Research Report

Social Pathways in the Comorbidity between Type 2 Diabetes and Mental Health Concerns in a Pilot Study of Urban Middle- and Upper-Class Indian Women

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Abstract   This report describes preliminary findings about the connections between type 2 diabetes, mental health, and normative social roles among women living in Delhi, India. We conducted freelist interviews with 62 diabetic and nondiabetic women about women's roles, perceptions of diabetes, and ''tension,'' a common Hindi-language idiom used to express stress. Using the freelist results, we produced and then administered a question-naire to a pilot sample of 33 diabetic women. Among the diabetic women, physical symptoms of diabetes predicted higher biomedical anxiety and ''tension,'' whereas difficulties achieving gender-specific social roles predicted higher biomedical depression. We conclude that both physical symptoms of diabetes and difficulties achieving socially important roles contribute to poor mental health among these diabetic women; further research will clarify the relationships among depression, anxiety, ''tension,'' and women's physically and socially mediated experiences of diabetes. [type 2 diabetes, depression, India, and anxiety]

> When I make only roti [instead of rice], my mother-in-law complains. If I don't offer sweets, the children complain. If I add less ghee to the dal, my husband complains. What can I do? I have so much tension. I can't think about myself.

—Shifalika, 37-year-old homemaker with type 2 diabetes

Chronic diseases account for an ever-increasing portion of the global burden of disease (Mathers and Loncar 2005), and comorbidity of two or more chronic diseases is similarly increasing (Hoffman et al. 1996). Epidemiologists have been particularly interested in the globalization and interconnections of diabetes, obesity, and common mental disorders, but these links have rarely been studied from a cross-cultural perspective. The relationship between chronic illnesses and poor mental health is likely at least partially socially consti-tuted, and undoubtedly has important sociocultural consequences. In this research report, we begin to address this gap in knowledge by reporting on preliminary data about the connections between type 2 diabetes, mental health, and normative social roles among middle- and upper-class women living in Delhi, India.

People with diabetes have a significantly higher prevalence of depression than their non-diabetic counterparts (Almawi et al. 2008; Anderson et al. 2001; Egede et al. 2002). In some

cases, depression is higher among people treated for diabetes than among those untreated (Golden et al. 2008), suggesting a depression-inducing effect of treatment. This comorbidity has serious consequences for health and wellbeing (Katon and Ciechanowski 2002) including increased risk of retinopathy and neuropathy (DeGroot et al. 2001), reduced adherence to treatment (Ciechanowski et al. 2000; Lerman et al. 2009), increased healthcare expenditure (Egede et al. 2002), lower perceived quality of life (Goldney et al. 2004), and higher mortality (Katon et al. 2005). In this brief report, we explore several non–mutually exclusive hypotheses that may account for the comorbidity of diabetes and depression.

India, and women in Delhi in particular, are excellent foci for studying the links between culture, diabetes, and depression. Women around the world experience higher levels of diabetes and depression than men (Desjarlais et al. 1996), but relatively little work has considered how women in India perceive health and illness (Kielmann 2002), particularly outside the context of reproductive health. Some research suggests that Indian diabetic women report lower quality of life and fewer coping abilities than diabetic men (Madhu and Sridhar 2001). A recent population-based study in India has documented levels of depression around 15 percent (Poongothai et al. 2009), comparable to levels in countries such as Brazil, the Netherlands, and the UK, and slightly above the global average of about 10 percent (WHO 2001). The current prevalence of type 2 diabetes in India hovers around 13 percent (Ramachandran et al. 2001) and is expected to increase dramatically by 2025 (International Diabetes Federation 2003). Complicating the health picture for Indian women is what one physician in our study referred to as a "widespread ethos of quiet suffering": women frequently conceal symptoms of ill health to avoid generating concern or incurring expenses, delaying treatment until serious complications arise (Basu 1990; Conrad and Pacquiao 2005). This pattern is shaped by gender-based inequalities and beliefs about appropriate timing and methods of care seeking (Amin and Bentley 2002).

There are several explanations for the comorbidity between diabetes and depression among Indian women. Here, we explore two nonexclusive possibilities. First, one possibility with significant support in the literature is that this comorbidity may be primarily biological, rather than social. The blood sugar fluctuations and endocrine and metabolic changes associated with diabetes affect mood and mental state, which can either instigate depression or exacerbate existing depression (Bjorntorp et al. 1999; Lustman and Clouse 2007; Talbot and Nouwen 2000).

