

Supplemental Content

Echocardiographic and Electrocardiographic Abnormalities Among Elderly Adults with Cardiovascular Disease in Rural South Africa.

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Supplementary Methods: Electrocardiographic and Echocardiographic Analyses

Standard 12-lead ECGs were interpreted by E.G.F., T.V.J. and T.A.G., who were blinded to clinical information. The following electrocardiographic (EKG) abnormalities were pooled to define a composite variable known as major EKG abnormalities, based on the sex-specific Minnesota EKG Code:¹¹ left ventricular hypertrophy (LVH) as defined in the main text, ventricular conduction defects, including codes 7-1 for left bundle branch block (LBBB), 7-2 for right bundle branch block (RBBB), 7-4 for intraventricular conduction delay (IVCD); major Q wave abnormalities (codes I-1, 1-2 except 1-2-8); major ST-T wave abnormalities (codes 4-1, 4-2, 5-1, 5-2 without 3-1, 3-3, 1-1 to 1-3); atrial fibrillation (AF), code 8-3.

Two-dimensional and color Doppler Transthoracic echocardiography (TTE) was performed by two accredited sonographers using a Vivid q machine (General Electric), and were interpreted by F.P., who was blinded to clinical information. TTE measurement of diastolic dysfunction based on the 2016 ASE/EACVI expert consensus could not be performed,³³ as average E/e' and tricuspid regurgitant velocity measurements were missing in many participants. We therefore defined diastolic dysfunction based on a recently published study,³⁴ which employed mitral E/A ratio, E-wave deceleration time (EDT) and Left Atrial Volume Index (LAVI) – all of which are listed as reliable parameters to assess

diastolic dysfunction in the 2016 ASE/EACVI expert consensus.³³ Using these parameters, we defined normal diastolic function (E/A: 0.76-1.5 and EDT: 151-240 and LAVI <28 ml/m²), mild (E/A: < 0.75 OR EDT>240 ms), moderate (E/A: 0.76-1.5 and EDT 151-240 ms and LAVI ≥28 ml/m²) and severe (E/A: >1.5 or EDT: ≤150 ms) diastolic dysfunction.³⁴

References

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Supplementary Table 1: Prevalence of Additional Electrocardiographic Abnormalities in Total Study Sample

	All (n=729)	Male (n=291)	Female (n=438)	p-value
Rhythm	N (%)	N (%)	N (%)	
Sinus Bradycardia	146 (20.03)	60 (20.62)	86 (19.63)	0.7451
Sinus Tachycardia	4 (0.55)	2 (0.69)	2 (0.46)	0.6532
Atrial Flutter	2 (0.27)	1 (0.34)	1 (0.23)	1
Wide Complex Tachycardia	1 (0.14)	0 (0)	1 (0.023)	1
First Degree Atrioventricular Block	53 (7.27)	19 (6.53)	34 (7.76)	0.5299
Higher Degree Atrioventricular Block	0	0	0	N/A
Evidence of Paced Beats	0	0	0	N/A
Other ECG Variables	N (%)	N (%)	N (%)	
Left Axis Deviation	38 (5.21)	17 (5.84)	21 (4.79)	0.5332
Left Atrial Hypertrophy	73 (10.01)	36 (12.37)	37 (8.45)	0.0839
Right Axis Deviation	2 (0.27)	2 (0.69)	0	0.159
Right Ventricular Hypertrophy	1 (0.14)	0	1 (0.23)	1
Right Atrial Hypertrophy	14 (1.92)	8 (2.75)	6 (1.37)	0.1839

Table Legend. ECG, electrocardiogram;

Supplementary Table 2: Prevalence of Additional Echocardiographic Abnormalities in Total Study Sample

