



# How Common Is the Rare Charcot Foot in Patients With Diabetes?

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The Charcot foot is a devastating complication to diabetes (1). It manifests as an acute aseptic inflammation of bones and joints in the feet. If not diagnosed and treated in time, it may lead to collapse of bones in the foot, which causes deformity, foot ulcers, amputation, and death (1). The diagnosis of acute Charcot foot is often delayed due to little knowledge of the disease among patients and clinicians, probably because of its rarity. But how rare is it?

To answer this, we have assessed the incidence and prevalence of the Charcot foot among all patients with diabetes in Denmark.

The Danish National Patient Register contains information on all hospitalizations and information on outpatient visits and emergency room contacts from 1995 to present (2). Data about age, sex, and emigrations (temporary or permanent) were retrieved from The Danish Civil Registration System, and dates of death were found in the Death Register, Statistics Denmark (2).

All individuals in the Danish National Patient Register with an ICD-10 code for diabetes, i.e., DE10.x, DE11.x, DE13.x, or DE14.x, from 1 January 1995 to 31 December 2018, were identified.

Patients with a closed hospital contact related to diabetes before 1995 were

excluded. Furthermore, patients with a diabetes code registered after the date of death or after the date of emigration were excluded. Charcot foot patients were identified as having the ICD-10 codes DM146 (neuropathic arthropathy) or DM142 (diabetic arthropathy). Person-years were calculated from the first date of diagnosis of diabetes until date of death, emigration, or diagnosis of Charcot foot.

A total of 350,736 individuals were registered with an ICD-10 code of diabetes from 1995 to 2018. Of these, 1,084 individuals were excluded due to closed hospital contacts related to diabetes before 1995. Furthermore, 40,042 individuals were excluded due to emigration, and 53 patients were excluded because their diabetes codes were registered after the date of death. Thus, after these exclusions, 309,557 individuals in Denmark had an ICD-10 diagnosis of diabetes. Their mean age at diagnosis of diabetes was 63.1 ( $\pm$  17.2) years, and 55.4% were men. The mean follow-up time was 7.5 ( $\pm$  6.2) years, giving a total of 2,330,857 person-years.

Of the individuals with an ICD-10 diagnosis of diabetes, 1,722 were diagnosed with Charcot foot (1,554 patients with neuropathic arthropathy [DM146] and 168 patients with diabetic arthropathy

[DM142]). The mean age of diagnosis of Charcot foot was 60.2 ( $\pm$  11.9) years.

Thus, the prevalence of Charcot foot was 0.56% (1,722 with Charcot foot of 309,557 with diabetes) from 1995 to 2018. The incidence rate of Charcot foot was 7.4 per 10,000 person-years ( $[1,722/2,330,857] \times 10,000$ ).

The current study is the largest study ever to investigate the incidence and prevalence of Charcot foot in patients with diabetes. Most previous studies reporting incidence and prevalence of Charcot foot are based on smaller subpopulations (3–5), often from diabetes outpatient clinics or specialized diabetes foot clinics, whereas our study population is more representative of the general diabetes population in Denmark. However, our study does have some selection bias, as we included only individuals with an ICD-10 code of diabetes in the Danish National Patient Register. Patients with diabetes who have never been hospitalized will not be registered with an ICD code of diabetes; thus, this study may underestimate the number of patients with diabetes in Denmark. However, the total number of patients with diabetes in Denmark in 2019 is estimated to be  $\sim$ 370,000 (6), which is not that different from our diabetes prevalence.

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Thus, in conclusion, in Denmark, the incidence rate of Charcot foot is 7.4 per 10,000 person-years, whereas the prevalence is 0.56% among patients with diabetes.

From these numbers, it can be estimated that in Denmark, a general practitioner that has 2,000 patients in his practice will have 100 patients with diabetes and 0–1 diabetes patients with a Charcot foot, with a new case of Charcot foot every 13th year. A hospital-based diabetes outpatient clinic with 10,000 diabetes patients will have 56 diabetes patients with a Charcot foot and 7 new cases of Charcot foot every year.

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