

Type 2 Diabetes and Congestive Heart Failure are Mutually Independent Predictors of the Presence of Albuminuria

M. MAECHLER^{1,2,3}, A. VONBANK^{1,2,3}, B. LARCHER^{1,2,3}, A. MADER^{1,2,3}, L. SPRENGER^{1,2,3}, B. MUTSCHLECHNER^{1,2,3}, M. BENDA^{1,2,3}, A. LEIHERER^{1,3,4}, A. MUENDLEIN^{1,3}, H. DREXEL^{1,3,5,6}, C.H. SAELY^{1,2,3}

¹ Vorarlberg Institute for Vascular Investigation and Treatment (VIVIT), Feldkirch, Austria; ² Academic Teaching Hospital Feldkirch, Feldkirch, Austria; ³ Private University of the Principality of Liechtenstein, Triesen, Principality of Liechtenstein;

⁴ Medical Central Laboratories Feldkirch, Feldkirch, Austria; ⁵ Department of Medicine, County Hospital Bregenz, Austria; ⁶ Drexel University College of Medicine, Philadelphia, PA, USA;

All authors disclosed no conflict of interest

BACKGROUND

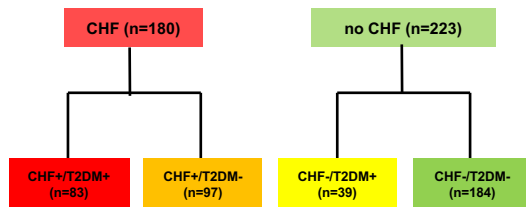
Albuminuria is a well-known characteristic of diabetic nephropathy and it is also present in a large portion of patients with congestive heart failure (CHF). However, it is not known how albuminuria associates with the presence of type 2 diabetes mellitus (T2DM) and CHF together. This issue therefore was addressed in the present study.

RESULTS

The prevalence of albuminuria was lowest in CHF-/T2DM- subjects (8.7%). When compared to this group it was significantly higher in CHF-/T2DM+ (23.1%, $p=0.010$), CHF+/T2DM- (38.1%, $p<0.001$) and CHF+/T2DM+ patients (62.7%, $p<0.001$). It was highest in CHF+/T2DM+ patients, in whom it was higher than in CHF-/T2DM+ ($p<0.001$) and in CHF+/T2DM- ($p=0.001$) patients; a trend towards a higher prevalence of albuminuria in CHF-/T2DM+ patients vs. CHF+/T2DM- patients did not reach statistical significance ($p=0.093$). In logistic regression analysis CHF and T2DM were mutually independent predictors of albuminuria, when adjusted for age, sex, body mass index, LDL cholesterol, history of smoking and hypertension, as well as use of statins and ACE inhibitors/angiotensin II receptor blockers (OR 2.57 [95% CI 1.47–4.51]; $p=0.001$ and OR 4.15 [2.18 – 7.88]; $p<0.001$, respectively).

MATERIAL & METHODS

We investigated 180 patients with CHF, of whom 83 had T2DM (CHF+/T2DM+) and 97 did not have diabetes (CHF+/T2DM-) and 223 controls without CHF, of whom 39 had T2DM (CHF-/T2DM+) and 184 did not have diabetes (CHF-/T2DM-).



Definitions

- Type 2 Diabetes mellitus was defined according to ADA guidelines 2020
- Congestive heart failure was defined according to ESC guidelines 2016
- Albuminuria was defined as an albumin – creatinine ratio ≥ 30 mg/g

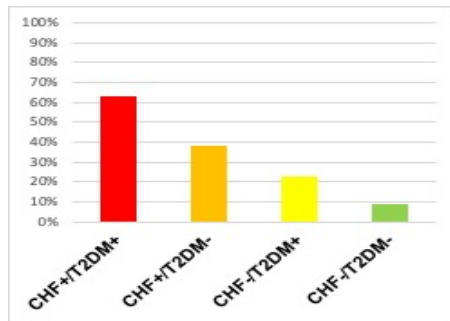
Baseline characteristics

	CHF- n=223 (55.3%)	CHF+ n=180 (44.7%)	p-value
Age (years)	60 $\pm$ 10 (58.6 – 61.4)	73 $\pm$ 14 (70.9 – 75.0)	<0.001
Sex (men)	54.3%	60.6%	0.204
BMI (kg/m ²)	28.3 $\pm$ 4.6 (27.7 – 28.9)	27.7 $\pm$ 6.1 (26.8 – 28.6)	0.048
History of smoking (yes)	57.4%	55.6%	0.710
History of hypertension (yes)	61.4%	74.4%	0.006
LDL-C (mg/dl)	134 $\pm$ 37 (129.2 – 139.1)	127 $\pm$ 56 (118.1 – 135.0)	<0.001
Use of statins (yes)	33.2%	58.8%	<0.001
Use of ACEi or ARB	32.3%	62.5%	<0.001
Prevalence of T2DM	17.5%	46.1%	<0.001
ACR (mg/g)	25.981 (14.2 – 35.7)	187.585 (100.6 – 272.6)	<0.001

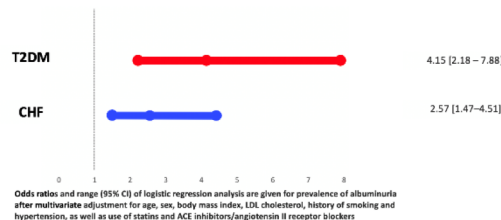
CHF = congestive heart failure, BMI = body mass index, LDL-C = low-density lipoprotein cholesterol, ACEi = angiotensin-converting enzyme inhibitors, ARB = angiotensin-receptor blocker T2DM = type 2 diabetes mellitus, ACR = albumin-creatinine ratio

* defined as either micro- or macro albuminuria, ACR ≥ 30 mg/g

Prevalence of albuminuria



Log. regression analysis: prevalence of albuminuria



Odds ratios and range (95% CI) of logistic regression analysis are given for prevalence of albuminuria after multivariate adjustment for age, sex, body mass index, LDL cholesterol, history of smoking and hypertension, as well as use of statins and ACE inhibitors/angiotensin II receptor blockers

CONCLUSION

We conclude that T2DM and CHF are mutually independent predictors of albuminuria.