

Can your patients with heart failure see? The prevalence of visual impairment among adults with heart failure

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INTRODUCTION

Heart failure (HF) management requires medication and diet adherence, as well as daily weight and fluid monitoring.¹ In addition, patients are often asked to follow specific written instructions after hospital discharge. All of these activities require adequate visual acuity (VA). Yet, to date, little is known about the visual function of adults with HF.

Herein, we provide the first national estimates of the prevalence of visual impairment (VI) among adults with HF.

METHODS

We analyzed data from adults ≥ 50 years of age who underwent VA assessments in the 2005–2008 waves of the National Health and Nutrition Examination Survey (NHANES), a series of ongoing cross-sectional surveys of the civilian, non-institutionalized US population.² These waves were used because they offer the most recent, objective VA assessments of adults. Since the majority of HF management requires near VA, objective and functional assessments of near vision were studied. All assessments were conducted on each eye, using the individuals' presenting correction (if any).

Presenting (objective) near visual impairment (PNVI) was defined as seeing worse than 20/40 on a near card. Functional limitations due to vision were assessed using two items from the National Eye Institute's 25-item Visual Functioning Questionnaire, a previously validated instrument.³ Functional near visual impairment (FNVI) was defined as having at least moderate difficulty with reading ordinary newsprint or doing work that requires seeing close-up. Participants with either PNVI or FNVI were considered to have global near visual impairment (NVI). Finally, self-rated vision was assessed. Like other NHANES studies, participants were classified as

having HF if they answered yes to "Has a doctor ever diagnosed you with heart failure?"^{4, 5}

All analyses were weighted to provide national estimates using Stata statistical software (StataCorp LP). We compared differences in participant characteristics, as well as the prevalence of VI, by HF status. All analyses were adjusted for age. The study was approved by the National Center for Health Statistic's Institutional Review Board and all participants provided written informed consent.

RESULTS

The characteristics of our study sample, weighted to the US population, are displayed in Table 1. Overall, 6.2% ($n = 168$) of the sample had HF. Participants with HF were older and had more cardiovascular comorbidities those without HF. With respect to ocular comorbidities, diabetic retinopathy and a history of cataract surgery were more prevalent among participants with HF, compared to those without HF. The majority of participants wore glasses for near work (86.5%); however, there was not a statistically significant difference in the use of glasses by HF status.

Overall, 23.8% of adults with HF had NVI (Table 2). While the prevalence of PNVI was higher among adults with HF (20.1% [95% CI: 15.2–25.9%]) compared with those without HF (13.2% [11.5–15.1%]), the difference was not statistically significant ($p = 0.64$). Notably, participants with HF had significantly more FNVI than those without HF (11.05% [CI: 7.6–15.9%] vs. 5.4% [4.6–6.4%], $p = 0.002$). Finally, the prevalence of self-rated VI was significantly higher among participants with HF ($p < 0.001$).

DISCUSSION

Our study provides the first national prevalence estimates of VI in HF. Objective near VA assessments revealed that one out of five adults with HF has difficulty seeing up close, even when wearing their corrective lenses. Additionally, our findings suggest that HF patients have more functional limitations due to vision compared to those without HF, after accounting for age. While we were unable to assess participants' ability to

Table 1 Characteristics of the study population by heart failure status, from the 2005–2008 National Health and Nutrition Examination Survey (NHANES)

