doctors hold the belief that varicose veins are hereditary; however evidence to support this theory is difficult to obtain. Persons with varicose veins are more likely to notice this condition in their relatives, and, therefore, family histories are unreliable. Several important studies—for example the Basel study—demonstrated a positive family history in persons with varicose veins, but again the relatives were not examined (13). In a small family study using continuous wave Doppler ultrasonography, some evidence was found for a familial occurrence of saphenofemoral valve incompetence (69). In a pilot survey of 88 families (289 persons) in Cardiff, United Kingdom, in 1966, physicians took family histories and performed examinations on family members (17). A considerable discrepancy became apparent between the history given of the presence or absence of varicose veins in other members of the family and the findings from clinical examination of the same people. The family findings in this study were inconclusive, possibly because of the small number of families studied. The authors concluded that any genetic study must be based on clinical examination of each member of the family, and that varicose veins occur in approximately 12 percent of the population. A large sample would need to be examined before any conclusions could be drawn.

Pregnancy and parity

Many observers have shared the general belief that parity is an important risk factor in the etiology of varicose veins and chronic venous insufficiency. Hormonal changes, increased blood volume, and obstruction of venous return during pregnancy were proposed...
as etiologic factors. The majority of women who develop varicose veins during pregnancy do so in the first trimester (70–72). The production of estrogens causes the relaxation of smooth muscle and softening of collagen fibers; increased distensibility of vein walls has also been reported as a result of estrogen therapy (73, 74).

Furthermore, the progesterone level and the estrogen-progesterone ratio play a role in venous distensibility. Obstructive effects of the uterus are present in the second and third trimesters and probably play an insignificant role in the development of varicose veins.

Although hormonal factors and pregnancy influence vessel wall characteristics, these changes can reverse after childbirth. It is, therefore, uncertain if pregnancy is associated with the development of varicose veins and chronic venous insufficiency in later life. It is interesting to note that the majority of observers who included age in their analysis found no relation between the prevalence of varicose veins and parity.

**Occupation**

Several studies have reported prolonged periods of standing as contributing to varicose veins (table 5). Standing results in increased hydrostatic pressure and diminished function of the calf muscle. The calf muscle pump, sometimes called the peripheral heart, is important for the venous return of blood.

Lake et al. (75) were the first to assert the role of prolonged standing in the development of varicose veins. This team diagnosed varicose veins by physical examination in 536 persons over 40 years of age working in a department store. In women, the highest incidence of varicose veins was found in occupations which require standing; 74 percent had varicose veins as opposed to 57 percent of the women who sat as part of their jobs. In men, no statistically significant differences between occupations were found.

The female cotton workers’ study performed by Mekky et al. (49) also supports the process of standing in the development of varicosis. Women who sat at their work had the lowest prevalence of varicose veins (English women, 18 percent; Egyptian women, 3 percent). Those who worked standing had the highest prevalence (English women, 57 percent; Egyptian women, 8 percent).

In 387 Dutch male workers, a statistically significant relation was found between the number of years the men stood at their jobs and the severity of their chronic venous insufficiency, but no relation could be determined with the actual prevalence (2).

In the Framingham Study, the number of hours spent each day in sedentary activities (defined as sitting or standing) was assessed as significant to the development of varicose veins in women (48). The adjusted incidence rates were calculated, indicating the “extra” incidence that was found was a result of the type of work that was done. Women with four or less hours a day of sedentary activities had a 2-year adjusted incidence rate of varicose veins of 57/1,000. Women with 8 or more hours a day of sedentary activity had a 2-year adjusted incidence rate of 74/1,000. In men the differences (44/1,000 and 48/1,000, respectively) were not significant. The Framingham Study is a large cohort study adjusting for age and other risk factors. It therefore gives relatively strong evidence to support the role of physical activity in the development of varicose veins. The Bochum study showed a high prevalence of varicose veins in German schoolchildren (61). Since schoolchildren in western countries spend many years sitting, it was suggested that sitting was one of the risk factors for the development of venous disorders. Considering the studies mentioned above, there is every indication that both prolonged standing and chair-sitting are factors in the progressive development and severity of varicosities.

**Obesity**

Several authors have found an association of weight and body mass with an increased risk for varicose veins. Of 12 studies performed, a positive correlation with varicose veins was found in eight and none was found in four (2, 6, 13, 16, 48–51, 54, 62, 76–78). The available data suggest that obesity is particularly associated with the more severe forms of varicose veins, especially in women. In a study of 387 male workers, a high relative risk for varicose veins and chronic venous insufficiency was found only in very heavy men, those weighing over 100 kg (2).

Although there is agreement that obesity is a risk factor, it is uncertain if this is related to a certain degree of overweight. Perhaps there is a threshold effect.

