


Diabetes Distress and Associated Factors Among Chinese Americans with Type 2 Diabetes in New York City

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Purpose: The purpose of this study is to describe diabetes distress and related factors among Chinese Americans with type 2 diabetes in New York City (NYC).

Methods: We conducted a secondary data analysis of the baseline data from three research studies conducted among community-dwelling Chinese American adults with type 2 diabetes. Diabetes Distress Scale (DDS) was used to measure sources of diabetes distress including emotional-, regimen-, interpersonal-, and physician-related distress. A score of 2 or greater indicates moderate diabetes distress or higher. Patient Health Questionnaire-2 (PHQ-2) was used to measure depressive symptoms. Participants' socio-demographic information was also collected. Descriptive statistics were used to describe diabetes distress, and logistic least absolute shrinkage and selection operator (LASSO) regression was used to examine factors associated with diabetes distress level.

Results: Data from 178 participants (mean age 63.55±13.56 years) were analyzed. Most participants were married (76.40%), had a high school degree or less (65.73%), had a household annual income < \$25,000 (70.25%), and reported limited English proficiency (93.22%). About 25.84% reported moderate or higher overall distress. The most common sources of distress were emotional burden (29.78%), followed by regimen- (28.65%), interpersonal- (18.54%), and physician-related distress (14.04%). Participants who were younger, female, limited English proficient, and had elevated depressive symptoms were more likely to have higher diabetes distress.

Conclusion: Diabetes distress is prevalent among Chinese immigrants with type 2 diabetes, especially emotional- and regimen-related distress. Given the known link between diabetes distress and poor glycemic control, it is critical to screen for diabetes distress at primary care clinics and incorporate psychological counseling in diabetes care in this underserved population.

Keywords: Chinese Americans, immigrant health, ethnic minority, diabetes distress, psychological burden, mental health, stress, emotional distress

In the United States, Asian American is the fastest-growing minority group, and Chinese American is the largest Asian subgroup.¹ According to a 2022 report, 33.8% and 13.3% of Chinese Americans aged 45–64 have prediabetes and type 2 diabetes, respectively.² A significant portion of Chinese Americans are low-income, foreign-born immigrants with limited English proficiency.³ Aside from diabetes per se, social determinants of health factors such as socioeconomic disadvantages, language barriers, limited health literacy, and cultural differences contributed to poor diabetes self-management behaviors and led to suboptimal diabetes control in this underserved population.^{4,5}

While improving diabetes control is the central goal of diabetes care, healthcare providers and researchers have begun to realize that screening and care for psychological distress in patients with diabetes are of vital importance. Patients with diabetes experience stress due to the demands of diabetes management, fears about care guidelines not being closely followed, worries that healthcare providers are not taking them seriously, and frustrations over how others do not understand their

difficulties.⁶ Importantly, elevated level of diabetes distress impedes self-care behaviors, such as diet, physical activity, and medication adherence,⁷⁻⁹ which were linked to poor glycemic control. Evidence showed that the prevalence of diabetes distress among adults with type 2 diabetes can be as high as 79.5% in non-Hispanic whites (82% of the sample).¹⁰ Given the accumulating evidence demonstrating the important role of diabetes distress, the American Diabetes Association called for researchers and clinicians to screen for and develop treatment plans for patients with elevated diabetes distress. Therefore, understanding diabetes distress and its related factors is necessary to achieve optimal diabetes outcomes.

While the literature on diabetes distress is growing, limited data and research studies have been conducted in Chinese Americans with type 2 diabetes. Considering the high and unique burden this population faces, it is crucial to understand their distress to develop targeted interventions suitable for them. This study, therefore, aims to describe diabetes distress among Chinese Americans with type 2 diabetes living in NYC and to explore associated factors. By “Chinese Americans”, we refer to individuals of Chinese ethnicity, whether they were born in the US or elsewhere. Information regarding the prevalence and common sources of diabetes-related distress and associated factors can enhance healthcare providers’ awareness of this problem, better equipping them to identify at-risk individuals and treat them appropriately.