Characteristics	Overall prevalence* % (95% CI)	Prevalence* % (95% confidence interval)		Age-adjusted P values
		Participants without heart failure	Participants with heart failure	
Age group, years				—
50–59	43.6 (40.9–46.2)	45.3 (42.6–48.0)	14.3 (9.6–20.8)	
60–69	27.6 (25.9–29.4)	27.3 (25.6–29.0)	34.1 (26.8–42.1)	
70–79	18.2 (16.7–19.7)	17.7 (16.1–19.3)	27.9 (22.2–34.6)	
80–89	10.7 (9.3–12.2)	9.8 (8.5–11.2)	23.6 (17.6–31.0)	
Male Sex	46.1 (44.6–47.6)	45.5 (43.9–47.1)	54.9 (48.4–61.1)	0.005
Race/Ethnicity				0.03
Non-Hispanic White	78.2 (73.3–82.34)	78.4 (73.3–82.3)	75.5 (68.1–81.6)	
Non-Hispanic Black	9.7 (7.2–12.8)	9.5 (7.0–12.6)	13.8 (10.4–18.2)	
Hispanic	7.2 (5.4–9.5)	7.3 (5.6–9.6)	4.4 (2.8–7.0)	
Other	5.0 (3.8–6.6)	4.9 (3.6–6.5)	6.2 (3.0–12.4)	
Education Level				0.005
< High school	20.9 (18.6–23.3)	19.9 (17.8–22.2)	36.1 (28.6–44.3)	
High school	27.3 (25.3–29.3)	27.3 (25.3–29.3)	26.9 (22.4–32.0)	
Some college or higher	51.8 (48.1–55.6)	52.8 (49.3–56.2)	37.0 (27.8–47.4)	
Income				0.25
Below poverty level	8.8 (7.3–10.5)	8.6 (7.2–10.3)	11.7 (7.7–17.3)	
At poverty level to two times above it	21.9 (20.0–23.9)	21.2 (19.2–23.2)	35.3 (26.8–44.7)	
Two times poverty level and above	69.3 (66.1–72.3)	70.2 (67.0–73.3)	53.0 (42.2–63.6)	
Insured	90.2 (88.0–92.0)	90.0 (87.8–91.9)	92.5 (87.2–95.7)	0.83
Marital status				0.24
Married or living with a partner	65.2 (62.1–68.1)	65.9 (62.9–68.7)	52.9 (44.0–61.6)	
Widowed, separated or divorced	29.9 (27.4–32.6)	29.2 (26.7–31.8)	42.9 (33.9–52.4)	
Never married	4.9 (4.1–5.9)	4.9 (4.1–5.9)	4.2 (2.3–7.6)	
Social Support	93.9 (92.6–95.0)	94.2 (93.0–95.2)	91.0 (85.4–94.6)	0.27
Smoking status				0.26
Never	47.7 (45.3–50.2)	48.0 (45.5–50.5)	43.6 (36.9–50.5)	
Former	35.4 (33.5–37.3)	35.0 (33.1–37.0)	41.5 (35.5–47.7)	
Current	16.9 (15.2–18.8)	17.0 (15.2–19.0)	15.0 (11.9–18.7)	
Coronary Heart Disease	2.0 (1.5–2.5)	1.1 (0.8–1.4)	17.4 (12.7–23.3)	< 0.001
Diabetes	23.6 (21.6–25.8)	22.1 (20.1–24.3)	49.2 (43.8–54.6)	< 0.001
Hypertension	47.0 (45.2–48.7)	45.4 (43.8–47.0)	73.1 (66.1–79.1)	< 0.001
Chronic Kidney Disease	3.3 (2.7–4.0)	2.5 (2.0–3.1)	17.4 (13.4–22.3)	< 0.001
Stroke	6.1 (5.1–7.2)	5.1 (4.3–6.1)	22.8 (16.7–30.2)	< 0.001
Diabetic Retinopathy [^]				0.04
None	62.9 (59.6–66.2)	65.1 (61.2–68.7)	44.4 (36.0–53.2)	< 0.001
Mild	14.1 (12.4–16.0)	13.3 (11.5–15.4)	20.8 (13.6–30.6)	0.05
Moderate/severe/proliferative	5.5 (4.4–7.0)	5.1 (3.8–6.7)	9.6 (5.4–16.5)	
Not measured	17.4 (15.0–20.2)	16.5 (13.9–19.5)	25.1 (19.7–31.5)	
History of cataract surgery	15.1 (13.6–16.6)	14.2 (12.8–15.7)	31.9 (25.9–38.5)	0.02
Glaucoma				0.79
None	94.4 (93.1–95.4)	94.6 (93.4–95.6)	90.0 (85.4–93.3)	
Possible	2.8 (2.1–3.7)	2.6 (1.9–3.6)	5.3 (3.6–7.8)	
Probable/definite	2.9 (2.3–3.6)	2.8 (2.2–3.5)	4.7 (2.4–8.8)	
Age-related macular degeneration				0.42
None	91.1 (89.8–92.3)	91.5 (90.2–92.6)	85.2 (79.1–89.7)	
Early/late	8.9 (7.7–10.2)	8.5 (7.4–9.8)	14.8 (10.3–20.9)	
Glasses for near work	86.5 (85.2–87.8)	86.7 (85.2–88.1)	83.1 (77.5–87.5)	0.09
Glasses for distance	63.6 (61.4–65.8)	63.9 (61.6–66.2)	57.7 (50.6–64.4)	0.16

