ELSEVIER

Atherosclerosis 172 (2004) 95–105

ATHEROSCLEROSIS

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High prevalence of peripheral arterial disease and co-morbidity in 6880 primary care patients: cross-sectional study

Curt Diehm [a,*,1], Alexander Schuster [b], Jens R. Allenberg [c], Harald Darius [d], Roman Haberl [e], Stefan Lange [f], David Pittrow [g], Berndt von Stritzky [h], Gerhart Tepohl [i], Hans-Joachim Trampisch [f]

[a] *Department of Internal Medicine, Vascular Medicine, Affiliated Teaching Hospital, University of Heidelberg, Guttmannstr. 1, D-76307 Karlsbad, Germany*
[b] *3P Consulting, D-82393 Pöcking, Germany*
[c] *Department of Vascular Surgery, Section for Vascular Surgery, Ruprecht-Karls University of Heidelberg, D-69120 Heidelberg, Germany*
[d] *Department of Medicine, Klinikum Berlin-Neukölln, Vivantes Netzwerk für Gesundheit, D-12313 Berlin, Germany*
[e] *Department of Neurology, Städtisches Krankenhaus München-Harlaching, D-81545 Munich, Germany*
[f] *Department of Medical Informatics, Biometry and Epidemiology, Ruhr University Bochum, D-44780 Bochum, Germany*
[g] *Department of Clinical Pharmacology, Medical Faculty, Technical University of Dresden, D-01307 Dresden, Germany*
[h] *Medical Department, Sanofi-Synthelabo, D-10785 Berlin, Germany*
[i] *Practice for Vascular Medicine, D-80336 Munich, Germany*

Received 7 March 2003; received in revised form 16 May 2003; accepted 22 May 2003

Abstract

We aimed to obtain reliable data on the epidemiology, co-morbidities and risk factor profile of peripheral arterial disease (PAD) in general medical practise. In the cross-sectional part of the observational German Epidemiological Trial on Ankle Brachial Index (getABI study), 344 general practitioners throughout Germany determined the ABI of consecutive, unselected patients aged 65 years or older with bilateral Doppler ultrasound measurements. Additional assessments comprised patient history with the focus on atherothrombotic diseases, physical examination, and the WHO questionnaire on intermittent claudication. A total of 6880 patients were included (42.0% male, mean age 72.5 years, mean body mass index 27.3 kg/m^2, mean systolic/diastolic blood pressure 143.7/81.3 mmHg). The prevalence of PAD for men/women as indicated by an ankle brachial index (AB1) < 0.9 was 19.8/16.8%. Patients with PAD were slightly older than patients without PAD, suffered more frequently from diabetes (36.6 vs. 22.6%; adjusted OR: 1.8), hypertension (78.8 vs. 61.6%; OR: 2.2), lipid disorders (57.2 vs. 50.7%; OR: 1.3) and other coexisting atherothrombotic diseases (any cerebrovascular event: 15.0 vs. 7.6%; OR: 1.8; any cardiovascular event: 28.9 vs. 17.0%; OR: 1.5). The data highlight the high prevalence of PAD in primary care. PAD patients are characterised by a high co-morbidity, particularly with regard to other manifestations of atherothrombosis. Doppler ultrasound measurement for ABI determinations is a non-invasive, inexpensive, reliable tool in primary care and enables GPs to identify patients at risk of PAD.

Keywords: Peripheral arterial disease; Atherothrombosis; Ankle brachial index; Primary care; Prevalence; Cross-sectional study; Epidemiology

1. Introduction

The clinical importance of the early identification and treatment of lower extremity peripheral arterial disease (PAD) as a manifestation of generalised atherothrombotic disease has been increasingly acknowledged in recent years [1]. Limb loss is a fairly rare event in PAD patients with intermittent claudication (IC), with a 5-year risk of amputation of only 2% [2]. More importantly, PAD is a powerful predictor of future cerebrovascular and cardiovascular events such as myocardial infarction and stroke, and of increased mortality [3–7]. The risk is already considerably increased in patients with symptom- free PAD, and increases substantially in PAD patients with clinical symptoms.

Patient history and physical examination are insensitive for diagnosing PAD [8–10]. An efficient method of objectively documenting the presence and severity of lower extremity PAD is determination of the ankle brachial index

* Corresponding author. Tel.: +49-7202-61-3340; fax: +49-7202-61-6167.
E-mail address: curt.diehm@kkl.srh.de (C. Diehm).
[1] For the German Epidemiological Trial on Ankle Brachial Index (getABI) Study Group.

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doi:10.1016/S0021-9150(03)00204-1

(ABI), which can be done in a physician's office with inexpensive equipment consisting of an ordinary blood pressure cuff and a Doppler ultrasonic sensor [11,12]. Among well-trained operators, test-retest reliability is excellent [1,13]. When compared to angiography, the sensitivity of the ABI is about 90%, and the specificity is about 98% for stenosis of 50% or more in leg arteries [10,14].

Data on the prevalence of PAD in the primary care setting are sparse, although this information is critically important as a scientific basis for developing strategies to enhance treatment of this condition as prevention of cerebrovascular and cardiovascular events in the community.

Primary care is the principal target for investigation if the aim is improved population-based care. Primary care doctors play a key role, as they are the first point of contact for recognition, diagnosis and referral. Due to the availability of modem pharmacological and adjunctive therapy they are also increasingly important for the treatment of PAD [2,15].

However, there are several issues that urgently need to be addressed with new data in order to help design rational strategies to further improve the service provision and quality of care for PAD patients. This study is the first to investigate the scope of the problem, including the prevalence and co- morbidity of PAD, as well as the frequency of symptomatic and asymptomatic disease in unselected elderly primary care patients.

2. Subjects and methods

2.1. Selection of centres

The getABI study is a large-scale epidemiological study with a cross-sectional and longitudinal part. The methods and design of the study have been described elsewhere in greater detail [16]. Briefly, the study had a complex, multistage design and used a stringent epidemiological approach following the 'Good Epidemiological Practice' recommendations issued by the 'German Working Group Epidemiology' [17]. The central study co-ordinating centre selected 34 vascular physicians, on the basis of their expertise in PAD. These vascular physicians, serving as centres of excellence, were evenly distributed geographically nation-wide, and each suggested on average 10 general practitioners to the central co-ordinating centre. Appropriate statistical methods were used to check that the distribution of the 344 GPs was representative in terms of location (post codes) and education (internists serving as GPs, and general physicians) for the total number of approximately 56,000 primary care physicians in Germany. Only certain regions scattered across Germany (coastal area, rural Bavarian areas, etc.) were not covered due to logistical reasons. Several weeks before the start of the study, in 34 regional meetings the centres of excellence instructed the GPs and their support staff about the requirements of the study and trained them in the clinical measurements, with special focus on ABI.