	Total (N=155)	Male (n=52)	Female (n=103)	p- value
Diastolic Function Parameters	N (%)	N (%)	N (%)	
E/A Ratio, mean (\pm SD)	0.89 (\pm 0.32)	0.89 (\pm 0.31)	0.89 (\pm 0.32)	0.92
< 0.75	60 (38.7)	26 (50.0)	34 (33.0)	0.10
\geq 0.75 but \leq 1.5	89 (57.4)	24 (46.2)	65 (63.1)	
> 1.5	6 (3.9)	2 (3.9)	4 (3.9)	
LAVi, mean in mL/m ² (\pm SD)	48.4 (\pm 19.2)	44.1 (\pm 17.9)	50.5 (\pm 19.5)	0.05
< 28	21 (13.6)	9 (17.3)	12 (11.7)	0.33
\geq 28	134 (86.5)	43 (82.7)	91 (88.4)	
EDT, mean in ms (\pm SD)	196.5 (\pm 53.1)	183.3 (\pm 51.6)	203.0 (\pm 52.9)	0.03
\leq 150	37 (23.9)	18 (34.6)	19 (18.5)	0.04
> 150 but \leq 240	89 (57.4)	28 (53.9)	61 (59.2)	
> 240	29 (18.7)	6 (11.5)	23 (22.3)	
LV Chamber Dimensions	N (%)	N (%)	N (%)	
LVEDSD, mean in mm (\pm SD)	29.6 (\pm 5.1)	30.3 (\pm 5.5)	29.3 (\pm 4.9)	0.21
Normal LVEDSD	145 (93.5)	50 (96.2)	95 (92.2)	0.50
High LVEDSD	10 (6.5)	2 (3.9)	8 (7.8)	
LVEDDD, mean in mm (\pm SD)	43.7 (\pm 5.6)	45.1 (\pm 6.3)	43.0 (\pm 5.1)	0.03
Normal LVEDDD	151 (97.4)	52 (100)	99 (96.1)	0.30
High LVEDDD	4 (2.6)	0 (0)	4 (3.9)	
LVESV, mean in mL (\pm SD)	35.5 (\pm 14.5)	39.4 (\pm 16.0)	33.4 (\pm 13.3)	0.02
Normal LVESV	139 (89.7)	49 (94.2)	90 (87.4)	0.27
High LVESV	16 (10.3)	3 (5.8)	13 (12.6)	
LVEDV, mean in mL (\pm SD)	83.6 (\pm 23.7)	91.9 (\pm 26.5)	79.4 (\pm 21.1)	0.003
Normal LVEDV	141 (91.0)	50 (96.2)	91 (88.3)	0.14
High LVEDV	14 (9.0)	2 (3.8)	12 (11.6)	
Other Variables	N (%)	N (%)	N (%)	
IVC Diameter, mean in mm (\pm SD)	14.1 (\pm 3.0)	13.9 (\pm 3.6)	14.2 (\pm 2.6)	0.65
< 21 mm	153 (98.7)	50 (96.1)	103 (100)	0.11
\geq 21 mm	2 (1.3)	2 (3.9)	0	
IVC Status	-	-	-	-
Collapsing	151 (98.2)	50 (100)	101 (98.1)	1
Unreactive	2 (1.8)	0	2 (1.9)	
Pericardial Effusion	0	0	0	-

Table Legend. EDT, E deceleration time; IVC, inferior vena cava; LAVi, left atrial volume index; LVEDD, left ventricular end diastolic diameter; LVEDV, left ventricular end diastolic volume; LVESD, left ventricular end systolic diameter; LVESV, left ventricular end systolic volume.

Supplementary Table 3: Prevalence of Electrocardiographic and Echocardiographic Abnormalities Among Obese Patients.

	Obesity		
	Yes (N= 460)	No (N= 269)	
ECG Variable	N (%)	N (%)	p-value*
Any Major ECG Abnormality	125 (46.5)	222 (48.3)	0.64
Any Q Wave Abnormality	17 (6.3)	38 (8.3)	0.34
Any ST-T Segment Abnormality	3 (1.1)	10 (2.2)	0.39
Left Ventricular Hypertrophy**	101 (37.6)	165 (35.9)	0.65
Left Bundle Branch Block	1 (0.4)	1 (0.2)	1.00
Right Bundle Branch Block	4 (1.5)	7 (1.5)	1.00
Atrial Fibrillation	0	2 (0.4)	0.53
Left Axis Deviation	12 (4.5)	26 (5.7)	0.49
Right Axis Deviation	2 (0.8)	0	0.14
Prolonged QTc	46 (17.1)	91 (19.8)	0.37
	Yes (N= 95)	No (N= 60)	
TTE Variable	N (%)	N (%)	p-value*
Ejection Fraction <40%	3 (5.0)	2 (2.1)	0.38
Mod Diastolic Dysfunction	12 (20.0)	36 (37.9)	0.02
Sev Diastolic Dysfunction	17 (28.3)	23 (24.2)	0.57
Eccentric LVH	7 (11.7)	16 (16.8)	0.38
Concentric LVH	9 (15.0)	40 (42.1)	<0.01
High RWT	66 (69.5)	34 (56.7)	0.10
High LVM	16 (26.7)	56 (59.0)	<0.01
High LVMi	27 (45.0)	44 (46.3)	0.88
High IVSd	31 (56.7)	75 (79.0)	<0.01
High PWD	25 (41.7)	67 (70.5)	<0.01
High LAVi	47 (78.3)	87 (91.6)	0.02
High LVESD	4 (6.7)	6 (6.3)	0.93
High LVEDD	2 (3.3)	2 (2.1)	0.65

Table Legend. ECG, Electrocardiogram; QTc, rate-corrected and gender-specific QT interval; TTE, transthoracic echocardiogram; IVSd, interventricular septum diameter; PWD, posterior wall diameter; LVM/LVMi, left ventricular mass/index; LVH, left ventricular hypertrophy; LAVi, left atrium volume index; LVESD/ LVEDD, left ventricular end systolic/diastolic diameter; RWT, relative wall thickness. * Chi-square probability or Fisher's exact probability where any cell count ≤ 5 ; ** Left ventricular hypertrophy was defined by the combination of gender-specific Sokolow-Lyon, Cornell and Peguero criteria.

