



Acculturative Stress and Depressive Symptoms Among Chinese Immigrants: the Role of Gender and Social Support

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Abstract

The USA has among the largest immigrant population of any country in the world, and over the past few decades, the proportion of Chinese immigrants in the USA has increased significantly. Immigrants may experience substantial acculturative stress as they learn to navigate their new environment, and this stress can contribute to depressive symptoms and poor mental health. Social support can help mitigate the effects of stress on depressive symptoms, but the protective effects of social support have been reported to differ between men and women. Thus, the present study examined associations of acculturative stress and depressive symptoms among Chinese immigrants and explored whether the effects of social support on depressive symptoms varied by gender. Participants included 620 foreign-born Chinese men and women who completed questionnaires on acculturative stress, social support, and depressive symptoms. In nested regression analyses, acculturative stress was positively associated with depressive symptoms among both men and women. However, the interaction of social support and acculturative stress on depressive symptoms was statistically significant among men ($\beta = -0.89$, $p < 0.001$), but not women ($\beta = -0.43$, $p = 0.21$). These findings suggest that social support moderates the association of acculturative stress with depressive symptoms, but only among Chinese immigrant men. Future research should explore factors that can enhance resilience and mitigate acculturative stress effects on psychological well-being among Chinese immigrant women.

Keywords Acculturative stress · Asian immigrants · Depressive symptoms · Social support

Introduction

The USA is home to the largest immigrant population of any country in the world. In 2018, 13.7% of the US population (greater than 44 million people) were foreign-born [1]. Asian immigrants comprise one of the fastest growing racial/ethnic groups in the USA; notably, the population of Chinese immigrants has increased dramatically since 1980 and now

represents almost 6% of US foreign-born residents [2]. Although Chinese immigrants may initially report better physical health and lower chronic disease risk compared with their US-born counterparts upon migration [3], empiric data indicate that immigrants face significant risk for mental distress including high prevalence of depression and anxiety [4, 5]. Indeed, mental health concerns have been documented among Chinese immigrants, with rates of depression ranging from 11 to 51% [6, 7].

Migration-related stressors can have a considerable impact on psychological functioning and adjustment [8, 9]. Immigrants experience considerable levels of acculturative stress (i.e., the stress of adapting to a new culture), including language challenges and often extensive changes in employment and social networks (e.g., separation from family members and friends). In a prior study, 70% of Asian American immigrants reported experiencing acculturative stress [8], and emerging evidence demonstrates that these stressors can contribute to depressive symptoms among Chinese immigrants [10].

On the other hand, factors that enhance resilience to stress—such as social support—can confer protection from

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depressive symptoms [11–13]. Cohen and Wills described two potential mechanisms via which social support may have beneficial effects: (1) by contributing directly to overall well-being (main effect hypothesis) or (2) by mitigating or “buffering” the detrimental effects of stress on depressive symptoms and other mental and physical health outcomes (stress-buffering hypothesis) [14]. That is, under the stress-buffering hypothesis, the association between stress and depressive symptoms is lessened under conditions of high support. Studies of Asian Americans have demonstrated that greater social support attenuated the association of various stressors with psychological distress [9] and mental health outcomes [15] including depressive symptoms [12], thus providing support for the stress-buffering hypothesis. In contrast, data from the National Latino and Asian American Study (NLAAS) found that social support was directly associated with lower depressive symptoms (main effect hypothesis), but did not moderate the association of acculturative stress and depressive symptoms [16]. However, these studies did not focus solely on immigrant samples, but included a mixture of foreign-born and US-born individuals.

In addition, the positive effects of social support may vary by gender. Although women frequently report higher levels of social support [17], men may reap the protective benefits at lower levels of support than women do. For example, in a study of older Japanese adults, emotional support was associated with better self-rated health among men—but not women—despite men reporting overall lower levels of support [18]. Prior studies have also observed a gender effect, with the benefits of social support being more pronounced among men than women [19, 20]. Therefore, the present study examined associations among acculturative stress, social support, and depressive symptoms among Chinese immigrants and explored whether the effects of social support varied by gender. Specifically, it was hypothesized that acculturative stress would be positively associated with depressive symptoms, whereas social support would be inversely associated with depressive symptoms. In addition, it was hypothesized that the relationship between acculturative stress and depressive symptoms would be attenuated or lessened among those individuals with high social support (i.e., the stress-buffering hypothesis), but that the moderating effect of social support would be more apparent among men given prior evidence of gender differences in social support benefits.

Methods

Study Sample and Procedures

A convenience sample of 650 healthy adult Chinese immigrant men and women was recruited between January 2016 and May 2019. Eligibility criteria were as follows: Chinese

heritage, age 35–65 years, and immigration from Asia as an adult (age 18 + years). Exclusion criteria included the following: self-reported history of diabetes, cancer, auto-immune disorders, or HIV infection; current use of anti-inflammatory medications; current pregnancy or breastfeeding; and inability to provide informed consent. The study was approved by the Fox Chase Cancer Center Institutional Review Board, and all participants provided a written informed consent to participate.

Study interviews were conducted in either English or Chinese in the participant’s preferred dialect (Mandarin or Cantonese) by multilingual study staff. Of the 650 participants, 30 individuals were missing data on relevant variables or covariates (13 individuals were missing data on length of US residence, 9 were missing data on marital status, 6 were missing data on acculturation, 1 was missing data on self-rated health, and 1 had incomplete data on multiple study measures). Therefore, the final sample for the present analysis included 620 participants.

