Perceived Stress, Social Support, and Dry Mouth Among US Older Chinese Adults

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OBJECTIVES: Dry mouth is a common condition among older adults that negatively influences oral health, general health, and quality of life. The role of psychosocial factors in oral health conditions and diseases remains largely unknown. We conducted a study to examine the relationship between perceived stress and dry mouth among US older Chinese adults and further investigated the potential moderating role of social support and social strain from different sources in the relationship.

DESIGN: Cross-sectional analysis.

SETTING: Baseline of the Population Study of Chinese Elderly in Chicago, a community-engaged, population-based longitudinal study of health and well-being among community-dwelling US older Chinese adults.

PARTICIPANTS: Individuals 60 years or older (N = 3157).

MEASUREMENTS: Perceived stress was measured by the 10-item Chinese Perceived Stress Scale to evaluate the degree to which life situations were perceived as stressful during the preceding month on a 5-point scale, ranging from 0 ("never") to 4 ("very often"). Dry mouth was a binary self-reported outcome variable (1 = "dry mouth"). Social support was measured by the Health and Retirement Study's social support and strain scale from sources including spouse, other family members, and friends with a 3-point response set, ranging from 0 ("hardly ever") to 2 ("often"). Sociodemographics and disease processes were assessed as covariates.

We conducted stepwise logistic regressions with interaction terms.

RESULTS: Having higher levels of perceived stress was significantly associated with a higher likelihood of reporting dry mouth (odds ratio = 1.03; 95% confidence interval = 1.02-1.04). The effect of perceived stress on dry mouth may vary by levels of family and friend support.

CONCLUSION: Perceived stress may influence dry mouth either directly or indirectly. To prevent or reduce dry mouth, in addition to disease processes, interventions need to consider psychosocial factors in dry mouth, especially perceived stress and social support, in this growing population. J Am Geriatr Soc 67:S551–S556, 2019.

Key words: stress; oral health; social support; social strain; older Chinese immigrants

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Dry mouth is a common condition, ranging from 17% to 29% among older adults.[1,2] Saliva protects the teeth and the tissues of the mouth and is critical in maintaining oral health and function.[1] Dry mouth is used to describe the subjective sensation or evaluation of oral dryness.[1] Dry mouth can have negative effects on oral health, general health, and quality of life among older adults.[3,4] Individuals with dry mouth can have trouble swallowing, chewing, and speaking; report symptoms of burning, altered taste, aspiration, and sensation; and experience poor oral health outcomes including dental caries, gingivitis, and difficulty in dental treatment.[5]

Perceived stress could potentially influence dry mouth in later life. Older adults are susceptible to stress because they face higher risk of loss of functions, mobility, and independence; loss of significant others; and limited income and social support compared with general populations.[6] Perceived stress is a reaction to events or problems that initiate a physiologic response (fight or flight) in the body[7] and is an important

indication of mental and physical health.[6] More perceived stress was associated with self-reported dry mouth in a mixed-age sample (including older adults) in Sweden[8] and in clinical settings in the Netherlands.[9]

Older immigrants are particularly vulnerable to stress due to interrupted or lost social ties and acculturation challenges after immigration to a new country.[10] However, the role of psychosocial factors in oral health and diseases remains largely unknown.[11] Older Chinese immigrants tend to have poorer oral health outcomes and use fewer dental services compared with their host country counterparts.[12] Older Chinese immigrants in Calgary ranked dental problems as their third most common health problem after arthritis and hypertension.[13] Older adults who migrated from China comprise the fourth largest immigrant group in the United States.[14] The increasing oral health disease burdens among older Chinese immigrants point to the need for investigations of psychosocial factors in light of the current emphasis on physical diseases and health behaviors in oral health.[11] Whether and how perceived stress influences dry mouth in this population warrants further exploration.

