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Glycemic Control among U.S. Hispanics/Latinos with Diabetes from the HCHS/SOL Sociocultural Ancillary Study: Do Structural and Functional Social Support Play a Role?

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Abstract

Background—Social support is one potential source of health-related resiliency in Hispanics with diabetes.

Purpose—This study examined relationships of structural (i.e., social integration) and functional (i.e., perceived) social support with glycemic control (glycosylated hemoglobin; HbA1c) in the Hispanic Community Health Study/Study of Hispanics (HCHS/SOL) Sociocultural Ancillary Study.

Methods—This study included 766 men and women representing multiple Hispanic ethnic backgrounds, aged 18-74 years, with diagnosed diabetes who completed fasting blood draw,

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Informed Consent Statement: All procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

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medication review, and measures of sociodemographic factors, medical history, structural support (Cohen Social Network Index), and functional support (Interpersonal Support Evaluation List-12).

Results—After adjusting for sociodemographic covariates and medication, a one standard deviation increase in functional support was related to an 0.18 % higher HbA1c ($p = 0.04$). A similar trend was observed for structural support; however, this effect was non-significant in adjusted models.

Conclusion—Greater functional support was associated with *poorer* glycemic control in Hispanics.

Keywords

Hispanic; Latino; Diabetes; Glycemic Control; Social Support

Diabetes affects nearly 26 million, or 8.3% of U.S. individuals, and if current trends continue, one in three American adults is expected to have diabetes by the year 2050 (Centers for Diabetes Control and Prevention, 2011). Approximately one in 10 U.S. health care dollars is spent treating diabetes, and with the prevalence of diabetes rising, costs will likely increase (American Diabetes Association, 2013b). In 2012, 25-45% of diabetes-attributed medical expenditures were spent treating complications of diabetes (American Diabetes Association, 2013b). Glycemic control is a strong indicator of future risk for patient relevant diabetes outcomes, including complications and mortality (Cheta & Rusu, 2013). The American Diabetes Association recommends glycosylated hemoglobin (HbA1c) target < 7% with individualization based on the clinical profile (American Diabetes Association, 2012).

Compared to non-Hispanic Whites, diabetes risk is 66% higher among Hispanics[1] (Mainous et al., 2007). This group has also exhibited poorer glycemic control (Campbell et al., 2012) – HbA1c mean difference of +0.5% across 11 studies (Kirk et al., 2008) – and more frequent complications and worse outcomes than non-Hispanic Whites (Centers for Disease Control and Prevention, 2008). Low socioeconomic status, poor healthcare access, cultural beliefs and limited diabetes knowledge may contribute to these disparities (Caballero, 2011). However, research investigating resources that promote better diabetes self-management and glycemic control in Hispanics is warranted.

Social support is an interpersonal psychosocial resource that has been widely studied in the context of physical health. Whereas *structural support* describes the existence of relationships (e.g., network size, marital status) and an individual's interaction with his/her network (e.g., social contact frequency, number of roles), *functional support* reflects the receipt of resources (e.g., emotional, informational, tangible support) from the social network, or the perceived availability thereof (i.e., perceived support). Given the common cultural value of personal relationships and family in the Hispanic population (Marin & Marin, 1991), social support is a potential source of health-related resiliency in this group. Prior research in Hispanics has shown greater social contact frequency (e.g., with

[1]*Hispanic* will be used to encompass *Hispanic, Latino*, and other terms that may be preferable to specific groups, acknowledging the range of opinion surrounding the use and relevance of these terms.

community health workers) (Ingram et al., 2007; Thompson et al., 2007) and higher levels of functional support (Gallegos-Carrillo et al., 2009) [including support specific to managing diabetes (Fortmann et al., 2011)] to be associated with better glycemic control; however, conflicting findings have also been reported [e.g., (Rees et al., 2010)].