Materials and Methods

Study Design

We conducted a secondary data analysis on the baseline data derived from three small-scale research studies conducted at different times among Chinese Americans with type 2 diabetes living in NYC. The first study is a cross-sectional survey that investigated type 2 diabetes management behaviors and the current use of mobile health (mHealth) for diabetes management.¹¹ The other two studies are pilot randomized controlled trials that aimed to examine the potential efficacy of culturally-tailored and linguistically-adapted mHealth interventions on glycemic control in Chinese Americans with type 2 diabetes.^{12,13} Between 2018 and 2022, participants were recruited from several community centers in Chinatown areas in NYC using flyers, direct referrals from providers, and NYU Langone Health Electronic Medical Records. Participants’ diabetes distress, depressive symptoms, and demographic information were collected using standardized questionnaires and information intake sheets. The study materials were available in English, Mandarin, and Cantonese, and a bilingual community health worker administered surveys in the participant’s preferred language. The Institutional Review Board of the sponsored university approved the study protocols (protocols s17-01696, s18-00609, and s19-01275). All participants provided informed consent before study entry.

Participants

In general, to be eligible for the study, participants must: 1) self-identify as Chinese American, 2) be 18 years of age or older, 3) be able to speak and understand Mandarin (only apply to the two pilot randomized controlled trials), 4) self-report or have a medical diagnosis of type 2 diabetes, and 5) be currently living in the community (ie, not institutionalized) and self-managing type 2 diabetes at home. Those who were unable or unwilling to provide informed consent and who had gestational diabetes were excluded from the study. Additional details regarding the inclusion and exclusion criteria for each study have been reported elsewhere.^{11,14,15}

Measures

Diabetes Distress

Diabetes distress was assessed at baseline using the 17-item Diabetes Distress Scale (DDS).⁶ Using the 4 subscales in DDS, participants report distress experienced within the past month, including emotional distress, physician-related distress, regimen-related distress, and interpersonal distress. The items are scored on a 6-point Likert scale, ranging from 1 (not a problem) to 6 (a very serious problem), with a higher score reflecting greater diabetes distress. Item responses were averaged to generate a total score and subscale scores. A total score or subscale score ≥ 2 indicates a moderate or higher distress level and is considered clinically important.¹⁶ In this report, dummy variables of overall diabetes distress level and subscale distress levels were generated using this cutoff point to explore

diabetes distress-related factors. The total score and subscale scores were also reported. Cronbach's alpha coefficient was used to assess the internal consistency of the 17-item DDS. In the current sample of 178 observations, the Cronbach alpha value for the full DDS was 0.92, with subscales having Cronbach alpha values ranging from 0.77 to 0.85.

Depressive Symptoms

Depressive symptoms were measured using Patient Health Questionnaire-2 (PHQ-2).¹⁷ PHQ-2 is a 2-item scale that measures the frequency of depressive symptoms and is usually used for screening purposes. PHQ-2 scores range from 0 to 6, with higher scores indicative of greater severity. A score ≥ 2 has good sensitivity in detecting elevated depressive symptoms.¹⁸ The current study used a cutoff of 2 to distinguish people who experienced depressive symptoms more frequently from those who did not. In the current sample of 175 observations, the Cronbach alpha value of the PHQ-2 was 0.82, indicating good internal consistency.

Sociodemographic Characteristics

Age, gender, marital status, education, annual household income, employment status, duration of residence in the United States, and English proficiency were obtained using a baseline sociodemographic questionnaire.

Statistical Analysis

Descriptive statistics were conducted for all variables in the study. Mean (standard deviation) was reported for normally distributed continuous variables, median (IQR) was reported for the skewed continuous variables, and frequency (percentage) was reported for categorical variables. Considering the clinical relevance and distribution of the overall diabetes distress scores, diabetes distress was included in the further analysis as a binary variable, coded 0 representing normal or mild distress level, and 1 representing moderate or higher distress level. Logistic least absolute shrinkage and selection operator (LASSO) regression was used to select the most valuable factors related to diabetes distress. The LASSO penalty reduces the coefficient value toward zero, thus allowing the less contributing variables to have a zero coefficient and effectively perform feature selection. The analysis was conducted on complete data ($n = 172$). The following variables were included in the model: age, gender, marital status, education, employment status, duration of residence in the United States, English proficiency, and depressive symptoms. The penalty term lambda (λ) was selected by running ten-fold cross-validation 100 times. In our study, the lambda.min (ie, the value of λ that gives minimum mean cross-validated error) was 0.0227. All analyses were performed using R 4.2.1¹⁹ and logistic LASSO regression was conducted using package "glmnet" 4.1–6.²⁰