Measures

Sociodemographic Characteristics and Covariates

Participant characteristics including age, gender, marital status, highest level of education, occupation, and length of US residence were assessed. Occupation was categorized into four categories, based on categories used in our own and prior research [21, 22]: blue collar (e.g., farmer/farm worker, machine or vehicle operator, craftworker (such as baker, mechanic, and tailor), or service worker (such as janitor, hairdresser, and waitress)), clerical or sales worker (e.g., secretary, dispatcher, sales representative), white collar (e.g., manager, administrator, professional (including accountant, engineer, doctor, computer programmer)), or unemployed. Self-employment was categorized with white collar occupations.

Acculturation was assessed using an abridged version of the General Ethnicity Questionnaire-American version (GEQ-A) [23], which includes 11 items assessing the participant’s exposure to or familiarity with American people, culture, and activities. Each item is rated on a scale from 1 (least acculturated) to 5 (most acculturated), and level of acculturation is computed as the mean score across the 11 items. The scale has been commonly used in studies of Chinese Americans [24, 25] and demonstrated high internal reliability in the present sample (Cronbach’s $\alpha = 0.86$). Additionally, given extensive data demonstrating that self-rated health is associated with depressive symptoms, participants were asked to rate their health using a widely used single-item ordinal measure with 5 levels (excellent, very good, good, fair, and poor). Similar to prior studies, responses were dichotomized into two categories: excellent/very good/good versus fair/poor [26]. This item is frequently used as an indicator of general

health status in epidemiologic and population health research [26], including among Chinese populations [27, 28].

Acculturative Stress

Acculturative stress was measured using the Migration-Acculturation Stressor Scale (MASS) [29], which is comprised of 22 potential acculturative stressors, including cultural, social, and functional difficulties. For each item, participants were asked if they had encountered that difficulty in the past year, with answers ranging from 1 (no) to 5 (very much). Examples of MASS items include difficulties with language, housing, unfamiliar environment, making friends, cultural differences, missing family, missing their homeland, loneliness, and discrimination. Total level of acculturative stress was calculated by summing across all items, with higher scores representing greater stress. The MASS has been validated among Chinese immigrant populations [30–33] and had high internal reliability in the present sample ($\alpha = 0.89$).

Social Support

Social support was assessed using the Provisions of Social Relations Scale (PSR) [34, 35]. This 15-item measure assesses respondents' perceived support from family members (6 items) and friends (9 items). Response options range from 1 (very much) to 5 (not at all). A total PSR score was computed as the sum across all 15 items, where a higher score represents greater perceived support. The PSR has been used successfully with Chinese [36] and Korean immigrants [35] and had high internal reliability in the present sample ($\alpha = 0.91$).

Depressive Symptoms

Depressive symptoms were assessed using the 20-item Center for Epidemiologic Studies-Depression (CES-D) scale [37]. The CES-D is designed for use in large-scale studies, and it has been widely used in Chinese populations [38] including a multiethnic cohort study in the USA [39]. Each item asks respondents to rate how often they experienced a particular symptom (e.g., poor appetite, restless sleep) in the past week, with response options ranging from 0 (rarely or none of the time) to 3 (most or almost all the time). Responses are summed across the 20 items, with higher scores representing greater depressive symptoms. A score of 16 or greater may identify individuals at risk for clinical depression [40]. Internal reliability of this scale was high in the present sample (Cronbach's $\alpha = 0.89$).

Statistical Analysis

Data analyses were conducted using SPSS version 26 and R version 3.6.1. Preliminary analyses were performed to

characterize the sample in terms of demographic and psychosocial variables. Next, correlational analyses and one-way analyses of variance (ANOVAs) were performed to examine potential sociodemographic and psychosocial correlates of depressive symptoms. Associations of acculturative stress and social support with depressive symptoms were examined in the entire sample using regression analyses. Then, to assess whether associations of acculturative stress and social support with depressive symptoms varied by gender, separate regression analyses were performed by participant gender. Regression analyses controlled for relevant demographic covariates. In the regression equation, three blocks of variables were entered sequentially (nested models). The blocks were comprised of the following: (a) level of acculturation, length of US residence, and any sociodemographic covariates identified as significantly correlated with depressive symptoms in preliminary analyses (i.e., marital status, self-rated health); (b) main effects of acculturative stress and social support; and (c) the product term representing the two-way interaction (i.e., acculturative stress \times social support). All tests of statistical significance were performed using two-tailed tests.

Results

Participants were on average 51 years of age and had lived in the USA for a mean of 20 years (Table 1). The majority of participants (89%) were currently married. There was a diverse range of education level with over 58% of participants reporting a high school education or lower. More than 16% of participants reported their health to be fair or poor, and 13.1% had a CES-D score of 16 or higher.

Gender differences were observed in age, length of US residence, marital status, occupation, and social support (Table 1). Men were slightly older ($M = 52.05$ years, $SD = 7.70$) and had lived in the USA for a greater length of time ($M = 21.89$ years, $SD = 9.12$) compared with women (age, $M = 50.35$ years, $SD = 7.56$; length of US residence, $M = 18.83$ years, $SD = 8.64$). In addition, a greater proportion of men were married (94.6%) and worked in blue collar occupations (50.8%) compared with women (married, 85.0%; blue collar occupation, 27.6%). Women reported higher levels of social support ($M = 63.43$, $SD = 8.39$) compared with men ($M = 61.92$, $SD = 9.91$). No other gender differences were observed.