**Other risk factors**

Few studies have suggested that persons with varicose veins are at increased risk of cardiovascular disease (48). In the Framingham Study, an excess risk of coronary heart disease among women with varicose veins was found, but this relation was not significant after statistically controlling for body mass and systolic blood pressure. In the Paris prospective study (51), a significantly higher incidence of arterial disease was found in men with varicose veins, however overweight was not registered. Obesity probably only serves to confound the relation between varicose
<table>
<thead>
<tr>
<th>Location (reference no.)</th>
<th>Year</th>
<th>No.</th>
<th>Ages</th>
<th>Method</th>
<th>Definition</th>
<th>Occupation</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varicose veins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States (75)</td>
<td>1942</td>
<td>536</td>
<td>&gt;40</td>
<td>Interview, physical examination</td>
<td>Visible varicose veins</td>
<td>Department store (all)</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sitting</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Standing</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Walking</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Climbing stairs</td>
<td>34</td>
</tr>
<tr>
<td>Switzerland (12)</td>
<td>1965</td>
<td>4,625</td>
<td>15–65</td>
<td>Interview, color slide evaluation</td>
<td>All varicosis, including intracutaneous</td>
<td>Chemical company, not specified</td>
<td>55</td>
</tr>
<tr>
<td>England (49)</td>
<td>1969</td>
<td>504</td>
<td>&gt;15</td>
<td>Interview, physical examination</td>
<td>Elongated, tortuous, pouchled, and thickened veins</td>
<td>Cotton workers (all)</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sitting</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Standing</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Walking</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mixed</td>
<td>35</td>
</tr>
<tr>
<td>Egypt (49)</td>
<td>1969</td>
<td>467</td>
<td>&gt;15</td>
<td>Interview, physical examination</td>
<td>Elongated, tortuous, pouchled, and thickened veins</td>
<td>Cotton workers (all)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sitting</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Standing</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Walking</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mixed</td>
<td>6</td>
</tr>
<tr>
<td>Hanover, Germany (76)</td>
<td>1972</td>
<td>441</td>
<td>15–54</td>
<td>Plethysmography</td>
<td>Varicosis</td>
<td>Industry, not specified</td>
<td>14</td>
</tr>
<tr>
<td>Switzerland (50)</td>
<td>1973</td>
<td>610</td>
<td>&gt;15</td>
<td>Interview, color slide evaluation</td>
<td>All varicosis, including intracutaneous</td>
<td>Department store (all)</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sitting</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Standing</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Walking</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mixed</td>
<td>29</td>
</tr>
<tr>
<td>France (51)</td>
<td>1981</td>
<td>7,432</td>
<td>42–53</td>
<td>Questionnaire, physical examination</td>
<td>Any venous enlargement</td>
<td>Policemen</td>
<td>26</td>
</tr>
<tr>
<td>Czachoslovakia (16)</td>
<td>1991</td>
<td>696</td>
<td></td>
<td>Interview, physical examination</td>
<td>All varicosis, including intracutaneous</td>
<td>Department store</td>
<td>60</td>
</tr>
<tr>
<td>Chronic venous insufficiency</td>
<td>1965</td>
<td>4,625</td>
<td>15–65</td>
<td>Interview, color slide evaluation</td>
<td>Widmer I–IV</td>
<td>Chemical company, not specified</td>
<td>7</td>
</tr>
<tr>
<td>Switzerland (12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
veins, coronary heart disease, and systolic blood pressure.

A correlation between cigarette smoking and varicose veins was found among men in the Framingham Study (48), but this relation was not found in several other studies. A decrease in fibrinolytic activity was suggested as a possible mechanism. Reduced wall fibrinolytic activity has been observed in patients with chronic venous insufficiency (79, 80). In the Aachen study (44), increased viscosity and clotting of the blood was found in persons with venous disorders, compared with those without venous disorders.

Some authors found evidence that oral progestogens with a high progesterone component increase venous capacity (81). In epidemiologic studies, to our knowledge, a positive association between the use of oral contraceptives and the prevalence of varicose veins was never demonstrated.

In about one-quarter of subjects, varicose veins occur in only one leg. Theoretically, the left leg is more prone to develop varicose veins (82); compression of the left common iliac vein and its accompanying lymphatics by the right iliac artery probably has hemodynamic consequences. This association was described for deep venous thrombosis (82), but for varicose veins most studies did not find evidence for the increased prevalence in the left leg (13, 55, 83).

In women, the role of wearing corsets was mentioned twice, but was found significant in only one study. Furthermore, the possible role of squatting (in which the angle between the iliac and femoral veins could prevent pressure being transferred into the leg veins when straining during defecation) and diet (fiber intake) was mentioned.

Risk factors: conclusions

There have been two main theories regarding the etiology of varicose vein formation; either that the condition is due to an inherited defect or that it is an acquired condition due to environmental factors. van den Berg et al. (77) postulated that primary and aggravating factors are present in the pathogenesis of venous disorders (77). They suggested that familial predisposition, sex, and hormonal disposition were primary factors, while professions requiring standing and sitting were aggravating factors.

