Diabetes-Related Stigma and its Influence on Social Networks, Social Support, and HbA1c in Ghana

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Objective: We applied a social network approach to examine if three types of diabetes-related stigma (self-stigma, perceived stigma and enacted stigma) moderated associations between social network characteristics (network size, kin composition, household composition, and network density), social support, and blood glucose among Ghanaians with type 2 diabetes mellitus (T2DM).

Methods: Data were obtained through a cross-sectional survey of 254 adults at a diabetes clinic in Ghana that assessed participants' social networks, social support, and frequency of experiencing three types of diabetes-related stigma.

Results: Self-stigma moderated associations between kin composition and social support when controlling for network size (β=-.97, P=.004). Among study participants reporting low self-stigma, kin composition was positively associated with social support (β=1.29, P<.0001), but this association was not found among those reporting high self-stigma. Network size was positively associated with social support among participants reporting both low and high self-stigma. None of the types of diabetes-related stigma moderated other associations between social networks, social support, and blood glucose.

Conclusions: Individuals with T2DM who report high self-stigma may have lower social support, which can reduce their capacity for disease management. Additionally, larger social networks may be beneficial for individuals with T2DM in countries like Ghana, and interventions that expand network resources may facilitate diabetes control. *Ethn Dis*.2020; 31(1):57-66; doi:10.18865/ed.31.1.57

Introduction

Diabetes-related stigma refers to negative societal attitudes and behaviors because of a person's type 2 diabetes mellitus (T2DM) status, disease attribute, or disease management, which may manifest as discrimination, exclusion, or internalized shame or guilt for having diabetes.[1] The broader literature on health-related stigma suggests that individuals who worry about being stigmatized may refuse to disclose their health condition or delay, reduce, or terminate medical treatment, leading to poor health outcomes.[2] A small but growing body of research from high-income countries (HICs) indicates that people who feel stigmatized because of their T2DM report increased psychological distress, less social support, and worse glycemic control (HbA1c).[3–5] In contrast, research on diabetes-related stigma is scarce in low- and middle-income countries (LMICs), so there is limited insight regarding its effects on individuals with T2DM in LMICs.

Cultural context and social settings often shape identities, behaviors, and appearances that are considered as appropriate or normal; thus, social contexts can influence what may be stigmatized or not over time.[6] In rural Ghana, a qualitative study found that some individuals with uncontrolled diabetes experienced rapid weight loss, which was erroneously perceived as a symptom of HIV/AIDS.[7] Consequently, there were rumors that people with diabetes had HIV/AIDS or that their weight loss was associated with witchcraft.[7] Although participants with diabetes did not have HIV/AIDS, they experienced HIV-related and witchcraft stigma, which

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were entrenched in socially constructed representations of disease.[7] The study showed that sociocultural contexts can affect the nature of stigma and its influence on disease management; however, additional research in urban Ghana may increase our understanding of how diabetes-related stigma affects glycemic control.

In HICs and LMICs, T2DM management strategies, such as dietary habits, often occur within a family or household context and involve resource mobilization, collective decision-making, and social support.[8,9] Some studies suggest that the extent to which family (kin composition) or household members (household composition) comprise a person's social network, as well as interconnectivity among one's network members (network density) are important structural and compositional network characteristics to consider in the context of understanding social support and diabetes management.[9–11] In many LMICs where social networks are essential for access to health care,[12] what remains unclear is whether diabetes-related stigma affects individuals' social networks or the social support that these networks provide for glycemic control.

The goal of this study was to apply a social network approach in examining how diabetes-related stigma may influence perceived social support and glycemic control among Ghanaian adults with type 2 diabetes mellitus

The goal of this study was to apply a social network approach in examining how diabetes-related stigma may influence perceived social support and glycemic control among Ghanaian adults with T2DM. We hypothesized that individuals with T2DM who report higher levels of stigma would have poorer glycemic control. We were also interested in testing whether diabetes-related stigma moderated two types of associations: 1) associations between social network characteristics (kin composition, household composition, and network density) and social support; and 2) the association between social support and HbA1c.

