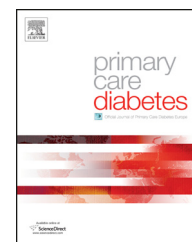




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## Original research

# Prevalence and risk factors of neuropathy in newly diagnosed type 2 diabetes in primary care practices: A retrospective database analysis in Germany and UK



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## ABSTRACT

**Aims:** To estimate the prevalence and risk factors of diabetic neuropathy in newly diagnosed type 2 diabetes in general practices.

**Methods:** Longitudinal data from nationwide general practices in Germany ( $n = 630$ ) and UK ( $n = 100$ ) (Disease Analyzer) were analyzed. Patients with newly diagnosed (<1 year) type 2 diabetes (2008–2012) were identified including 45,633 patients (age: 66, SD: 12 years) in Germany and 14,205 patients (age: 63, SD: 13 years) in UK. Neuropathy was identified by ICD code (E11.4) or the original diagnosis. Associations of potential risk factors with neuropathy were investigated using logistic regression.

**Results:** The prevalence of diagnosed neuropathy was 5.7% (95% CI: 5.5–5.9%) in Germany and 2.4% (1.9–2.9%) in UK. In Germany, factors independently associated with neuropathy in stepwise logistic regression were age (>70 years: OR; 95% CI 2.1; 1.6–2.8), retinopathy (3.0; 2.1–4.2), peripheral artery disease (PAD: 1.9; 1.4–2.5), insulin treatment (4.6; 3.5–6.2) and oral antidiabetic drugs (OAD: 1.6; 1.2–2.0). In UK, male sex (1.4; 1.01–1.9), nephropathy (1.7; 1.2–2.5), PAD (1.5; 1.1–2.1), antihypertensives (1.7; 1.1–2.5), insulin (2.1; 1.1–3.8) and OAD (1.4; 1.01–1.8) were identified.

**Conclusions:** The prevalence of diabetic neuropathy at time of type 2 diabetes diagnosis was low in primary care (Germany, UK). Neuropathy was associated with age, PAD and microvascular complications.

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## 1. Introduction

Diabetes mellitus is a major cause of peripheral neuropathy [1,2]. The typical diabetic neuropathy is a chronic, symmetrical sensorimotor polyneuropathy [1,2]. Long-term hyperglycemia is the most important risk factor, which is associated with alterations of microvessels, similar to those in diabetic retinopathy and nephropathy [2]. Thus, diabetic neuropathy has been considered a chronic complication that occurs after long diabetes duration.

Evidence is growing that after careful testing neuropathy already manifests in up to 20% of subjects with prediabetes [3,4]. In addition, nerve disorders can already be present at the time of diabetes diagnosis. However, there are few studies on the prevalence and determinants of diabetic neuropathy at onset of type 2 diabetes [5–8]. Based on these mostly small study samples, neuropathy was already present in 2–10% [5–8]. Therefore, the aim of the current study was to study the prevalence and risk factors of diabetic neuropathy in patients with newly diagnosed type 2 diabetes in primary care in Germany and UK.

## 2. Patients and methods

The Disease Analyzer database (IMS HEALTH) assembles drug prescriptions, diagnoses, basic medical and demographic data directly obtained from the practice computer system of general practitioners [9]. Diagnoses (ICD-10), prescriptions (Anatomical Therapeutic Chemical (ATC) Classification System) and the quality of reported data were monitored by IMS

based on a number of criteria (e.g. completeness of documentation, linkage of diagnoses and prescriptions).

In Germany, the sampling methods for the selection of physicians' practices were appropriate to obtain a representative database of primary care practices [9]. Prescription statistics for several drugs were very similar to available data from pharmaceutical prescription reports [9]. The age structures for given diagnoses in Disease Analyzer also agreed well with those from corresponding disease registries [9]. In UK, there is a good correlation between the Disease Analyzer patients and the UK population in terms of age and male-to-female ratio [10,11]. In addition, the panel of general practitioners in the UK database is broadly representative, although there is under-representation of smaller practices and of practices in some regions (Scotland, Northern Ireland), and there is a slight over-representation of younger doctors [10,11].

The present database analysis covered the time period from January 2008 to December 2012 (Disease Analyzer Germany and UK). For the present study, only patients with continuous visits during the observation period (2008–2012) were included in the analysis, defined as one or more visits each half year. Patients with type 2 diabetes (age group >40 years) were identified on the basis of International Classification of Diseases (ICD-10) codes (E11). Finally, patients with diabetes duration recorded in the practices <1 year were selected. Prevalence of neuropathy (95% CI) was defined on the basis of the ICD code (E11.4) or on the original diagnosis text of the physicians.

For each study subject, age, sex, diabetes duration, BMI, HbA<sub>1c</sub>, systolic and diastolic blood pressure, diagnosed hypertension, antihypertensive drug prescriptions (Anatomical

**Table 1 – Characteristics of newly diagnosed type 2 diabetes patients (<1 year duration) in primary care practices in Germany (Disease Analyzer) stratified by neuropathy status.**

Characteristics	Total	No neuropathy	Neuropathy
N	45,633	43,050	2583
Male sex (%)	49.2	49.2	48.2
Age (years)	66.2 (12.4)	66.0 (12.5)*	69.1 (11.0)*
Age ≤60 years (%)	33.7	33.3*	22.6*
Age 61–70 years	26.0	25.9*	27.8*
Age >70 years	40.3	39.8*	45.6*
Body mass index (kg/m <sup>2</sup> )	30.9 (5.7)	30.9 (5.7)	30.8 (5.3)
HbA <sub>1c</sub> (%)	7.1 (1.4)	7.1 (1.4)*	7.4 (1.5)*
Systolic BP (mmHg)	139.6 (20.2)	139.5 (20.2)	140.2 (20.6)
Diastolic BP (mmHg)	82.0 (11.3)	82.1 (11.2)*	80.0 (12.2)*
Oral antidiabetics (%)	34.3	34.3	34.2
Insulin (%)	7.0	6.1*	21.3*
Coronary heart disease (%)	23.2	23.5*	19.2*
Myocardial infarction (%)	6.9	6.9	6.2
Stroke (%)	5.3	5.2	6.0
Lipid disorders (%)	46.0	46.9*	31.5*
Lipid-lowering drugs (%)	36.4	36.8*	30.0*
Hypertension (%)	71.2	72.5*	50.1*
Antihypertensives (%)	74.9	75.1*	56.0*
Retinopathy	3.6	3.1*	10.5*
Nephropathy	9.4	9.2*	12.8*
Peripheral artery disease	9.5	9.0*	17.0*

Data are means (SD) or prevalence (%).

\* p-Value < 0.05: neuropathy vs no neuropathy.

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