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Association Between Types of Family Support and Glycemic Control for Adults With Cognitive Impairment

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Abstract

Background: Family support is important in assisting with diabetes self-management for individuals with cognitive impairment, but what types of family support are most effective remain unknown.

Objectives: We aimed to examine the association between the types of family support in diabetes self-management with glycemic control in middle-aged and older adults with cognitive impairment.

Methods: A total of 267 individuals were included with diabetes and cognitive impairment (27-point Telephone Interview for Cognitive Status score <12), using the data of 2003 Health and Retirement Study (HRS) Diabetes Study and 2004 wave of the HRS.

Results: Most respondents were White (68.9%), followed by Black (25.8%). The mean age was 73.4 ± 8.4 years. Adults with strong family support (as indicated by a "strongly agree" response) in testing sugar and in handling feelings about diabetes had significantly lower A1C compared with those with less family support (mean $\pm$ standard deviation: 7.08 ± 1.39 vs. 7.51 ± 1.42, P=.03; 6.79 ± 0.87 vs. 7.57 ± 1.53; P=.007 respectively).

Conclusions: Our findings indicate that family members of individuals with cognitive impairment provide critical support to patients with diabetes and cognitive impairment, and may need additional intervention to assist with diabetes self-management tasks that require unique knowledge and skills.

Keywords

family support, diabetes, cognitive impairment

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Over 15 million U.S. older adults have diabetes, who have a higher risk of cognitive impairment (American Diabetes Association Professional Practice Committee, 2022; Kirvalidze et al., 2022; Moin et al., 2021). Individuals with cognitive impairment have poorer outcomes related to both diabetes control (Camp et al., 2015; Grober et al., 2011; Hopkins et al., 2016; Laiteerapong et al., 2011; Strizich et al., 2016) and overall health outcomes (e.g., increased mortality, reduced functionality) (American Diabetes Association, 2018; Kalyani et al., 2017). In 2017, diabetes care cost $327 billion in the U.S., of which 61% was attributed to older adults covered by Medicare (American Diabetes Association, 2018). Additionally, Medicare spends nearly twice as much annually on older adults who have both diabetes and cognitive impairment ($26,851 per person per year) than on those with only diabetes ($15,049) (Alzheimer's Association, 2022).

The strategies for achieving ideal glycemic control involve performing diabetes self-management tasks (e.g., insulin dose adjustment, glucose monitoring, and meal planning) (Camp et al., 2015; Hopkins et al., 2016; Laiteerapong et al., 2011; Strizich et al., 2016). However, cognitive impairment makes it more difficult for individuals with diabetes to follow standard procedures to complete adequate diabetes self-management tasks or make appropriate self-management decisions, particularly when there are impairments in executive function and associated deficits in attention, planning, and problem-solving (Grober et al., 2011). Because of this, family support from care partners (e.g., spouses/significant others, adult children, or friends) (Schulz et al., 2020) is often

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Table 1. Sample Description ($N = 267$).

Demographic characteristics	Mean ± SD or *n* (%)]
Age, years	73.4 ± 8.4
Education, years	9.7 ± 3.8
Age (*n*, %)	
50–65	46(17.2)
65–75	95 (35.6)
≥75	126 (47.2)
Gender	
Male	120 (44.9)
Female	147 (55.1)
Race	
White (non-Hispanic)	184(68.9)
Black/African American	69(25.8)
Other	14 (5.2)
Marital status	
Married or living with partner	160 (59.9)
Widowed, divorced, separated, other	107(40.1)
Medical conditions	
Hypertension	215 (80.5)
Heart problem	110 (41.3)
Stroke	47 (17.6)
Cancer	46 (17.2)
Lung disease	31 (11.6)
Psychological problem	55 (20.6)
Arthritis	200 (74.9)
A1C, %	7.25 ± 1.44

relied upon to help compensate for individuals' difficulties managing diabetes. These care partners can provide supervision and assistance for diabetes management tasks(Baig et al., 2015; Kirkman et al., 2012; Munshi et al., 2013; Pamungkas et al., 2017) as well as emotional support (Pamungkas & Chamroonsawasdi, 2020).

