Stress Burden and Diabetes in Two American Indian Reservation Communities

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Received for publication 23 October 2007 and accepted in revised form 30 November 2007.

Additional information for this article can be found in an online appendix at http://care.diabetesjournals.org.

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ABSTRACT

Objective: To examine the association between psychosocial stress and diabetes in two American Indian reservation communities (Northern Plains and Southwest).

Methods: The American Indian Services Utilization, Psychiatric Epidemiology, Risk and Protective Factors Project (AI-SUPERPFP), a cross-sectional probability sample survey, interviewed 3,084 randomly selected members of two American Indian tribal groups. Included were a psychiatric epidemiological interview, a physical health problems checklist, and an extensive sociodemographic section.

Results: Stress was common in these reservation communities, and the stress burden was greater among those with diabetes. After adjusting for sociodemographic characteristics, early-life interpersonal trauma and community family dysfunction were significantly associated with increased odds of diabetes in the Northern Plains, while discrimination and community addiction problems were significantly associated with increased odds of diabetes in the Southwest.

Conclusions: A number of psychosocial stresses were significantly associated with increased odds of self-reported diabetes in these two American Indian communities.
Diabetes is a serious health problem for American Indians (AIs) with a prevalence being, on average, 2-3 times greater than that of others in the U.S.\textsuperscript{1,2} A number of studies suggest that psychosocial stress plays an important role in the development of diabetes.\textsuperscript{3-8} Many AIs live in pervasively adverse social and physical environments that place them at high risk to stress exposure.\textsuperscript{9,10} To date, the association between stress burden and diabetes among AIs has remained unexplored; that deficit is addressed here in two AI reservation populations.

**METHODS**

The American Indian Service Utilization, Psychiatric Epidemiology, Risk and Protective Factors Project (AI-SUPERPFP) was a community-based epidemiological study. AI-SUPERPFP methods are described in detail elsewhere.\textsuperscript{11} Data were collected between 1997 and 1999 from members of Southwest (SW) and Northern Plains (NP) tribes. For confidentiality purposes, we use the general descriptors of NP and SW rather than specific tribal names. Eligibility for participation was restricted to noninstitutionalized enrolled tribal members who were 15-54 years old at the time of sampling in order to allow direct comparisons to the National Comorbidity Survey.\textsuperscript{12} Among those located and determined eligible, 76.8\% in the NP and 73.7\% in the SW agreed to participate (N=3,084; 1638 NP and 1446 SW); response rates were lowest for men and younger tribal members.

Variable construction was completed using SPSS\textsuperscript{13} and SAS.\textsuperscript{14} Self-reported diabetes status was assessed by the question: “Did a doctor, medicine man, or other health-care professional ever tell you that you had diabetes?” Stress burden was indexed in terms of early-life stress and chronic stress. Early-life stress involved participant reports of 25 specific adverse events that happened before age 18, grouped into 6 broad categories: separation from parents (e.g., parents seriously ill and unable to care for child), interpersonal trauma (e.g., sexual abuse), non-interpersonal trauma (e.g., life-threatening accident), witnessed violence (e.g., seeing others subjected to violence), traumatic news (e.g., suicide of someone close), and significant untimely deaths (e.g., sibling death). Chronic stress of an ongoing or enduring nature were measured by 30 items in 7 categories: expectations (e.g., taking on too many things at once), social life stress (e.g., avoiding social events), location hassles (e.g., noisy or polluted neighborhood), discrimination (e.g., having problems related to being Indian), community family dysfunction (e.g., broken homes perceived as a big problem), community addiction problems (e.g., substance use seen as a big problem), and community economic distress (e.g., not enough jobs). More information about stress variables may be found in online Appendix 1.

Inferential analyses were conducted in Stata\textsuperscript{15} using sample and non-response weights to account for differential selection probabilities and for non-response biases.\textsuperscript{16} Participants with unknown diabetes status were excluded from all analyses. Differences in group characteristics were examined by $\chi^2$ analyses or two sample t-tests. Multiple logistic regressions were used to examine the association between diabetes and the stress variable which showed significant unadjusted associations with diabetes, controlling for the following sociodemographic variables: gender, age, educational level, and employment status.

**RESULTS**

The overall weighted prevalence of diabetes was 8.8\% in the NP and 6.6\% in the SW. Unadjusted association between diabetes
and stress is summarized in online appendix 1 (available at http://care.diabetesjournals.org). Stress was common in these reservation communities; with the stress burden being greater among those with diabetes. Specifically, early-life interpersonal trauma and location hassles were significantly more common among NP diabetics than non-diabetics. In the SW, childhood neglect and discrimination experiences were more common among diabetics than non-diabetics. In both tribes, respondents with diabetes reported significantly higher levels of all 3 community stresses: family dysfunction, addiction problems, and economic distress.

In the multivariate models (Table 1), when adjusting for sociodemographic characteristics only, early-life interpersonal trauma and community family dysfunction were significantly associated with diabetes in the NP. However, in the model which adjusted for both sociodemographic characteristics and other stresses, only early-life interpersonal trauma remained significantly associated with diabetes. In the SW, higher level of perceived discrimination and higher level of community addiction problems were significantly associated with increased likelihood of diabetes in both adjusted models.

CONCLUSIONS

Our findings support and extend the current literature by providing evidence of an association between stress burden and increased odds of self-reported diabetes in two AI communities. The mechanism of the observed association is not known and cannot be determined from these data due to the cross-sectional design of this study. It has been proposed that psychological reaction to stress leads to the activation of the hypothalamopituitary-adrenal (HPA) axis, causing various endocrine perturbations, which leads to obesity and insulin resistance.4,5 Hence, it is possible that psychosocial stress causes diabetes via psychoendocrine pathways. On the other hand, it is also possible that having diabetes leads to higher levels of perceived psychosocial stress in one’s life. Future longitudinal studies with more information on diabetes onset and physiological markers represent important next steps in elucidating the mechanisms of the association between diabetes and stress evident in our findings.

