

HEART RATE VARIABILITY (HRV) IN CHRONIC KIDNEY DISEASE (CKD): THE RENAL RESEARCH INSTITUTE (RRI) CKD STUDY

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Patients with CKD are at high risk of cardiovascular disease (CVD). Associations of HRV and CVD have not been systematically studied in CKD.

The RRI-CKD study (n=834) is a multicenter, prospective observational study that includes a subset who underwent 24-hr Holter [n=309; mean glomerular filtration rate (GFR) = 28 ± 11.6 ml/min/1.73m²]. Predictors of HRV (time and frequency domain) were assessed using multiple linear regression, adjusting for demographics, comorbidities and key laboratory variables.

Mean age was 59.5 ± 14.7 yr, subjects were 51% male and 78% white. Diabetes mellitus (DM) was present in 31%; hypertension (HT) in 88%, and history of CVD in 37%. Selected HRV variables for the CKD subjects by DM and CKD stage are shown in the Table. CKD patients had lower SDNN and SDANN, and mostly higher LF/HF than controls.

Measure of HRV	Normal	Overall n=309	DM n=94	non-DM n=214	Stage 3 n=122	Stage 4 n=146	Stage 5 n=39
Heart Rate (bpm)		73.4 ± 10.5	72.6 ± 11.8	73.8 ± 9.9	73.8 ± 10.6	73.4 ± 10.0	72.5 ± 11.4
Standard deviation (SD) of all normal to normal R-R (NN) intervals (SDNN)	141 ± 39	107.6 ± 37.5	96.6 ± 40.7	112.2 ± 35.1	107.1 ± 37.4	110.5 ± 36.9	96.6 ± 39.2
SD of 5-min average NN intervals (SDANN)	127 ± 35	91.3 ± 32.5	81.2 ± 34.6	95.5 ± 30.6	92.3 ± 34.0	93.3 ± 31.3	78.6 ± 29.9
Low/High Frequency (LF/HF) Ratio (median [IQR])	1.0 – 2.0	2.5 (2.7)	1.8 (2)	2.9 (2.6)	2.4 (2.5)	2.8 (2.6)	1.9 (2.3)

In multivariable analysis, SDNN was lower in diabetics (p=0.009), in women (p=0.007) and in those with lower albumin (p=0.011). LF/HF ratio was higher in those without DM or HTN (p=0.013), in men (p=0.001), in those with lower serum phosphorus (p=0.003), and in those with a history of coronary artery disease (p=0.028). Higher LF/HF ratio, but not SDNN, was associated with lower odds of a composite CVD end point (OR: 0.71, p=0.004). HRV as a risk factor for CVD in CKD warrants further exploration.