Methods

Between July and August 2018, a cross-sectional survey was conducted with a convenience sample of 254 patients at the diabetes clinic at the Komfo Anokye Teaching Hospital (KATH) in Kumasi, Ghana. KATH is a 1,200-bed facility and the country's second-largest teaching hospital, serving approximately 4 million people in the Ashanti region. It is a referral hospital for all regional and district hospitals in the region and for 10 of Ghana's 16 regions. Kumasi, Ghana's second largest city, is the capital of the Ashanti region and is home to more than 40% of the Ashanti population.[13] It is a commercial and transportation hub that attracts individuals with diverse socio-economic backgrounds across West Africa.[13] Previously, diabetes was one of Kumasi's leading causes of death, and disease prevalence rates have steadily increased in the Kumasi area.[14] At KATH's diabetes clinic, individuals are diagnosed with T2DM if they have an HbA1c reading ≥6.5% (7mmol/L for fasting blood glucose).

For this study, only previously diagnosed patients who were at the clinic for routine follow-up visits were recruited and enrolled. Eligible patients were aged ≥18 years, diagnosed with T2DM for at least one year, and fluent in English or Twi, which were the two predominant languages within the patient population. Based on diabetes type and length of disease, a daily list of potentially eligible participants was generated by screening medical records of patients who were present for a clinical visit. Using this list, trained research staff approached patients in the diabetes clinic's waiting area to determine their interests in the study and confirm their eligibility. After participants provided verbal and written informed consent, a nurse at the clinic measured their HbA1c levels. In a private setting at the clinic, research staff identified a participant's language preference and orally administered the questionnaire in English or Twi.

Each participant received an incentive of 15 Ghana cedis (approximately 3.4 USD) upon survey completion. Ethical approval was provided

by the institutional review boards (IRB) at the University of South Carolina, the Kwame Nkrumah University of Science and Technology and KATH. All procedures were followed in accordance with the ethical standards of the IRB and the Helsinki Declaration of 1975, as revised in 2000. All study participants provided verbal and written informed consent before any data were collected.

The dependent variable for the study was HbA1c, which was assessed with an SD BIOSENSOR, standard A1cCare Analyzer and test kits. The raw values were treated as continuous data for analytical purposes, and they ranged from 4.1-14.7 for the 234 individuals for whom the test was successfully conducted.

Prior to data collection at KATH, measures of social support and diabetes-related stigma were pretested and refined using data from cognitive interviews with 14 Ghanaians with T2DM at another hospital. Diabetes-related stigma was assessed using 28 items. Sixteen items were adapted from the 19-item, Type 2 Diabetes Stigma Assessment scale (DSAS-2), which consisted of three subscales and was originally developed in Australia.[5]

We developed seven items to expand on existing DSAS-2 items and five additional items based on previous stigma research in Ghana and other LMICs.[2,7,15] For example, a DSAS-2 item asked if a person with T2DM was excluded from social occasions involving food or drink that others thought he or she should not have. One of the new items asked if this type of restriction also occurred at home. A Likert scale that ranged from "never" (1) to "very often" (5) was used to measure the frequency of participants' stigma-related experiences and perceptions, with higher scores indicating more frequent stigma. The stigma variable was computed by averaging responses across all items (α=.88). Three subscale scores were also computed to assess enacted stigma (11 items; α=.68), perceived stigma (11 items querying blame and judgment; α=.82), and self-stigma (6 items assessing internalized stigma; α=.81).

Enacted stigma refers to experiences of discrimination or being shunned by others because one has T2DM.[1,5] Perceived stigma is apprehension about societal attitudes and reactions from individuals who may make assumptions about a person's lifestyle and criticize that person for having T2DM.[1,5] Self-stigma occurs when a person feels ashamed, guilty, or has lower self-esteem because of his/her T2DM status.[1,5]

Four social network characteristics were assessed: network size, kin composition, household composition, and network density. These characteristics have been studied and validated as measures of personal networks over the past 30 years.[16,17] We measured network size using two name generators to identify individuals (alters) within study participants' social networks.[16] First, participants named a maximum of three people with whom they discussed important matters. Second, they identified a maximum of three people who assisted them with household tasks. Network size, which ranged from 0-6, referred to the total number of alters that each participant identified.