Stress could influence health through direct or indirect pathways. Social support could affect health for individuals under stress (the buffering model) or irrespective of stress (the main-effect model).[15] Many close relationships are characterized by helpful and upsetting traits, propelling scholars to examine both positive and negative aspects of social support.[16] Social support typically embodies the supportive or positive aspect, whereas social strain describes negative exchanges between individuals including conflict, criticism, and rejection.[17] Scholars also need to investigate different types and sources of support and strain.[18]

Social support and social strain could have main effects on dry mouth in later life. Individuals with stronger social support have better health compared with those who do not, irrespective of stress exposure.[15] No research has explored the direct relationship between social support, social strain, and dry mouth in later life. We extrapolated findings from the few studies on social support and other oral health outcomes. Low social support was associated with fewer functioning teeth and more anterior open tooth spaces among older Swedish men[19] and poor self-rated oral health among middle-aged and older English adults.[20] Among older Americans, need for more emotional support was associated with higher odds of root decay and poor self-rated oral health,[21] but not with periodontal disease.[22] The relationship between social support and oral health outcomes is equivocal given different measures of oral health and social support in different countries.

Social support and social strain could be a stress buffer on dry mouth in later life. Individuals with strong social support tend to have better health, compared with those who do not, when exposed to stress.[15] Social support may alleviate stress through reappraisal, prevention of maladaptive responses, or promotion of adaptive responses.[15] Due to limited empirical studies on the main effects of social support and strain on dry mouth among older adults, the stress-buffering effects warrant further investigation.

This study examined the relationship between perceived stress and dry mouth among US older Chinese adults and further investigated the moderating role of social support and social strain from different sources in the relationship.

This study advances research on stress and dry mouth among older Chinese immigrants, expands the investigation of different sources of social support and strain and dry mouth in this population, and unveils the potential pathways linking perceived stress and dry mouth in this context. We addressed three research questions: (1) What is the relationship between perceived stress and dry mouth among US older Chinese adults? (2) What is the main effect of different sources of social support and strain on dry mouth? (3) Do different sources of social support and strain moderate the relationship between perceived stress and dry mouth and, if so, to what extent?

METHODS

Population and Setting

This study used baseline data from the Population Study of Chinese Elderly in Chicago (PINE), the largest population-based, community-engaged study of its kind.[23] The PINE study aimed to understand the relationship between key psychosocial and cultural determinants, health, and well-being among community-dwelling US older Chinese adults.[23] We included 3157 older Chinese adults in the greater Chicago area in the analyses.

Measures

Dry Mouth

At the time of the interview when reviewing past medical history, participants were asked whether they experienced any problems with dry mouth in the past (1 = "dry mouth," 0 = "no such condition"). This is a common measure to assess dry mouth. Subjective assessments of oral dryness were shown to be a robust indicator or measure of dry mouth in various studies.[8,24,25] Self-reported information on oral dryness is important to consider in promoting health and quality of life among older adults.[26]

Perceived Stress

We used the 10-item Chinese Perceived Stress Scale, with a Cronbach α of .86 in our sample,[6] to evaluate the degree to which participants perceived life situations as stressful during the preceding month on a 5-point scale, ranging from 0 ("never") to 4 ("very often"). A total score after reverse coding of positive items was calculated. Higher scores indicated greater psychological stress, with a theoretical range of 0 to 40.

Social Support

Social support was measured by the Health and Retirement Study's social support scale, with Cronbach α of .73 in our sample.[27] Participants were asked how often they could "open up to" or "rely on" their spouse, other family members, and friends for help (0 = "hardly ever," 1 = "some of the time," 2 = "often"). A total score for each source was created. Higher values indicated higher levels of social support, with a theoretical range of 0 to 4.

Social Strain

Social strain was measured by the Health and Retirement Study's social strain scale, with Cronbach α of .63 in our sample.[27] Participants were asked to report how often they experienced "too many demands" or being "criticized" by their spouse, other family members, and friends (0 = "hardly ever," 1 = "some of the time", 2 = "often"). Higher values indicated higher levels of social strain. A total score for each source was created, with a theoretical range of 0 to 4.