2.2. Patients

A prevalence assessment of primary care attendees, irrespective of their reason for seeing the doctor, was then conducted within a pre- specified week in October 2001. In each practice, the gender and age category (<18/18–64/65–69/70–74/75–79/80–84/≥ 85 years) of all patients attending the practice and seeing the doctor were recorded in a log-file for each day of the week. The only exclusion criterion was life expectancy ≤ 6 months. A total of 20 (in exceptional cases up to 25) eligible patients fulfilling the inclusion criteria (age ≥ 65 years, patient being legally competent and able to co-operate appropriately and providing written informed consent) were recruited, preferably as evenly as possible over this week in order to avoid selection bias. The data management centre was notified by fax about the inclusion of the patients on a daily basis. The baseline visit with the initial study examinations as specified below was to be performed within 6 weeks after the recruitment week.

The medical history as assessed at baseline included the following conditions: (a) cardiovascular diseases (i.e. myocardial infarction, angina pectoris, revascularisation procedures), (b) cerebrovascular diseases (i.e. stroke, transitory ischemic attacks, or revascularisation procedures on the carotids), (c) peripheral PAD (i.e. a history with regard to gangrene or amputation (minor and major form) of the lower extremities on account of PAD, IC (pain in the calf muscles while walking or during other exertion, which disappears within 10 min at rest), or revascularisation procedures on the peripheral arteries), (d) risk factors, i.e. the existence of arterial hypertension, diabetes mellitus or disorders of lipid metabolism, (e) smoking status and (f) social status. The comorbidities hypertension and lipid disorders were recorded according to physician's clinical diagnoses. Subjects were defined as diabetics: (1) if they bad been assigned the clinical diagnosis by their physician; and/or (2) if their HbA1c was $\geq 6.5\%$; and/or (3) if they received any oral antidiabetic drug and/or insulin. In sequence, a short physical examination was performed (body weight and height, blood pressure and heart rate at rest after 5 min in sitting position, auscultation of the carotid arteries, and pulse status).

2.3. Ankle brachial index at rest

The GPs were specifically trained by certified angiologists (centers of excellence) during 34 regional study workshops to perform ABI measurements under standardised conditions [12]. A standardised Doppler ultrasonic device was used (Kranzbühler 8 MHz, Solingen, Germany). Both measures ensured standardized equipment and measurement techniques.

The blood pressure cuff was used to measure systolic blood pressure to the nearest 2 mmHg in the brachial artery in both arms by use of the Doppler detector in the antecubital fossa. It was then applied to the distal calf, and the

Doppler probe was used to determine systolic blood pressure at the left and right posterior and anterior tibial arteries after a 5-min rest. Since PAD is often unilateral, measurements were made on both sides. Measurements were carried out after a 5-min rest in supine position with the upper body as flat as possible, since measurements in the sitting or semi-sitting position can result in a substantial blood pressure increase, in the tibial arteries. However, a pillow as support for he head was acceptable. The ABI was measured and calculated according to the recommendations of the American Heart Association [11]: The ABI for each leg equals the ratio of the higher of the two systolic pressures (tibial posterior and anterior artery) above the ankle to the average of the right and left brachial artery pressures, unless there is a discrepancy ≥ 10 mmHg in blood pressure values between the two arms. In such a case, the higher reading was used for the ABI. Pressures in each leg were measured and the ABIs calculated separately for each leg. In the case of a missing ABI value in one leg, the value from the other was used, and missing brachial artery pressure values in one arm were dealt with in the same manner. Accordingly, in the case of a missing artery pressure value (tibial posterior or anterior) above the ankle in one leg, the other was used for the calculation of the side-specific ABI. In addition to the ABI determinations, at baseline the patients completed the WHO Rose questionnaire on IC [18].

2.4. Prevalence of PAD

An ABI < 0.90 in either leg was considered as evidence of PAD. However, the classification of patients according to the ABI was modified as follows: patients with an ABI > 1.5 and no history of peripheral revascularisation and/or amputation on account of PAD ($n = 59$) were excluded from the analysis. An ABI of 1.5 or higher is consistent with poorly compressible leg arteries and an ability to gauge arterial perfusion accurately [19–21]. Additionally, patients with a history of peripheral vascular revascularisation and/or limb amputation and ABI values ≥ 0.9 ($n = 65$), were classified as PAD patients; however, their ABI values were not used in the quantitative ABI analyses. In a further 12 patients ABI values were not available, and the classification of these patients with regard to PAD status (present/not present) was carried out by an expert panel on the basis of clinical data.

2.5. Statistical analyses

First, the prevalence of PAD (i.e. ABI < 0.9) was calculated using the raw data for the whole cohort and stratified according to gender and age categories. In a second step, the prevalence was adjusted with regard to the age-distribution of all screened patients in the recruitment week. Further statistical analyses compared the reference group without PAD (i.e. ABI≥ 0.9) with the PAD group. Continuous and categorical variables were compared across the two clinical groups using two-tailed *t*-tests and χ^2-tests, respectively.

For selected categorical variables, multivariate logistic regression analyses with presence of PAD as the outcome variable were performed, and the corresponding odds ratios (or and their 95% confidence intervals [CI]) were calculated. Statistical significance was accepted at the 0.05 level. All statistical analyses were performed with SAS version 8.2 (SAS Institute Inc., Cary, NC, 1999).