Notably, these studies were conducted in Hispanic samples of predominantly or entirely Mexican origin, which limits generalizability to the more diverse U.S. Hispanic population. Further, no study has directly compared the relative predictive utility of different types of social support in relation to glycemic control in a diverse sample of Hispanics. To begin to address these gaps in the literature, the current study examined associations of structural support (i.e., social integration) and functional (i.e., perceived) support with HbA1c among individuals with diabetes who participated in the Sociocultural Ancillary Study to the Hispanic Community Health Study/Study of Hispanics (HCHS/SOL). In a prior analysis of this large cohort of adults representing multiple Hispanic backgrounds, greater structural and functional support were associated with lower diabetes prevalence (Gallo et al., Submitted). Among those with diagnosed diabetes, we predicted that elevations of either type of support would be associated with better glycemic control. As some research shows support-health associations to vary by age (Tomaka et al., 2006), gender (Berkman et al., 1992; Coyne et al., 2001), socioeconomic status (Gorman & Sivaganesan, 2007; Schollgen et al., 2011), immigration status and/or acculturation (Viruell-Fuentes & Schulz, 2009), we also examined the stability of findings across sociodemographic subgroups.

Methods

Participants and Procedures

The HCHS/SOL recruited 16,415 individuals of Cuban, Dominican, Central and South American, Mexican, Puerto Rican, and other Hispanic backgrounds across four sites: Bronx, NY, Chicago, IL, Miami, FL, and San Diego, CA. A detailed description of the HCHS/SOL sampling design (LaVange et al., 2010) and methods (Sorlie et al., 2010) is provided elsewhere. In brief, individuals who self-identified as Hispanic and were 18-74 years of age were recruited using a two-stage area household probability sampling approach. During the HCHS/SOL baseline exam, an anthropometric assessment and fasting blood draw were conducted; participants were asked to fast and refrain from smoking for 12 hours prior and blood samples were collected according to standardized protocols. Medication review and an interview to ascertain sociodemographics and medical history were also completed. Participants willing to attend a separate visit within 9 months of this baseline exam were eligible to participate in the Sociocultural Ancillary Study, a comprehensive assessment of sociocultural correlates of health, as described in Gallo, Penedo and colleagues (In Press). Of the 7,321 HCHS/SOL study participants that study personnel attempted to contact, N= 5,313 (72.6%) were enrolled in the Sociocultural Ancillary Study. The current study excluded N=126 of these individuals with incomplete social support data, N=4,420 who did not meet criteria for a preexisting diabetes diagnosis (according to self-report or medication review), and N=1 who was missing HbA1c data, resulting in a final sample of 766 participants for these analyses. Institutional Review Board approval was obtained at all sites for HCHS/SOL and Sociocultural Ancillary Study procedures and materials. All participants provided written informed consent.

Measures

Social Support—The 12-item, Social Network Index (SNI) (Cohen et al., 1997) high-contact roles subscale was used to assess structural support (i.e., social integration). This scale reflects the number of social roles (e.g., spouse, parent, neighbor, employee) in which the respondent has contact at least once every 2 weeks with at least one person. Possible scores range from zero to 12 social roles. The 12-item version of the Interpersonal Support Evaluation List (ISEL) assessed the perceived availability of emotional, belonging, and tangible support (Brookings & Bolton, 1988; Cohen et al., 1985). The total ISEL score was used to represent functional support; possible scores range from 0-36, with higher scores reflecting greater overall perceived availability of support. Prior research has shown the ISEL to be reliable and valid, and to relate to mental (Cohen et al., 1985) and physical (Rosengren et al., 2004) health outcomes. Analyses in the Sociocultural Ancillary cohort showed evidence of internal consistency (Cronbach's αs > .80 for both language versions), factorial validity, and construct validity (Merz et al., In Press).

Glycemic Control—Glycemic control was represented by HbA1c, an integrated marker of glycemic control over the previous 3 months, with higher levels indicating worse control. HbA1c was measured using a Tosoh G7 Automated HPLC Analyzer (Tosoh Bioscience).