Correlates of Depressive Symptoms

First, we examined potential covariates of depressive symptoms. Age, occupation, and education levels were not

Table 1 Demographic and psychosocial characteristics by gender

Variable	Total sample mean (SD) or %	Men (n = 261)	Women (n = 359)	p Value
Age (years)	51.06 (7.66)	<i>52.05 (7.70)</i>	<i>50.35 (7.56)</i>	0.01
Length of US residence (years)	20.07 (8.98) Range: 34–65 Range: 2.60–45.44	<i>21.89 (9.12)</i>	<i>18.83 (8.64)</i>	< 0.001
Acculturation (GEQ-A)	2.79 (0.68)	2.76 (0.67)	2.81 (0.68)	0.39
Marital status (% married)	89.0%	<i>94.6%</i>	<i>85.0%</i>	< 0.001
Education				0.93
< High school	33.1%	32.0%	33.8%	
High school grad/GED	25.0%	25.9%	24.4%	
Some college/technical school	25.2%	24.7%	25.6%	
College grad/post-grad	16.7%	17.4%	16.2%	
Occupation				< 0.001
Unemployed	5.2%	1.5%	7.8%	
Blue collar	37.3%	50.8%	27.6%	
Service industry	33.9%	24.2%	40.9%	
White collar	23.6%	23.5%	23.7%	
Self-rated health (% fair/poor)	16.3%	17.2%	15.6%	0.59
Acculturative stress	40.14 (12.64)	39.19 (12.67)	40.83 (12.60)	0.11
Social support	62.79 (9.09)	<i>61.92 (9.91)</i>	<i>63.43 (8.39)</i>	0.04
Depressive symptoms	7.12 (7.63)	6.84 (8.10)	7.32 (7.27)	0.44
% with CES-D score ≥ 16	13.1%	11.1%	14.5%	0.22

Variables that significantly differ between men and women are noted in italics

associated with depressive symptoms. Married participants reported lower levels of depressive symptoms (M = 6.83, SD = 7.48) compared with unmarried participants (M = 9.04, SD = 8.06), $p = 0.02$. Participants with fair/poor self-rated health reported higher levels of depressive symptoms (M = 11.12, SD = 9.32) compared with participants with good to excellent self-rated health (M = 6.26, SD = 6.90), $p < 0.001$.

Next we examined associations among levels of acculturation, length of US residence, acculturative stress, social support, and depressive symptoms (Table 2). Patterns of associations were similar across both men and women. Specifically, living in the USA for more years was associated with greater acculturation and lower levels of acculturative stress. Depressive symptoms were positively associated with

Table 2 Correlations among Study Variables

Variable	2	3	4	5
Men				
1. Acculturation ($\alpha = 0.85$)	0.23***	-0.11	0.07	-0.05
2. Length of US residence	-	-0.14*	0.06	-0.11
3. Acculturative stress ($\alpha = 0.90$)		-	-0.34***	0.49***
4. Social support ($\alpha = 0.92$)			-	-0.51***
5. Depressive symptoms ($\alpha = 0.91$)				-
Women				
1. Acculturation ($\alpha = 0.86$)	0.25***	-0.06	0.03	-0.05
2. Length of US residence	-	-0.25***	0.01	-0.06
3. Acculturative stress ($\alpha = 0.89$)		-	-0.24***	0.39***
4. Social support ($\alpha = 0.90$)			-	-0.42**
5. Depressive symptoms ($\alpha = 0.88$)				-

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

acculturative stress (all p values < 0.001) and negatively associated with social support (p values < 0.001).

Associations of Stress and Social Support with Depressive Symptoms

Regression analyses were performed to examine associations of acculturative stress and social support with depressive symptoms (Table 3). In both the pooled sample and gender-specific analyses, the covariates of marital status, acculturation, length of US residence, and self-rated health were entered into the regression equation in step 1. Participant gender was also added as a covariate in the pooled analysis. In step 2, the independent variables of acculturative stress and social support were added. The interaction of acculturative stress \times social support was entered in step 3.

Results from the pooled analysis revealed significant main effects of acculturative stress ($\beta = 0.31$, $p < 0.001$) and social

support ($\beta = -0.35$, $p < 0.001$) on depressive symptoms in step 2. In step 3, the interaction term of acculturative stress and social support was statistically significant ($\beta = -0.81$, $p < 0.001$). Acculturative stress remained significantly associated with depressive symptoms ($\beta = 1.11$, $p < 0.001$) in step 3, but the association of social support with depressive symptoms was attenuated and no longer statistically significant ($\beta = 0.05$, $p = 0.64$).

We repeated the regression analyses separately by participant gender. As seen in Step 2, acculturative stress was positively associated with depressive symptoms among both men ($\beta = 0.34$, $p < 0.001$) and women ($\beta = 0.29$, $p < 0.001$). Social support was negatively associated with depressive symptoms among men ($\beta = -0.37$, $p < 0.001$) and women ($\beta = -0.32$, $p < 0.001$). The addition of acculturative stress and social support in step 2 accounted for a 31% increase in the explained variance in depressive symptoms among men and an additional 20% of explained variance in depressive symptoms among women.