3. Results

3.1. Description of the sample

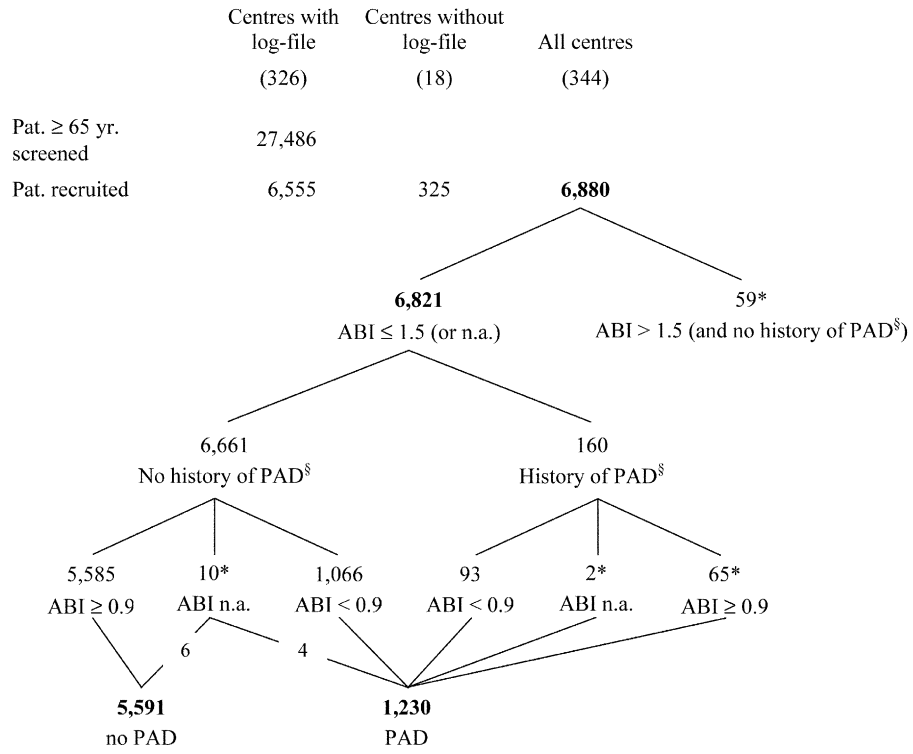
Fig. 1 displays the disposition of patients. Three hundred and twenty-six out of 344 participating centres (94.8%) provided data from the log-file. In these centres, a total of 27,486 patients ≥ 65 years (10,722 men and 16,764 women) saw their GP in the recruitment week. The age distribution of the screened patients compares very well with the age distribution in Germany (Table 1). Of the screened patients, 6880 (6555 from centres with log-file information and 325 patients from centres without this information) were included in the study, and 6821 were included in the statistical analyses. On comparison of the numbers of patients screened with those recruited, the percentage of recruited patients was somewhat higher in the younger age groups and lower in the older age groups. Likewise, compared with the general population [22], the younger age groups (65–69 and 70–74 years) were over-represented in our study, groups 75–79 and 80–84 years a nearly identical match, and the very old (≥ 85 years) were somewhat under-represented in this study. The sex distribution in our study was very similar to the one of the general population in Germany (Table 1).

Of the participating physicians, 270 were GPs (78.5%) and 74 were internists by training, and now practising as GPs (21.5%), which is almost identical to the ratio of both groups in Germany (79.4 and 20.6%). The characteristics of patients treated by both physician groups did not differ either with respect to sex, age and other variables.

3.2. Demographics

Table 2 summarises patient characteristics in the total cohort and in the subgroups with or without PAD. Patients suffering from PAD were slightly older, had a higher mean systolic (but not diastolic) blood pressure, and comprised a higher proportion of current or past smokers. The proportion of patients in the PAD group with concomitant diabetes mellitus, clinical hypertension, lipid disorders or smoking was also significantly higher.

The prevalence of PAD in the total sample as indicated as the proportion of patients with an ABI < 0.9 was 18.0% (age-adjusted: 19.8%; Table 3(a)). Mean prevalence was lower in women (16.8%) than in men (19.8%). Among women, rates were lower in the younger age groups and increased more sharply from 11 to 39% in the oldest group



n.a.: not available; * Data could not be used for quantitative ABI analyses; § History of amputation or peripheral revascularisation (on account of PAD)

Fig. 1. Disposition of patients

(Fig. 2). Table 3(b) details the number of patients in the different ABI categries.

3.3. Comorbidity

The rates of atherosclerotic diseases as reported by the treating physicians were substantially higher for PAD patients compared to patients without PAD (Table 4). Of the PAD patients, 15.0 and 28.9%, respectively, had a manifestation of cerebrovascular or cardiovascular disease as compared to 7.6 and 17.0%, respectively, in the control group. The corresponding odds ratios for the co-prevalent atherothrombotic conditions indicate that for all disease manifestations the risk for PAD patients is substantially increased compared to non-PAD patients. Regarding other diseases, for PAD patients, the odds ratios (adjusted for age,

Table 1
Age distribution of screened and included patients in comparison to the age distribution in Germany (Federal Statistical Office 2001) [22]

Age category (years)	Sex	Germany	Patients screened for getABI ($n = 27,486$) (%)	Patients included in getABI ($n = 6880$) (%)
65–69	Female	25.7	27.7	32.9
	Male	37.1	35.9	36.8
	∑	30.1	30.9	34.6
70–74	Female	25.0	25.0	31.1
	Male	29.3	28.9	33.7
	∑	26.6	26.5	32.1
75–79	Female	23.2	20.7	22.9
	Male	18.4	18.9	19.8
	∑	21.4	20.0	21.7
80–84	Female	11.1	15.1	10.7
	Male	7.4	10.4	7.8
	∑	9.7	13.3	9.4
≥ 85	Female	15.0	11.4	2.4
	Male	7.8	5.9	1.9
	∑	12.2	9.3	2.2

Table 2
Patient characteristics

	All patients ($n = 6821$)	Patients without PAD (ABI 0.9) ($n = 5591$)	Patients with PAD (ABI < 0.9) ($n = 1230$)[a]	p Value*
Ankle brachial index ± S.D.	1.03 ± 0.17[b]	1.08 ± 0.11	0.75 ± 0.13[b]	
PAD according to WHO	2.8	1.0	11.1	< 0.001
IC questionnaire (%)				
Age, mean ± S.D. (years)	72.5 ± 5.3	72.2 ± 5.1	–	
65–69 years	34.6%	36.3%	27.0%	
70–74 years	32.1%	32.9%	28.2%	
75–79 years	21.7%	20.5%	27.1%	
80–84 years	9.4%	8.5%	13.4%	
≥ 85 years	2.2%	1.8%	4.3%	
Female/male (%)	58.0/42.0	58.9/41.1	54.0/46.0	0.001
Body mass index (kg/m^2)	27.3 ± 4.1	27.3 ± 4.1	27.4 ± 4.3	0.396
Systolic and diastolic	143.7 ± 19.4/	142.7 ± 18.9/	148.4 ± 21.1/	< 0.001/
Blood pressure, mean ± S.D. (mmHg)	81.3 ± 9.6	81.3 ± 9.4	81.6 ± 10.4	0.354
Smoking status (%)				< 0.001
Current	9.3	7.9	15.9	
Past	36.7	35.3	42.9	
Never	54.1	56.9	41.3	
Pack years (smokers only)				
< 20	23.6	23.5	24.1	
≥ 20	22.3	19.6	34.5	
Diabetes mellitus (%)[c]	25.1	22.6	36.6	< 0.001
Hypertension (%)[d]	64.7	61.6	78.8	< 0.001
Lipid disorders (%)[d]	51.8	50.7	57.2	< 0.001

All values are presented as numbers (percentages), unless otherwise specified.
[a] ABI < 0.9 or history of peripheral revascularisation or amputation (on account of PAD).
[b] Patients with history of amputation or peripheral revascularisation (on account of PAD) and ABI > 0.9 were excluded from quantitative ABI analyses (see Fig. 1).
[c] Subjects were defined as diabetics, (1) if they had been assigned the clinical diagnosis by their physician, and/or (2) if their HbA1c was 6.5% and/or (3) if they received any oral antidiabetic drug and/or insulin.
[d] Hypertension and lipid disorders according to physician's clinical diagnoses.
* Tests of significance (t-tests, χ^2-tests). S.D., standard deviation.