Covariates

We controlled for age (years), sex (1 = female, 0 = male), education (years), marital status (1 = married, 0 = not married), annual income (1 = >$10 000/year, 0 = ≤$10 000/year), years in the United States, diabetes (1 = having such condition, 0 = no such condition), and heart disease (1 = having such condition, 0 = no such condition).

Data Analysis

We used descriptive analyses for sample characteristics, conducted bivariate correlations to check multicollinearity, and checked group differences by dry mouth (t tests and χ^2 tests). To answer our research questions, we carried out stepwise logistic regression models by source of social support and strain. Model 1 contained covariates and perceived stress; model 2 added social support and strain from each source; and model 3 further added interaction terms including "perceived stress × social support" and "perceived stress × social strain" from each source. We used listwise deletion for missing data, which was far less than 5% of the sample. We generated outputs using statistical software SAS, v.9.4 (SAS Institute, Inc., Cary, NC).

RESULTS

In our sample, 25.5% of respondents reported dry mouth. 22.3% older adults reported having diabetes, and 15.1%

reported having heart disease. The average score for perceived stress was 10.1 (range = 0-39; standard deviation [SD] = 6.6). For social support (range = 0-4), the average score was 2.3 (SD = 1.8) for spousal support, 2.8 (SD = 1.3) for family support, and 1.6 (SD = 1.5) for friend support. For social strain (range = 0-4), the average score was 0.4 (SD = 0.8) for spousal strain, 0.2 (SD = 0.6) for family strain, and 0.1 (SD = 0.3) for friend strain. Older adults who reported dry mouth tended to be female with medical conditions and have lower income, shorter length of stay, more years of education, and more stress.

The logistic regression models demonstrated the relationship between perceived stress and dry mouth and further examined the moderating role of social support and strain by source. In model 1 (Tables 1–3), more perceived stress was significantly associated with higher odds of dry mouth, adjusted for covariates (odds ratio [OR] = 1.03; 95% confidence interval [CI] = 1.02-1.04). In subsequent models (Table 1), each 1-unit increase in perceived stress remained significantly correlated with higher odds of dry mouth (OR = 1.03; 95% CI = 1.01-1.05), accounting for covariates, spousal support or strain, and interactions.

Table 2 demonstrates that each 1-unit increase in perceived stress was significantly correlated with higher odds of dry mouth (OR = 1.03; 95% CI = 1.02-1.04), accounting for covariates and family support or strain. When including interactions of "stress × family support" and "stress × family strain," the significant effect of perceived stress disappeared. The interaction between stress and family support became significant (OR = 1.01; 95% CI = 1.00-1.02).

Table 3 shows that each 1-unit increase in perceived stress was significantly correlated with higher odds of dry mouth (OR = 1.02; 95% CI = 1.01-1.04), accounting for covariates and friend support or strain. Higher levels of friend support were significantly correlated with lower odds of dry mouth (OR = .94; 95% CI = 0.88-1.00). After adding interactions of "stress × friend support" and "stress × friend strain," the significant effect of perceived stress disappeared. The significant effect of friend support remained (OR = 0.94;

Table 1. Logistic Regression Models for Dry Mouth by Spousal Support and Strain (N = 3157)

	Model 1 (n = 3071) OR (95% CI)	Model 2 (n = 3030) OR (95% CI)	Model 3 (n = 3030) OR (95% CI)
Age	1.00 (.99-1.01)	1.00 (.99-1.02)	1.00 (.99-1.02)
Female	1.40 (1.17-1.69)***	1.45 (1.20-1.75)***	1.45 (1.21-1.75)***
Married	.99 (.80-1.21)	1.04 (.74-1.46)	1.04 (.74-1.46)
Education	1.03 (1.01-1.04)**	1.03 (1.01-1.04)**	1.03 (1.01-1.04)**
Annual income (>$10 000)	.93 (.72-1.21)	.95 (.73-1.23)	.95 (.73-1.23)
Years in United States	.98 (.97-.99)***	.98 (.97-.99)***	.98 (.97-.99)***
Diabetes	1.38 (1.14-1.68)**	1.40 (1.15-1.70)***	1.40 (1.15-1.70)***
Heart disease	1.77 (1.42-2.19)***	1.78 (1.43-2.22)***	1.78 (1.43-2.22)***
Perceived stress	1.03 (1.02-1.04)***	1.03 (1.02-1.04)***	1.03 (1.01-1.05)**
Spousal support		.98 (.90-1.07)	.98 (.90-1.07)
Spousal strain		1.05 (.94-1.17)	1.05 (.94-1.17)
Perceived stress × spousal support			1.00 (.99-1.01)
Perceived stress × spousal strain			1.00 (.99-1.02)
Pseudo R^2	.06	.06	.06