Table 3 Associations of acculturative stress and social support with depressive symptoms

	All Participants		Men		Women		β	ΔR^2	β	ΔR^2
	β	ΔR^2	B	SE	B	SE				
Step 1		<i>0.08***</i>							<i>0.08**</i>	<i>0.09***</i>
Female gender	0.002		–	–	–	–	–	–	–	–
Married	–0.08		–2.56	2.16	–0.07		–1.90	1.04	–0.09	
Fair/poor self-rated health	<i>0.25***</i>		<i>2.24</i>	<i>0.54</i>	<i>0.25***</i>		<i>2.28</i>	<i>0.44</i>	<i>0.27***</i>	
Acculturation	–0.01		–0.08	0.74	–0.01		–0.17	0.56	–0.02	
Length of US residence	–0.07		<i>–0.11</i>	<i>0.06</i>	<i>–0.12*</i>		–0.03	0.04	–0.03	
Step 2		<i>0.25***</i>							<i>0.31***</i>	<i>0.20***</i>
Female gender	0.03		–	–	–		–	–	–	
Married	–0.04		–1.36	1.76	–0.04		–0.99	0.93	–0.05	
Fair/poor self-rated health	<i>0.12**</i>		<i>1.05</i>	<i>0.45</i>	<i>0.12*</i>		<i>1.09</i>	<i>0.41</i>	<i>0.13**</i>	
Acculturation	0.01		0.56	0.81	0.05		–0.26	0.50	–0.02	
Length of US residence	–0.01		–0.05	0.05	–0.06		0.03	0.04	0.03	
Acculturative stress	<i>0.31***</i>		<i>0.22</i>	<i>0.03</i>	<i>0.34***</i>		<i>0.17</i>	<i>0.03</i>	<i>0.29***</i>	
Social support	<i>–0.35***</i>		<i>–0.30</i>	<i>0.04</i>	<i>–0.37***</i>		<i>–0.28</i>	<i>0.04</i>	<i>–0.32***</i>	
Step 3		<i>0.02***</i>							<i>0.04***</i>	<i>0.003</i>
Female gender	0.04		–	–	–		–	–	–	
Married	–0.04		–1.54	1.71	–0.04		–0.87	0.93	–0.04	
Fair/poor self-rated health	<i>0.11**</i>		<i>0.86</i>	<i>0.44</i>	<i>0.10</i>		<i>1.09</i>	<i>0.41</i>	<i>0.13**</i>	
Acculturation	0.01		0.49	0.59	0.04		–0.20	0.50	–0.02	
Length of US residence	–0.02		–0.06	0.04	–0.07		0.02	0.04	0.03	
Acculturative stress	<i>1.11***</i>		<i>0.79</i>	<i>0.14</i>	<i>1.24***</i>		<i>0.41</i>	<i>0.20</i>	<i>0.71*</i>	
Social support	0.05		0.10	0.11	0.12		–0.11	0.14	–0.13	
Interaction: stress \times support	<i>–0.81***</i>		<i>–0.01</i>	<i>0.002</i>	<i>–0.89***</i>		<i>–0.004</i>	<i>0.003</i>	<i>–0.43</i>	
	Total $R^2 = 0.35$		Total $R^2 = 0.43$		Total $R^2 = 0.29$					
	F (8, 619) = 41.61***		F (7, 260) = 27.58***		F (7, 358) = 20.44***					

Statistically significant values are noted in italics

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

In step 3, the interaction of acculturative stress and social support was statistically significant among men ($\beta = -0.89, p < 0.001$). We plotted the regression of depressive symptoms on acculturative stress at high and low levels of social support (see Fig. 1). Findings indicate that acculturative stress was positively associated with depressive symptoms, but only under conditions of low social support. Under conditions of high social support, the association between acculturative stress and depressive symptoms was attenuated, thus suggesting that social support had a moderating role on the effect of acculturative stress on depressive symptoms.

Among women, the interaction of acculturative stress and social support was not statistically significant ($\beta = -0.43, p = 0.21$) and did not explain any additional variance in depressive symptoms. Fair/poor self-rated health and acculturative stress remained significantly associated with depressive symptoms in step 3 after the addition of the interaction term.