Table 3
(a) Crude and age-adjusted prevalence of PAD (ABI < 0.9)[a] for men and women in a sample representative of patients aged 65 in primary care and (b) distribution of ABI

	Crude/adjusted[b]	Crude/adjusted[b]	Crude/Adjusted[b]		
	Women	Men	Total		
(a) Crude and age-adjusted prevalence of PAD					
PAD(%)	16.8/19.4	19.8/20.4	18.0/19.8		
No PAD (%)	83.2/80.6	80.2/79.6	82.0/80.2		
	ABI < 0.7	0.7–0.89	0.90–1.09	> 1.10	Total
(b) Distribution of ABI					
Percentage (%)	4.7	12.4	50.6	32.2	100
n	320	839	3414	2171	6744[c]

[a] ABI < 0.9 or history of peripheral revascularisation or amputation on account of PAD.
[b] Adjusted for the age distribution of the log-file population.
[c] Patients with ABI > 1.5 or history of peripheral revascularisation or amputation because of PAD and ABI≥ 0.9 were excluded (see Fig. 1).

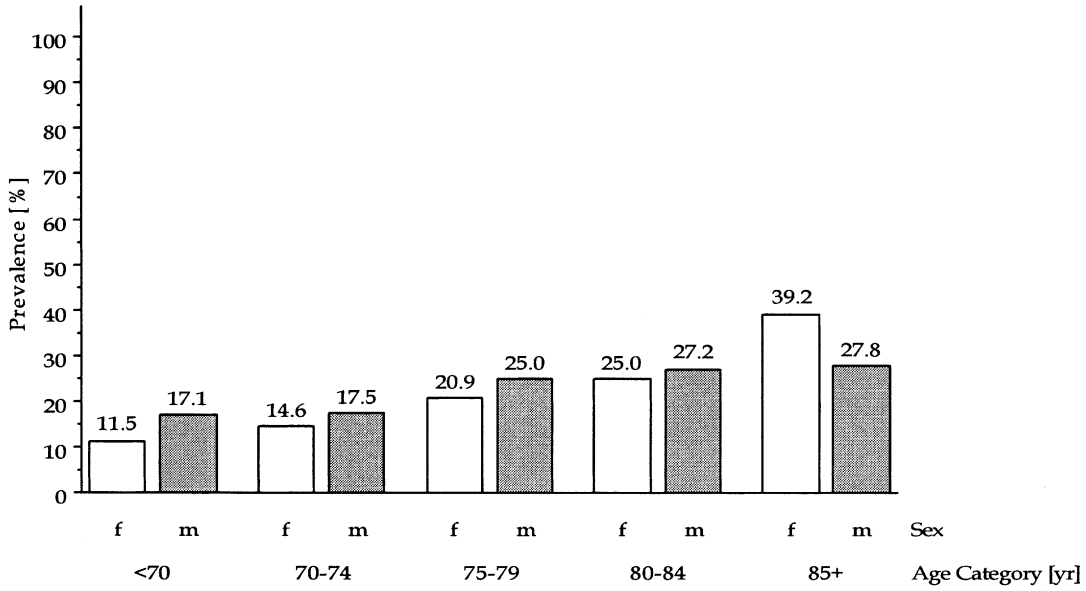


Fig. 2. Prevalence of PAD (ABI < 0.9) for men and women in a sample representative of patients aged 65 in primary care.

Table 4
Frequency of concomitant manifestations of atherothrombotic diseases among patients with (ABI < 0.9) and without PAD (≥ 0.9) in primary care (odds ratios, 95% confidence intervals)

Symptoms	All patients ($n = 6821$)	Patients without PAD ($n = 5591$)	Patients with PAD[b] ($n = 1230$)	OR [95% CI]	
				Crude	Adjusted
Coronary events					
Any	19.2	17.0	28.9	1.98 [1.72; 2.28]	1.53 [1.31; 1.78]
Myocardial infarction	8.8	7.8	13.7	1.89 [1.57; 2.29]	1.42 [1.16; 1.74]
Coronary revascularisation	7.5	6.1	13.5	2.39 [1.96; 2.91]	2.07 [1.67; 2.56]
Angina pectoris	14.2	12.7	21.2	1.86 [1.58; 2.17]	1.42 [1.20; 1.68]
Infarction or revascularisation	11.9	10.2	19.9	2.20 [1.87; 2.59]	1.74 [1.45; 2.08]
Cerebrovascular events					
Any	8.9	7.6	15.0	2.14 [1.78; 2.58]	1.77 [1.46; 2.15]
Stroke	4.6	3.9	7.7	2.08 [1.62; 2.67]	1.57 [1.21; 2.04]
Revascularisation of carotids	1.0	0.6	2.9	4.52 [2.83; 7.23]	3.50 [2.14; 5.72]
TIA	5.0	4.4	8.1	1.92 [1.51; 2.44]	1.73 [1.34; 2.23]
Stroke or revascularisation	5.3	4.3	9.8	2.41 [1.92; 3.03]	1.84 [1.45; 2.33]
Symptomatic PAD					
Any	8.7	3.6	31.5	–	–
Amputation[a]	0.2	–	1.2	–	–
Necrosis/gangrene	0.3	0.1	1.6	[c]	[c]
Peripheral revascularisation[a]	2.3	–	12.7	–	–
Intermittent claudication[d]	7.7	3.6	26.4	–	–

Odds ratios from logistic regression. Adjusted by age, gender, smoking status, and presence of diabetes, hypertension, or lipid disorders. 95% CI = 95% confidence interval:

[a] on account of underlying PAD.

[b] ABI < 0.9 or history of peripheral revascularisation or amputation.

[c] No odds ratios are given because PAD was defined as history of peripheral revascularisation or amputation.

[d] According to physician's record.

sex, smoking status, presence of diabetes, hypertension, and lipid disorders) for having co-prevalent diabetes were 1.78 (95% CI 1.55; 2.05), hypertension 2.16 (CI: 1.86; 2.52), and lipid disorders 1.26 (CI: 1.11; 1.44).