Among individuals living with chronic diseases such as diabetes, family support is essential to help those individuals cope (Kamaryati & Malathum, 2020). Family members assist by relating to information about the treatment, providing time for sharing about feelings, and preparing funds for disease treatments (Kamaryati & Malathum, 2020). Cross-sectional studies have shown family support may buffer the negative association between low cognitive functioning and diabetes control using the data of both Health and Retirement Study (Okura et al., 2009) and The Hispanic Community Health Study/Study of Latinos (Strizich et al., 2016). However, limited studies have examined whether generic types of family support in diabetes management (e.g., meal planning, medication adherence) is relevant to the improvement of diabetes control for individuals with comorbid diabetes and cognitive impairment. Whether additonal training or expertise for care partners to support diabetes management for this unique population is need also remains unknown. Thus, the aim of the study was to examine the association between the types of family support in diabetes management with glycemic control in middle-aged and older adults with cognitive impairment.

Methods

Study Design

The study is a secondary analysis using data from the Health and Retirement Study (HRS). The HRS has surveyed more than 30,000 Americans over the age of 50 and their spouses or partners since 1992. Biennial waves collect information on income, work, physical health and functioning, and cognitive function. The HRS 2003 Diabetes Study was a supplement to the HRS, aiming to collect self-reported questionnaire data on aspects of treatment and self-management of diabetes, and also collected a validated glycosylated hemoglobin (A1C) using the Flexsite Diagnostics Home A1C Test Kit (Okura et al., 2009). The diabetes survey was sent out to 2,350 HRS respondents who reported having diabetes in the 2002 wave of the HRS. Among them, 1,901 completed the survey (80.9% response rate), and 1,233 provided valid A1C. This analysis used the data from the HRS 2003 Diabetes Study and the 2004 wave of the HRS. This study is exempted from IRB review as data used are publicly available without unique identifiers.

Measurement

Independent variable: diabetes-related family support types. The family support types were measured by eight questions, including: "I can count on my family or friends to help and support me a lot with: following my meal plan; taking my medicine; taking care of my feet; getting enough physical activity; testing my sugar; going to the doctor or nurse; keeping my weight under control; and handling my feelings about diabetes." Responses ranged from "strongly agree" to "strongly disagree" on a five-point Likert scale, with "strong" family support considered indicated by a "strongly agree" response.

Dependent variable: glycemic control. Glycemic control, measured by A1C, was the dependent variable for the analysis. The Flexsite Diagnostics Home A1C Test Kit was used to assess A1C for participants in the 2003 Diabetes Study.

Sociodemographic characteristics. Sociodemographic covariates included age (<65, 65–74, ≥75 years), years of formal education, gender (male or female), race (White, Black, and other), and marital status.

Medical conditions. The medical conditions include self-reported physician diagnosed hypertension, cancer, lung disease, heart problems, stroke, psychological problems, and arthritis.

Cognitive impairment. As part of the HRS study, the study team utilized the validated 27-point Telephone Interview for Cognitive Status (TICS) to assess cognitive impairment, which is defined as scores < 12 (Crimmins et al., 2011). The 27-point scale includes: 1) immediate and delayed 10-noun free recall test to measure memory (0 to 20 points); 2) a serial sevens subtraction test to measure working memory (0 to 5 points); and

Table 2. Differences in A1C by Types of Family Support (A1C, % (Mean ± SD)).

Family support types	Strongly agree	Not strongly agree	F values	*p* values
Following my meal plan	7.27 ± 1.53	7.43 ± 1.40	0.47	.493
Taking my medicine	7.18 ± 1.37	7.50 ± 1.43	2.83	.094
Taking care of my feet	7.20 ± 1.42	7.46 ± 1.43	1.53	.217
Getting enough physical activity	7.13 ± 1.31	7.46 ± 1.45	2.28	.132
Testing my sugar	7.08 ± 1.39	7.51 ± 1.42	4.67	.032
Going to the doctor or nurse	7.17 ± 1.40	7.51 ± 1.42	3.18	.076
Keeping my weight under control	7.20 ± 1.33	7.44 ± 1.45	1.26	.263
Handling my feelings about diabetes	6.79 ± 0.87	7.57 ± 1.53	11.69	<.001

3) a counting backward test to measure the speed of mental processing (0 to 2 points).