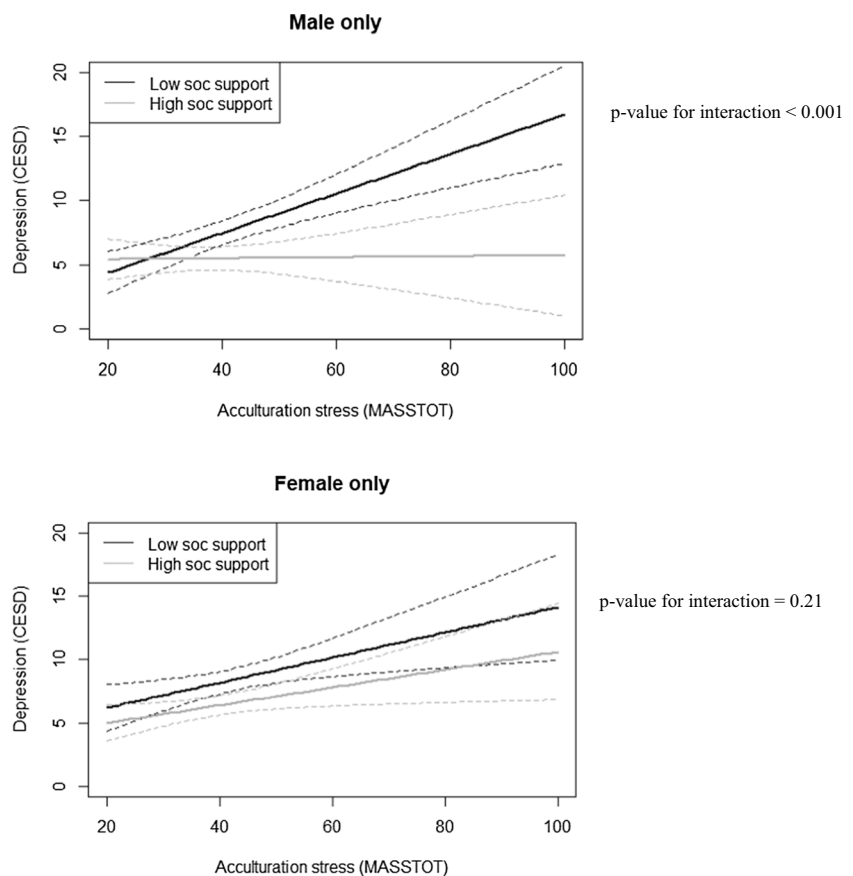
Discussion

In the present study of US Chinese immigrants, over 13% of respondents reported depressive symptomology, as assessed by the CES-D with the standard cutoff score of 16 or higher. This finding is comparable with other studies that have also

utilized the CES-D and reported rates of 8–14% in Chinese Americans [41, 42], but lower than the 26% prevalence rate reported by Li and colleagues [43]. As expected, acculturative stress was positively associated with depressive symptoms, confirming the detrimental consequences that can accompany the process of cultural adaptation and adjustment. Stressors related to the immigrant experience are commonly linked to poor mental health, and our study findings are consistent with data from the National Latino and Asian American study ([9, 44]) and studies of college students [45], which have reported that acculturative stress is a risk factor for psychological distress and decrements in well-being among Asian Americans [46].

Importantly, this study contributes to the existing literature by highlighting potential gender differences in the moderating role of social support. There is a robust body of research investigating how gender relates to social support and coping with stress [47, 48]. Studies have reported that women more often serve as social support providers and are more likely to report seeking and receiving emotional support compared with men [49]. Gender norms and gender role socialization are likely key factors contributing to the observed differences. Although sex-linked biologic factors (e.g., sex hormones) are known to partially contribute to differences in the development and prevalence of depression observed between men

Fig. 1 Social support moderates the association between acculturative stress and depressive symptoms among Chinese immigrant men, but not women



and women [50, 51], social support has been less well-studied with respect to biologic differences and more generally studied in terms of gender norms. Indeed, studies have found gender roles to be more closely aligned with social support patterns, more so than biologic sex [47, 49, 52]. Female gender norms usually encompass features such as being supportive, warm, and emotionally expressive. In contrast, male or masculine role norms have not traditionally emphasized being nurturing, but rather have highlighted traits such as independence and self-reliance [53]. Thus, differences in social support behavior have been primarily attributed to gender role socialization, rather than sex-linked factors [47].

Although higher levels of social support were associated with lower levels of depressive symptoms among all participants, the protective effects of social support with regard to buffering the negative consequences of acculturative stress were less pronounced among women. Why this moderation effect was not observed among women is less clear. One potential explanation may be due to differences in length of US residence. In this sample, women tended to be more recent immigrants compared with men. A meta-analysis and systematic review reported that a shorter length of residence is associated with a greater prevalence of depression [54]; this association has been attributed, in part, to the generally higher levels of acculturative stress experienced in the early post-migration period. The significant disruptions encountered during this phase may account for the absence of stress buffering among women in our sample.

Studies in other populations have also reported that the effect of social support on other outcomes, such as health-related quality of life, varies by gender with men reaping the benefits of social support more than women do [20]. For example, among Taiwanese military personnel, social support moderated the association of stress with mental and physical health among men, but not among women [55]. Due to gender differences in perceived support [48], social networks may exact more of a “cost” from women who often are support providers to others or have significant caregiving responsibilities associated with their social roles. As a result, the protective effects of social support may be evident for women only at higher levels of support. In addition to gender norms, Chinese cultural values and norms, such as a patriarchal social context in which Chinese women often hold subordinate roles to men, may also influence how social support is perceived, received, and provided by Chinese American women [56]. Thus, the differential pattern of findings observed in the present study warrants further investigation into the possible limitations of social support for Chinese American women.

There are several limitations of this study. First, the cross-sectional study design does not allow us to examine the temporal nature of these associations or enable any inferences about possible causal mechanisms that may exist. As

depression can make it more difficult for one to manage or cope with stress [57], we cannot rule out the possibility that individuals who were experiencing depressive symptoms were more likely to report higher levels of acculturative stress. Future longitudinal studies will help clarify the temporal nature of these associations. Second, the study sample was a convenience sample of foreign-born Chinese Americans who had immigrated as adults and had been living in the US for on average 20 years. As a result, the present findings may not generalize to more recent immigrants, for whom the burden of acculturative stress may be greater. Nonetheless, the present findings contribute to the growing literature on migration-related stress and psychological well-being among Chinese immigrants and represent one of the first studies to highlight key gender differences in the moderation of stress effects on depressive symptoms in this population.