We assessed kin composition by asking participants to indicate if each named alter was a spouse or an unmarried partner, child, other relative, friend, or some other connection. Kin composition was calculated by summing the number of alters that each participant identified as a spouse, child, or relative and then dividing this number by the total number of unique alters mentioned by each participant. The final kin composition variable represented a proportion ranging from 0 to 1, with higher values indicating that more alters were family members.

For the household composition measure, each participant indicated if he or she currently lived with any of his/her named alters, and we divided the number of alters who lived with each participant by the total number of named alters. Household composition was a proportion ranging from 0 to 1, with higher values indicating that more alters were household members.

We also measured network density by asking each study participant to indicate whether named alters had relationships with each other as friends, family members, or some other type of connection using binary responses of "yes" or "no" for each alter-alter dyad in a person's network. These responses were used to calculate network density with the formula: Network density= $k/[(n(n-1))/2]$ where k represented the total number of connections among alters in the network, and n was network size.[18] The network density variable was a proportion ranging from 0 to 1, with higher values indicating that more alters had connections to one another.

Finally, perceived diabetes social support (PDSS) was measured using

eight items from the emotional/informational support subscale and four items from the tangible (instrumental) support subscale from the Medical Outcomes Study Social Support Survey (MOS-SSS).[19] All 12 items were modified to assess diabetes-related support outside of a clinical setting. Based on previous research in Ghana indicating that health-related financial support is often lacking from social networks,[20] we added an item about financial support to the instrumental support subscale. All items used the original MOS-SSS 5-point Likert scale ranging from "none of the time" (1) to "all of the time" (5). The average of responses to all 13 PDSS items was calculated to form a single scale score (α=.87).

Participants reported various demographic characteristics, including ethnicity. The following characteristics were included as covariates: age in years; sex (male or female); educational attainment (0-6 years of education, completed junior secondary school [JSS], completed senior secondary school [SSS] or higher); number of self-reported T2DM comorbidities based on five pre-identified conditions (hypertension, stroke, heart condition, tuberculosis, HIV/AIDS); and T2DM duration in years (time since diagnosis).

Statistics

All analyses were conducted using SAS® software.

First, we ran descriptive and bivariate statistics to identify sample characteristics. More than 60% of our study participants had low stigma scores that fell between 1 and 1.4, which was the mean stigma score. Similar to a previous LMIC study on chronic disease-related stigma,[21] we considered the median stigma score as an appropriate point for stratifying the sample and comparing the levels of stigma. In our study, participants were categorized as having low or high stigma, and differences between the two groups were examined using Pearson chi-square tests for categorical variables and t-tests for continuous variables.

Secondly, we ran three multivariable linear regression models to estimate the influence of three social network characteristics (kin composition, household composition, and network density) as predictors of PDSS. We examined the moderating effect of diabetes-related stigma (full scale with 28 items) on the associations between network characteristics and PDSS. To examine the role of each type of stigma (perceived stigma, enacted stigma, and self-stigma) as a moderator, we ran additional models to evaluate the influence of each network characteristic on PDSS while including an interaction term for each network characteristic and type of stigma in separate models. Since network size is an important factor that affects other network characteristics and indicates the boundary of each network,[18] we controlled for size in all models that included any of the three network characteristics as an independent variable.

Thirdly, we used a multivariable linear regression model to estimate the influence of PDSS on glycemic control. We also ran additional models to examine the effect of each type of stigma as a moderator of the relationship between PDSS and glycemic control. We adjusted for age, sex, education, number of T2DM comorbidities, and T2DM duration in all models, and those that included a statistically significant interaction provided evidence for further stratifying the analyses.

Results

Sample characteristics are provided in Table 1. Approximately 75% of study participants (n=176) had an HbA1c reading that was >7.0 %, indicating poor glycemic control. The average score for diabetes-related stigma was 1.40 (median = 1.31) and ranged from 1-5. On average, participants with low stigma were significantly older than those with high stigma (t=3.17, P=.002). No other significant differences were observed when comparing individuals with high stigma with those with low stigma. In total, 252 study participants identified 1028 alters who helped with household tasks and with whom they discussed important matters. Two participants did not identify any alters. There were 814 family members within study participants' social networks, and most family members were participants' children (n=455). For 129 participants, all alters were family members (data not shown).