Statistical Analysis

Statistical analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC). Continuous variables were described using mean ± standard deviation (SD). Categorical variables (e.g., gender, race, and education) were described using frequency and percentages. Generalized linear models were used to examine the association between the types of family support with glycemic control, before and after adjusting for demographic variables (e.g., age, sex, race, education, and marital status).

Results

A total of 267 adults with diabetes and cognitive impairment aged 50 years and older were identified, who had a completed information on A1C from the dataset. Among 267 adults with diabetes and cognitive impairment, the mean age was 73.4±8.4 years, with the mean education being 9.7±3.8 years. Most of the respondents were white (68.9%), followed by Black (25.8%). Over half were females (55.1%) and married or living with partners (59.9%). Many respondents had comorbid medical conditions, including hypertension (80.5%), heart problems (41.3%), stroke (17.6%), and psychological problems (20.6%) (Table 1). Besides diabetes and cognitive impairment, 83.1% of them had more than one comorbid condition and the average number of comorbid medical conditions were 3.06±1.70.

Adults who reported having strong family support in testing sugar and in handling feelings about diabetes had significantly lower A1C compared with those with less family support (mean ± standard deviation: 7.08±1.39 vs. 7.51±1.42, P=.03; 6.79±0.87 vs. 7.57±1.53; P=.007). There was no significant association between other family support types (i.e., following my meal plan, taking my medicine, taking care of my feet, getting enough physical activity, going to the doctor or nurse, and keeping my weight under control) with A1C (Table 2). After adjusting the demographic variables, including age, sex, race, education, and marital status, the conclusions remained the same.

Discussions

Our findings showed that adults with strong family support in testing sugar and in handling feelings about diabetes had significantly lower A1C compared with those with less family support. This is compared to other types of support (e.g., supporting medication and planning meals) which were not associated with A1C control. This study adds to the limited literature by focusing on the types of family support on diabetes management for adults with both diabetes and cognitive impairment, and reinforces previous findings that target glucose management and emotional support as specific activities that family members can engage in to improve care of their loved ones. Our study further demonstrates that some specific types of family support is particularly relevant to the improvement of diabetes control among persons with cognitive impairment.

Our findings indicate that strong family support in testing sugar and in handling feelings about diabetes was significantly associated with lower A1C, which is consistent with other reported studies (Baig et al., 2015; Ritchie et al., 2020; Trief et al., 2016). Mansfield et al found that care partners played a significant role in patient diabetes self-management, particularly in making decisions about medication administration and glucose checks, meal planning and preparation, participating in physical activity, and assisting with technology (Mansfield et al., 2022). Trief et al. (2016) found that people with diabetes involved in a telephone educational offering with a partner had decreased depression compared with those receiving individual education. Similarly, Pamungkas et al found a positive decline in A1C when providing comfort and encouragement for older adults who face distress or frustration of their diabetes care due to cognitive impairment (Pamungkas & Chamroonsawasdi, 2020). However, our findings related to other types of family support (e.g., medication management and meal planning) were inconsistent with the reported literature (Mansfield et al., 2022). These diabetes self-management tasks may require unique knowledge and skills, indicating that family members of individuals with cognitive impairment may need additional support or training to better assist with such types of diabetes self-management. Further studies are needed in this area of research.

There are significant number of literatures on the caregiving outcomes. Numerous studies have demonstrated that family support effectively improves diabetes management and glycemic control for individuals with only diabetes, contributing to greater reductions in A1c, improvements in medication adherence, and protection against adverse events (Baig et al., 2015; Kirkman et al., 2012; Munshi et al., 2013; Pamungkas et al., 2017). However, very limited studies on the helping caregivers to assist with chronic disease management for persons with cognitive impairment, which is the uniqueness of this study that adds to the literature. Given the increasing number of older adults with diabetes and cognitive impairment, more studies are needed to provide scientific foundations to help develop targeted interventions and programs.

