

Heart Failure and Type 1 Diabetes. Excess risk and risk factors

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligens försvaras i Arvid Carlsson salen, Academicum, Medicinaregatan 3, den 19 april, klockan 13:00

av Daniel Vestberg

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Avhandlingen baseras på följande delarbeten

- I. Vestberg D, Rosengren A, Olsson M, Gudbjörnsdóttir S, Svensson AM, Lind M. Relationship Between Overweight and Obesity With Hospitalization for Heart Failure in 20,985 Patients With Type 1 Diabetes: A population-based study from the Swedish National Diabetes Registry. *Diabetes Care*. 2013;36(9):2857-61.
- II. Rosengren A, Vestberg D, Svensson AM, Kosiborod M, Clements M, Rawshani A, Pivodic A, Gudbjörnsdóttir S, Lind M. Long-term excess risk of heart failure in people with type 1 diabetes: a prospective case-control study. *Lancet Diabetes Endocrinol*. 2015;3(11):876-85.
- III. Vestberg D, Rosengren A, Olsson M, Gudbjörnsdóttir S, Haraldsson B, Svensson AM, Lind M. Decreased eGFR as a Risk Factor for Heart Failure in 13 781 Individuals With Type 1 Diabetes. *J Diabetes Sci Technol*. 2016;10(1):131-6.
- IV. Vestberg D, Rosengren A, Eeg-Olofson K, Miftaraj M, Franzen S, Svensson A-M, Lind M. Body mass index as a risk factor for coronary events and mortality in patients with type 1 diabetes. *Open Heart*. 2018 Jan 20;5(1):e000727
- V. Vestberg D, Johansson M, Letho A, Pivovic A, Hallström S, Ólafsdóttir AF, Rosengren A, Lind M. Investigation of early signs of systolic and diastolic dysfunction among persons with type 1 diabetes. (Manuscript)

**SAHLGRENKA AKADEMIN
INSTITUTIONEN FÖR MEDICIN**



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Abstract

Background: Approximately 45,000 individuals live with type 1 diabetes (T1D) in Sweden. Previous studies have shown an increased risk for heart failure in persons with diabetes, but most of the studies have been in the setting of unspecified diabetes or included patients with type 2 diabetes. The aim of this thesis is to study some of the potential risk factors, body weight (expressed as Body Mass Index, BMI, Study I) and renal function (defined by estimated glomerular filtration rate, eGFR (Study II) for heart failure in persons with T1D, and also study a potential excess risk for development of heart failure compared to controls from the general population (Study II). In the fourth study BMI was investigated as a risk factor for myocardial infarction (MI) and mortality. The fifth study is an echocardiography (ultrasound) study evaluating early signs of cardiac dysfunction in persons with T1D.

Material and Methods: For the first four studies data from the National Diabetes Registry (NDR) was linked with entries in the inpatient register (diagnoses from hospital admissions), the cause specific death register (causes of death) and data from statistics Sweden (SCB) including for example level of education. In the second study we studied the excess risk for admission to hospital because of heart failure by comparing 33 402 persons with T1DM and 166 228 matched controls. The screening study with echocardiography is based on 287 persons with T1D.

Results and conclusions: Persons with T1D have four times higher risk for admission to hospital due to heart failure compared to age and sex matched controls from the general population. The magnitude of the excess risk is dependent on glycemic control and albuminuria. Within the population with T1DM elevated BMI and decreased eGFR are strong risk factors for heart failure. Elevated BMI was not associated with increased risk for MI. Early signs of decreased cardiac function with ultrasound is detectable among 9.9-14.8% of persons with T1DM being 50 years or older, while it is relatively rare below this age (1.7-4.1 %).

Keywords: Diabetes mellitus, type 1, Heart failure, Myocardial infarction