Second, depression and diabetes may co-occur at least in part because of stress resulting from the intensive self-care required for effective diabetes management (Talbot and Nouwen 2000). This novel hypothesis assumes a tension between diabetes-controlling behaviors (such as changing one's diet, exercising, monitoring blood glucose, taking medicines on schedule), and normative behaviors related to age, class, and gender for Indian women. This tension is evident in Shifalkia's epigraph above. Cultural models of appropriate gendered behavior might include crucial household management tasks such as food preparation and childcare, which are considered women's work in North India's patriarchal societies (Derne 1995; Donner 2008; Harlan and Courtright 1995; Mandelbaum 1988;

Menon and Shweder 1998; Seymour 1999; Standing 1991; Wadley 2008). Pereira and colleagues (2007) report that family-related stresses are a key feature of depressed Indian women's explanatory models of depression, and one woman in their study talked specifically of household *tension* (using the English word in a Hindi sentence) as a cause of her depression.

The use of the English word *tension* to describe generalized stress is common in India (Halliburton 2005; Pereira et al. 2007), and frequently came up in our conversations with diabetic women. "Tension" has been recognized as a "tangible domain of illness for women [in India]" (Kielmann and Bentley 2003), but its meaning has rarely been explored. Several researchers have highlighted the importance of identifying idioms of distress and developing culturally specific mental health assessments (Patel et al. 2001; Pike and Williams 2006). Because mental health concerns are stigmatized in India (Desjarlais et al. 1996; Raguram et al. 1996), and because an equivalent Hindi term *(tanav)* exists but is rarely if ever used, we suspect that *tension* may be an idiom for depression or anxiety (Halliburton 2005). As part of this preliminary investigation, we explore how "tension" relates to women's mental health and experiences of diabetes.

The two possibilities described above predict different relationships between physical symptoms of diabetes, role failure, and depression, yet they may both be relevant to women's lived experiences of health and illness in this specific cultural context. Below, we explore these relationships through an analysis of the relative impact on mental health of physical symptoms of diabetes as opposed to women's difficulties in gender-specific social roles and responsibilities. Although our primary interest is in depression, we also assess anxiety symptoms because we wish to explore whether "tension" is more similar to anxiety or depression.

Methods

Recruitment

Diabetic and nondiabetic women were recruited in 14 private clinics throughout Delhi. We chose this method because of our interest in urban middle and upper socioeconomic strata, the fastest-growing sectors of India's population and those currently most vulnerable to chronic diseases (Griffiths and Bentley 2001; Sridharan 2004). We did not directly assess income because women resisted discussing their finances during one-time meetings, but private clinics' fees are generally prohibitive for lower socioeconomic groups in India (Bhat 1993). On random days, the researchers visited each clinic and interviewed consenting patients as they waited to see the physician. Interviews were conducted in Hindi, or, if participants preferred, in English. All interview materials were translated into Hindi and back-translated into English. The interviews were conducted with a local assistant and took about one hour. All participants gave informed consent, and no identifying information was retained in the data. These study procedures were preapproved by the Internal Review Board of Emory University.

Phase 1: Freelisting and Generation of Questionnaires for Semistructured Interviews

We conducted semistructured interviews with 62 diabetic and nondiabetic women (n = 37 diabetic) using freelisting techniques (Borgatti 1999) to collect baseline information about important women's roles and perceptions of diabetes and "tension." Freelisting involves asking open-ended questions and requesting that respondents state as many answers as they can think of.