Results

Data from 178 Chinese immigrants with type 2 diabetes were included in this analysis. Table 1 shows the participants' characteristics. All of the participants (mean age 63.55 ± 13.56 years) were foreign-born, most were currently married (76.40%), had a high school education or less (65.73%), and had a household annual income $< \$25,000$ (70.25%). Despite having resided in the United States for an average of 19.10 ± 12.96 years, 93.22% of them reported limited English proficiency. Overall, 24.00% of participants experienced elevated depressive symptoms and 25.84% reported moderate or higher overall distress levels. As shown in Table 2, the most common sources of distress were emotional burden (29.78%), followed by regimen (28.65%), interpersonal (18.54%), and physician-related distress (14.04%).

Table 3 shows the coefficients of variables in LASSO regression at $\lambda = 0.0227$. The results identified age, gender, limited English proficiency, and depressive symptoms as being correlated with diabetes distress levels. Those who were younger (OR = 0.98), female (OR = 0.57), limited English proficiency (OR = 1.05), or had elevated depressive symptoms (OR = 5.58) had higher diabetes distress levels than older, male, English proficient participants with little or no depressive symptoms. Marital status, education, employment status, and duration of residence in the US were not significantly correlated.

Table 1 Demographic Characteristics, Depressive Symptoms, and Diabetes Distress

Characteristics		
Age in years, Mean (SD)	63.55	(13.56)
<45, n (%)	12	(6.74)
≥45 and < 65, n (%)	79	(44.38)
≥65, n (%)	87	(48.88)
Female, n (%)	92	(51.69)
Currently married, n (%)	136	(76.40)
Education, n (%)		
Less than high school	65	(36.52)
High school graduate	52	(29.21)
More than high school	61	(34.27)
Annual income, n (%)		
<US \$25,000	111	(70.25)
≥ US \$25,000	47	(29.75)
Declined to answer or do not know	20	(11.49)
Employment status, n (%)		
Employed	75	(42.13)
Not employed, not working	27	(15.17)
Retired	76	(42.70)
Foreign born, n (%)	178	(100.00)
Duration of residence in years, Mean (SD) ^a	19.10	(12.96)
Limited English proficiency, n (%) ^a	165	(93.22)
Experienced depressive symptoms frequently, n (%) ^a	42	(24.00)
Overall distress score, Median (IQR)	1.41	(1.12–2.06)
Moderate or higher overall distress level, n (%)	46	(25.84)

Notes: The total sample size in the study is 178. ^aThere were missing values for duration of residence, English proficiency, and depressive symptoms. The sample size for these variables was 176, 177, and 175, respectively. There is no missing data for other variables.

Table 2 Diabetes Distress Subscale Scores and Distress Levels by Distress Sources

Distress Source	DDS Score, Median (IQR)	Moderate or Higher Distress Level, n (%)	DDS Item	Item Score
Emotional distress	1.40 (1.00–2.55)	53 (29.78)	Feeling that diabetes is taking up too much of my mental and physical energy every day.	2.18
			Feeling angry, scared, and/or depressed when I think about living with diabetes.	1.83
			Feeling that diabetes controls my life.	2.09
			Feeling that I will end up with serious long-term complications, no matter what I do.	2.05
Physician distress	1.00 (1.00–1.50)	25 (14.04)	Feeling overwhelmed by the demands of living with diabetes.	1.56
			Feeling that my doctor does not know enough about diabetes and diabetes care.	1.43
			Feeling that my doctor does not give me clear enough directions on how to manage my diabetes.	1.46
			Feeling that my doctor does not take my concerns seriously enough.	1.38
			Feeling that I do not have a doctor who I can see regularly enough about my diabetes.	1.38

(Continued)

Table 2 (Continued).