3.4. WHO IC questionnaire

Symptomatic PAD (IC) as assessed by the questionnaire was reported by 3.6% of men and 2.3% of women. In both

Table 5
ABI-based diagnosis of PAD[a] and IC as assessed by the WHO questionnaire in primary care patients ≥ 65 years

ABI-based diagnosis[a]	IC according to the WHO questionnaire		
	PAD	No PAD	All
PAD	11.1% ($n = 137$)	88.9% ($n = 1093$)	100% ($n = 1230$)
No PAD	1.0% ($n = 57$)	99.0% ($n = 5534$)	100% ($n = 5591$)
All	2.8% ($n = 194$)	97.2% ($n = 6627$)	100% ($n = 6821$)

Sensitivity: 11.1% (137/1230); specificity: 99.0% (5534/5591); predictive value of a positive questionnaire: 70.6% (137/194); predictive value of a negative questionnaire: 83.5% (5534/6627).

[a] ABI < 0.9 or history of peripheral revascularisation or amputation on account of PAD.

men and women a clear increase of IC with increasing age was noted, ranging from 3.2% in the age category 65–69 years to 5.6% in the age category ≥ 85 years in men, and from 2.0 to 10% in women. In order to assess the incremental value of using the Doppler ultrasound ABI measurements, a cross-tabulation of the PAD detection rates from the ABI versus the WHO IC questionnaire was set up (Table 5). The sensitivity of diagnosis—proportion of PAD patients in whom correctly PAD is detected correctly by means of the questionnaire—was 11.1%. The corresponding specificity of diagnosis—proportion of non-PAD patients in whom correctly no PAD is diagnosed—was 99.0%.

4. Discussion

This is the first large-scale study to screen an unselected sample of patients in primary care for PAD. The representativity of the patient sample has been indirectly confirmed by a 47,000 patient cross-sectional study that has concurrently investigated the prevalence and co-morbidity of hypertension and diabetes in primary care, and described a very similar patient pattern in primary care in Germany [23]. Compared to the general population, the younger age groups in our study were somewhat over-represented and the very old under-represented [22], which hints at a reluctance of physicians to include frail patients in the trial.

Our study shows that the prevalence of PAD in a typical unselected sample of patients in a primary care setting is substantial. On average, about every fifth unselected patient (age-adjusted prevalence 19.8%) in primary care has an ABI < 0.9, indicating generalised atherothrombosis. The prevalence patterns for men and women differ in that the average prevalence of PAD in men is higher in the younger age group and increases moderately. Conversely, in women the corresponding numbers are lower in the younger age group but sharply increase when assessing the very old (39% in the ≥ 85-year-old). Of those patients with PAD, every fourth (27.6%) has a very low ABI (< 0.7), indicating a more severe disease stage.

Other cross-sectional studies of similar size and scope have investigated different populations and some applied other ABI cut-off values (< 0.85 or < 0.95). However, they consistently confirmed the high and underestimated prevalence of PAD. The Rotterdam study [19] in 7715 individuals ≥ 55 years identified from a registry, found a point prevalence of 19.1% (ABI cut-off < 0.9), the Limburg PAOD study [24] in 3171 patients aged 45–74 years in primary care a prevalence of 6.9% (ABI cut-off < 0.95), and the Cardiovascular Health Study [25] in 5888 Medicare patients ≥ 65 years a prevalence of 13.4% (ABI cut-off < 0.9). The PARTNERS program was in design and scope similar to our study in design and scope [26]. However, it investigated a considerably more selected patient group, namely GP patients aged > 70 years as well as high risk patients (e.g. with diabetes) aged 50–69 years, and reported a prevalence of 29% (ABI < 0.9). The smaller-size US Minnesota Regional PAD Screening program focused on 347 selected high-risk patients (diabetics, elderly) recruited via a media campaign and found a prevalence of 26.5% (ABI≤ 0.85) [27].

Not only is the frequency of PAD surprisingly high in primary care, but also the complexity in view of the multiple comorbid atherosclerotic conditions. The frequency of patients with an ABI < 0.9 of having any coronary event, was increased by 70% in our cohort (adjusted OR 1.53), and was even double as high for having any cerebrovascular event (97%; OR 1.77) compared to patients with an ABI ≥ 0.9. Also the frequency of diabetes mellitus, hypertension and lipid disorders, as diagnosed by the GPs, was substantially higher in all mentioned studies in PAD patients compared to non-PAD patients. Thus, PAD is not an isolated disease, but occurs as a facet of comorbid disorders. A high rate of comorbidity—especially atherothrombotic conditions—in PAD patients is the rule, not the exception, in primary care, posing particular challenges in terms of diagnosis and treatment to the GP. As a limitation of our study, presence of lipid disorders, hypertension and diabetes was mainly based on the diagnosis of the treating physician, and not verified according to the criteria of the respective guidelines. Thus, misdiagnoses cannot be excluded, but seem unlikely in view of the usual year-long relationship between general physicians and patients of this age group.

Another important aspect of our study is that by means of the WHO IC questionnaire [18] only a fraction of patients with PAD (11%) could be identified when using the ABI as yardstick against which the questionnaire was compared. This confirms that the questionnaire is of certain use to identify symptomatic PAD (IC; sensitivity 9–92%; [2]), but not as screening for early PAD. The majority of PAD patients would have gone undiagnosed if physicians had relied solely on the WHO questionnaire (or the clinical examination, respectively). Obviously the ABI determination is somewhat more time-consuming than the use of questionnaires and requires training of the observers, but is a feasible and efficient screening measure also in a community population [4,7,26]. Thus, the determination of a low ABI is a useful tool to identify PAD as a manifestation of atherothrombotic disease, not only in the hands of specialists, but also of GPs.

It will be art essential part of an effective strategy to reduce the scourge PAD in primary care [28,29].

Acknowledgements

The study was supported by an unrestricted educational grant of Sanofi-Synthelabo, Berlin, Germany. The authors thank the centres of excellence for their commitment. We appreciate the help of the participating GPs for collecting the data for the study and their practice staff for their assistance.