Regression models indicated that kin composition (P=.01) and household composition (P=.01) were significantly associated with social support, while adjusting for self-stigma (Table 2). Network density was not associated with social support. Fully adjusted analysis examining the effect of self-stigma as a moderator of the relation-

Table 1. Sociodemographic and social network characteristics of study participants; full sample and by low vs high diabetes-related stigma

	Full sample, n=254	Low diabetes-related stigma: ≤1.31, n=128	High diabetes-related stigma: >1.31, n=126
Age in years: mean (SD)	62.90 (10.20)	64.88 (9.76)	60.89 (10.28)
Sex, % female	59.45	59.38	59.52
Ethnicity, %			
Akan	82.29	80.47	84.13
Ewe	2.36	3.13	1.59
Grussi	2.36	2.34	2.38
Hausa	1.57	3.13	.00
Mole Dagbani	1.18	.78	1.59
Other ethnicity	10.24	10.16	10.32
Married, %	57.09	54.69	59.52
Education, %			
0-6 years of education	35.04	33.59	36.51
Completed JSS (middle school)	38.19	33.59	42.86
Completed SSS (high school) or higher	26.77	32.81	20.63
Monthly income, %			
Less than 200 Ghana cedis[a]	23.38	20.20	26.47
200-499 Ghana cedis	37.81	36.36	39.22
500 Ghana cedis or more	38.81	43.43	24.31
Work status, %			
Employed full-time	32.28	27.34	37.30
Unemployed	26.38	23.44	29.37
Retired	21.26	28.13	14.29
Other	20.08	21.10	19.05
T2DM duration in years: mean (SD)	13.14 (7.10)	13.17 (6.91)	13.10 (7.31)
Number of T2DM comorbidities: mean (SD)	.88 (.61)	.89 (.52)	.87 (.69)
HbA1c: % (mmol/mol)	9.2 (77)	9.2 (77)	9.4 (79)
Social network characteristics: mean (SD)			
Network size	4.08 (1.31)	4.02 (1.32)	4.15 (1.31)
Kin composition	.80 (.25)	.79 (.26)	.82 (.24)
Household composition	.56 (.32)	.54 (.32)	.59 (.31)
Network density	.94 (.21)	.95 (.18)	.92 (.23)
Perceived diabetes social support: mean (SD)	3.53 (1.03)	3.61 (1.03)	3.46 (1.04)
Diabetes-related stigma: mean (SD)	1.40 (.40)	1.16 (.09)	1.65 (.43)
Perceived stigma subscale: mean (SD)	1.35 (.44)	1.14 (.15)	1.55 (.54)
Enacted stigma subscale: mean (SD)	1.46 (.44)	1.20 (.18)	1.72 (.47)
Self-stigma subscale: mean (SD)	1.40 (.64)	1.10 (.20)	1.71 (.77)

a. At the time of the study, 1 USD was approximately equivalent to 4.4 Ghana cedis

ship between kin composition and social support showed a statistically significant interaction between kin composition and self-stigma (P=.01). Self-stigma did not moderate the relationship between household composition and social support or between network density and social support.

To examine the significant interaction between kin composition and self-stigma, further analysis was stratified by low and high self-stigma (Table 3). Fully adjusted models revealed that among study participants who reported low self-stigma, there was still a significant association between kin composition and social support (P<.0001); however, this association was not observed among participants who reported high self-stigma (Figure 1). In both models, network size was positively associated with social support, regardless of whether study participants reported high or low self-stigma. Diabetes-related stigma (full scale) did not moderate any of the associations between

Table 2. Results of linear regression models showing the effects of diabetes-related self-stigma as a moderator of associations between social network characteristics and perceived diabetes social support

