

I just need a little support: Marital support and strain link to A1C for people with diabetes

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Abstract

Marital quality factors (i.e., support and strain) are associated with hemoglobin A1C (A1C) for people with diabetes. However, how these marital factors might be linked to A1C, in combination, is unclear. This study uses Midlife in the United States Biomarker Project data to examine independent and moderated associations between marital strain and marital support and A1C for individuals with diabetes mellitus ($N = 136$). Marital strain and support interact in their association with A1C ($B = -0.24$, standard error [SE] = 0.11, $p < .05$). Simple slope analysis indicates marital strain is linked to higher A1C, but only in the context of low marital support ($B = 0.63$, SE = 0.29, $p = .03$). Meaning, the presence of moderate levels of marital support may buffer against the problematic association between

Statement of Relevance: This study is among the first to examine how the interaction between marital strain and support is linked to A1C for people with diabetes. Although marital strain and support do not uniquely explain variability in A1C, in combination, these two relationship quality factors are linked to A1C. Specifically, marital strain only appears to be associated with higher levels of A1C in the context of marital relationships with very low levels of support.

marital strain and worse A1C. This may suggest interventions for individuals with diabetes to include marital partners, but harnessing and improving support in existing marital relationships may be an important target for future family-based diabetes management interventions.

KEYWORDS

diabetes mellitus, hemoglobin A1C, marital quality, marriage

1 | INTRODUCTION

Approximately 1 in 10 people in the United States are diagnosed with diabetes mellitus, with an additional 22.8% undiagnosed (Centers for Disease Control & Prevention [CDC], 2024). Diabetes mellitus is a chronic condition where the body cannot produce or utilize insulin to regulate glucose metabolism, leading to excess glucose in the bloodstream. Hemoglobin A1C (A1C) is a reliable assessment of blood glucose over 3 months; higher percentages of A1C indicate worse glycemic control. Poorly controlled A1C increases the risk of disease complications, including heart attack, lower-limb amputation, and depressive symptoms (CDC, 2024). A1C control often requires flexibility in the marital relationship to restructure behaviors required to accommodate changes in diet, exercise, and medication management (Helgeson et al., 2022). Thus, individuals with greater relationship quality may be more likely to accommodate these lifestyle changes (e.g., Trief et al., 2016), yet current couple-based interventions that improve marital quality yield inconsistent results for A1C regulation (Olson et al., 2010). These inconsistencies may be due to known differences in how relationship characteristics may differ regarding diabetes management support (Mayberry et al., 2021), and a “one-size-fits-all” approach to couple-based diabetes interventions (i.e., increasing support while decreasing strain) may not be effective for everyone. A lack of understanding of how specific facets of marital quality (i.e., support and strain) affect A1C control may lead to suboptimal intervention strategies that target relational factors individually and in combination.

1.1 | Theoretical model: Biobehavioral family model

The biobehavioral family model (BBFM) (Wood et al., 2021) is a biopsychosocial theoretical model with empirical support for explaining adult morbidity (Roberson et al., 2024; Roberson & Fincham, 2018; Woods et al., 2020). The BBFM posits a mediation relationship whereby family emotional climate impacts disease activity via biobehavioral reactivity (Roberson et al., 2018). Critical for this study, the BBFM posits that family emotional climate reflects the balance of positive (e.g., warmth, support) and negative (e.g., strain, hostility, withdrawal) exchanges within a relationship. Disease activity represents a specific disease's onset (e.g., diabetes) and/or symptom severity of that disease (e.g., A1C level). The BBFM would hypothesize that a family emotional climate that is not balanced (e.g., low support with high strain) would increase an individual's psychophysiological stress response (e.g., depression, anxiety, allostatic load),

leading to poorer regulated A1C. However, the current study focuses on a single path between family emotional climate and disease activity to specifically examine how the balance between marital strain and support together are linked to the A1C level for people with diabetes.

1.2 | Marital quality and A1C

Marital quality is linked to the risk of developing diabetes (Roberson & Fincham, 2018; Whisman et al., 2014) and achieving A1C control (Roberson & Fincham, 2018). Generally, negative marital quality (e.g., strain, conflict) is linked to higher A1C (Trief et al., 2016). Positive marital quality (e.g., communication support) is linked to lower A1C (Trief et al., 2016), but there are some inconsistencies in the association between marital quality and A1C management (Rastkar & Jalalifar, 2023). Despite the assumption that high support should be linked to better A1C outcomes, one study found that people with high support and high strain have poorer A1C management (Mayberry et al., 2021). Thus, testing the interaction of positive and negative marital qualities may be especially necessary for informing effective couple-based behavioral health interventions for A1C control. Specifically, we hypothesize that:

Hypothesis 1. There will be an interaction between marital strain and marital support in relation to A1C.