Distress Source	DDS Score, Median (IQR)	Moderate or Higher Distress Level, n (%)	DDS Item	Item Score
Regimen distress	1.60 (1.00–2.20)	51 (28.65)	Feeling that I am not testing my blood sugars frequently enough.	1.99
			Feeling that I am often failing with my diabetes routine.	2.07
			Not feeling confident in my day-to-day ability to manage diabetes.	1.70
			Feeling that I am not sticking closely enough to a good meal plan.	2.15
			Not feeling motivated to keep up my diabetes self-management.	1.49
Interpersonal distress	1.00 (1.00–2.00)	33 (18.54)	Feeling that friends or family are not supportive enough of self-care efforts (eg, planning activities that conflict with my schedule, encouraging me to eat the “wrong” foods).	1.60
			Feeling that friends or family do not appreciate how difficult living with diabetes can be.	1.74
			Feeling that friends or family do not give me the emotional support that I would like.	1.47

Note: The sample size for DDS is 178.

Abbreviation: DDS, Diabetes Distress Scale.

Table 3 The Estimated Coefficients for Logistic Least Absolute Shrinkage and Selection Operator (LASSO) Regression

Variables	Beta	OR
Age in years	−0.02	0.98
Gender (reference: female)	−0.56	0.57
Currently married	0	1
Education	0	1
Employment status	0	1
Duration of residency in years	0	1
Limited English proficiency	0.05	1.05
Elevated depressive symptoms (reference: no depressive symptoms)	1.72	5.58

Notes: The sample size for this analysis is 172. Variables with a coefficient of zero are not correlated with diabetes distress.

Discussion

This study described diabetes distress and its associated factors among Chinese immigrants with type 2 diabetes in NYC. Approximately 25.8% of the participants had moderate or high distress levels, which is consistent with the rates reported in a meta-analysis.¹⁰ A recent study in Chinese Americans with type 2 diabetes found a diabetes distress rate of 57.6%.²¹ The different results might arise from the fact that most of our participants live in Chinatowns in NYC, so they may feel more supported than those in Huang et al’s study, which recruited participants from three cities in Texas. NYC’s Chinatowns are ethnic enclaves with a long history and a high concentration of Chinese Americans. Chinese Americans living in areas with higher ethnic density report more social support and fewer depressive symptoms compared to non-ethnic enclave residents.^{22,23} Hence, participants of our study may feel more accepted and receive more support from the community in general and when dealing with diabetes. Nonetheless, our data along with data from Huang et al indicated that diabetes distress is a prevalent issue among Chinese Americans with type 2 diabetes.

The most common source of diabetes distress was emotional distress, with 30% of the participants reporting moderate to high levels. The relatively high rate of emotional distress may be attributed to the fact that Chinese culture tends to view mental health issues and emotional needs negatively, resulting in most emotional distress being left unresolved. A secondary analysis of data from a national survey of Chinese Americans revealed that among 1747 respondents aged 18–65, 75% never sought any type of help (formal or informal) for emotional or mental health issues, and only 15% of

those with mental health disorders sought mental health services.²⁴ Many people hide and deny their mental health problems²⁵ or conceal their feelings of sadness and other negative emotions^{26,27} out of shame and fear of discrimination. As a result, they often avoid seeking help when they are emotionally distressed.²⁸ According to Abe-Kim et al, only 3.6% of Chinese American participants in their study sought help for emotional distress. This is because Chinese people tend to prefer dealing with mental health issues on their own and lack confidence in and perceive a low need for professional mental health treatment.²⁵ Therefore, it is crucial to provide mental health education, culturally appropriate screening, and treatment for this population to raise awareness of mental health issues and the importance of professional care. Potential strategies include engaging primary care providers, who are often regarded as trusted authorities in Chinese culture, to screen and address mental health issues. For example, screening for diabetes distress could be conducted in the waiting area while patients await their visits with their primary care doctors. Afterward, doctors can review the results and determine if further action is required.