Supplementary Table 4: Prevalence of Electrocardiographic Abnormalities Stratified by Age.

	All (n=729)	Age 40-54 (n=360)	Age≥55 (n=369)	p-value
Major ECG Abnormalities	N (%)	N (%)	N (%)	
Any Major ECG Abnormality (composite)	347 (47.6)	155 (43.1)	192 (52.0)	0.015
Left Ventricular Hypertrophy*	266 (36.5)	110 (30.6)	156 (42.3)	0.001
Any Major Q Wave Abnormality	55 (7.5)	26 (7.2)	29 (7.9)	0.745
Any Major ST Segment Abnormality	13 (1.8)	4 (1.1)	9 (2.4)	0.263
Any Major T Wave Abnormality	99 (13.6)	43 (12.0)	56 (15.2)	0.203
Intra Ventricular Conduction Delay	4 (0.6)	1 (0.3)	3 (0.8)	0.624
Left Bundle Branch Block	2 (0.3)	0	2 (0.5)	0.499
Right Bundle Branch Block	11 (1.5)	4 (1.1)	7 (1.9)	0.546
Atrial Fibrillation	2 (0.3)	1 (0.3)	1 (0.3)	1.00
Other Conduction Defects	N (%)	N (%)	N (%)	
Prolonged QTc	137 (18.8)	58 (16.1)	79 (21.4)	0.067
Q Wave Abnormality Distribution**	N (%)	N (%)	N (%)	
Inferior (Posterior) Q Wave Abnormality	18 (2.5)	10 (2.8)	8 (2.2)	0.596
Anterior Q Wave Abnormality	15 (2.1)	6 (1.7)	9 (2.4)	0.463
Lateral Q Wave Abnormality	23 (3.2)	11 (3.1)	12 (3.3)	0.879
T Wave Abnormality Distribution**	N (%)	N (%)	N (%)	
Inferior T Wave Abnormality	42 (5.8)	17 (4.7)	25 (6.8)	0.234
Anterior T Wave Abnormality	54 (7.4)	26 (7.2)	28 (7.6)	0.850
Lateral T Wave Abnormality	54 (7.4)	23 (6.4)	31 (8.4)	0.300

Table Legend. ECG, Electrocardiogram; QTc, rate-corrected and sex-specific QT interval; * Left Ventricular Hypertrophy was defined by the combination of sex-specific Sokolow-Lyon, Cornell and Peguero criteria; ** The distribution of each abnormality is not mutually exclusive.

Supplementary Table 5: Prevalence of Echocardiographic Abnormalities Stratified by Age.