Sociodemographic and Health-Related Covariates—Information on age, sex, Hispanic background, nativity/immigration, education, household income, healthcare access (represented by insurance coverage), and the prescription of glucose-lowering medications (0 = no, 1 = yes; via medication review) was obtained. Preferred language of interview was used as a proxy for acculturation.

Statistical Analyses

Descriptive analyses were conducted in IBM SPSS Statistics 20 (IBM Corporation, 2011), and remaining analyses were conducted in MPlus 6.0 (Muthen & Muthen, 2006). All analyses accounted for design effects and sample weights (LaVange et al., 2010). The maximum likelihood robust (MLR) estimation procedure in MPlus, which provides standard errors that are adjusted for multivariate non-normality and missing data, was used to estimate model parameters. Analyses examining associations of social support with HbA1c were conducted as follows. First, structural and functional support indicators were examined as predictors in separate regression models (i.e., unadjusted models). Second, sociodemographic factors and the glucose-lowering medication variable were added as covariates to these models (i.e., adjusted models). Adjusted analyses were conducted with and without control for obesity (i.e., body mass index; BMI); however, because results were not substantively altered with the inclusion of BMI, the more parsimonious model was retained. Sensitivity analyses were then conducted to explore the stability of the adjusted associations across age, sex, nativity/immigration status, language, income, and education categories. An alpha level of .01 was used to reduce type 1 error risk given the number of comparisons in sensitivity analyses. Finally, both support indicators were entered conjointly in adjusted models to more directly examine their relative predictive utility in relation to glycemic control (i.e., adjusted conjoint models). To facilitate interpretation, functional support scores were standardized [mean = 0, standard deviation (SD) = 1], whereas structural support retained its original metric (i.e., social roles count) in all analyses.

Results

Table 1 provides detailed information describing participants and study variables. Participants were 19 to 75 years of age (*Mean* = 55.40, *SD* =10.56). The majority of participants were female (65.40%), born outside of the US mainland (87.33%), and preferred to complete the interview in Spanish (84.33%); Mexican was the most commonly reported Hispanic background (37.78%). HbA1c ranged from 4.7 to 15.4% (*Mean* = 7.8%, *SD* = 2.1). Structural and functional social support scores ranged from 0 to 10 social roles (*Mean* = 5.19, *SD* = 1.85) and 0 to 36 (*Mean* = 24.79, *SD* = 6.90), respectively. The association between these social support indicators was positive and moderate in magnitude ($r = 0.33$, $p < .001$).

Social Support and HbA1c

As shown in Table 2, greater structural support related to poorer glycemic control in unadjusted analyses ($B = 0.15$, $p = 0.006$); however, this association decreased in magnitude and was attenuated to non-significance after covariate adjustment ($B = 0.08$, $p = 0.17$). Higher levels of functional social support also related to poorer glycemic control ($B = 0.22$, $p = 0.03$), and this association remained statistically significant in the adjusted models. Specifically, after control for sociodemographic covariates and glucose-lowering medication, a one-SD increase in perceived support was related to an 0.18% higher HbA1c ($p = 0.04$).[1] In (adjusted) conjoint models, structural support remained nonsignificant ($B = 0.05$, $p = 0.40$) and the association of functional support with HbA1c was reduced to marginal significance ($B = 0.16$, $p = 0.08$). Sensitivity analyses indicated that there were no consistent patterns of variability in the aforementioned (adjusted) support-HbA1c associations across age, sex, nativity/immigration status, language preference, income, or education groups.

Discussion

This study was the first to our knowledge to compare the relative associations of structural and functional support with HbA1c in diabetes among U.S. adults from diverse Hispanic background groups, and to examine whether these relationships persisted across sociodemographic categories. Contrary to our predictions, greater functional support (but not structural support) related to *poorer* glycemic control after adjusting for medication and sociodemographic covariates. Based on estimates from prior research, the HbA1c difference associated with a one-SD increase in perceived support in the present study translates to approximately 4% and 3-7% differentials in risk for diabetes-related mortality and complications (e.g., microvascular complications, myocardial infarction), respectively (Stratton et al., 2000). A similar trend was observed for structural support and HbA1c; however, this association was non-significant in adjusted models. These findings were consistent across sociodemographic groups.