	Models without interaction term β (SE)			Models with interaction term β (SE)		
Dependent variable: Perceived diabetes social support (PDSS)	**Model 1, n=247**	**Model 2, n=246**	**Model 3, n=247**	**Model 1, n=247**	**Model 2, n=246**	**Model 3, n=247**
Social network characteristics						
Kin composition	.69 (.25)[a]	–	–	2.14 (.56)[c]	–	–
Household composition	–	.51 (.20)[a]	–	–	.74 (.47)	–
Network density	–	–	.55 (0.33)	–	–	.26 (.59)
Network size	.23 (.05)[c]	.22 (.05)[c]	.18 (0.05)[b]	.23 (.05)[c]	.23 (.05)[c]	.18 (.05)[b]
Diabetes-related, self-stigma	-.16 (.10)	-.20 (.10)	-.14 (0.10)	.60 (.28)[a]	-.12 (.17)	-.29 (.26)
Kin composition * Diabetes-related, self-stigma	–	–	–	-.97 (.34)[b]	–	–
Household composition* Diabetes-related, self-stigma	–	–	–	–	-.16 (.30)	–
Network density * Diabetes-related, self-stigma	–	–	–	–	–	.18 (.29)
Sex						
Female	Referent	Referent	Referent	Referent	Referent	Referent
Male	.21 (.14)	.21 (.14)	.25 (.14)	.20 (.14)	.21 (.14)	.25 (.14)
T2DM duration (years)	-.01 (.01)	-.01 (.01)	-.02 (.01)	-.01 (.01)	-.01 (.01)	-.02 (.01)
Education						
0-6 years of education	Referent	Referent	Referent	Referent	Referent	Referent
Completed junior secondary school	.29 (.15)	.25 (.15)	.24 (.15)	.31 (.15)[a]	.25 (.15)	.24 (.15)
Completed senior secondary school or higher	.09 (.17)	.01 (.17)	.05 (.17)	0.11 (.17)	.01 (.17)	.05 (.17)
Number of T2DM comorbidities	.18 (.10)	.22 (.10)	.19 (.11)	.24 (.10)[a]	.22 (.10)	.21 (.11)
R^2	.15	.15	.13	.18	.15	.14
Model P	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

a. P<.05; b. P<.01; c. P<0.001.

social network characteristics and social support (results not shown). Neither perceived stigma nor enacted stigma moderated associations between the network characteristics and social support. Additionally, social support did not have a significant association with glycemic control.

Discussion

In this study, we examined whether three types of diabetes-related stigma (perceived stigma, enacted stigma, and self-stigma) moderated associations between social network characteristics and social support, or between social support and glycemic control among Ghanaians with T2DM. Study participants' levels of diabetes-related self-stigma determined the extent to which kin composition was associated with social support for disease management.

Among those with low self-stigma, a higher proportion of family members in one's social network was positively associated with greater social support. The observation that family provides more support is consistent with research from HICs, which indicates that family members are among primary social connections through which social support is provided for adults with diabetes.[22] Perceived social support may improve individuals' ability to adequately face challenges if there is some assurance that others are available to help them cope during various situations.[23] Among family ties, information and caregiving responsibilities can be discussed and shared in a way that may facilitate access to important health resources.

Although our findings show that family members are the most important source of T2DM social support among urban Ghanaians, previous research in Ghana suggests that relying on family support for chronic disease

management may result in an increased financial burden on the family and strained relationships among family members.[7] Future social network studies can examine whether certain types of family members are more helpful for people with T2DM.

We did not observe associations between kin composition and social support among participants who reported high self-stigma. Higher levels of self-stigma—internalized feelings of shame, guilt, and negative attitudes toward oneself—can reduce self-efficacy and self-esteem such that affected individuals become withdrawn, depressed, and less likely to interact with existing but potentially supportive ties.[24,25] Research in Japan has indicated that experiences of self-stigma affected the degree to which people with T2DM participated in social activities.[26] Some people abandoned medication and diet adherence practices to maintain a certain persona and preserve social relationships, while some individuals tried to avoid stigma by disconnecting from others and becoming isolated.[26] Other diabetes studies in HICs have revealed that those with the highest levels of self-stigma have low levels of social participation, and higher levels of perceived stigma are associated with reduced perceived social support.[3,27] Taken together, these findings provide insights for the current study. It is plausible that Ghanaians with T2DM who reported high self-stigma may have been less outgoing or felt less deserving of assistance from others, thus leading to perceptions that social support had diminished. Self-stigma may change how individuals perceive themselves in comparison to others who lack the stigmatizing condition, as well as their interactions with others,[28] potentially resulting in adverse effects on existing, supportive relationships.