In the first freelist, we sought to identify locally salient gender-specific roles and responsibilities so that we could later assess whether diabetes impinges on these activities. We relied on freelisting to learn about women's roles and responsibilities, rather than on direct observation or on the substantial anthropological literature on daily life in South Asia (cf. Derne 1995; Donner 2008; Harlan and Courtright 1995; Mandelbaum 1988; Menon and Shweder 1998; Seymour 1999; Standing 1991; Wadley 2008) because of time constraints and because of our interest in a locally derived list of tasks and roles pertaining specifically to women in the same population as the women with diabetes participating in this study. Because diabetic women may not be engaging in some normative activities due to illness, we interviewed both diabetic and nondiabetic women about tasks that women like themselves should perform to care for themselves, their families, and their communities (Bolton and Tang 2002). Secondly, we were interested in women's perceptions regarding symptoms of diabetes (are they conceived of in entirely physical terms, or are affective symptoms also a part of women's perceptions?). We asked both diabetic and nondiabetic women in the second freelist to name all the symptoms of diabetes that they knew. Thirdly, we asked women to name as many synonyms or symptoms of "tension" as they could. We interviewed both diabetic and nondiabetic women to capture a general (nondiabetes-specific) conception of "tension." We also collected basic demographic information.

Results of the freelist interviews were handled as follows: Items mentioned by more than two (or in the case of the daily activities freelist, three) out of the total 62 women were retained for further study. From these frequently mentioned items in the three freelist exercises, we created three checklists about daily function, diabetes symptoms, and "tension." For instance, 11 of the 62 women mentioned *anger* as a synonym for *tension*. We converted "anger" into an item in the "tension" checklist by adding "feeling angry" under the question "Since getting diabetes, do you feel any of the following mood-related items more, less, or the same as before?" with the response categories "much more," "somewhat more," "no change," or "n/a or no answer." Additional items in this checklist were derived from other synonyms of *tension* nominated by multiple women, such as "feeling troubled" and "feeling weak or tired." Similarly, the daily function items were aggregated under the heading, "Below is a list of tasks that women do regularly. Since getting diabetes, have you had a lot more trouble, some more, or no more trouble doing these tasks?" Finally, we created an inventory for physical diabetes symptoms under the heading, "Which of the following physical problems have you experienced due to diabetes?" We included here only symptoms mentioned by women (rather than using a standard medical interview) because we were interested in learning how women's experiences of diabetes map onto others' expectations of the

symptoms one would have, and because women's lists of symptoms closely resembled a standard clinical interview.

Phase 2: Creating and Administering a Locally Relevant Questionnaire from Freelist Data

The three freelist-derived checklists comprised part of a questionnaire about women's experiences with diabetes, difficulties with gender-specific social roles and responsibilities, and "tension." We also included in this questionnaire a Hindi-translated version of the Hopkins Symptoms Checklist-25 (Mollica et al. 2004). The first 10 questions of the HSCL assess anxiety; the latter 15 questions assess depression. The purpose of including a standard mental health assessment was to compare whether diabetic women who perceived more "tension" in their lives also reported more symptoms of depression or anxiety. In this questionnaire we also collected demographic information.

We administered the questionnaire to a novel sample of 33 diabetic women. We created simple summary scores for number and severity of diabetes symptoms each woman reported, number of tasks with which women reported difficulty, and number of "tension" symptoms. HSCL scores were summed and divided by 25 to obtain an overall depression–anxiety score. HSCL items 1–10 were summed and divided by 10 to obtain an anxiety score, and items 11–25 were summed and divided by 15 to obtain a depression score. In all three measures (aggregate depression–anxiety, anxiety, and depression), scores of 1.75 or above were considered symptomatic. These are standard cutoffs for the HSCL (Mollica et al. 2004), and indicate the average severity of each symptom on a Likert scale ranging from zero (not at all) to three (severe). Because there are no standardized cutoffs for our "tension" scale, we divided the respondents' "tension" scores into three groups to represent low, medium, and high numbers of symptoms. Individuals with "tension" scores in the highest tertile were considered to have high scores compared to the others.

Qualitative Data Collection

We did not systematically collect qualitative data. However, during freelist and questionnaire interviews, women often instigated side discussions or made comments about particular items. We took field notes on these comments whenever possible; this is the source of all qualitative data presented below.

Overview of Quantitative Analysis

First, we performed univariate analyses to characterize the demographics of the first-phase (freelist) and second-phase (questionnaire) samples. For the second-phase data, we assessed measures of internal validity (using Cronbach's alpha and a factor analysis) to establish the reliability of the HSCL and the "tension" checklists. We examined correlations among mental health variables and our predictor variables of interest, diabetes symptoms, and difficulties in role function. Finally, we performed four simple linear regressions to examine

the relative effects of symptoms and difficulties in gender-specific social roles and responsibilities on mental health outcomes. These tests were designed to address the main research question regarding the relative influence of social difficulties and biological symptoms on diabetic women's mental health status. Each test included two independent variables, symptoms of diabetes and difficulties in gender-specific social roles and responsibilities, and an outcome variable, one of the four measures of mental health. We contextualized these results with women's qualitative comments. Data for these analyses were managed using Microsoft Excel, and statistical analyses were performed using SAS (ver. 9.2).