The main study limitation is that the sample was predominately white and with high levels of education, which may not generalize to the other populations with cognitive impairment. Second, causal inference cannot be made due to cross-sectional nature of this study. Third, the TICS measurements used to define cognitive impairment is not equivalent to a clinical diagnostic assessment. Fourth, family support is self-reported, which needs to be objectively validated on how much actual family support was happening. The main strength is that this research identified specific areas of family support for diabetes management for people with cognitive impairment that had not yet been identified, which makes a meaningful contribution to the literature on diabetes care for this vulnerable population. Another uniqueness is that our study adds to the limited literature that focuses on helping caregivers to assist with chronic disease management for persons with cognitive impairment.

In conclusion, our findings indicate that future research or clinical work in diabetes management for adults with cognitive impairment should include a focus on upskilling family members in the domains of glucose testing (testing sugars) and emotional support of patients (handling feelings) to help facilitate patients' self-management; this could include formal training or education. The finding also indicated that family members of individuals with cognitive impairment may need additional interventions to better assist with diabetes self-management tasks that require unique knowledge and skills (e.g., medication management and meal planning).

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Declaration of Conflicting Interests

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Ethical Conduct of Research

The data used in this analysis are publicly available data from the Health and Retirement Study (HRS) and contain no unique identifiers. The HRS is sponsored by the National Institute on Aging and has been approved by the University of Michigan Health Sciences Institutional Review Board.

Clinical Trial Registration

Not available

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References

Alzheimer's Association. (2022). *2022 Alzheimer's disease facts and figures*. https://www.alz.org/media/Documents/alzheimers-facts-and-figures.pdf

American Diabetes Association. (2018). Economic costs of diabetes in the U.S. in 2017. *Diabetes Care*, *41*(5), 917–928. https://doi.org/10.2337/dci18-0007

American Diabetes Association Professional Practice Committee. (2022). 13. Older adults: Standards of medical care in diabetes—2022. *Diabetes Care*, 45(Suppl 1), S195–S207. https://doi.org/10.2337/dc22-S013

Baig, A. A., Benitez, A., Quinn, M. T., & Burnet, D. L. (2015). Family interventions to improve diabetes outcomes for adults. *Annals of the New York Academy of Sciences*, *1353*(1), 89–112. https://doi.org/10.1111/nyas.12844

Camp, C. J., Fox, K., Skrajner, M. J., Antenucci, V., & Haberman, J. (2015). Creating effective self-management for older adults with type 2 diabetes and cognitive impairment. *Advances in Aging Research*, *4*(2), 33–41. https://doi.org/10.4236/aar.2015.42005

Crimmins, E. M., Kim, J. K., Langa, K. M., & Weir, D. R. (2011). Assessment of cognition using surveys and neuropsychological assessment: The health and retirement study and the aging, demographics, and memory study. *The Journals of Gerontology Series B Psychological Sciences and Social Sciences*, *66*(Suppl 1), i162–i171. https://doi.org/10.1093/geronb/gbr048

Grober, E., Hall, C. B., Hahn, S. R., & Lipton, R. B. (2011). Memory impairment and executive dysfunction are associated with inadequately controlled diabetes in older adults. *Journal of Primary Care & Community Health*, *2*(4), 229–233. https://doi.org/10.1177/2150131911409945

Hopkins, R., Shaver, K., & Weinstock, R. S. (2016). Management of adults with diabetes and cognitive problems. *Diabetes Spectrum: A Publication of the American Diabetes Association*, *29*(4), 224–237. https://doi.org/10.2337/ds16-0035

Kalyani, R. R., Golden, S. H., & Cefalu, W. T. (2017). Diabetes and aging: Unique considerations and goals of care. *Diabetes Care*, *40*(4), 440–443. https://doi.org/10.2337/dci17-0005

Kamaryati, N., & Malathum, P. (2020). Family support: A concept analysis. *Pacific Rim International Journal of Nursing Research*, *24*(3), 403–411.