Table 3. Results of linear regression models estimating the influence of kin composition on perceived diabetes social support, stratified by low/high diabetes-related self-stigma

Dependent variable: Perceived diabetes social support (PDSS)	Low diabetes-related, self-stigma: ≤1.17, n=141	High diabetes-related, self-stigma: >1.17, n=106
Kin composition	1.25 (0.31)[b]	.10 (.39)
Network size	.15 (0.06)[a]	.33 (.07)[b]
Sex		
Female	Referent	Referent
Male	.12 (.18)	.19 (.22)
T2DM duration, years	.00 (.01)	-.04 (.02)[a]
Education		
0-6 years of education	Referent	Referent
Completed junior secondary school	.62 (.20)	-.02 (.21)
Completed senior secondary school or higher	.18 (.21)	.09 (.28)
Number of T2DM comorbidities	.31 (.16)	.04 (.13)
R^2	.21	.22
Model P	<.0001	.001

a. P<.05; b. P<.001

Among those with low self-stigma, a higher proportion of family members in one's social network was positively associated with greater social support.

Little is known about causal linkages between stigma and social interactions among people with T2DM, and cross-sectional and longitudinal research in the United States has yielded mixed evidence about these linkages with respect to mental health.[29–31] Longitudinal studies in LMICs and HICs are needed to increase our understanding of how stigma and social interactions affect glycemic control over time.

Findings from this study also indicate that participants with larger social networks felt that they had greater availability of social support for T2DM management. This observation resonates with results from previous research in HICs, in which positive associations have been observed between network size and perceived social support.[32] Among our study participants, the positive association between network size and support, irrespective of levels of self-stigma, strongly suggests that network size, as compared with compositional characteristics of social

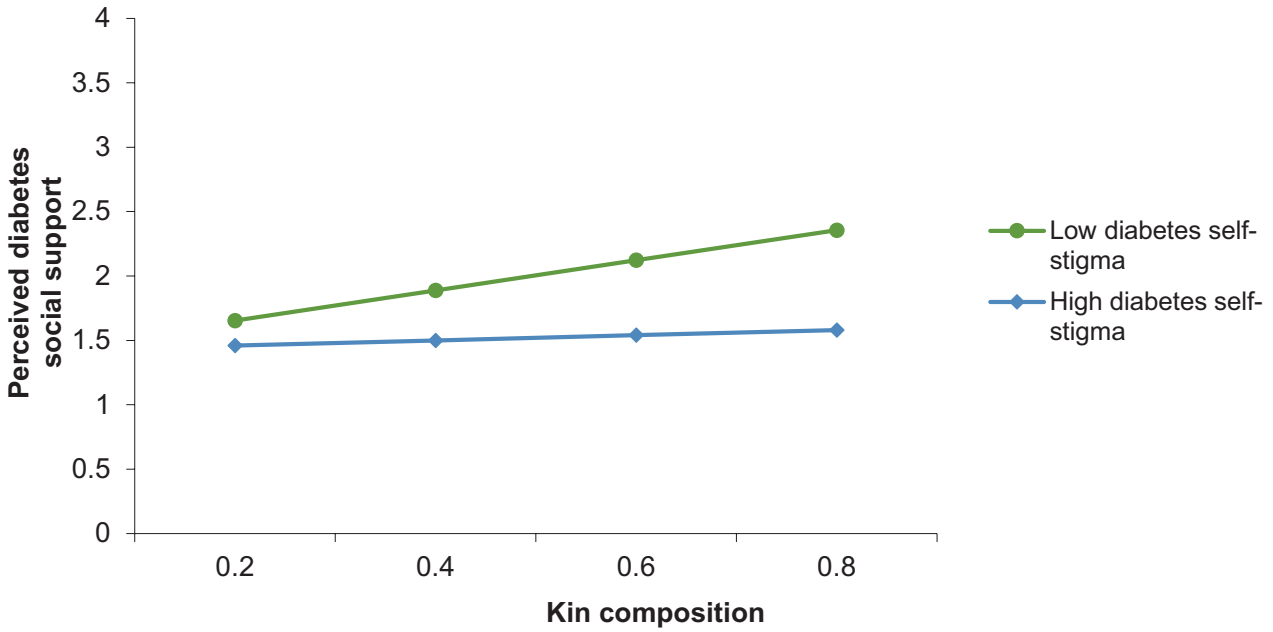

Figure 1. Association between kin composition and social support, stratified by low/high diabetes-related self-stigma