Results

Phase 1: Semistructured Freelist Interviews

Sample characteristics. The freelist sample contained 37 diabetic and 25 nondiabetic women, for a total of 62 women. The average age of these 62 women was 52 years. They had been married an average of 27 years (seven were widowed) and had a mean 2.5 children ever born. Thirteen percent had no formal education, eight percent held a high school diploma, and 52 percent held a BA degree or above. Sixteen percent were employed outside the home. Forty-one percent lived in joint families, and 82 percent self-identified as Hindu, with the remaining 18 percent Sikh, Jain, Christian, Muslim, and agnostic. The average duration of diabetes among the 37 diabetic women in this sample was 10 years.

Women's daily tasks freelists. In freelists about tasks that a woman should do daily to care for herself, her family, and her community, 26 items were mentioned by at least three women out of the 62 (see Table 1). We chose a cutoff of three for this domain (rather than two, used in the other domains) because the results required significant reduction to be manageable. Women often found the question "What should a woman do every day to care for herself?" difficult to answer. One woman stated, "The thought never occurred to me." Others similarly said, "I don't have time to think of myself, God does that," "Responsibilities to myself? I don't think much about myself," "We must always put our families first." No one hesitated, however, to state what a woman should do to care for family members: women enumerated household duties (such as preparing food for the family, doing daily *pooja* [meditation–prayer], helping children with homework, overseeing servants); they noted the importance of maintaining good relations with the neighbors; and—despite some hesitation—of taking care of oneself (exercising, eating healthily). However, self-care activities were not always classified by respondents as such, but were sometimes included under the category of family care instead. Overall, the three most frequently mentioned items were getting up early (mentioned by 59 women), making food for the family (47), and daily exercise (41).

Symptoms of type 2 diabetes freelist. We asked both diabetic and nondiabetic women to name the symptoms of type 2 diabetes, and 21 items were endorsed by two or more women. The top three items were pain in extremities (mentioned by 25 women), body weakness (24), and

TABLE 1. Results of Important Daily Tasks Freelist and Number of Times Independently

Activity	Frequency
Getting up early	59
Making food for family and providing balanced diet	47
Walking or other exercise, like yoga	41
Looking after children or grandchildren (like spending time with them, helping them study)	40
Meeting and chatting with the neighbors, helping neighbors	36
Cleaning the house and the area outside it	33
Taking care of your diet, health, and weight	32
Watching TV or movies at home (TV dekhna)	30
Taking rest during the day	25
Making time for yourself (pursuing hobbies, reading a newspaper or book, going to the beauty parlor, etc.)	24
Doing pooja or meditation	20
Freshening up or bathing	19
Staying happy, avoiding tension or family conflict	17
Going out for dinner, functions/celebrations, films, etc. with friends and family	10
Laundry	9
Supervising servants	9
Talking to friends or family on the phone	8
Taking care and spending time with husband	8
Running errands (like buying things for the house)	7
Participating in a social or charity group	7
Working in a job outside the home	5
Stitching/mending work	5
Going to temple, church, or religious events	3
Taking care of sick family members, taking them to the doctor	3
Entertaining guests	3

Note. Roles and responsibilities volunteered by diabetic (n = 37) and non-diabetic (n = 25) women in a freelist exercise about important tasks that women like themselves should do daily to care for themselves, their families, and their communities (Bolton and Tang 2002), arranged by frequency of times each item was mentioned.

frequent urination (19). Two women specifically mentioned mental health problems as an outcome of type 2 diabetes, and several more mentioned diabetes as a source of mental strain, change in one's outlook on life, or lack of wellbeing, but most symptoms mentioned in this freelist were physical. In general, they reflected a biomedical understanding of diabetes.

