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Microvascular complications in Nuuk, Greenland, among Greenlanders and non-Greenlanders diagnosed with type 2 diabetes

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ABSTRACT

Aim: The objective of this study was to estimate and compare between Greenlanders and non-Greenlanders living in Nuuk the proportion of patients with type 2 diabetes with microvascular complications.
Methods: This study was performed as a cross-sectional register study based on information in the Electronic Medical Record (EMR). All patients diagnosed with type 2 diabetes and with permanent addresses in Nuuk were included. Patients born in Greenland were considered to be Greenlanders, while patients born outside Greenland were considered as non-Greenlanders. Proportions of patients with retinopathy, microalbuminuria, nephropathy and neuropathy were estimated based on information from the EMR.
Results: A total of 393 patients (295 Greenlanders and 98 non-Greenlanders) were included. In total 83.0% of all patients have been screened for retinopathy, while 66.4% were screened for microalbuminuria and 64.6% for neuropathy within a two year period. The most frequent microvascular complication was neuropathy, which was observed among half (49.6%) of all patients followed by microalbuminuria (28.4%), retinopathy (10.7%) and nephropathy (7.3%). Retinopathy was observed among 21.4% of the non-Greenlanders compared to only 7.0% of the Greenlanders ($p = .001$). Microalbuminuria was also observed more frequently ($p = .047$) among non-Greenlanders (37.5%) than among Greenlanders (24.9%).
Conclusion: Greenlanders seem to be less prone to especially retinopathy than are non-Greenlanders.

1. Introduction

Globally, diabetes is one of the most common metabolic disorders in the world now affecting 382 million people (2013), and the prevalence of diabetes in adults has been increasing during the last few decades [1,2]. Urbanization has driven dramatic changes in lifestyle and the accompanying increases in risk factors for diabetes particularly in developing countries [2]. Diabetes is a chronic disease characterized by elevated blood glucose, which over time leads to serious damage to the vasculature [3]. These are classified as either small vascular injury (microvascular disease) typically including retinopathy, nephropathy and neuropathy, or injury to the large blood vessels of the body (macrovascular disease)

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mainly atherosclerosis [3]. Diabetes is the leading cause of preventable blindness [4] and chronic renal disease [5]. Risk of developing microvascular complication is associated with both the duration and severity of hyperglycemia and thus partly preventable [3]. Also in Greenland, increasing prevalence of diabetes has been reported in both population surveys and register studies [6–8]. Thus, complications to diabetes must be expected to increase with the next decade. However, the actual prevalence of complications among Greenlanders remains unknown. A recent study identified a common mutation in TBC1D4 causing insulin resistance and postprandial hyperglycaemia among Greenlanders [9]. The mutation was found in 17% of the population and could explain 15% of all cases of diabetes observed in the population survey [9]. Furthermore, the mutation was not associated with usual risk factors for diabetes. Thus, the diabetes and complications rates observed among Greenlanders may differ from other populations. Higher frequencies of diabetic complications have been observed among ethnic minorities despite uniform medical care coverage and may be a result of both genetic and environmental factors [10]. Only one study of the complications among Greenlanders diagnosed with diabetes in Greenland has yet been performed; only 81 Greenlanders were included. In Nuuk, the capital of Greenland, around a third of all patients with diabetes are immigrants. Thus, it is possible to study differences between the Greenlanders and non-Greenlanders receiving the same diabetes care from the health care system in Greenland. The aim of this study was to estimate and compare the proportion of Greenlanders to non-Greenlanders living in Nuuk with type 2 diabetes with microvascular complications.

2. Materials and Methods

This study was performed as a cross-sectional study based on information in the Electronic Medical Record (EMR) used in Nuuk, Greenland, since March 2015.

2.1. Setting

Approximately 56,000 people live in Greenland and the population is widely spread geographically along the coast in 18 towns and 60 settlements. Of the current population approximately 90% were born in Greenland and are ethnic Greenlanders [7]. Almost a third (31%) of the total population lives in the capital, Nuuk [11].

Queen Ingrid Health Care Clinic is the only primary health care clinic in Nuuk, and provides primary health care for all inhabitants in Nuuk including an emergency ward open continually. Health care is delivered to all residents in Greenland free of charge. This includes providing free medications. Patients with diabetes are offered lifestyle interventions including instruction in smoking cessation, free pedometers, dietary advice, regular control measurements of blood pressure and blood parameters. Also, screening for retinopthy with retinal photography, microalbuminuria with urine test and neuropathy by a chiropodist are parts of the offered primary health care service. All test are documented in an integrated lifestyle table within the EMR used by the clinic from March of 2015. Information from the lifestyle table can thus be extracted electronically.

2.2. Study population

All patients with permanent address in Nuuk, diagnosed with T90 (type 2 diabetes) according to the International Classification of Primary Care (2nd Edition) system [12] were identified electronically. Patients born in Greenland were considered to be Greenlanders while patients born outside Greenland were considered to be non-Greenlanders.

2.3. Variables and analysis

Information available from the lifestyle table in the EMR included year of diabetes diagnosis, smoking habits, physical activity, height, weight, blood pressure at work, home blood pressure, glycated haemoglobin (HbA_{1c}) and urine albumine creatine ratio (ACR). In addition information about sex, age in 2016, medical treatment, results of screening for retinopathy and neurpathy was obtained. Only the most recent test results and only tests performed in a two year period were included. The duration of the diabetes was calculated as the year 2016 minus the year of the diagnosis. Patients were considered to be smokers or non- smokers based on the most recently recorded "daily use of tobacco" entry shown in the lifestyle table in the EMR. Patients were considered physically inactive if the most recent registration of activity indicated less than 5000 steps per day. Body mass index (BMI) was calculated based on recorded height and weight. The standard guidelines for measuring height and weight were defined as measurements taken while the patient wore light clothing but no outerwear nor shoes. Home blood pressure measurements based on an average of at least 12 measurements were included. Blood pressure measurements in the medical office were performed on patients while sitting after five minutes of rest. These were included if no home blood pressure measurements were performed. Blood pressure was measured using the automatic blood pressure Easy Rapid device from PiC Solutions [13]. Medical treatment was classified based on active drug prescriptions noted in the EMR. Antihypertensive drugs were defined as drugs with Anatomical Therapeutic Chemical (ATC) codes C02-C04 and C07-09. Lipid lowering drugs included ATC codes C10 while ATC codes A10 were considered blood glucose lowering drugs. HbA_{1c} level was measured through analysis of venous blood using the Tosoh G8 HPLC Analyser® [7]. Urine was analyzed for extraction of albumin using an Architect 8000T from Abbot®. All analyses were performed at The Central Laboratory at Queen Ingrid Hospital, which is a member of the Danish Quality Control System for laboratories [14]. Retinal imaging was performed using the Daytona Ultra-Widefield Optos® retinal camera. All patients were considered without retinopathy unless any sign of retinopathy was discovered and recorded by the ophthalmologist. Classification was based on the worst affected eye. Patients were considered to have neuropathy if the latest examination of vibration perception thresholds were 25 mV or above as performed by a chiropodist using a biothesiometer from Rova Company®. Classification was based on the