Appendix A

Steering Committee

Prof. Dr. med. Diehm

Curt, Chefarzt Innere Abteilung, Klinikum Karlsbad-Langensteinbach, Guttmannstr. 1, 76307 Karlsbad, Tel.: 07202/61 33 40, Fax: 07202/61 61 67, e-mail: Curt.Diehm@kkl.srh.de

Prof. Dr. med. Spengel, Florentin A.†

Ärztlicher Leiter Klinik Feldafing

Univ.-Prof. Dr. rer. nat. Trampisch, Hans-Joachim
Abteilung für Medizinische Informatik, Biometrie und Epidemiologie, Ruhr-Universität Bochum, Overbergstr. 17,44780 Bochum, Tel.: 0234/3 22 77 90, Fax: 0234/3 21 43 25, e-mail: hans.trampisch@ruhr-uni-bochum.de

Dr. med. von Stritzky, Berndt

Sanofi-Synthelabo GmbH, Potsdamer Str. 8, 10785 Berlin, Tel: 030/25 75 25 29, Fax: 030/25 75 25 23, e-mail: BERNDT.STRITZKY@sanofi-synthelabo.com

Advisory Board

Prof. Dr. med. Allenberg, Jens-Rainer
Chirurgische Universitätsklinik Heidelberg, Im Neuenheimer Feld 110,69120 Heidelberg, Tel.: 06221/56 62 49, Fax: 06221/56 54 23, e-mail: jens-rainer.allenberg@urz.uni-hd.de

Prof. Dr. med. Darius, Harald

I. Medizin. Klinik, Vivantes Klinikum Neukölln, Rudower Str. 48, 12351 Berlin, Tel.: 030/60 04 20 11, Fax: 030/60 04 24 04, e-mail: harald.darius@vivantes.de

Prof. Dr. med. Haberl, Roman
Chefarzt, Städt. Krankenhaus Harlaching,Sanatoriumsplatz 2,81545 München, Tel.: 089/62 10 22 57, Fax: 089/62 10 24 53, e-mail: r.haberl@khmh.de

Dr. med. Tepohl, Gerhart
Sendlinger-Tor-Platz 8,80336 München, Tel.: 089/59 35 17, Fax: 089/5 50 17 74, E-mail: ge.tepohl@t-online.de

Data Center (Planning, Analysis, Epdemiology)

PD Dr. med. Lange, Stefan; Dr. rer. nat. Fricke, Rainer; Dipl.-Stat. Holland-Letz, Tim; Prof. Dr. rer. nat. Trampisch, Hans-Joachim
Abteilung für Medizinische Informatik, Biometrie und Epidemiologie, Ruhr Universität Bochum, Overbergstr. 17, 44780 Bochum, Tel.: 0234/3 22 79 14, Fax: 0234/3 21 43 25, e-mail: stefan.f.lange@ruhr-uni-bochum.de

Monitoring, Data Management

Winicker Norimed GmbH
Praterstr. 17, 90429 Nürnberg

Dr. rer. nat. Collet, Wilfried (Data management)
Tel.: 0911/0 26 80 31, Fax: 0911/9 26 80 40, E-mail: wilfried.collet@winicker-norimed.de

Dr. rer. nat. Lindauer, Elfriede (Monitoring)
Tel.: 0911/9 26 80 27, Fax: 0911/9 26 80 40, e-mail: elfriede.lindauer@winicker-norimed.de

Publication Consulting and Management

3P Consulting, Pöcking
Dr. med. Pittrow, David

Tel.: 08157/9 96 31 00, e-mail: pittrow@3p-consulting.com

Centers of Excellence

Dr. med. Betzl, Gabriele
Weinstr. 6, 80333 München, Tel.: 089/21 77 77 0, Fax: 089/21 77 77 21

Dr. med. Bolte, Jürgen
Schildsteinweg 30b, 21339 Lüneburg, Tel.: 04131/76 02 77, Fax: 04131/76 02 79

Dr. med. Bröker, H.-J.
Kurhess. Diakonissenhaus, Goethestr. 85, 34119 Kassel, Tel.: 0561/100 23 17, Fax: 0561/100 23 20

Dr. med. Büdinger, Zdenka
Watzenborner Weg 8,35394 Gießen,Tel.: 0641/97 22 30, Fax: 0641/7 74 08

Dr. med. Dresler, Rainer
Viersener Straße 56,41061 Mönchengladbach, Tel.: 02161/8 60 11

Dr. med. Emter, Michael
Bödekerstr. 73,30161 Hannover, Tel.: 0511/62 02 84, Fax: 0511/62 02 85

Dr. med. Faltz, H.-Christian
Hauptkanal links 79-81, 26871 Papenburg, Tel.: 04961/9 11 90, Fax: 04961/91 19 13

Dr. med. Heres, Steffy
Kroatenweg 70,39116 Magdeburg, Tel.: 0391/6 09 94 40

Dr. med. Herman, Georg
Kamp 45,49074 Osnabrück, Tel.: 0541/2 72 00, Fax: 0541/2 05 01 05

Dr. med. Huber, Karl-Heinz
Römerstr. 57,69115 Heidelberg, Tel.: 06221/16 61 61, Fax: 06221/18 43 13

Prof. Dr. med. Hupp, Thomas
Katharinenhospital,Klinikum Stuttgart, Kriegsbergstr. 60,70174 Stuttgart, Tel.: 0711/2 78 36 00, Fax: 0711/2 78 36 09

Dr. med. Joel, Angela
Breite Str. 22,04317 Leipzig, Tel.: 0341/6 89 88 01, Fax: 0341/6 89 85 51

Dr. med. Keil, Ulrich
Ivo-Beucker-Str. 43,40237 Düsseldorf, Tel.: 0211/91 52 99-0, Fax: 0211/91 52 99-9

Dr. med. Kister, Martin
Berliner Allee 56,40212 Düsseldorf, Tel.: 0211/37 04 27, Fax: 0211/37 04 29

Dr. med. Köhler, Andreas
Kleinschmieden,606108 Halle, Tel.: 0345/38 82 60, Fax: 0345/3 88 26 80

Dr. med. Kopp, Helmut
Bahnhofplatz 2,55116 Mainz, Tel.: 06131/22 11 00, Fax: 06131/22 13 30

CA Dr. med. Ludwig, Norbert
Kamillianerstr. 40-42,41069 Mönchengladbach, Tel.: 02161/81 21 41, Fax: 02161/81 21 44

Dr. med. Manz, Jochen
Adolf-Schmetzer-Str. 11,93055 Regensburg, Tel.: 0941/79 15 43, Fax: 0941/79 28 16

Prof. Dr. med. Marshall, Markward
Tegernseer Straße 101,83700 Rottach-Egern, Tel.: 0802/2 12 18, Fax: 0802/15 75

Dr. med. Mietaschk, Andreas
Tal 13,80331 München, Tel.: 089/2 42 15 86, Fax: 089/29 16 15 01

Dr. med. Noppeney, Thomas
Obere Turnstr. 8,90429 Nürnberg, Tel.: 0911/27 06 30, Fax: 0911/2 70 61 44

Dr. med. Pfister, Rahel
Zähringer Str. 14,79108 Freiburg, Tel.: 0761/5 66 99, Fax: 0761/55 45 02

Dr. med. Piehler, Uwe
Sonnenstr. 2,08060 Zwickau, Tel.: 0375/52 37 39, Fax: 0375/52 37 41