"Tension" freelist. This freelist explored what women mean when they talk about "tension." Twenty items were mentioned independently by at least two women out of the total of 62. These items cluster into three categories: affective symptoms (such as anger, feeling irritated or hopeless), behavioral symptoms (being violent toward others, crying, being restless), and physical symptoms (weakness, upset stomach, headaches, and sleeplessness). The most endorsed items were anger (mentioned by 11 women), "thinking too much" (10), and feeling

generally troubled (eight). Some diabetic women associated their diabetes with "tension" directly. For instance, one woman explained: "After my husband died I had a lot of tension, and this is when I fell ill." Another stated, "I have tension because I have diabetes and it's not getting better." Eleven items were very similar between the Hopkins Symptoms Checklist and the "tension" assessment, and a majority (eight out of 11) of these similarities fall within HSCL items 11–25 that measure depression (see Table 2). This suggests that the construct of "tension" in this cultural context resembles depression more closely than anxiety.

Phase 2: Questionnaire Results

Sample characteristics and univariate analyses. This analysis focuses on a separate sample of 33 type 2 diabetic women with whom we administered the questionnaire (see Table 3). Their average age was 55 years. More than half of the women did not complete secondary school, but 33 percent held a BA degree or above. Eighty-eight percent identified as Hindu, with the remaining 12 percent Muslim. Women had been married for an average of 33 years,

TABLE 2. Comparison of Items in the Hopkins Symptoms Checklist-25 and the 20-Item Locally Derived "Tension" Scale Developed in this Study

Hopkins Symptoms Checklist	"Tension" assessment checklist
1. Suddenly scared for no reason	Feeling angry
2. Feeling fearful	Feeling troubled or upset
3. Faintness, dizziness or weakness	Frequent mood swings
4. Nervousness or shakiness inside	Feeling disappointed due to unmet expectations
5. Heart pounding or racing	Being irritable
6. Trembling	Feeling oversensitive
7. Feeling tense or keyed up[†]	Feeling stressed out, tense[†]
8. Headaches[†]	Headaches/migraines[†]
9. Spell of terror or panic	Feeling like hitting someone or becoming physically violent
10. Feeling restless or can't sit still[†]	Feeling restless[†]
11. Feeling low in energy, slowed down[†]	Feeling weak or tired out[†]
12. Blaming yourself for things[†]	Blaming others or taking out anger on them[†]
13. Crying easily[†]	Crying[†]
14. Loss of sexual interest or pleasure	Stomach pain, gas, or digestive problems
15. Poor appetite[†]	Loss of appetite[†]
16. Difficulty falling asleep, staying asleep[†]	Problems sleeping[†]
17. Feeling hopeless about future[†]	Feeling hopeless[†]
18. Feeling blue[†]	Feeling bad for no particular reason[†]
19. Feeling lonely	Negative thinking
20. Thought of ending your life	
21. Feeling of being trapped or caught	
22. Worry too much about things	
23. Feeling no interest in things[†]	Not feeling like doing anything at all[†]
24. Feeling everything is an effort	
25. Feeling of worthlessness	

[†]Similar items are arranged adjacent to each other.

TABLE 3. Selected Sample Characteristics of Diabetic Women in the Second Phase of the Project (n = 33)

Characteristic		
Age (avg)	55	Range 39–79
Education		
% less than HS	58.6	
% BA or above	33.3	
Married (yrs)	31	0–60
# children	3	0–8
Diabetes duration (yrs)	12	0–30
Symptoms of diabetes avg	14	0–26
Role difficulty score avg	5	0–46
HSCL		
% symptomatic	36.4	
HSCL anxiety		
% symptomatic	21.1	
HSCL depression		
% symptomatic	24.2	
Tension score		
% in highest tertile	39.4	

although five were widowed, and had a mean three children ever born. On average, the participants had been coping with diabetes for 12 years. On a scale measuring difficulty in gender-specific roles and responsibilities and ranging from 0 to 46, women reported an average of five, indicating low role impairment. They reported an average of 14 symptoms of diabetes on a scale ranging from 0 to 26.

Many of these diabetic women reported high frequency of symptoms of depression, anxiety, and "tension." Twelve of the 33 women (36.4 percent) had cumulative HSCL scores indicating depression—anxiety based on standard cutoff criteria (Mollica et al. 2004). When these were broken down into separate anxiety and depression components, 15 (45.5 percent) women were symptomatic of either depression (n = 8, 24.2 percent) or anxiety (n = 7, 21.2 percent). The average score on the "tension" assessment was 14 on a scale ranging from 0 to 40.