2 | METHODS

2.1 | Procedures

Data were obtained by combining multiple Midlife in the United States datasets (MIDUS; Ryff et al., 2017) of participants who met the following inclusion criteria: (1) Completed one of the biomarker assessments; (2) classified as having diabetes (using A1C or self-report; see Roberson & Fincham, 2018; Tsenkova et al., 2016 for method); and (3) reported being in a romantic relationship. We combined participants from *Main* MIDUS II Project 1, MIDUS II Milwaukee Project samples (African American sample), and biomarker data from Project 4 (biomarker study; Ryff et al., 2017; $N = 126$); data were collected between 2004 and 2005. Also, we combined the *Refresher* Project 1 and *Refresher* Milwaukee samples with the biomarker data ($N = 55$); data were collected from 2011 to 2014. Dienberg Love et al. (2010) describe the complete protocol. According to the University of Tennessee, Knoxville IRB, this secondary data analysis is exempt from human-subject research.

2.2 | Participants

Of the final combined sample ($N = 181$), 25% of the data were missing on the control variables, leaving a final sample of $N = 136$. The average age was 59.30 years (standard deviation [SD] = 11.00, median = 60.00), and the majority were men (56.8%). The average annual household income was \$44,923.91 (SD = \$46,136.67, median = \$31,250.00). The sample was mostly White (85%) and Black/African American (15%). For diabetes, 63% reported having a doctor's diagnosis of diabetes, and the remaining 37% had A1C thresholds $\geq 6.5\%$. For the entire sample, the average A1C was 7.65% (SD = 1.81). As noted in previous diabetes studies using MIDUS

(Roberson & Fincham, 2018), the diagnosed diabetes was defined by a self-reported yes to questions about a doctor's diabetes diagnosis. In MIDUS, participants were not asked to specify if the diabetes diagnosis was type 1 or type 2 diabetes, so we refer to diabetes in general.

2.3 | Measures

Means, SDs, and ranges for all variables are presented in Table 1.

2.3.1 | Dependent variable

Hemoglobin A1C (A1C) was collected uniformly during the Project 4 (biomarker project) blood draw (see Ryff et al., 2017 for the complete protocol). Higher A1C numbers indicate poorer glycemic stability and, thus, poorer outcomes. There were no missing data.

2.3.2 | Marital quality variables

MIDUS developed marital quality variables (Ryff et al., 2017) and collected during MIDUS II, project 1, among spouses and committed/cohabiting partners. *Marital strain*, a 6-item scale (e.g., "How often do they criticize you?") had responses ranging from 0 = Never to 3 = Often. *Marital support*, a 6-item scale (e.g., "How much do they understand the way you feel about things?"), had responses ranging from 0 = not a lot to 3 = a lot. Higher scores indicate greater marital strain or support.

2.3.3 | Control variables

All control variables (depressed affect, anxiety disorder, consumption of sugary beverages, body mass index, gender, age, education, and race) were single-item variables.

2.4 | Analytic strategy

We tested a single multivariate regression model, where A1C was regressed onto control variables, marital strain, marital support, and the interaction term for marital support and strain (i.e., to test moderation). A statistically significant interaction term was probed using simple slope analyses to determine how combinations of marital strain and support are differentially associated with A1C. Analyses were conducted in Mplus (L. K. Muthén & Muthén, 1998–2017) using list-wise deletion and including covariates to reduce bias in parameter estimation that may be linked to missingness. We observed a higher correlation between marital strain and marital support ($r = -.69$), indicating the potential for multicollinearity issues. Although standard correlation cutoffs are typically $r = .80$ (Berry & Feldman, 1985), some suggest concerns with correlation as low as $r = .50$ (Donath et al., 2012). In addition to standardizing independent variables to reduce multicollinearity, linear ridge regression is automatically employed in Mplus calculations when there are multicollinearity issues (B. O. Muthén, 2006) to correct

TABLE 1 Correlation matrix and descriptive statistics for outcome variable, independent variables, and control variables ($N = 136$).