Following emotional distress, a similar proportion of participants (29%) reported moderate or high regimen-related distress, and “Feeling that I am not sticking closely enough to a good meal plan.” was the second highest scoring item on the Diabetes Distress Scale. Participants’ regimens and diet concerns might also be related to Chinese culture. Diabetes management curricula typically focus on Western diets and lifestyles, and their dietary recommendations do not always reflect Chinese immigrants’ dietary practices. Thus, Chinese immigrants often find it difficult to translate these recommendations within Chinese culture.^{29,30} In addition, social elements of meals make it difficult for people to follow an appropriate diet.³¹ The plate method technique, for instance, allows people to manage well-balanced meals by filling their plates with different types of food before eating. However, Chinese people typically dine family style, eating from common plates and not assembling their own. In Chinese culture, the plate method may be considered impolite, so people may not follow it. Raising public awareness about healthy plates and developing culturally tailored programs are critical for promoting healthy dietary intake among Chinese immigrants with type 2 diabetes.

In the current sample, younger age and female gender are related to higher chances of diabetes distress. These results are consistent with previous findings.^{10,32–34} Our findings indicate that the likelihood of experiencing high diabetes distress decreases as age increases. Managing diabetes will likely contribute to the stress and burden that younger people with diabetes already experience due to their families, jobs, and finances, whereas Medicare may alleviate some older adults’ financial burdens by covering diabetes management expenses. The gender difference could be due to that women are more concerned about diabetes, more sensitive to symptoms, and more likely to discuss health issues.³⁵ It is also possible that men refused to admit distress because it is perceived as a weakness in masculinity.³⁶ To reduce diabetes-related distress in the younger and female subgroups, it is critical to identify the particular diabetes-related stressors they face and identify the social support available to them.

It is not surprising that individuals with limited English proficiency (LEP) are more likely to experience diabetes distress, given that LEP is a significant social determinant of health that leads to health disparities and restricted access to healthcare. Latino and Asian Americans with LEP experience higher levels of psychological distress,³⁷ and those with mental health issues are less likely to identify a need for mental health services and use mental health services, which leads to a longer duration of untreated disorders.³⁸ Our finding suggests that LEP may exacerbate the psychological burden of diabetes management, leading to higher levels of distress. Therefore, addressing communication barriers through interventions may be crucial in reducing diabetes distress among Chinese Americans with LEP.

This study also found a relationship between diabetes distress and depressive symptoms. This supports previous studies that diabetes distress and depression, another common psychological condition associated with type 2 diabetes, are partially overlapped constructs that can exist together, occur separately, or be presented differently.^{10,39} In the current sample, 24% reported elevated depressive symptoms, 25.8% reported diabetes distress, and 13.7% reported both. Studies have also shown that depression is negatively related to glycemic control and self-care behavior of Chinese with type 2 diabetes.^{7,40} When assessing the psychological status of Chinese people with type 2 diabetes, both diabetes stress and depression should be considered. Both conditions must also be differentiated so that appropriate interventions can be provided.

This is the first study to examine the common sources and associated factors of diabetes distress in Chinese immigrants with type 2 diabetes. The findings of this study can help to identify at-risk population for high level of diabetes distress. There are some limitations worth noting. First, the small sample size from one urban city limits the generalizability of findings to all Chinese immigrants with type 2 diabetes. Further, the cross-sectional survey may include multiple participants from the same

family that share similar distress levels, but we did not conduct subgroup analysis due to the small sample size. Future studies should explore diabetes distress at the family level, considering the family-oriented nature of Chinese culture. In addition, this study was unable to examine some possible factors associated with diabetes distress due to the use of secondary data. These factors include diabetes control, diabetes duration, diabetes complications, sedentary lifestyles, and psychosocial factors (eg, family support).^{32,41} A mixed-methods study incorporating these factors is warranted to disentangle the association between diabetes management experiences and mental distress. We employed LASSO regression to identify key factors associated with diabetes distress, as it is a rigorous method for feature selection. While LASSO may slightly underestimate effect sizes, this is unlikely to significantly impact our results given the small sample size. We also recognize that several of the categorical variables are correlated, which may introduce bias into the model. While LASSO can handle correlated predictors to a certain degree, our findings should be validated with a larger sample.