Abbreviations: CI, confidence interval; OR, odds ratio.

**p < .01.

***p < .001.

Note. Missing value was less than 5% of the total sample. Listwise deletion was used.

Table 2. Logistic Regression Models for Dry Mouth by Family Support and Strain (N = 3157)

	Model 1 (n = 3071) OR (95% CI)	Model 2 (n = 3064) OR (95% CI)	Model 3 (n = 3064) OR (95% CI)
Age	1.00 (.99-1.01)	1.00 (.99-1.02)	1.00 (.99-1.02)
Female	1.40 (1.17-1.69)***	1.42 (1.18-1.71)***	1.43 (1.19-1.72)***
Married	.99 (.80-1.21)	.99 (.80-1.22)	.98 (.80-1.21)
Education	1.03 (1.01-1.04)**	1.03 (1.01-1.04)**	1.03 (1.01-1.04)**
Annual income (>$10,000)	.93 (.72-1.21)	.94 (.73-1.22)	.94 (.72-1.21)
Years in United States	.98 (.97-.99)***	.98 (.97-.99)***	.98 (.97-.99)***
Diabetes	1.38 (1.14-1.68)**	1.39 (1.14-1.68)**	1.39 (1.14-1.69)***
Heart disease	1.77 (1.42-2.19)***	1.78 (1.43-2.21)***	1.77 (1.43-2.20)***
Perceived stress	1.03 (1.02-1.04)***	1.03 (1.02-1.04)***	1.00 (.97-1.03)
Family support		.98 (.91-1.05)	.96 (.89-1.03)
Family strain		.95 (.82-1.10)	1.00 (.84-1.17)
Perceived stress × family support			1.01 (1.00-1.02)*
Perceived stress × family strain			.99 (.97-1.01)
Pseudo R^2	.06	.06	.06

Abbreviations: CI, confidence interval; OR, odds ratio.
*p < .05.
**p < .01.
***p < .001.
Note. Missing value was less than 5% of the total sample. Listwise deletion was used.

Table 3. Logistic Regression Models for Dry Mouth by Friend Support and Strain (N = 3,157)

	Model 1 (n = 3071) OR (95% CI)	Model 2 (n = 3046) OR (95% CI)	Model 3 (n = 3046) OR (95% CI)
Age	1.00 (.99-1.01)	1.00 (.99-1.01)	1.00 (.99-1.01)
Female	1.40 (1.17-1.69)***	1.44(1.19-1.73)***	1.44 (1.20-1.74)***
Married	.99 (.80-1.21)	.96 (.78-1.19)	.96 (.78-1.18)
Education	1.03 (1.01-1.04)**	1.03 (1.01-1.05)**	1.03 (1.01-1.05)**
Annual income (>$10 000)	.93 (.72-1.21)	.94 (.73-1.22)	.94 (.73-1.22)
Years in United States	.98 (.97-.99)***	.98 (.97-.99)***	.98 (.97-.99)***
Diabetes	1.38 (1.14-1.68)**	1.37 (1.13-1.66)**	1.38 (1.13-1.68)**
Heart disease	1.77 (1.42-2.19)***	1.77 (1.42-2.20)***	1.78 (1.43-2.21)***
Perceived stress	1.03 (1.02-1.04)***	1.03 (1.02-1.04)***	1.02 (1.00-1.03)
Friend support		.94 (.88-1.00)*	.94 (.88-1.00)*
Friend strain		1.05 (.81-1.35)	1.11 (.84-1.46)
Perceived stress × friend support			1.01 (1.00-1.02)*
Perceived stress × friend strain			.98 (.94-1.01)
Pseudo R^2	.06	.06	.06

Abbreviations: CI, confidence interval; OR, odds ratio.
*p < .05.
**p < .01.
***p < .001.
Note. Missing value was less than 5% of the total sample. Listwise deletion was used.