Dr. med. Ranft, Jürgen
Osterfelder Str. 157,46242 Bottrop, Tel.: 02041/15 11 00,

Dr. med. Rüthlein, Verena
Isinger Tor 12,45276 Essen, Tel.: 0201/85 10 60

Dr. med. Schäfer, Roland
Altmärker Str. 8,39307 Genthin, Tel.: 03933/94 87 97

PD Dr. med. Sternitzky, Reinhardt
Forststr. 3,01099 Dresden, Tel.: 0351/8 06 43 38, Fax: 0351/8 06 43 00

Dr. med. Turowski, Andreas
Bornholmer Str. 73,10439 Berlin, Tel.: 030/4 44 36 10, Fax: 030/4 44 36 20

Dr. med. Tepohl, Gerhart
Sendlinger-Tor-Platz 8,80336 München, Tel.: 089/59 35 17, Fax: 089/5 50 17 74

Dr. med. Thum, Joachim
Pelizaeusplatz 1,31134 Hildesheim, Tel.: 05121/3 52 46, Fax: 05121/3 27 44

Dr. med. Baron von Bilderling, Peter
Tal 13,80331 München, Tel.: 089/2 42 15 86, Fax: 089/29 16 15 01

Dr. med. von Nettelbladt, Egbert
Ackerstr.7,67227 Frankenthal/Pfalz, Tel.: 06233/2 42 67, Fax: 06233/31 91 33

Dr. med. Waldhausen, Peter
Neue Linner Str. 86,47799 Krefeld, Tel.: 02151/63 13 46, Fax: 02151/63 13 07

Dr. med. Wrobel, Jörg
Paul-Neumann-Str. 5,14482 Potsdam, Tel.: 0331/2 80 46 15, Fax: 0331/7 04 28 14

Participating general practitioners:

Ackermann I, Magdeburg. – Adams R, Kassel. – Afschar H, Stuttgart. – Alder C, Düsseldorf. – Arzt G, Regensburg. – Aßmann E, Parey. – Auer H, Heidelberg. – Aulich H, Berlin. – Bacher-Zeller I, Pohlheim. – Bangemann M, Nürnberg. – Bannasch I, Berlin. – Batz T, Freiburg. – Bauer B, München. – Baumeister B, Mönchengladbach. – Bausch T, Freiburg.-Bawidamann G, Nittendorf. – Beermann H, Hannover. – Behnen E, Sögel. – Berndt M, Hannover. – Bertram W, Mönchengladbach. – Bier P, Poing. – Biskowitz M, Hannover. – Blasko E, Zwickau. – Blume J, Essen. – Boch G, Düsseldorf. – Bodamer S, Genthin. – Bode K, Hildesheim. – Bogner G, Zeitlarn. – Bohm E, Berlin. – Boll B, Heidelberg. – Bondke C, Berlin. – Brauer D, Magdeburg. – Braun B, Gießen. – Braun F, Dennheritz. – Bräutigam B, Leipzig. – Breitmeier B, Schönebeck. – Brömme K, Genthin. – Büchsel H, Gießen. – Büdke M, Halle. – Bünte R, Lüneburg. – Bünte W, Scharnebeck. – Busse Grawitz M, Merzhausen. – Carls–Ott A, Vellmar. – Cassel H, Fernwald.-Claßen W, Diekholzen. – Cremer B, Mönchengladbach. – Curdes H, Mönchengladbach. – Czenkusch R, Potsdam. – Dan J, Parey. – Diehl M, Mainz. – Diehls K, Kassel. – Diels C, Kassel. – Dipper S, Stuttgart. – Dörrler-Naidenoff N, München. – Doßow H, Magdeburg. – Doubravsky J, Heidelberg. – Dujka B, Krefeld. – Dürr T, Zwickau. – Duschek D, Elzach. – Eberl B, München. – Ebert C, Magdeburg. – Eggers S, Hannover. – Engel M, Waakirchen. – Engelhardt