The HSCL and "tension" scales had excellent internal validity; the standard cutoff for validity using a Cronbach's alpha statistic is 0.70 or above (Nunnally and Bernstein 1994) indicating high internal consistency among individuals' responses to each item in the scale. The HSCL had a Cronbach's alpha of 0.92, and the "tension" scale had 0.93. The anxiety component of the HSCL (questions 1–10) had a Cronbach's alpha of 0.81, and the depression component (questions 11–25) had 0.89. A factor analysis revealed one dominant factor in the "tension" scale, explaining 40 percent of the variance, and two dominant factors in the HSCL, explaining 31 and 15 percent of the variance. This suggests that the "tension" scale assesses one major underlying construct, while the HSCL measures two (in this case, likely depression and anxiety). A correlation analysis between the two HSCL factors and the

"tension" summary scores for each individual revealed that factor two of the HSCL was significantly correlated with "tension," but factor one was not. Furthermore, analysis of the two HSCL factors suggests that factor two most closely resembles depression, based on an examination of the loadings on different HSCL questions. This implies that the items in the "tension" scale measure somewhat similar information as the items in the depression assessment portion of the HSCL, echoing the finding already illustrated in Table 2 that "tension" more closely resembles clinical depression than anxiety.

Bivariate and multivariate analyses. Cumulative HSCL and "tension" scores were moderately correlated ($r = 0.56$, $p < .01$). There was moderate agreement between the two scales: approximately 27 percent of women scored high (≥ 1.75 for HSCL and 16 for "tension" scale) on both scales, 52 percent scored low on both, and only 12 percent scored low on the HSCL but high on "tension."

Women's scores on difficulties in gender-specific roles and responsibilities and diabetes symptoms were strongly and positively correlated ($r = 0.76$; $p < .01$). Total HSCL was also correlated with difficulties in gender-specific roles and responsibilities ($r = 0.63$; $p = .0002$) and diabetes symptoms ($r = 0.70$; $p < .0001$). "Tension" was correlated with difficulties in gender-specific roles and responsibilities ($r = 0.68$; $p < .0001$) and diabetes symptoms ($r = 0.71$; $p < .0001$). Correlations with difficulties in gender-specific roles and responsibilities and diabetes symptoms remained significant when HSCL was disaggregated into anxiety and depression components.

To compare the relative influence of diabetes symptoms and difficulty in gender-specific roles and responsibilities on depression and anxiety, we used simple linear regressions (see Table 3) on a subset of 29 diabetic women with complete data for the variables of interest. We tested whether (1) difficulties in gender-specific roles and responsibilities, or (2) physical symptoms of diabetes better explained scores on the depression, anxiety, and "tension" scales among diabetic women. The small sample size limits the scope of our analyses; each regression contains only the two predictor variables and one of four mental health outcomes. Our goal was to discern trends that may serve as a foundation for future research and hypothesis testing. This comparison is intended to represent the two pathways laid out in the introduction: that difficulties in achieving social roles may significantly influence the link between diabetes and poor mental health, and that symptoms of diabetes may impact this link.

In the first exercise, none of the covariates were statistically significant predictors of a higher total HSCL score (see Table 4). When we disaggregated the depression and anxiety components of the HSCL, some significant relationships emerged. In Exercise 2, symptoms of diabetes predicted higher anxiety ($\beta = 0.02$, $p = .037$). In Exercise 3, difficulties in gender-specific social roles and responsibilities predicted higher depression ($\beta = 0.08$, $p = .039$). Finally, in Exercise 4, symptoms of diabetes were a significant predictor of higher "tension" ($\beta = 0.76$, $p = .079$; $\beta = 0.24$, $p = .031$).