Our hypotheses were informed by the fairly substantial body of literature on the salubrious effects of social support (Cohen, 2004), as well as research illustrating the cultural value of family and relationships in the Hispanic population (Gallo et al., 2009; Marin, 1993; Sanchez-Burks et al., 2000). In addition, as noted above, higher support related to lower diabetes prevalence in this same cohort (Gallo et al., Submitted). Nonetheless, there is precedence for the idea that social relationships can have both positive and negative effects (Smith & Ruiz, 2002; Gallant, 2003). For example, a prior qualitative study of adults with diabetes found that individuals who perceived more familial support also perceived more non-supportive behaviors from family members (e.g., arguments or criticism over self-care behaviors) (Mayberry & Osborn, 2012; Samuel-Hodge et al., 2013), which could negate the potential benefits of social support. In addition to providing assistance, support persons can complicate diabetes self-care [e.g., by not being supportive of patients' prescribed diet, causing patients to feel embarrassed about their self-care, placing competing demands on patients' time (Rosland et al., 2010)], particularly with respect to dietary regimens (Gallant, 2003). Engaging in behaviors that are integral to one's *own* health at the possible expense of relationships or others' needs or desires may be difficult from the Hispanic cultural perspective (Caballero, 2011). Alternatively, greater perceived support may serve as a proxy indicator of psychological distress or coping difficulties, which in turn could predict less optimal diabetes self-care and glycemic control (Lustman et al., 2000; Hermanns et al., 2013). Finally, it is possible that patients with poorly controlled diabetes attract more support from their social networks than do patients with relatively better control. Future research should consider both the positive and negative effects of social relationships and the mechanisms that may explain their associations with diabetes control.

These findings should be considered in light of the following limitations. First, the cross-sectional design precludes causal conclusions. Second, because HbA1c and social support were assessed at the HCHS/SOL baseline and Sociocultural Ancillary Study visits (respectively), up to 9 months separated these assessments; however, 88% of participants completed the visits within 6 months of each other. Third, although we control for the prescription of glucose-lowering medications, this variable provides no information about adherence. In addition, we were unable to differentiate between type 1 and type 2 diabetes in this cohort; however, this is unlikely to substantively influence our findings as, in the overall population, type 2 represents the vast majority (90-95%) of diabetes cases (American Diabetes Association, 2013a). Finally, the relevance of the types of social support assessed in this study - i.e., to diabetes health and to this population - warrants consideration. For instance, the form of support most commonly cited as a facilitator of diabetes management in a prior qualitative study was support specific to completing self-care activities (versus other types of perceived support – e.g., emotional, informational) (Mayberry & Osborn, 2012); however, diabetes-specific support was not examined in the current study. On a related note, the ISEL does not assess the source, perceived quality, or utilization of one's available support resources - all of which may moderate the degree to which social support is related to health and well-being. Additional research is needed to examine these complexities.

This study provides valuable new information about associations of social support and glycemic control in the Hispanic population. Although effect sizes were small, preliminary evidence was found for an association between higher functional (i.e., perceived) support and *poorer* glycemic control in this group. Further research is needed to better understand how these social factors covary with glycemic control in Hispanics. In particular, studies should explore predictive factors that are more specific to diabetes (e.g., support for diabetes management) and to the Hispanic population (e.g., family cohesion), as these may be central determinants of glycemic control. Research should also explore self-management behaviors (e.g., diet, exercise, medication adherence) and other potential mechanisms underlying support-glycemic control associations. More globally, there is a need to understand how the Hispanic social environment may influence diabetes management through mechanisms other than support provision.