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
AIC (1)	5.94 (1.14) 3.60– 19.70											
Marital support (2)	–0.06	3.59 (0.57) 1–4										
Marital strain (3)	0.05	–0.69*	2.17 (0.64) 1–4									
Education (4)	0.03	0.16*	–0.04	7.74 (2.52) 1–12								
Gender (5)	–0.03	–0.17*	0.08	–0.09	0.55 (0.50) 0–1							
Race (6)	0.16*	–0.17*	0.08	–0.27**	0.28**	0.20 (0.40) 0–1						
Body mass index (7)	–0.07	–0.02	0.03	–0.08	0.15*	0.16*	29.61 (7.73) 15.00– 65.00					
Depressive symptoms (8)	0.03	–0.001	0.07	–0.16*	0.06	0.04	–0.02	0.61 (1.76) 0–7				
Anxiety symptoms (9)	–0.06	–0.06	0.12	–0.08	0.03	0.06	–0.09	0.20**	0.18 (1.03) 0–10			

(Continues)

TABLE 1 (Continued)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sugary beverage consumption (10)	-0.01	-0.12	0.12	-0.09	-0.06	0.08	-0.09	0.08	0.08	1.63 (0.98)		
Regular exercise (11)	-0.05	-0.15*	0.07	0.07	-0.05	0.08	0.16*	0.08	0.05	0.10	0.25 (0.43)	0-1
Age (12)	-0.15*	0.22**	-0.22*	0.14	-0.18**	-0.29**	-0.22**	-0.09	-.11*	-0.08	-0.08	53 (12) 25- 84
Cronbach's alpha	-	.90	.88	-	-	-	-	-	-	-	-	-

* $p < .05$; ** $p < .001$.

issues with multicollinearity in our model. Using *F*-tests with interaction terms, we conducted a post hoc sensitivity test for this interaction model. Assuming a power of .80 ($\beta = .80$), an alpha of .05 ($\alpha = .05$), with 12 covariates and five groups to test the interaction levels (i.e., -2 SD, -1 SD, mean, $+1$ SD, $+2$ SD), we were able to detect a medium to large effect ($f = 0.36$).

3 | RESULTS

Correlations among all variables are presented in Table 1. Consistent with our hypothesis (Table 2), there was a significant interaction effect of marital strain and support with A1C ($B = -0.24$, standard error [SE] = 0.11, $p < .05$). When using simple slope analysis of the interaction focusing on differential levels of marital support (Figure 1; Table 2), we find that among participants reporting *very low* and *low* marital support (2 and 1 SDs below the mean), marital strain is linked to higher A1C ($B = 1.02$, SE = 0.35, $p = .004$; $B = 0.64$, SE = 0.25, $p = .01$, respectively). Similarly, when examining simple slope analysis of the interaction focusing on differential levels of marital strain (Figure 2; Table 2), we find that for participants with *very low*, *low*, and *average* marital strain (2 and 1 SDs below the mean and the mean), marital support is linked to *higher* A1C ($B = 1.37$, SE = 0.51, $p = .007$; $B = 0.99$, SE = 0.38, $p = .01$; $B = 0.62$, SE = 0.28, $p = .02$, respectively). Put together, in the presence of low to average marital strain, marital support has an exacerbating effect on A1C in this sample. However, when marital support is low, the marital strain also exacerbates A1C. Seemingly, only a balance of marital strain and support is linked to A1C.

TABLE 2 Results of multivariate regression model testing for all hypotheses ($N = 136$).

Variable	B (SE)	p-Value	90% CI	Cohen's <i>d</i>
Strain	0.27 (.19)	.16	-0.11, 0.65	0.12
Support	0.62 (0.28)	.02*	0.08, 1.16	0.19
Strain × Support	-0.38 (0.14)	.006*	-0.64, -0.11	0.23
Simple slope analysis (support as moderator)				
-2 SD support	1.02 (0.35)	.004*	0.32, 1.71	0.25
-1 SD support	0.64 (0.25)	.01*	0.15, 1.14	0.22
Mean support	0.27 (0.19)	.16	-0.11, 0.65	0.12
+1 SD support	-0.10 (0.22)	.63	-0.53, 0.32	0.04
+2 SD support	-0.48 (0.31)	.12	-1.08, 0.12	0.34
Simple slope analysis (strain as moderator)				
-2 SD strain	1.37 (0.51)	.007*	0.38, 2.36	0.23
-1 SD strain	0.99 (0.38)	.01*	0.24, 1.75	0.22
Mean strain	0.62 (0.28)	.02*	0.08, 1.16	0.19
+1 SD strain	0.24 (0.20)	.22	-0.15, 0.64	0.10
+2 SD strain	-0.13 (0.20)	.52	-0.53, 0.27	0.02

Note: "×" indicates an interaction between the two variables. The model controlled for gender, age, race, depression, anxiety, sugary drinks, and body mass index but are not included to ease interpretation.