In sum, accumulating data suggest that Chinese immigrants experience considerable acculturative stress, which can have a detrimental impact on mental health. In light of studies demonstrating that acculturative stress is not only associated with poorer mental health, but also with greater self-reported disability [58], it is critically important to understand and address the migration-related stressors and challenges that can impair emotional health and well-being. Future studies may draw upon evidence-based strategies to assist Chinese Americans in managing depression [59] or in enhancing social support and social networks [60] to help Chinese immigrants feel more connected and integrated within their communities. Such programs may be successful in not only addressing the acculturative stressors and challenges faced by immigrants but also providing essential mental health benefits and promoting overall well-being.

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Data Availability A de-identified dataset that does not contain any PHI (personal health information) can be made available to interested parties upon written request.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethics Approval This study was approved by the Fox Chase Cancer Center Institutional Review Board.

Consent to Participate This research involved human study participants. All individuals provided written informed consent prior to participating in the study.

References

- Batalova J, Brittany B, Jessica B. Frequently requested statistics on immigrants and immigration to the United States. Washington, DC: Migration Policy Institute; 2020.
- Pew Research Center. Key facts about Asian origin groups in the U.S. Accessed 05/22/2019.
- Singh GK, Rodriguez-Lainz A, Kogan MD. Immigrant health inequalities in the United States: use of eight major national data systems. *Sci World J*. 2013;2013:21. <https://doi.org/10.1155/2013/512313>.
- Dong X, Chen R, Li C, Simon MA. Understanding depressive symptoms among community-dwelling Chinese older adults in the greater Chicago area. *J Aging Health*. 2014;26(7):1155–71. <https://doi.org/10.1177/0898264314527611>.
- Pumariega AJ, Rothe E, Pumariega JB. Mental health of immigrants and refugees. *Community Ment Health J*. 2005;41(5):581–97. <https://doi.org/10.1007/s10597-005-6363-1>.
- Guo M, Stensland M. A systematic review of correlates of depression among older Chinese and Korean immigrants: what we know and do not know. *Aging Ment Health*. 2018;22(12):1535–47. <https://doi.org/10.1080/13607863.2017.1383971>.
- Lin X, Haralambous B, Pachana NA, Bryant C, LoGiudice D, Goh A, et al. Screening for depression and anxiety among older Chinese immigrants living in Western countries: the use of the geriatric depression scale (GDS) and the geriatric anxiety inventory (GAI). *Asia Pac Psychiatry*. 2016;8(1):32–43. <https://doi.org/10.1111/appy.12191>.
- Lueck K, Wilson M. Acculturative stress in Asian immigrants: the impact of social and linguistic factors. *Int J Intercult Relat*. 2010;34(1):47–57. <https://doi.org/10.1016/j.ijintrel.2009.10.004>.
- Singh S, McBride K, Kak V. Role of social support in examining acculturative stress and psychological distress among Asian American immigrants and three sub-groups: results from NLAAS. *J Immigr Minor Health*. 2015;17(6):1597–606. <https://doi.org/10.1007/s10903-015-0213-1>.
- Chau V, Bowie JV, Juon H-S. The association of perceived discrimination and depressive symptoms among Chinese, Korean, and Vietnamese Americans. *Cult Divers Ethn Minor Psychol*. 2018;24(3):389–99. <https://doi.org/10.1037/cdp0000183>.
- Gariépy G, Honkaniemi H, Quesnel-Vallée A. Social support and protection from depression: systematic review of current findings in Western countries. *Br J Psychiatry*. 2018;209(4):284–93. <https://doi.org/10.1192/bjp.bp.115.169094>.
- Wang X, Cai L, Qian J, Peng J. Social support moderates stress effects on depression. *Int J Ment Heal Syst*. 2014;8(1):41. <https://doi.org/10.1186/1752-4458-8-41>.
- Alegria M, Alvarez K, DiMarzio K. Immigration and mental health. *Curr Epidemiol Rep*. 2017;4(2):145–55. <https://doi.org/10.1007/s40471-017-0111-2>.
- Cohen S, Wills TA. Stress, social support, and the buffering hypothesis. *Psychol Bull*. 1985;98(2):310–57.