Similar to several previous AI-SUPERPFP findings showing tribal differences,17-20 the association between stress and diabetes observed here varies by tribe, suggesting that additional factors moderating the relationship between stress and diabetes likely differ across these tribes. Though this study was not designed to explain the source or nature of these differences, our findings emphasize the variability in the characteristics and functioning of AI tribes. Limitations of this study include lack of information on the relative onset of diabetes and stress, precluding assessment of temporal precedence and inference of causality. Additionally, diagnoses of diabetes were by self-report only and no information on the type or severity of the illness was obtained. Finally, given the limited age range of this study (15-54), further studies on this topic are needed regarding older populations. Despite these limitations, this study adds to the sparse literature on stress and diabetes in ethnic minorities and provides preliminary evidence for a significant association between diabetes and a wide spectrum of psychosocial stresses in AI tribal populations; these findings can inform the design of more effective interventions for diabetes prevention and treatment in this special population.

ACKNOWLEDGEMENTS

The study was supported by the following NIH grants: R01 MH48174 (SM Manson and J Beals, PIs), P01 MH42473 (SM Manson, PI). Manuscript preparation was supported by
AI-SUPERPFP would not have been possible without the significant contributions of many people. The following interviewers, computer/data management and administrative staff supplied energy and enthusiasm for an often difficult job: Anna E. Barón, Antonita Begay, Amelia T. Begay, Cathy A.E. Bell, Phyllis Brewer, Nelson Chee, Mary Cook, Helen J. Curley, Mary C. Davenport, Rhonda Wiegman Dick, Marvine D. Douville, Pearl Dull Knife, Geneva Emhoolah, Fay Flame, Roslyn Green, Billie K. Greene, Jack Herman, Tamara Holmes, Shelly Hubing, Cameron R. Joe, Louise F. Joe, Cheryl L. Martin, Jeff Miller, Robert H. Moran Jr., Natalie K. Murphy, Melissa Nixon, Ralph L. Roanhorse, Margo Schwab, Jennifer Settlemiire, Donna M. Shangreaux, Matilda J. Shorty, Selena S. S. Simmons, Wileen Smith, Tina Standing Soldier, Jennifer Truel, Lori Trullinger, Arnold Tsinajinnie, Jennifer M. Warren, Intriga Wounded Head, Theresa (Dawn) Wright, Jenny J. Yazzie, and Sheila A. Young. We would also like to acknowledge the contributions of the Methods Advisory Group: Margarita Alegria, Evelyn J. Bromet, Dedra Buchwald, Peter Guarnaccia, Steven G. Heeringa, Ronald Kessler, R. Jay Turner, and William A. Vega. Finally, we thank the tribal members who so generously answered all the questions asked of them.
REFERENCES

15. Stata Statistical Software [computer program]. College Station, TX: Stata Corporation; 2003.
TABLE 1. Adjusted Association between Diabetes and Stress Burden†

<table>
<thead>
<tr>
<th></th>
<th>NP (^a) (95% CI)</th>
<th>NP (^b) (95% CI)</th>
<th>SW (^a) (95% CI)</th>
<th>SW (^b) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early-Life Stress</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separation from parents</td>
<td>1.08 (0.72, 1.62)</td>
<td>0.98 (0.63, 1.51)</td>
<td>1.42 (0.90, 2.25)</td>
<td>1.42 (0.90, 2.24)</td>
</tr>
<tr>
<td>Interpersonal trauma</td>
<td>1.70 (1.06, 2.71)*</td>
<td>1.67 (1.01, 2.77)*</td>
<td>1.16 (0.63, 2.14)</td>
<td>0.95 (0.52, 1.75)</td>
</tr>
<tr>
<td>Chronic Stress</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location hassles</td>
<td>1.36 (0.89, 2.06)</td>
<td>1.20 (0.73, 1.96)</td>
<td>1.00 (0.55, 1.84)</td>
<td>0.75 (0.41, 1.38)</td>
</tr>
<tr>
<td>Discrimination</td>
<td>1.14 (0.65, 2.01)</td>
<td>0.78 (0.39, 1.59)</td>
<td>2.74 (1.52, 4.96)***</td>
<td>2.76 (1.49, 5.11)***</td>
</tr>
<tr>
<td>Community family dysfunction</td>
<td>1.34 (1.00, 1.79)*</td>
<td>1.19 (0.77, 1.85)</td>
<td>1.22 (0.87, 1.71)</td>
<td>0.78 (0.47, 1.30)</td>
</tr>
<tr>
<td>Community addiction problem</td>
<td>1.34 (0.99, 1.81)</td>
<td>1.15 (0.75, 1.77)</td>
<td>1.56 (1.10, 2.20)*</td>
<td>1.91 (1.10, 3.30)*</td>
</tr>
<tr>
<td>Community economic distress</td>
<td>1.25 (0.85, 1.83)</td>
<td>0.93 (0.60, 1.45)</td>
<td>1.20 (0.82, 1.76)</td>
<td>0.90 (0.55, 1.47)</td>
</tr>
</tbody>
</table>

† Only include stressors which showed a significant unadjusted relationship with diabetes in NP or SW

\(^a\) Controlling for gender, age, education, and employment status.

\(^b\) Controlling for gender, age, education, employment status, and other stress variables.

* \(p < 0.05\), ** \(p < 0.01\), *** \(p < 0.001\)