Conclusion

The current study found diabetes distress was high among Chinese immigrants with type 2 diabetes. The most common sources of diabetes distress among this population are emotional burdens and regimen-related distress. Female gender, younger age, and those with limited English proficiency and elevated depressive symptoms are more likely to experience diabetes distress. The results of this study suggest that mental health issues should be screened and addressed as part of diabetes assessment and treatment. We propose screening for diabetes distress while patients are in the waiting area to see their primary care doctors. Doctors can review the results and decide whether further action is needed. It also shows the need for mental health interventions in low-income Chinese immigrants with type 2 diabetes and identifies the at-risk groups that require greater attention.

Research Ethics and Patient Consent

This study complies with the Declaration of Helsinki and the study protocols were approved by the New York University Grossman School of Medicine Institutional Review Board (s17-01696, s18-00609 and s19-01275). All participants provided informed consent before study entry.

Acknowledgment

The abstract of this paper was presented at the American Diabetes Association 83rd Scientific Sessions as a poster presentation with interim findings. The poster's abstract was published in "Poster Abstracts" in *Diabetes*: <https://doi.org/10.2337/db23-655-P>

Funding

Dr. Lu Hu received support from Grants NIH R01MD017579, AHRQ 1R18HS029813, NIH K99MD012811, NIH R00MD012811, American Diabetes Association 7-22-ICTSN-08, NIH P50MD017356 pilot award, NIH U54MD000538-15 pilot award, and NIH P30DK111022 pilot award. The views of this study are those of the authors and do not necessarily represent the views of the NIMHD, the NIDDK, the NHLBI, the NIH, the US Department of Health and Human Services, and the American Diabetes Association.

Disclosure

LH reports holding stock in Tencent Holdings Limited. The authors report no other conflicts of interest in this work.

References

1. Budiman A, Ruiz NG. Key facts about Asian Americans, a diverse and growing population; 2021. Available from: <https://www.pewresearch.org/fact-tank/2021/04/29/key-facts-about-asian-americans/>. Accessed October 12, 2022.
2. Vicks WS, Lo JC, Guo L, et al. Prevalence of prediabetes and diabetes vary by ethnicity among U.S. Asian adults at healthy weight, overweight, and obesity ranges: an electronic health record study. *BMC Public Health*. 2022;22(1):1954. doi:10.1186/s12889-022-14362-8
3. Rajpathak SN, Wylie-Rosett J. High prevalence of diabetes and impaired fasting glucose among Chinese Immigrants in New York City. *J Immigr Minor Health*. 2011;13(1):181–183. doi:10.1007/s10903-010-9356-2
4. Canedo JR, Miller ST, Schlundt D, Fadden MK, Sanderson M. Racial/ethnic disparities in diabetes quality of care: the role of healthcare access and socioeconomic status. *J Racial Ethn Health Disparities*. 2018;5(1):7–14. doi:10.1007/s40615-016-0335-8