TABLE 4. Simple Linear Regressions Using Each Mental Health Measure as an Outcome Variable

Model	Outcome	Role Difficulty β	Symptoms of diabetes β
1	HSCL total	0.657	0.384
2	HSCL Anxiety	0.030	0.016**
3	HSCL Depression	0.080**	0.002
4	Tension	0.760*	0.550**

** = significant at $\alpha = 0.05$,

* = significant at $\alpha = 0.1$

Discussion

Our results contribute important information about women's health and their health-related perspectives in this North Indian context, and suggest directions for future research. Both symptoms of diabetes and difficulties achieving gender-specific social roles are associated with poorer mental health among our sample of diabetic women in New Delhi, but differently so: greater physical symptoms predict higher anxiety and "tension," whereas greater role difficulties (even when relatively minimal) predict higher depression. These findings broadly resemble the results of studies on diabetes, physical function, and mental health among Western adults, which have found that both diabetes and reduced physical function are associated with poorer mental health (Anderson et al. 2001; Egede et al. 2002; Tomey et al. 2010). Further research is needed in this context to clarify the varied relationships between depression, anxiety, "tension," and women's physical and social experiences of type 2 diabetes.

A comparison of the phase-1 freelist exercises and the phase-2 questionnaire data reveal similarities and differences between women's perceptions and actual experiences of gendered social roles, diabetes symptoms, and "tension." For instance, the freelist results suggest that women's roles should consist largely of household management, childcare, and food preparation; such results are consistent with previous anthropological findings that indicate a culturally pervasive understanding of domestic tasks as women's purview in North India (Derne 1995; Donner 2008; Harlan and Courtright 1995; Mandelbaum 1988; Menon and Shweder 1998; Seymour 1999; Standing 1991; Wadley 2008). However, these roles do not preclude women from acting agentively and purposefully (Menon and Shweder 1998). Indeed, many women in our study reported that they try to exercise and eat healthfully, thereby actualizing some degree of self-care. Many hesitated to answer the question about what one should do to care for oneself, suggesting that in this context self-care is less emphasized than family care or community care. This result may be a product of the often-remarked-on cultural value placed in North India on interdependence of individuals and family members for care (Cohen 2000; Markus and Kitayama 1991; Marriott and Inden 1977; Ramanujan 1989; Vatuk 1995; Wadley 2008). Such conceptions of interpersonal selfhood and outward-directed agency may help to explain why some women hesitated to answer questions about self-care, instead subsuming activities such as exercise and healthful

eating under family care. From a more pragmatic standpoint, diabetes campaigns centered on diet and activity could gain traction in this community, where, if our results are substantiated, there appears to be an awareness of these factors for health. It is not clear how this apparent de-emphasis on self-care may impact women's management of diabetes, but the frequency with which women hesitated to discuss self-care suggests that it is not a common mode of expression.

The freelists also showed that diabetic and nondiabetic women perceived type 2 diabetes as a primarily physical condition; however, several diabetic women from the second phase reported mental health symptoms as part of their experience. This suggests a mismatch between perceptions and experiences of the disease, which could complicate recognition of poor mental health among diabetic women.

The referents of the English term *tension* as described by the women in the freelists resemble clinical depression more closely than clinically significant levels of anxiety, but it is by no means clear that *tension* directly expresses depression. For instance, the question of duration remains (i.e., does *tension* refer to a passing feeling or a more long-term state?). Similar nonspecific categories such as "nerves" have been noted in U.S. populations (Dahlberg et al. 2009); a cross-cultural comparison that considers "tension" not as an expression for a psychiatric condition but as a distinct category could be a fruitful future direction and is, in any case, an important step toward generating a locally derived understanding of mental health and illness.

Diabetic women generally reported little difficulty achieving normative roles because of diabetes, and moderate levels of physical symptoms. Although we did not have access to medical records, this suggests that women may be managing their diabetes effectively. Alternatively, they may be underreporting symptoms because of the culturally pervasive belief that women should avoid complaining (Basu 1990; Conrad and Pacquiao 2005).

We have proposed a novel hypothesis that links cultural roles, diabetes treatment, and mental health. Because this study was cross sectional, we could not make any conclusions about the direction of these associations; rather, our goal was to characterize these relationships at one point in time. Future investigations should explore the anxiety- and "tension-inducing" potential of physical symptoms in comparison to the depression-inducing potential of role impairment in a longitudinal manner, and explore the extent to which diabetes care conflicts with gendered roles and responsibilities. Our hypothesis, based on this preliminary study, suggests that in contexts where there is little conflict between diabetes care and roles, the link between diabetes and depression should be attenuated.

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