Prevalence and determinants of heart failure stage A and B in a population-based sample – Results from the STAAB cohort study

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BACKGROUND

- Heart failure (HF) is considered a progressively aggravating continuum ranging from subjects with risk factors for HF (stage A) to asymptomatic cardiac dysfunction (stage B) and symptomatic HF (stages C and D) (Figure 1)
- To derive the population at risk for developing HF, we aimed to assess prevalence and characteristics of early stages of HF in a population-based cohort.

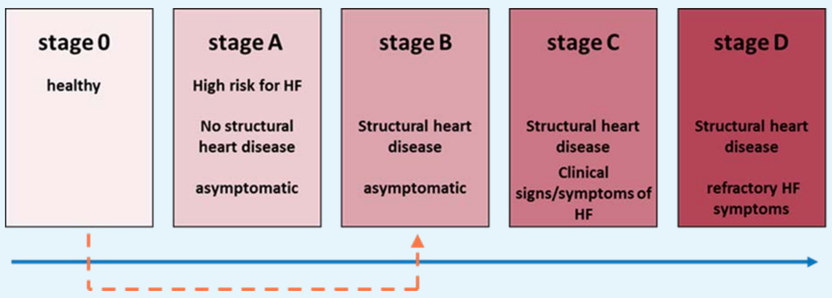

Figure 1: Development of heart failure (HF) adjusted from *Circulation. 2005;112:e154-235*

METHODS

- planned interim analysis
- prospective Characteristics and Course of Heart Failure Stages A-B and Determinants of Progression (STAAB) cohort study
- representative sample of residents of the City of Würzburg, Germany, aged 30 to 79 years and reporting no previously diagnosed HF
- Stratification goals: 1:1 for sex and 10:27:27:27:10 for age groups 30-39, 40-49, 50-59, 60-69, and 70-79 years
- Participants underwent detailed cardiac phenotyping and standardized echocardiography
- Categorization of HF was performed according to AHA/ACC guidelines.
  - A: ≥1 risk factor for HF (hypertension, arteriosclerotic disease, diabetes mellitus, obesity, metabolic syndrome), but absence of structural heart disease (SHD);
  - B: asymptomatic but SHD (reduced left ventricular (LV) ejection fraction, LV hypertrophy, LV dilation, stenosis or more than mild regurgitation of aortic or mitral valve, worse than mild diastolic dysfunction) or history of myocardial infarction;
  - C: SHD and signs and symptoms of HF (Framingham criteria)

RESULTS

- We analyzed 2473 participants (54±12 years, 51% female)
- stage A, 42% (58±11 years, 42% female)
- stage B, 18% (58±12 years, 63% female)

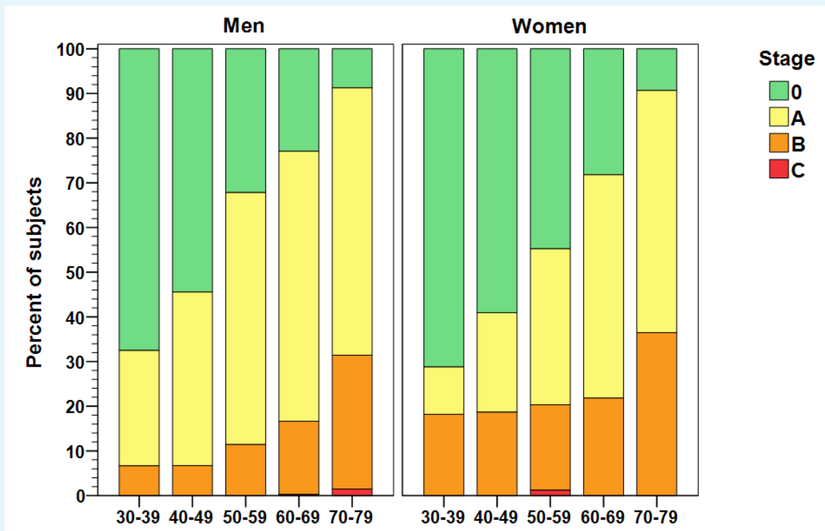

Figure 2: Crude distribution of HF stages 0, A, B and C in men and women, by age decades.

- 31% of stage B subjects had no risk factor that would qualify for A (B-not-A).
- Compared to individuals in stage B with present A criteria (B&A), B-not-A were (Table):
  - significantly younger (47±10 vs. 63±10 years, p<0.001)
  - more often female (78% vs. 56%, p<0.001)
  - had LV dilation as predominant B-qualifying criterion (p<0.001)

	Heart failure stage		p
	B-not-A	B&A	
N (% of stage B)	131 (31)	296 (69)	
Age [y] – mean (SD)	47 (10)	63 (10)	<0.001
Female sex – n (%)	102 (78)	167 (56)	<0.001
Sinus rhythm - n (%)	127 (97)	283 (96)	0.60
Family history of cardiovascular disease – n (%)	39 (30)	143 (50)	<0.001
Smoking			
Ever smoked – n (%)	63 (48)	171 (58)	0.07
Current smoker – n (%)	21 (16)	47 (16)	>0.99
Renal function			
Creatinine [mg/dL] – mean (SD)	0.82 (0.15)	0.89 (0.19)	<0.001
eGFR[29] [mL/min/1.73m²] – mean (SD)	92 (15)	81 (16)	<0.001
Criteria qualifying for stage B – n (%)			
History of myocardial infarction	0 (0)	40 (14)	–
Stenosis of mitral or aortic valve	0(0)	22 (7)	<0.001
Regurgitation II-III° of mitral or aortic valve	7 (5)	39 (13)	0.02
LV systolic dysfunction ‡	42 (32)	114 (39)	0.23
LV dilation §	94 (72)	97 (33)	<0.001
LV hypertrophy ‖	10 (8)	73 (25)	<0.001
LV diastolic dysfunction more than mild	0 (0)	18 (6)	0.001
LVEF [%] - mean (SD)	59 (6)	56 (7)	<0.001
LVEDVi [mL/m²] - mean (SD)	64 (13)	59 (15)	<0.001
LAVi [mL/m²] - mean (SD)	23 (6)	29 (10)	<0.001
$e'_{average}$ [cm/s] - mean (SD)	11.0 (2.7)	7.7 (2.5)	<0.001
$E/e'_{average}$ - mean (SD)	6.9 (1.7)	9.9 (3.7)	<0.001
sPAP [mmHg] - mean (SD)	21 (4)	23 (5)	<0.001

Table: Baseline characteristics of individuals in stage B (n=427) according to the prevalence of risk factors qualifying for stage A

CONCLUSION

- In this population-based cohort, prevalence of both stage A and B was high and increased with advancing age
- Unexpectedly, about one third of individuals in stage B showed no risk factors qualifying for stage A
- challenging the conventional conception of the HF disease continuum (Figure 1)
- Future research should aim to further characterize this pathophysiologically interesting subgroup, investigate its natural course including outcome, and identify potentially preventable in addition to currently known risk factors for HF

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