5. Leung AYM, Bo A, Hsiao HY, Wang SS, Chi I. Health literacy issues in the care of Chinese American immigrants with diabetes: a qualitative study. *BMJ Open*. 2014;4(11):e005294. doi:10.1136/bmjopen-2014-005294
6. Polonsky WH, Fisher L, Earles J, et al. Assessing psychosocial distress in diabetes development of the Diabetes Distress Scale. *Diabetes Care*. 2005;28(3):626–631. doi:10.2337/DIACARE.28.3.626
7. Lin K, Park C, Li M, et al. Effects of depression, diabetes distress, diabetes self-efficacy, and diabetes self-management on glycemic control among Chinese population with type 2 diabetes mellitus. *Diabetes Res Clin Pract*. 2017;131:179–186. doi:10.1016/j.diabres.2017.03.013
8. Owens-Gary MD, Zhang X, Jawanda S, Bullard KM, Allweiss P, Smith BD. The importance of addressing depression and diabetes distress in adults with type 2 diabetes. *J Gen Intern Med*. 2019;34(2):320–324. doi:10.1007/s11606-018-4705-2
9. Patra S, Patro BK, Padhy SK, Mantri J. Prevalence of diabetes distress and its relationship with self-management in patients with type 2 diabetes mellitus. *Ind Psychiatry J*. 2021;30(2):234–239. doi:10.4103/ipj.ipj_60_19
10. Perrin NE, Davies MJ, Robertson N, Snoek FJ, Khunti K. The prevalence of diabetes-specific emotional distress in people with Type 2 diabetes: a systematic review and meta-analysis. *Diabetic Med*. 2017;34(11):1508–1520. doi:10.1111/dme.13448
11. Hu L, Trinh-Shevrin C, Islam N, et al. Mobile device ownership, current use, and interest in mobile health interventions among low-income older Chinese immigrants with type 2 diabetes: cross-sectional survey study. *JMIR Aging*. 2022;5(1):e27355. doi:10.2196/27355
12. Hu L, Islam N, Trinh-Shevrin C, et al. A social media-based diabetes intervention for low-income mandarin-speaking Chinese immigrants in the United States: feasibility study. *JMIR Form Res*. 2022;6(5):e37737. doi:10.2196/37737
13. Hu L, Cheng S, Islam N, et al. Feasibility and acceptability of a family-based mHealth intervention in low-income Chinese families with type 2 diabetes. *Diabetes*. 2022;71(Supplement_1):36–LB. doi:10.2337/db22-36-LB
14. Hu L, Islam N, Zhang Y, et al. Leveraging social media to increase access to an evidence-based diabetes intervention among low-income Chinese immigrants: protocol for a pilot randomized controlled trial. *JMIR Res Protocols*. 2022;11(10):e42554. doi:10.2196/42554
15. Hu L, Shi Y, Wylie-Rosett J, et al. Feasibility of a family-oriented mHealth intervention for Chinese Americans with type 2 diabetes: a pilot randomized control trial. *PLoS One*. 2024;19(3):e0299799. doi:10.1371/journal.pone.0299799
16. Fisher L, Hessler DM, Polonsky WH, Mullan J. When Is diabetes distress clinically meaningful? Establishing cut points for the Diabetes Distress Scale. *Diabetes Care*. 2012;35(2):259–264. doi:10.2337/DC11-1572
17. Spitzer RL, Kroenke K, Williams JBW; The Patient Health Questionnaire Primary Care Study Group. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. *JAMA*. 1999;282(18):1737–1744. doi:10.1001/jama.282.18.1737
18. Levis B, Sun Y, He C, et al. Accuracy of the PHQ-2 alone and in combination with the PHQ-9 for screening to detect major depression: systematic review and meta-analysis. *JAMA*. 2020;323(22):2290–2300. doi:10.1001/jama.2020.6504
19. R Core Team. R: a language and environment for statistical computing; 2021. Available from: <https://www.R-project.org/>. Accessed July 18, 2024.
20. Friedman J, Hastie T, Tibshirani R, et al. Glmnet: lasso and elastic-net regularized generalized linear models; 2022. Available from: <https://CRAN.R-project.org/package=glmnet>. Accessed March 2, 2023.
21. Huang YC, Zuñiga J, Hua Y, García A. Emotional distress and self-rated health among middle-aged and older Chinese Americans with type 2 diabetes. *J Immigrant Minority Health*. 2021;23(3):487–493. doi:10.1007/s10903-020-01062-x
22. Tseng M, Walton E, Handorf E, Fang CY. Ethnic density, social support, and loneliness among Chinese immigrants in Philadelphia. *Wellbeing Space Soc*. 2021;2:100050. doi:10.1016/j.wss.2021.100050