Kirkman, M. S., Briscoe, V. J., Clark, N., Florez, H., Haas, L. B., Halter, J. B., Huang, E. S., Korytkowski, M. T., Munshi, M. N., Odegard, P. S., Pratley, R. E., & Swift, C. S. (2012). Diabetes in older adults. *Diabetes Care*, *35*(12), 2650–2664. https://doi.org/10.2337/dc12-1801

Kirvalidze, M., Hodkinson, A., Storman, D., Fairchild, T. J., Bała, M. M., Beridze, G., Zuriaga, A., Brudasca, N. I., & Brini, S. (2022). The role of glucose in cognition, risk of dementia, and related biomarkers in individuals without type 2 diabetes mellitus or the metabolic syndrome: A systematic review of observational studies. *Neuroscience and Biobehavioral Reviews*, *135*, 104551. https://doi.org/10.1016/j.neubiorev.2022.104551

Laiteerapong, N., Karter, A. J., Liu, J. Y., Moffet, H. H., Sudore, R., Schillinger, D., John, P. M., & Huang, E. S. (2011). Correlates of quality of life in older adults with diabetes: The diabetes & aging study. *Diabetes Care*, *34*(8), 1749–1753. https://doi.org/10.2337/dc10-2424

Mansfield, K. J., Colicchio, V. D., Kauwe Tuitama, A. I., Tracy, E. L., Neuberger, J. D., & Litchman, M. L. (2022). Care partner support following a diabetes self-management education and support intervention. *The Science of Diabetes Self-Management and Care*, *48*(4), 235–246. https://doi.org/10.1177/26350106221099872

Moin, A. S. M., Al-Qaissi, A., Sathyapalan, T., Atkin, S. L., & Butler, A. E. (2021). Glucose excursions in type 2 diabetes modulate amyloid-related proteins associated with dementia. *Journal of Translational Medicine*, *19*(1), 131. https://doi.org/10.1186/s12967-021-02797-3

Munshi, M. N., Segal, A. R., Suhl, E., Ryan, C., Sternthal, A., Giusti, J., Lee, Y., Fitzgerald, S., Staum, E., Bonsignor, P., DesRochers, L., McCartney, R., & Weinger, K. (2013). Assessment of barriers to improve diabetes management in older adults: A randomized controlled study. *Diabetes Care*, *36*(3), 543–549. https://doi.org/10.2337/dc12-1303

Okura, T., Heisler, M., & Langa, K. M. (2009). Association between cognitive function and social support with glycemic control in adults with diabetes mellitus. *Journal of the American Geriatrics Society*, *57*(10), 1816–1824. https://doi.org/10.1111/j.1532-5415.2009.02431.x

Pamungkas, R. A., & Chamroonsawasdi, K. (2020). Family functional-based coaching program on healthy behavior for glycemic control among Indonesian communities: A quasi-experimental study. *Oman Medical Journal*, *35*(5), e173. https://doi.org/10.5001/omj.2020.115

Pamungkas, R. A., Chamroonsawasdi, K., & Vatanasomboon, P. (2017). A systematic review: Family support integrated with diabetes self-management among uncontrolled type II diabetes mellitus patients. *Behavioral Sciences*, *7*(3), 62. https://doi.org/10.3390/bs7030062

Ritchie, N. D., Baucom, K. J. W., & Sauder, K. A. (2020). Benefits of participating with a partner in the national diabetes prevention program. *Diabetes Care*, *43*(2), e20–e21. https://doi.org/10.2337/dc19-1489

Schulz, R., Beach, S. R., Czaja, S. J., Martire, L. M., & Monin, J. K. (2020). Family caregiving for older adults. *Annual Review of Psychology*, *71*, 635–659. https://doi.org/10.1146/annurev-psych-010419-050754

Strizich, G., Kaplan, R. C., González, H. M., Daviglus, M. L., Giachello, A. L., Teng, Y., Lipton, R. B., & Grober, E. (2016). Glycemic control, cognitive function, and family support among middle-aged and older Hispanics with diabetes: The Hispanic community health study/Study of Latinos. *Diabetes Research and Clinical Practice*, *117*, 64–73. https://doi.org/10.1016/j.diabres.2016.04.052

Trief, P. M., Fisher, L., Sandberg, J., Cibula, D. A., Dimmock, J., Hessler, D. M., Forken, P., & Weinstock, R. S. (2016). Health and psychosocial outcomes of a telephonic couples behavior change intervention in patients with poorly controlled type 2 diabetes: A randomized clinical trial. *Diabetes Care*, *39*(12), 2165–2173. https://doi.org/10.2337/dc16-0035