V, Mönchengladbach. – Erdmenger W, Berlin. – Erlinger R, Stuttgart. – Eyber P, Berlin. – Falkenberg G, Düsseldorf. – Fechner J, Emmendingen. – Ferl P, Düsseldorf. – Fiedler E, Chemnitz. – Fischer I, Halle. – Fleischer P, Bottrop. – Fleischer U, Bottrop. – Fliedner M, Düsseldorf. – Föhrenbacher U, Freiburg. – Forker-Tutschkus A, Leipzig. – Franck W, Stuttgart. – Franz L, Potsdam. – Freudenberg M, Heidelberg. – Fricke S, Hannover. – Füßl H, Regensburg. – Ganasinski J, Kassel. – Gasser H, Buseck. – Geibel U, Lambsheim. – Geißler K, Berlin. – Genzwürker C, Regensburg. – Gerzmann J, Adendorf. – Gilbrich K, Klietz. – Goldmeyer I, Osnabrück. – Göllner H, Nürnberg. – Greutelaers M, Bichl. – Groos-März C, München. – Groß G, Halle. – Gruhn C, München. – Grumbach K, Papenburg. – Gruner C, Zwickau. – Günther I, Magdeburg. – Haas H, Hildesheim. – Haas R, Dresden. – Haase K, Berlin. – Hagel S, Nürnberg. – Hähnel C, Zwickau. – Halbgewachs-Breiden H, Stuttgart. – Harder M, Nürtingen. – Hartmann M, Halle. – Hartmann T, München. – Hartung K, Halle. – Hauber P, München. – Hauer E, Regensburg. – Hausdorf K, München. – Haverkampf K, München. – Heberger S, Weyarn. – Heinemann U, München. – Heinke T, Potsdam. – Heinrich I, Halle. – Henrich M, Grünberg. – Hensel P, Dresden. – Hensel W, Hannover. – Henze K, München. – Hesse H, Marburg. – Hesse J, Kassel. – Heyer C, Mönchengladbach. – Hirte-Schoenwald B, Gießen. – Hochbruck B, Krefeld. – Hoepffner S, Erlangen. – Hoffmann V, Leipzig. – Höhle H, Ihlow. – Impe C, Magdeburg. – Iwersen D, Frankenthal. – Jachtmann W, Krefeld. – Jäger K, Essen. – Janssen U, Unterföhring. – Janssens W, Düsseldorf. – Jäsch K, Dresden. – Joseph K, Ottobrunn. – Junge H, Düsseldorf. – Kaiser J, Lüneburg. – Kaser G, Tönisvorst. – Kaßler U, Düsseldorf. – Kaviani N, München. – Keller H, Potsdam. – Keller K, Zwickau. – Klein A, Hildesheim. – Klinzing-Eidens I, Schliersee. – Klockmann D, Buseck. – Kluth W, Kaarst. – Köllner H, Teningen. – König R, Nürnberg. – König W, Mainz. – Konow A, Krefeld. – Korbmacher J, Erkrath. – Kothny K, München. – Kraft H, Worms. – Krahl H, Leipzig. – Kraiß M, Stuttgart. – Kranl P, Tegernsee. – Kraus H, Frankenthal. – Krenkel C, Dresden. – Kronberg W, Nürnberg. – Krüger D, Gießen. – Kruse J, Lüneburg. – Kühn C, Dresden. – Kümmel A, Gießen. – Kuschke H, München. – Kutzscher N, Mainz. – Laas D, Magdeburg. – Läer B, Lüneburg. – Lamby E, Regensburg. – Langer A, Miesbach. – Last W, Heidelberg. – Laumen H, Mönchengladbach. – Leben I, Essen. – Lebentrau K, München. – Lense J, München. – Lenzer H, Freiburg. – Lessel A, Krefeld. – Lessmann P, Georgsmarienhütte. – Levacher C, Düsseldorf. – Lindner-Funk G, Nürnberg. – Link B, Magdeburg. – Lipp I, Leipzig. – Loerke H, Düsseldorf. – Luerweg C, Bottrop. – Lukasczyk K, Zwickau. – Luther K, Magdeburg. –Lütticke L, Osnabrück. – Maier C, Gmund. – Marck G, Pohlheim. – Masing C, Amelinghausen. – Maßlich H, Dresden. – Matzeder A, München. – Maykemper B, Lollar. – Meißner M, Krefeld. – Messerschmidt M, Halle. – Metten M, Mönchengladbach. – Metzler G, Frankenthal. – Michels R, Mönchengladbach. – Miller I, Dirmstein. – Mi-Plaza P, Stuttgart. – Mohnsen K, Hannover. – Mordeja D, Hildesheim. – Müller G, Leipzig. – Nachmann A, München. – Nadler O, Mainz. – Niemetz I, Kassel. – Nieter K, Berlin. – Niggl-Fisser M, Tegernsee. – Noell H, Kassel. – Nölke-Desinger C, Essen. – Paczkowski K, Hannover. – Parastatidis I, München. – Paulsen R, Osnabrück. – Pawlak C, Gmund. – Peters H, Sögel. – Petri P, Gießen. – Pfeiffer K, München. – Pfeiffer C, Grünstadt. – Philippi M, München. – Piehler T, Werdau. – Pingel-Döring P, Lollar. – Pinnow S, Teltow. – Plank–Wihr A, Kallmünz. – Pokrandt-Koller A, München. – Pötschke T, Mönchengladbach. – Pusch M, Zwickau. – Rakette S, München. – Randerath B, Mönchengladbach. – Ranker N, München. – Rauch R, München. – Rauscher C, Regensburg. – Reinke A, München. – Renner K, Bad Salzdetfurth. – Richter M, Dresden. – Röcken A, Essen. – Rösner H, Bad Salzdetfurth. – Roßner B, Zwickau. – Rother J, Magdeburg. – Ruider H, München. – Rüller C, Bottrop. – Rutkowsky E, Berlin. – Rütten P, Essen. – Salbach T, Hildesheim. – Sander M, Sibbesse. – Satke-Stellwagen G, Beindersheim. – Sauther W, Emmendingen. – Sax G, Mönchengladbach. – Schabl J, Regensburg. – Schäfer A, Zwickau. – Scheu G, Teningen. – Schimanski K, Mönchengladbach. – Schlotjunker J, Düsseldorf. – Schlott C, Zwenkau. – Schmeißer J, Derben. – Schmidt P, Heidelberg. – Schmidt S, Lichtentanne, – Schmitt H, Gerlingen. – Schmitz N, Regensburg. – Schneider R, Regensburg. – Schneider-Gaßner K, Hildesheim. – Schober A, Parey. – Scholz H, Schwetzingen. – Schöne S, Berlin. – Schönherr L, Leipzig. – Schöning A, Osnabrück. – Schramek C, Leipzig. – Schüler B, Mainz. – Schulze H, Lüneburg. – Schwab K, Gauting. – Schwarz A, Heidelberg. – Scobel A, Leer. – Seelhoff G, Krefeld. – Seipold M, Magdeburg. – Seitz C, München. – Seitz M, Buseck. – Sensen W, Krefeld. – Siegel A, Schönfels. – Sigl K, München. – Sigrist S, Freiburg. – Skarupinski B, Halle. – Sonneborn U, Heidelberg. – Sonneck M, Düsseldorf. – Speetzen G, Magdeburg. – Spenke I, Berlin. – Sperling M, Gera. – Speyer U, Lollar. – Spiegel L, Güsen. – Spiegel M, Nürnberg. – Stadtmann J, Bottrop. – Stark M, Leipzig. – Staudt B, Berlin. – Stein W, Osnabrück. – Steinhöfel T, Miesbach. – Stenzig A, Hannover. – Stocker K, München. – Straßmüller O, Gmund. – Strnad W, Westoverledingen. – Strüngmann J, München. – Stumpf G, Nürnberg. – Stumpf H, Leimen. – Szika H, Neutraubling. – Thiel S, Mainz. – Thies H, Hannover. – Thimm A, Heidelberg. – Tölg D, Diekholzen. – Treu D, Hausham. – Trott J, Heidelberg. – Tützer W, Crimmitschau. – Tyroller A, Hildesheim. – Ullrich H, Milow. – Vernaleken T, Kassel. – Viehweger S, Zwickau. – Vogel-Bartl R, Halle. – Voß H, Leipzig. – Wagner J, Mönchengladbach. – Wahlländer-Danek U, Großhesselohe. – Waldleben M, Dresden. – Wallenfels M, Düsseldorf. – Weber M, Mönchengladbach. – Weber R, Georgsmarienhütte. – Weichert S, Leipzig. – Weiss K, Dresden. – Welbers M, Düsseldorf. – Wendland D, Wolfhagen. – Westers-van Halsem J, Aschendorf. – Widrat U, Berlin. –

Wiermann T, Halle. – Wilde E, Hildesheim. – Wilke G, Hannover. – Wille M, Wetzlar. – Willerding H, München. – Wilm B, Osnabrück. – Wirth K, München. – Wolf P, München. – Woltmann N, Biebertal. – Wulcko S, Parchen. – Wurm R, Stuttgart. – Wurziger J, Dresden. – Yasrebi S, Diekholzen. – Zachmann D, Berlin. – Zänker K, Magdeburg. – Zilz-Meyer T, München. – Zimmermann R, München. – Zisterer A, Frankenthal.

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