23. Guo M, Wang Y, Liu J, Dong X. Ethnic enclaves, social capital, and psychological well-being of immigrants: the case of Chinese older immigrants in Chicago. *Aging Mental Health*. 2022;1–9. doi:10.1080/13607863.2022.2084506
24. Kung WW. Chinese Americans' help seeking for emotional distress. *Social Serv Rev*. 2003;77(1):110. doi:10.1086/345707
25. Shi W, Shen Z, Wang S, Hall BJ. Barriers to professional mental health help-seeking among Chinese adults: a systematic review. *Front Psychiatry*. 2020;11. doi:10.3389/fpsy.2020.00442
26. Hwang HS, Matsumoto D. Ethnic differences in display rules are mediated by perceived relationship commitment. *Asian Am J Psychol*. 2012;3:254–262. doi:10.1037/a0026627
27. Ip KI, Miller AL, Karasawa M, et al. Emotion expression and regulation in three cultures: Chinese, Japanese, and American preschoolers' reactions to disappointment. *J Exper Child Psychol*. 2021;201:104972. doi:10.1016/j.jecp.2020.104972
28. Abe-Kim J, Takeuchi D, Hwang WC. Predictors of help seeking for emotional distress among Chinese Americans: family matters. *J Consult Clin Psychol*. 2002;70(5):1186–1190. doi:10.1037/0022-006X.70.5.1186
29. Eh K, McGill M, Wong J, Krass I. Cultural issues and other factors that affect self-management of Type 2 Diabetes Mellitus (T2D) by Chinese immigrants in Australia. *Diabetes Res Clin Pract*. 2016;119:97–105. doi:10.1016/j.diabres.2016.07.006
30. Ho EY, Tran H, Chesla CA. Assessing the cultural in culturally sensitive printed patient education materials for Chinese Americans with type 2 diabetes. *Health Commun*. 2015;30(1):39–49. doi:10.1080/10410236.2013.835216
31. Chesla CA, Chun KM, Kwan CML. Cultural and family challenges to managing type 2 diabetes in immigrant Chinese Americans. *Diabetes Care*. 2009;32(10):1812–1816. doi:10.2337/dc09-0278
32. Azadbakht M, Taheri Tanjani P, Fadayevean R, Froughan M, Zanjari N. The prevalence and predictors of diabetes distress in elderly with type 2 diabetes mellitus. *Diabetes Res Clin Pract*. 2020;163:108133. doi:10.1016/j.diabres.2020.108133
33. Onyenekwe BM, Young EE, Nwatu CB, Okafor CI, Ugwueze CV. Diabetes distress and associated factors in patients with diabetes mellitus in south east Nigeria. *DDE*. 2020;26(1):31–37. doi:10.1159/000508706
34. Wardian J, Sun F. Factors associated with diabetes-related distress: implications for diabetes self-management. *Soc Work Health Care*. 2014;53(4):364–381. doi:10.1080/00981389.2014.884038
35. Siddiqui MA, Khan MF, Carline TE. Gender differences in living with diabetes mellitus. *Mater Sociomed*. 2013;25(2):140–142. doi:10.5455/msm.2013.25.140-142
36. Doyal L. Gender equity in health: debates and dilemmas. *Soc sci med*. 2000;51(6):931–939. doi:10.1016/S0277-9536(00)00072-1
37. Kim G, Worley CB, Allen RS, et al. Vulnerability of older latino and asian immigrants with limited English proficiency. *J Am Geriatr Soc*. 2011;59(7):1246–1252. doi:10.1111/j.1532-5415.2011.03483.x
38. Bauer AM, Chen CN, Alegria M. English language proficiency and mental health service use among Latino and Asian Americans with mental disorders. *Med Care*. 2010;48(12):1097–1104. doi:10.1097/MLR.0b013e3181f80749

39. Snoek FJ, Bremmer MA, Hermanns N. Constructs of depression and distress in diabetes: time for an appraisal. *Lancet Diabetes Endocrinol.* 2015;3(6):450–460. doi:10.1016/S2213-8587(15)00135-7
40. Fung ACH, Tse G, Cheng HL, et al. Depressive symptoms, co-morbidities, and glycemic control in Hong Kong Chinese elderly patients with type 2 diabetes mellitus. *Front Endocrinol.* 2018;9. doi:10.3389/fendo.2018.00261
41. Kintzoglakis K, Vonta P, Copanitsanou P. Diabetes-related distress and associated characteristics in patients with type 2 diabetes in an urban primary care setting in Greece. *Chronic Stress.* 2020;4:2470547020961538. doi:10.1177/2470547020961538

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