networks, may be more important for support. Larger networks that include varied social ties may provide avenues for interactions with non-family members or distal social connections who may serve as additional sources of social support, as well as access to diverse resources.[32] Thus, individuals with T2DM who are connected to many network members may obtain assistance with different health-related needs from multiple sources.

Diabetes-related stigma did not moderate associations between household composition and social support or network density and social support. In the presence of stigma, there may be indirect mechanisms that link these network characteristics to support; however, evaluating those indirect mechanisms was beyond the scope of this study. Furthermore, self-stigma, which is one of the most well-studied concepts of stigma, is conceptually distinct from the other types of stigma,[33] and research shows that each type has unique effects on mental health-related behaviors.[34] This implies that there is potential for self-, perceived, and enacted stigma to also produce varying effects on social support and health outcomes, such that one type of stigma may be more relevant than others, as we observed. We did not find a significant relationship between social support and glycemic control or a moderating effect for diabetes-related stigma on the relationship between social support and glycemic control. While these results contradicted our hypotheses, social support may have operated through a buffering process, which considers the effects of stress on health outcomes and how support may mitigate those effects.[35] More research is warranted to determine whether social support is an important mechanism for improving glycemic control in various LMIC settings. For example, future studies can evaluate if social support reduces the adverse effects of stress on glycemic control, especially among individuals with high diabetes-related self-stigma.

Study Limitations

Although this study is novel in its application of a social network approach to examine the role of diabetes-related stigma within an LMIC context, it has certain limitations. First, our cross-sectional study de-

sign limited the ability to draw causal conclusions about social network characteristics and diabetes-related stigma. Secondly, social networks and diabetes-related stigma can change over time and have varying effects on individuals with T2DM as their health conditions also evolve over time. Longitudinal research will be useful in identifying these changes and how they impact glycemic control among Ghanaians. Thirdly, study participants could only list a maximum of six alters, which may have limited our ability to fully capture the nature of their social networks. Fourthly, most study participants reported low diabetes-related stigma, but these levels may not be reflective of all Ghanaians with T2DM or those at highest risk of adverse health outcomes. Additionally, different results may have been observed if there was more variation in the stigma scores. Finally, further research and psychometric evaluation are necessary to fully examine the psychometric properties of the measures used in this study.

Conclusion

Diabetes-related stigma and its association with existing social relationships is a complex phenomenon that has been understudied in LMICs, but it may have negative and potentially long-lasting health effects among people with T2DM. This study has demonstrated that in Ghana, the relationship between perceived social support and social network characteristics, like kin composition, depends on the type and frequency of stigma experiences and perceptions. Individuals with T2DM who reported high diabetes-related self-stigma may have lacked adequate social support for disease management, and smaller social networks were associated with lower social support. Further research on social network interventions that connect people with T2DM to institutional resources, such as diabetes peer support groups, may be useful in identifying additional opportunities for health education and emotional support. Future LMIC research can further examine how diabetes-related stigma, as a potential driver of health inequality, operates within social settings to facilitate or inhibit T2DM management in both rural and urban locations.

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Conflict of Interest

No conflicts of interest to report.

Author Contributions

Research concept and design: Botchway, Davis, Merchant, Appiah, Moore; Acquisition of data: Botchway, Appiah; Data analysis and interpretation: Botchway, Davis, Merchant, Moore; Manuscript draft: Botchway, Davis, Moore; Statistical expertise: Botchway, Davis, Merchant, Moore; Acquisition of funding: Botchway, Davis; Administrative: Botchway, Davis, Appiah; Supervision: Davis, Merchant, Appiah

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