- Lee J-S, Koeske GF, Sales E. Social support buffering of acculturative stress: a study of mental health symptoms among Korean international students. *Int J Intercult Relat*. 2004;28(5):399–414. <https://doi.org/10.1016/j.ijintrel.2004.08.005>.
- Xu L, Chi I. Acculturative stress and depressive symptoms among Asian immigrants in the United States: the roles of social support and negative interaction. *Asian Am J Psychol*. 2013;4(3):217–26. <https://doi.org/10.1037/a0030167>.
- Turner HA. Gender and social support: taking the bad with the good? *Sex Roles*. 1994;30(7):521–41. <https://doi.org/10.1007/BF01420800>.
- Okamoto K, Tanaka Y. Gender differences in the relationship between social support and subjective health among elderly persons in Japan. *Prev Med*. 2004;38(3):318–22. <https://doi.org/10.1016/j.ypmed.2003.10.010>.
- Shye D, Mullooly JP, Freeborn DK, Pope CR. Gender differences in the relationship between social network support and mortality: a longitudinal study of an elderly cohort. *Soc Sci Med*. 1995;41(7):935–47. [https://doi.org/10.1016/0277-9536\(94\)00404-h](https://doi.org/10.1016/0277-9536(94)00404-h).
- Hajek A, Brettschneider C, Lange C, Posselt T, Wiese B, Steinmann S, et al. Gender differences in the effect of social support on health-related quality of life: results of a population-based prospective cohort study in old age in Germany. *Qual Life Res*. 2016;25(5):1159–68. <https://doi.org/10.1007/s11136-015-1166-5>.
- Asfar T, Arheart KL, Dietz NA, Caban-Martinez AJ, Fleming LE, Lee DJ. Changes in cigarette smoking behavior among US young workers from 2005 to 2010: the role of occupation. *Nicotine Tob Res*. 2016;18:1414–23.
- Tseng M, Fang CY. Socio-economic position and lower dietary moderation among Chinese immigrant women in the USA. *Public Health Nutr*. 2012;15(3):415–23. <https://doi.org/10.1017/s1368980011001820>.
- Tsai JL, Ying Y, Lee PA. The meaning of "being Chinese" and "being American": variation among Chinese American young adults. *J Cross-Cult Psychol*. 2000;31:302–32.
- Ying YW, Lee PA, Tsai JL, Lee YJ, Tsang M. Relationship of young adult Chinese Americans with their parents: variation by migratory status and cultural orientation. *Am J Orthop*. 2001;71(3):342–9. <https://doi.org/10.1037/0002-9432.71.3.342>.
- Tsai JL, Mortensen H, Wong Y, Hess D. What does "being American" mean? A comparison of Asian American and European American young adults. *Cult Divers Ethn Minor Psychol*. 2002;8(3):257–73. <https://doi.org/10.1037/1099-9809.8.3.257>.
- Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav*. 1997;38(1):21–37.
- Yu T, Jiang Y, Gamber M, Ali G, Xu T, Sun W. Socioeconomic status and self-rated health in China: findings from a cross-sectional study. *Medicine*. 2019;98(12):e14904. <https://doi.org/10.1097/md.00000000000014904>.
- Meng Q, Xie Z, Zhang T. A single-item self-rated health measure correlates with objective health status in the elderly: a survey in suburban Beijing. *Front Public Health*. 2014;2(27). <https://doi.org/10.3389/fpubh.2014.00027>.
- Ying Y.-W. Variation in acculturative stressors over time: a study of Taiwanese students in the United States. *Int J Intercult Relat*. 2005;29:59–71.
- Ying Y.-W. Immigration satisfaction of Chinese Americans: an empirical examination. *J Community Psychol*. 1996; 24:3–16.
- Ying Y, Liese L. Initial adaptation of Taiwan foreign students to the United States: the impact of pre-arrival variables. *Am J Community Psychol*. 1990;18:825–45.
- Ying Y-W, Han M. The contribution of personality, acculturative stressors, and social affiliation to adjustment: a longitudinal study of Taiwanese students in the United States. *Int J Intercult Relat*. 2006;30(5):623–35. <https://doi.org/10.1016/j.ijintrel.2006.02.001>.
- Ying Y-W, Han M, Tseng M. Acculturation and post-migration stress in middle-aged Chinese immigrant women in Philadelphia: variation between the Fujianese and the non-Fujianese women. *J Hum Behav Soc Environ*. 2012;22(1):20–38. <https://doi.org/10.1080/15433714.2011.597303>.
- Turner RJ, Frankel BG, Levin DM. Social support: conceptualization, measurement, and implications for mental health. In: Greenley JR, Simmons RG, editors. *Research in community and mental health*. Greenwich: JAI Press; 1983. p. 67–111.
- Noh S, Avison WR. Asian immigrants and the stress process: a study of Koreans in Canada. *J Health Soc Behav*. 1996;37(2):192–206.

