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Social Network Size and Findings on Cranial Magnetic Resonance Imaging in Older Adults: The Cardiovascular Health Study

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To the Editor

Remaining free of dementia and maintaining a high level of cognitive functioning in late life is an important public health priority. Having a larger social network (SN) in late life is associated with a reduced risk of dementia and cognitive decline.¹ A review of studies in younger adults found an association between SN size and brain volumes,² but less is known about these associations in older populations. The objective of this study was to examine whether SN size and characteristics (family, friends, and social support) were associated with ventricular enlargement (VE) and white matter hyperintensities (WMHs)—markers of brain atrophy and associated with cognitive and physical impairments—using cranial magnetic resonance imaging (MRI) in a population-based cohort of older adults.

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METHODS

The Cardiovascular Health Study (CHS) is a longitudinal cohort study of cardiovascular disease risk factors in older adults living in four US communities. From 1989–1990 a total of 5201 participants were enrolled and from 1992–1993 an additional 687 African American participants were enrolled.³ Data for this study comes from CHS participants free of dementia, with a MRI between 1997 and 1999 and concurrent complete SN data. MRIs were obtained with 1.5 Tesla scanners and findings of interest for these analyses were VE and WMHs. Neuroradiologists rated severity on a 10-point scale with grades from 0 to 9.⁴ VE and WMHs were dichotomized based on high and low severity, with high severity representing those with a ventricular grade 5–9 and a white matter grade 3–9.^{4, 5} SN measures were assessed via the Lubben Social Network Scale, a validated 10-item measure scored from 0 to 50, and included measures of family, friends, and social support.⁶ Based on previously identified cut-points, four categories of SN size were identified: very small (< 20), small (21–25), medium (26–30), and large (31 and above).⁷ The associations between SN size, SN characteristics, VE and WMHs were evaluated using multivariable logistic regression models, adjusted for demographic and health characteristics. A series of sensitivity analyses were conducted to examine whether results changed when MRI findings were treated as continuous and after removing participants with Modified Mini-Mental State Examination (3MSE) <80.

RESULTS

A total of 1580 participants were included, with a mean age of 79.3 (SD = 4.1); 85% were White; 52% had hypertension; and about 70% reported a large SN. Those with smaller SNs were more likely to be older, female, and report more depressive symptoms than those with large SNs. Adjusted associations between SN size and VE and WMHs are presented in Table 1. Those with very small to small SNs were two times more likely to have severe VE compared to those with a large SN ($p < .01$). Those with a very small SN had increased odds of having WMHs compared to those with a larger SN ($p = .04$). Among the SN characteristics, a smaller family network and less social support were independently associated with severe VE; a smaller family network was associated with severe WMHs. Friend network was not associated with MRI findings. Results did not change substantively when VE and WMHs were treated as continuous or after excluding participants with a 3MSE score < 80.

DISCUSSION

This population-based study of community-dwelling older adults quantified the negative association between MRI findings of VE and WMH and SN size and characteristics. Several biological mechanisms have been proposed to explain the potential protective effects of SNs on brain health. SNs may be a source of environmental enrichment.⁸ Further, SNs may influence cardiovascular health through the sharing of health behaviors, such as physical activity and obesity, and through the provision of social support—which could alleviate stress⁹ and depression.¹⁰ However, studies on SNs and health often cannot determine causal

direction. Manifestations of VE and WMH include cognitive impairment and dementia, which could in turn lead to smaller SNs.

Strengths of this study included the large sample size with complete data on SNs and MRI findings as well as having a multi-site, population-based sample. Limitations of this study include the cross-sectional design, inability to determine the direction of causality, and the self-reported data on SNs and other health characteristics may be subject to bias.

CONCLUSION

Similar to studies showing that SN size was related to neuroimaging markers in younger adults, this study found that older adults with smaller SNs were more likely to have severe VE and WMHs. Although longitudinal follow-up is necessary to understand the causal direction of these effects, strengthening older adults' SNs, especially family networks, may be beneficial to physical and cognitive health.

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Table 1

Adjusted Associations between Social Networks Size and MRI Findings N=1580

Characteristics	Social Network (score 0–50)			
	Large (31 +)	Medium (26–30)	Small (21–25)	Very Small (20)
Severe VE (5–9)				
Model 1	1.00	1.13 (0.76–1.68)	1.88 (1.23–2.88)	2.19 (1.32–3.64)
Model 2	1.00	1.13 (0.76–1.69)	1.88 (1.23–2.89)	2.11 (1.26–3.54)
Model 3	1.00	1.14 (0.76–1.70)	1.86 (1.21–2.87)	2.09 (1.24–3.51)
Model 4	1.00	1.21 (0.81–1.83)	1.91 (1.23–2.96)	2.21 (1.30–3.76)
Severe WMHs (3–9)				
Model 1	1.00	1.03 (0.76–1.39)	1.17 (0.82–1.68)	1.58 (1.01–2.47)
Model 2	1.00	1.06 (0.78–1.44)	1.21 (0.84–1.74)	1.70 (1.08–2.69)
Model 3	1.00	1.06 (0.78–1.44)	1.20 (0.83–1.72)	1.69 (1.07–2.66)
Model 4	1.00	1.04 (0.76–1.42)	1.13 (0.78–1.64)	1.63 (1.03–2.60)

Note: VE = Ventricular enlargement, WMHs = White matter hyperintensities.

Model 1 adjusted for age, gender, race, and education. Model 2 adjusted for model 1 plus diabetes and hypertension. Model 3 adjusted for Model 2 and depressive symptoms (Center for Epidemiologic Studies Depression Scale >7). Model 4 adjusted for model 3 and Modified Mini-Mental State Examination <80.