Age, sex, and place of birth were strong risk factors for the presence of varicose veins and chronic venous insufficiency. Parity, overweight, and occupation were other significant factors. Risk factors were generally lacking for the subgroups with only hyphen webs or reticular varices, but they were frequent for the more severe types of varicosity. In contrast, the risk factor of sex was more pronounced in the less severe types of varicose veins. It is possible that women are more likely to report smaller varicose veins.

CONCLUSIONS

Studies into the epidemiology of venous disorders lack conformity in terms of study design, sampled population, and the disorder investigated. In some studies, no definition of the investigated disorder or population is mentioned at all; authors may confine themselves to simply “varicose veins” or “ulcer.” Many studies did not represent the general population, but, rather, the population of a town, neighborhood, or hospital. Among hospital patients, even though they were not attending the clinic for vascular disorders, a higher prevalence of varicose veins and chronic venous insufficiency was found than in the general population.

A normal study population is considered to consist of a community-based, westernized, Caucasian population of adults over 15 years of age (1). Table 3 shows the prevalence of varicose veins and chronic venous insufficiency from studies involving both males and females included within these criteria (reticular veins are not included). The prevalence of varicose veins in these studies varies between 10 and 50 percent, depending on the methodology used (6, 17, 44, 52–55); it is frequently estimated at about 20 percent. The prevalence of all types of varicose veins, including reticular and hyperhen web veins, is estimated to be present in more than half of the population (50). The prevalence of pronounced chronic venous insufficiency (grades II or III) is estimated to be between 2 and 5 percent of the population. Active chronic leg ulceration has a point prevalence of 0.1–0.2 percent of the adult population (19). Approximately 1 percent of the population will suffer from leg ulceration at some point in their lives. The fact that at least 10 percent of the world’s westernized population has medically significant varicose veins or chronic venous insufficiency suggests that chronic venous disease places a heavier burden on health resources than has been understood (18).

In most studies, age, place of birth, and sex were the significant risk factors in the occurrence of venous disorders. The etiology of varicose veins and chronic venous insufficiency is still unclear, but a multifactorial mechanism seems likely in terms of which genetic and environmental factors play a role (77).

Varicose veins and chronic venous insufficiency appear more frequently with advanced age; the incidence is approximately the same in all ages, which means that prevalence increases in linear correlation with age (52, 55, 56). Differences between the sexes in the prevalence of chronic venous insufficiency were
described but are not conclusive; in most studies the prevalence in women was slightly higher than in men (13, 44, 55). In other studies the prevalence in women was up to three times as high as in men (54), and this was especially the case in the small types of varicose veins; hormonal factors, parity, and methodological factors were also suggested for this higher prevalence rate.

Place of birth and race were the second most important factors. In some African countries, a much lower prevalence was found compared with Europe or the United States (57, 58), and southern-European women were found to have lower prevalence of varicose veins than central-European women (50). There is strong evidence that these ethnic differences are not present in people who left their country of origin early in their lives. For this reason, the role of cultural and environmental factors (food and straining habits during defecation being the most important) was proposed in several studies (49, 61–65). In our opinion, heredity was never conclusively demonstrated, but we found some evidence for familial predisposition (69). A lack of evidence may be caused by the fact that large-scale family studies for varicose veins and chronic venous insufficiency have never been carried out.

The literature we have studied suggests that, apart from the generally accepted risk factors of age, sex, race, and parity, other risk factors, such as profession, play a role in the development of varicose veins and chronic venous insufficiency (2, 49, 75). In our opinion this aspect is a promising field for research since these exogenous agents can be influenced and preventive measures can be taken.

Chronic venous disorders are a major burden to general health care but, until recently, were poorly recognized and did not get the attention they deserve. In our opinion, recognizing the consequences of this hidden disease will result in more research in the near future. An important obstacle is the lack of uniform nomenclature and study design, which make it impossible to compare studies in this field, either with each other or with future studies. We stress that, as no generally accepted study designs on this subject are yet available, definitions and methods should be documented carefully.

Attempts are now being made to improve these definitions. We suspect that, in the near future, this will result in better epidemiologic research.

REFERENCES


52. Coon WW, Willis PW III, Keller JB. Venous thromboembo-
77. van den Berg E, van den Berg B, Barbey K. Epidemiologie
und Pathophysiologie der primären Varicose. (In German).
78. Eberth-Willershausen W, Marshall M. Prevalenz, Risikofaktoren
und Komplikationen peripherer Venenerkrankungen in der
79. Cleave TL. On the causation of varicose veins and their
prevention and arrest by natural means: an evolutionary ap-
81. McCausland AM, Holmes F, Trotter AD Jr. Venous distens-
ibility during the menstrual cycle. Am J Obstet Gynecol 1963;
86:640–5.
82. Dodd H, Cockett FB. The pathology and surgery of the veins
of the lower limb. 2nd ed. Edinburgh, Scotland: E & S
Livingstone, 1956.
83. Philips RS. Surgical management of primary varicose veins.