36. Shen BJ, Takeuchi DT. A structural model of acculturation and mental health status among Chinese Americans. *Am J Community Psychol.* 2001;29(3):387–418.
37. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas.* 1977;1: 385–401.
38. Yu J, Li JK, Cuijpers P, Wu S, Wu Z. Prevalence and correlates of depressive symptoms in Chinese older adults: a population-based study. *Int J Geriatr Psychiatry.* 2012;27(3):305–12. <https://doi.org/10.1002/gps.2721>.
39. Lanza di Scalea T, Matthews KA, Avis NE, Thurston RC, Brown C, Harlow S, et al. Role stress, role reward, and mental health in a multiethnic sample of midlife women: results from the Study of Women's Health Across the Nation (SWAN). *J Women's Health.* 2012;21(5):481–9. <https://doi.org/10.1089/jwh.2011.3180>.
40. Lewinsohn PM, Seeley JR, Roberts RE, Allen NB. Center for Epidemiologic Studies Depression Scale (CES-D) as a screening instrument for depression among community-residing older adults. *Psychol Aging.* 1997;12(2):277–87. <https://doi.org/10.1037/0882-7974.12.2.277>.
41. Bromberger JT, Harlow S, Avis N, Kravitz HM, Cordal A. Racial/ethnic differences in the prevalence of depressive symptoms among middle-aged women: the Study of Women's Health Across the Nation (SWAN). *Am J Public Health.* 2004;94(8):1378–85. <https://doi.org/10.2105/ajph.94.8.1378>.
42. Camacho Á, Larsen B, McClelland RL, Morgan C, Criqui MH, Cushman M, et al. Association of subsyndromal and depressive symptoms with inflammatory markers among different ethnic groups: the multi-ethnic study of atherosclerosis (MESA). *J Affect Disord.* 2014;164:165–70. <https://doi.org/10.1016/j.jad.2014.04.018>.
43. Li Z, Hicks MH. The CES-D in Chinese American women: construct validity, diagnostic validity for major depression, and cultural response bias. *Psychiatry Res.* 2010;175(3):227–32. <https://doi.org/10.1016/j.psychres.2009.03.007>.
44. Leong F, Park YS, Kalibatseva Z. Disentangling immigrant status in mental health: psychological protective and risk factors among Latino and Asian American immigrants. *Am J Orthop.* 2013;83(2pt3):361–71. <https://doi.org/10.1111/ajop.12020>.
45. Wong CCY, Correa A, Robinson K, Lu Q. The roles of acculturative stress and social constraints on psychological distress in Hispanic/Latino and Asian immigrant college students. *Cult Divers Ethn Minor Psychol.* 2017;23(3):398–406. <https://doi.org/10.1037/cdp0000120>.
46. Hwang WC, Ting JY. Disaggregating the effects of acculturation and acculturative stress on the mental health of Asian Americans. *Cult Divers Ethn Minor Psychol.* 2008;14(2):147–54. <https://doi.org/10.1037/1099-9809.14.2.147>.
47. Reevy GM, Maslach C. Use of social support: gender and personality differences. *Sex Roles.* 2001;44(7):437–59. <https://doi.org/10.1023/A:1011930128829>.
48. Matud MP, Ibáñez I, Bethencourt JM, Marrero R, Carballeira M. Structural gender differences in perceived social support. *Personal Individ Differ.* 2003;35(8):1919–29. [https://doi.org/10.1016/S0191-8869\(03\)00041-2](https://doi.org/10.1016/S0191-8869(03)00041-2).
49. Ashton WA, Fuehrer A. Effects of gender and gender role identification of participant and type of social support resource on support seeking. *Sex Roles.* 1993;28(7):461–76. <https://doi.org/10.1007/BF00289608>.
50. Albert PR. Why is depression more prevalent in women? *J Psychiatry Neurosci.* 2015;40(4):219–21. <https://doi.org/10.1503/jpn.150205>.
51. Kuehner C. Why is depression more common among women than among men? *Lancet Psychiatry.* 2017;4(2):146–58. [https://doi.org/10.1016/s2215-0366\(16\)30263-2](https://doi.org/10.1016/s2215-0366(16)30263-2).
52. Burda PC, Vaux A, Schill T. Social support resources: variation across sex and sex role. *Personal Soc Psychol Bull.* 1984;10(1): 119–26. <https://doi.org/10.1177/0146167284101014>.
53. Barbee A, Cunningham M, Winstead B, Derlega V, Gulley M, Yankeelov P, et al. Effects of gender role expectations on the social support process. *J Soc Issues.* 2010;49:175–90. <https://doi.org/10.1111/j.1540-4560.1993.tb01175.x>.
54. Foo SQ, Tam WW, Ho CS, Tran BX, Nguyen LH, McIntyre RS, et al. Prevalence of depression among migrants: a systematic review and meta-analysis. *Int J Environ Res Public Health.* 2018;15(9): 1986. <https://doi.org/10.3390/ijerph15091986>.
55. Hsieh CM, Tsai BK. Effects of social support on the stress-health relationship: gender comparison among military personnel. *Int J Environ Res Public Health.* 2019;16(8). <https://doi.org/10.3390/ijerph16081317>.
56. Simon M. Gender differences in perceived social support in U.S. Chinese older adults. *J Gerontol Geriatr Res.* 2014;03. <https://doi.org/10.4172/2167-7182.1000163>.
57. Duman CH. Models of depression. *Vitam Horm.* 2010;82:1–21. [https://doi.org/10.1016/s0083-6729\(10\)82001-1](https://doi.org/10.1016/s0083-6729(10)82001-1).
58. Waldman K, Koyanagi A, Wang JS, Ko J, DeVlyder J, Oh H. Acculturative stress, disability, and health treatment utilization among Asian and Latin American immigrants in the United States. *Soc Psychiatry Psychiatr Epidemiol.* 2019;54(10):1275–84. <https://doi.org/10.1007/s00127-019-01691-0>.
59. Yeung A, Martinson MA, Baer L, Chen J, Clain A, Williams A, et al. The effectiveness of telepsychiatry-based culturally sensitive collaborative treatment for depressed Chinese American immigrants: a randomized controlled trial. *J Clin Psychiatry.* 2016;77(8):e996–e1002. <https://doi.org/10.4088/JCP.15m09952>.
60. Heaney CA, Israel BA. Social networks and social support. *Health behavior and health education: theory, research, and practice.* 4th ed. San Francisco: Jossey-Bass; 2008. p. 189–210.

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