Overall, 168 participants had HF and 2541 did not have HF

*Prevalence estimates are computed using MEC examination weights to provide estimates for the total US population and are age-standardized to the US 2010 Census population, given that we used NHANES 2005–2008 data

[^]The prevalence of diabetic retinopathy among participants with Diabetes

Italicized P values are significant, after age-adjustment

perform HF-related tasks, it is likely that difficulty with reading newsprint or doing work up-close would also impose problems with reading medication and nutrition labels,⁶ as well as HF management handouts and hospital discharge instructions.

One limitation of our study is that HF status in NHANES was ascertained by self-report. Additionally, our estimates likely underestimate the prevalence of VI in HF since nursing home and long-term care residents were not included. Thus,

future research is needed to examine VI in HF in a more validated and representative sample.

Nevertheless, given the burden of near and functional VI that exists in this patient population, increased awareness by treating health professionals is warranted. Furthermore, increased collaboration between general internists, ophthalmologists, cardiologists, pharmacists, and caregivers is needed to identify, screen, and potentially treat HF patients who may be at risk.

Table 2 Prevalence of visual impairment among adults in the USA, by heart failure status from the 2005–2008 National Health and Nutrition Examination Survey (NHANES)

Visual characteristics	Prevalence* (95% confidence interval)			Age-adjusted P value
	Overall	Participants without heart failure	Participants with heart failure	
Near visual impairment (VI)				0.26
Not Impaired	83.3% (81.6–84.9%)	83.8% (82.1–85.4%)	76.2% (70.5–81.1%)	
Impaired	16.7% (15.1–18.4%)	16.2% (14.6–17.9%)	23.8% (18.9–29.5%)	
Presenting near visual impairment (PNVI)				0.64
Not Impaired	86.4% (84.5–88.1%)	86.8% (84.9–88.5%)	79.9% (74.1–84.8%)	
Impaired	13.6% (11.9–15.5%)	13.2% (11.5–15.1%)	20.1% (15.2–25.9%)	
Functional near visual impairment (FNVI)				0.002
Not Impaired	94.2% (93.3–95.1%)	94.6% (93.6–95.4%)	88.9% (84.1–92.4%)	
Impaired	5.8% (4.9–6.7%)	5.4% (4.6–6.4%)	11.05% (7.6–15.9%)	
Self-rated vision				< 0.001
Excellent	28.2% (26.3–30.2%)	28.8% (26.7–30.9%)	16.8% (12.4–22.4%)	
Good	51.8% (49.4–54.2%)	52.0% (49.5–54.5%)	48.5% (41.0–56.2%)	
Fair	15.6% (14.0–17.3%)	15.2% (13.5–17.1%)	22.3% (15.1–31.6%)	
Poor	3.1% (2.4–3.8%)	2.8% (2.2–3.5%)	7.8% (5.5–11.1%)	
Very poor	1.4% (1.1–1.8%)	1.2% (0.9–1.6%)	4.4% (2.7–7.2%)	

*Prevalence estimates are computed using MEC examination weights to provide estimates for the total US population and are age-standardized to the US 2010 Census population, given that data from the 2005–2008 waves of NHANES were used

Definitions: Presenting near visual impairment (PNVI) was defined as near VA worse than 20/40 (could not read lines 4 or 5 on the near vision card). Functional near visual impairment (FNVI) was defined as having at least moderate difficulty with either reading ordinary newsprint or doing work or hobbies that require seeing well up close. Near visual impairment (VI) was defined as having PNVI, FNVI, or both. Self-rated vision: participants were asked to rate their eyesight with their usual glasses or contact lenses (if used) as excellent, good, fair, poor, or very poor
Bolded P values are significant, after age-adjustment

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Compliance with ethical standards:

Conflicts of interest: M. Sterling, D. Jannat-Khah, and S. Vitale have no conflicts to report.

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