Abbreviations: CI, confidence interval; SD, standard deviation; SE, standard error.

*Statistically significant ($p < .05$).

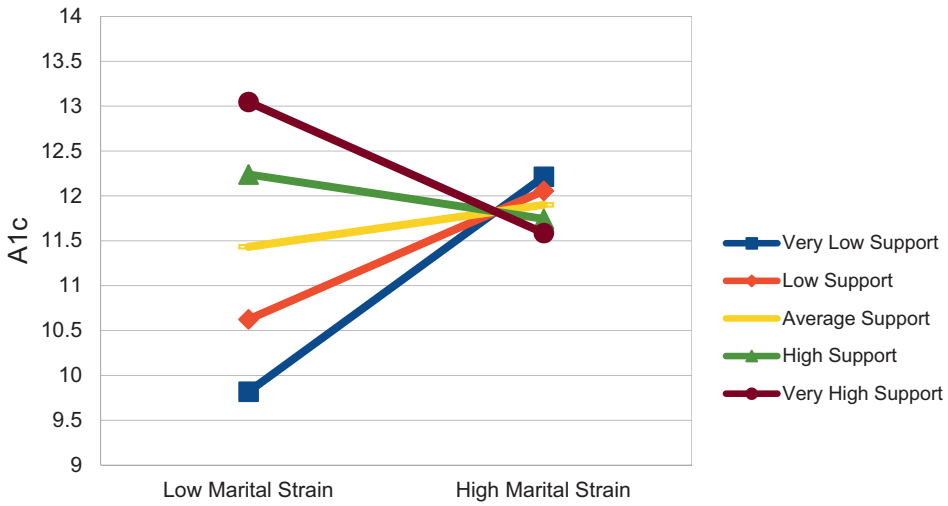


FIGURE 1 Figure depicting the interaction between marital strain and A1C moderated by marital support ($N = 136$).

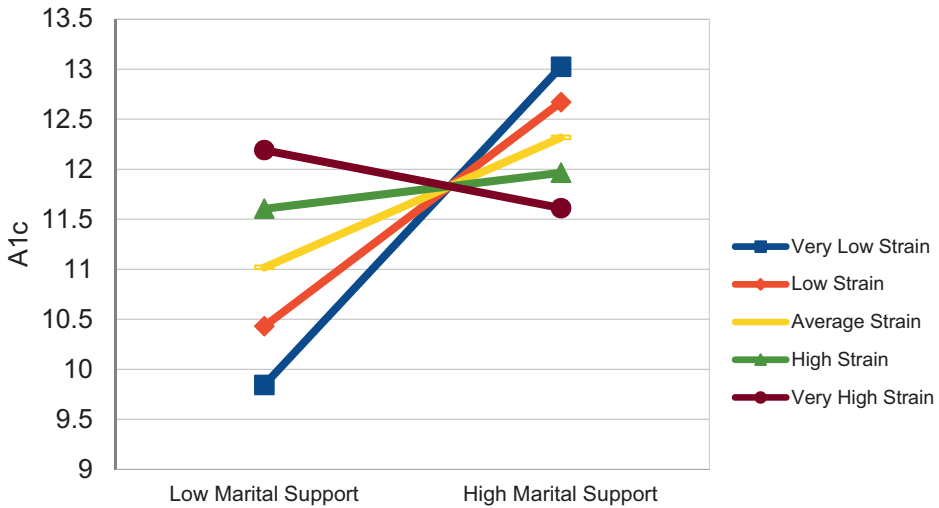


FIGURE 2 Figure depicting the interaction between marital support and A1C moderated by marital strain ($N = 136$).

4 | DISCUSSION

Marital quality is a crucial component of A1C control (CDC, 2024), but as evidenced here, the balance of positive and negative relationship characteristics is important to how marital quality impacts good A1C control. The BBFM posits that the balance of positivity and negativity in one's family emotional climate is a better indicator of one's disease activity (e.g., A1C) than individual family emotional climate characteristics. Therefore, our findings provide empirical support for this component of the BBFM. Many behavioral health interventions are being adapted or developed to target patients' marital relationships to bolster diabetes

self-management (Trief et al., 2016). However, the effectiveness of these interventions is mixed (Jarvandi et al., 2022; Olson et al., 2016). This may be due to an incomplete understanding of the interaction between marital relationship characteristics and diabetes management outcomes. Specifically, marital support on its own might be linked to poorer A1C. However, above-average marital strain and support in combination may mitigate any negative impact marital relationships have on A1C for people with diabetes.