	Total (N=155)	Age 40-54 (n=51)	Age≥55 (n=104)	
Systolic Function	N (%)	N (%)	N (%)	p-value
EF, mean in % (\pm SD)	58.3 (\pm 8.6)	58.5 (\pm 8.5)	58.3 (\pm 8.6)	0.875
EF <40%	5 (3.3)	1 (2.0)	4 (3.9)	0.282*
EF 41-49%	11 (7.1)	6 (11.8)	5 (4.9)	
EF \geq 50%	138 (89.6)	44 (86.3)	94 (91.3)	
Diastolic Function	N (%)	N (%)	N (%)	p-value
Normal Diastolic Function	2 (1.3)	0	2 (1.9)	<0.001**
Mild Diastolic Dysfunction	65 (41.9)	10 (19.6)	55 (52.3)	
Moderate Diastolic Dysfunction	48 (31.0)	20 (39.2)	28 (26.9)	
Severe Diastolic Dysfunction	40 (25.8)	21 (41.2)	19 (18.3)	
Left Ventricular Indices in Diastole	N (%)	N (%)	N (%)	p-value
Concentric Hypertrophy	49 (31.6)	15 (29.4)	34 (32.7)	0.680
Eccentric Hypertrophy	23 (14.8)	7 (13.7)	16 (15.4)	0.785
RWT, mean (\pm SD)	0.49 (\pm 0.10)	0.47 (\pm 0.12)	0.49 (\pm 0.12)	0.247
Normal RWT	55 (35.5)	20 (39.2)	35 (33.7)	0.497
High RWT	100 (64.5)	31 (60.8)	69 (66.4)	
IVSd, mean in mm (\pm SD)	10.97 (\pm 2.2)	10.7 (\pm 2.3)	11.1 (\pm 2.1)	0.195
Normal IVSd	49 (31.6)	17 (33.3)	32 (30.8)	0.747
High IVSd	106 (68.4)	34 (66.7)	72 (69.2)	
PWd, mean in mm (\pm SD)	10.4 (\pm 1.8)	10.1 (\pm 2.1)	10.5 (\pm 1.7)	0.202
Normal PWd	63 (40.7)	26 (51.0)	37 (35.6)	0.067
High PWd	92 (59.4)	25 (49.0)	67 (64.4)	
LVM, mean in g (\pm SD)	163.9 (\pm 42.0)	159.2 (\pm 45.3)	166.1 (\pm 40.4)	0.338
Normal LVM	83 (53.6)	29 (56.9)	54 (51.9)	0.562
High LVM	72 (46.5)	22 (43.1)	50 (48.1)	
LVMi, mean in g/m ² (\pm SD)	90.9 (\pm 21.1)	88.2 (\pm 21.3)	92.2 (\pm 21.0)	0.272
Normal LVMi	84 (54.2)	29 (56.9)	55 (52.9)	0.640
High LVMi	71 (45.8)	22 (43.1)	49 (47.1)	
Valvular Pathologies	N (%)	N (%)	N (%)	p-value
AR (moderate, severe)	3 (1.9)	2 (3.9)	1 (1.0)	0.252
No AR (including trace and mild)	152 (98.1)	49 (96.1)	103 (99.0)	
MR (moderate, severe)	3 (1.9)	2 (3.9)	1 (1.0)	0.252
No MR (including trace and mild)	152 (98.1)	49 (96.1)	103 (99.0)	
MS (trace, mild, moderate, severe)	10 (6.5)	2 (3.9)	8 (7.7)	0.499
No MS	145 (93.6)	49 (96.1)	96 (92.3)	
TR (moderate, severe)	5 (3.2)	2 (3.9)	3 (2.9)	0.664
No TR (including trace and mild)	150 (96.8)	49 (96.1)	101 (97.1)	
PR (moderate, severe)	1 (0.7)	0	1 (1.0)	1.00
No PR (including trace and mild)	154 (99.4)	51 (100.0)	103 (99.0)	

Table Legend. EF, ejection fraction; TTE, transthoracic echocardiogram; RWT, relative wall thickness; IVSd, interventricular septum diameter; PWd, posterior wall diameter; LVM/LVMi, left

ventricular mass/index; PASP, pulmonary artery systolic pressure; RV, right ventricle; AR, aortic regurgitation; MR, mitral regurgitation; MS, mitral stenosis; TR, tricuspid regurgitation; PR, pulmonary regurgitation. * This Chi-square test compared EF<40% and EF 41-49% (as a composite variable) versus EF \geq 50%. ** This Chi-square test compared normal diastolic function and mild diastolic dysfunction (as a composite variable) versus moderate and severe diastolic dysfunction (as a composite variable).

Supplementary Table 6. Missing Data

	Combined ECG and TTE Sub-Samples (n= 801)	Sub-Sample with ECG (n=729)	Sub-Sample with TTE (n=155)
Demographic-Ethnic Characteristics	% missing data	% missing data	% missing data
Age, years (Mean, \pm SD)	0.1%	0.0%	0.6%
Female (N, %)	0.1%	0.0%	0.6%
Vital Signs			
SBP, in mm Hg (Mean, \pm SD)	0.7%	0.8%	0.6%
DBP, in mm Hg (Mean, \pm SD)	0.7%	0.8%	0.6%
Heart Rate, in bpm (Mean, \pm SD)	0.7%	0.8%	0.6%
BMI, in kg/m ² (Mean, \pm SD)	0.1%	0.1%	0.6%
Laboratory Measurements			
Hs-CRP, in mg/dL (Mean, IQR)	9.4%	9.6%	8.4%
Cholesterol, in mmol/L (Mean, \pm SD)	11.9%	12.2%	5.8%
HDL, in mmol/L (Mean, \pm SD)	10.5%	10.8%	5.2%
LDL, in mmol/L (Mean, \pm SD)	20.7%	20.6%	16.8%
Triglycerides, in mmol/L (Mean, \pm SD)	10.9%	11.0%	6.5%
Blood Glucose, in mmol/L (Mean, IQR)	3.5%	3.7%	0.6%
Risk Factors	N (%)	N (%)	N (%)
Current Tobacco Smoking	0.0%	0.0%	0.0%
Alcohol Use			
Drank at least once in last 30 days	0.0%	0.0%	0.0%
Consumed >6 drinks in a day	0.0%	0.0%	0.0%