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Table 1

Descriptive statistics for sociodemographic, diabetes, and social support indicators.

	Total N = 766 N (%)[a]
Male	265 (34.60)
Hispanic Background	
Mexican	289 (37.78)
Cuban	97 (12.68)
Puerto Rican	201 (26.27)
Dominican	66 (8.63)
Central American	70 (9.15)
South American	33 (4.31)
Other/Mixed origin	9 (1.18)
Study Site	
Miami, FL	151 (19.71)
Bronx, NY	214 (27.94)
San Diego, CA	170 (22.19)
Chicago, IL	231 (30.16)
Nativity/Immigration Status	
Born in the US mainland	97 (12.67)
Immigrated ≥10 years ago	571 (74.54)
Immigrated <10 years ago	98 (12.79)
Spanish interview	646 (84.33)
< High school diploma/GED	365 (48.60)
<$30,000/yr household income	567 (80.65)
Health insurance coverage	515 (68.21)
On glucose-lowering medication	623 (82.85)
Self-reported diabetes diagnosis	722 (94.26)
Body mass index ≥ 30	468 (61.2)
	Unweighted M (SD)
Structural support[b]	5.19 (1.85)
Functional support[c]	24.79 (6.90)
HbA1c (%)	7.8 (2.1)

Notes: HbA1c = Glycosylated hemoglobin.

[a]Variations in sample size reflect missing data; valid percents are presented.

[b]Structural support assessed via the Social Network Index (Cohen, et al., 1997); scores reflect number of social roles, with maximum possible = 12.

[c]Functional (or perceived) support measured via the Interpersonal Support Evaluation List (Brookings & Bolton, 1988; Cohen, et al., 1985), with maximum possible = 36.

Table 2

Regression coefficients from unadjusted and adjusted support-HbA1c models (N = 766)

	HbA1c B [95% CI]
Demographic covariates[a]	
Age	−0.03 [−0.05, −0.02]
Gender[b]	−0.38 [−0.73, −0.04]
Hispanic Background[c]	
Cuban	−0.20 [−0.80, 0.39]
Puerto Rican	0.05 [−0.47, 0.56]
Dominican	−0.26 [−0.86, 0.34]
Central American	0.01 [−0.74, 0.75]
South American	−0.24 [−1.03, 0.54]
Other/Mixed origin	−0.47 [−1.40, 0.46]
Nativity/immigration status[d]	0.42 [0.01, 0.83]
Language of Interview	−0.73 [−1.33, −0.14]
Education	0.13 [−0.08, 0.33]
Income	0.03 [−0.06, 0.11]
Health insurance coverage[e]	−0.38 [−0.87, 0.11]
Glucose-lowering medication[e]	0.49 [−0.08, 1.07]
Unadjusted Models[f]	
Structural Support[g]	0.15 [0.04; 0.26]
Functional Support[h]	0.22 [0.02; 0.42]
Adjusted Models[f]	
Structural Support[g]	0.08 [−0.03; 0.18]
Functional Support[h]	0.18 [0.12; 0.36]
Adjusted Conjoint Model[i]	
Structural Support[g]	0.05 [−0.06, 0.16]
Functional Support[h]	0.16 [−0.02, 0.34]

Notes. Analyses account for design effects and sample weights. HbA1c = Glycosylated hemoglobin.

[a]Coefficients derived from model excluding support variables.

[b]Gender: 0 = male, 1 = female.

[c]Hispanic background variables were dummy coded with Mexican as reference group.

[d]Nativity/immigration status: 1= Immigrated <10 years ago; 2 = Immigrated ≥10 years ago 3 = Born in the US mainland.

[e]Health insurance coverage and medication: 0 = no, 1 = yes.

[f]Support indicators evaluated in separate models.

[g]Coefficients reflect difference in HbA1c per each additional social role.

[h]Coefficients reflect difference in HbA1c per one SD increase in perceived support.

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