Sex-Specific, Multi-Modal Assessment of Cardiac Function in Type 2 Diabetes Using the UK Biobank

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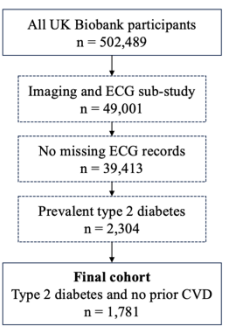
Introduction: Type 2 diabetes is a major risk factor for heart failure. Large-scale prospective studies are an ideal resource to characterise high-risk populations and identify early markers of disease.

Aim: Our goal is to quantify cardiac function in individuals with type 2 diabetes and no prior cardiovascular disease, in order to identify signs of early-stage cardiac remodelling.

Methods: Using multiple ascertainment pathways, we define a cohort of subjects with type 2 diabetes in the UK Biobank study, and extract these subjects' ECG and cardiac magnetic resonance image-derived biomarkers related to diastolic function and cardiac autonomic neuropathy.

Results: We identified 1781 subjects with type 2 diabetes using a combination of ICD codes, self-report, and circulating haemoglobin A1c levels. The cohort was mostly male, overweight, and elderly. We found that males and females with type 2 diabetes exhibit a QTc interval in the upper boundary of normal clinical ranges, with 272 subjects (15%) meeting age- and sex-specific clinical criteria for QTc prolongation, while 668 subjects (38%) had a ventricular rate above 70 bpm. These markers may indicate cardiac autonomic neuropathy and a higher risk of adverse cardiovascular complications. Left ventricular mass, end-diastolic volume, ejection fraction and maximum wall thickness were found to be within normal ranges, suggesting an absence of perceptible structural remodelling in these subjects.

Conclusion: The presence of subclinical electrophysiological abnormalities found in individuals with type 2 diabetes supports the need for adequate, sex-specific monitoring of early-stage adverse cardiac remodelling in the diabetic population.



	Male median (IQR)	Female median (IQR)	Missing values N (% of total cohort)
Ventricular rate (bpm)	65 (58-73)	67 (60-74)	0 (0%)
QTc interval (ms)	419 (404-434)	433 (417-447)	0 (0%)
LV mass (g)	103 (90-115)	73 (65-84)	263 (15%)
LVMi (g/m^2)	50 (45-55)	41 (36-45)	263 (15%)
LV maximum regional wall thickness (mm)	8.0 (7.4-8.7)	6.9 (6.3-7.5)	265 (15%)
LVEDV (ml)	142 (122-165)	113 (97-130)	280 (16%)
LVEDVi (ml/m^2)	70 (61-80)	62 (55-70)	280 (16%)
LVEF (%)	54 (50-58)	57 (53-61)	280 (16%)

Left: cohort selection flowchart. CVD: cardiovascular disease.
Top: sex-specific median and interquartile ranges of ECG and CMR-derived biomarkers of type 2 diabetic patients (full cohort N=1781). LV: left ventricular, M: mass, i: index, EDV: end-diastolic volume, EF: ejection fraction.