Our hypothesis was supported. For individuals with medium to high levels of marital support, marital strain is not statistically linked to A1C, and the same with high levels of marital strain. However, for individuals with the lowest level of marital support, higher marital strain was linked to poorer A1C. Perhaps the presence of almost *any* level of support may buffer against strain's negative effects on A1C (Trief et al., 2016). This may indicate that marital support is a buffer that may be particularly critical for individuals with advanced diabetes; each 1% reduction in A1C can decrease the risk of diabetes complications by 21% (Piatt et al., 2006). Couple-based interventions aimed at improving marital support may be an influential nonpharmacological mechanism to help lower A1C and ultimately reduce long-term diabetes complications.

A surprising finding was the significant negative link between support and A1C, with more support linked to *worse* A1C. However, this association appears to disappear in the presence of above-average strain. This was similar to Mayberry et al.'s (2021) work with family relationships that indicated one family typology, *Critically Involved*, characterized by the highest participant-reported family "helpful involvement" and the highest "perceived criticism," has the poorest A1C. However, Mayberry's group, *Collaborative and Helpful*, reported the highest family support across multiple support types (e.g., interpersonal enjoyment, autonomy support) and had better A1C. Therefore, understanding the influence of varying types of marital support in the context of other relationship characteristics (e.g., strain) may be vital in developing effective interventions tailored to the couple-specific diabetes management needs.

Put together, couple-based diabetes interventions could benefit from harnessing the existing support to foster a sense of shared responsibility for managing A1C. Dyadic coping (i.e., shared communication and responses to stress) is associated with higher relationship satisfaction (see Falconier et al., 2015). A dyadic diabetes education program could teach both the person with diabetes and their partner the necessary diabetes management skills (e.g., carb counting, meal planning, exercise, and medication adherence schedules) along with effective communication skills for the partner to provide support for managing diabetes.

The BBFM hypothesizes that biobehavioral reactivity mediates the association between family emotional climate and disease activity; biobehavioral reactivity is the psychophysiological stress response to chronically imbalanced family emotional climate (e.g., low support with high strain). Therefore, for people who experience higher strain and support in their marital relationships, it is possible that their psychophysiological pathways impacting A1C are not triggered. However, when strain "outweighs" the perceived support in a marital relationship, it is plausible that psychophysiological pathways are triggered (e.g., increased depressive symptoms; increased allostatic load), leading to poorer A1C. Future research should examine this mediating component of the BBFM using longitudinal data.

4.1 | Limitations and future research

These findings should be understood within the context of some limitations. Although the data comes from a large nationally representative adult sample, the current subsample of

participants with diabetes is cross-sectional. It includes predominantly White middle-aged adults, leaving out a major subset of those with diabetes in the United States (CDC, 2024). Another limitation is the reliance on patient self-report of diabetes for the majority of the sample and the omission of diabetes type (i.e., type 1 vs. type 2). Marital support and strain were highly correlated in this sample ($r = -.69$), highlighting potential multicollinearity issues despite efforts to reduce this. Factors contributing to A1C beyond our control variables (e.g., health behaviors, time since diagnosis, financial barriers) should be considered. As many people with diabetes are not partnered, future research should replicate this study with non-marital family relationships. Experts on family emotional climate and health outcomes have also examined how strain and support across different family relationships impact chronic pain (Woods et al., 2024)—such research methodologies could inform future A1C management research. Finally, these associations should also be examined longitudinally to provide more precise indications for who, when, and how best to intervene with marital relationships and A1C.

5 | CONCLUSION

Given the multiple intersections between marital quality and diabetes outcomes (e.g., Roberson et al., 2024; Roberson & Fincham, 2018), integrated behavioral health interventions with primary care could be especially beneficial. Specifically, primary care physicians could collaborate with couples and family therapists to develop and implement brief marital interventions for patients diagnosed with diabetes. Brief marital interventions that are flexible to meet the specific relational needs of each couple, such as a relationship checkup (Coop Gordon et al., 2019), could be beneficial. However, these types of interventions have not been tested and adapted to people with diabetes and their romantic partners within healthcare settings. This is a necessary next step for effectively developing family-based interventions to improve diabetes management.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in ICPSR at <https://www.icpsr.umich.edu/web/ICPSR/series/203>.

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