95% CI = .88-1.00). The interaction between stress and friend support became significant (OR = 1.01; 95% CI = 1.00-1.02).

We plotted the relationship between perceived stress and estimated probabilities of dry mouth by level of support to illustrate significant interactions. In Figure 1, the relationship between perceived stress and dry mouth varied by level of family support. Individuals with high family support had the steepest slope, followed by those with medium and low family support. In Figure 2, the relationship between perceived stress and dry mouth followed a similar pattern. The relationship between perceived stress and dry mouth was the strongest among participants with high family or friend support.

DISCUSSION

Our findings indicate that perceived stress was associated with dry mouth either directly or indirectly among US older Chinese adults, given sources of social support and strain. Specifically, more perceived stress was directly associated with higher odds of dry mouth, accounting for the effects of spousal support and strain. This is consistent with previous mixed-sample studies.[8,9] Social support and strain from a spouse did not attenuate the relationship between perceived stress and dry mouth, which is not unusual. A nonsignificant association between quality of marital relationships and subjective health ratings among older adults was reported, along with a significant association with psychological well-being.[18] Spousal
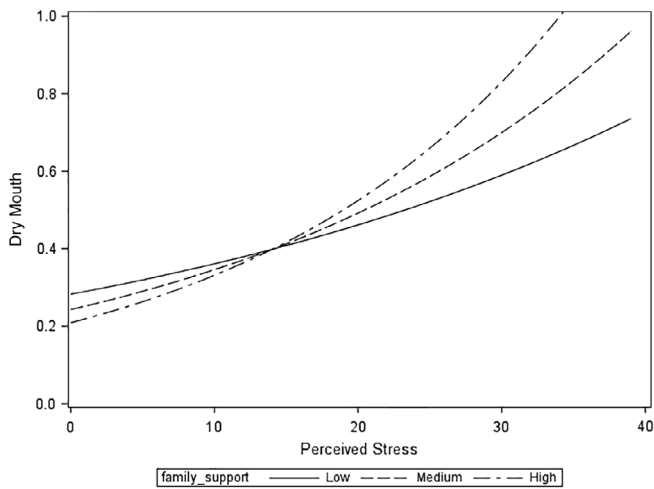
Figure 1. Line chart of estimated probabilities of dry mouth by perceived stress and family support, accounting for other covariates.
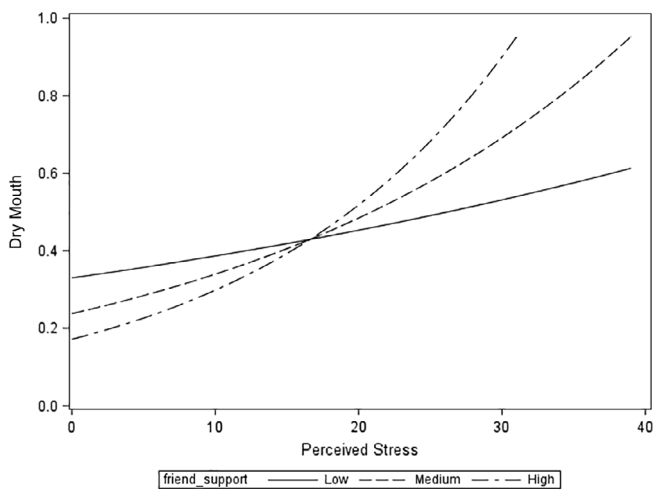

Figure 2. Line chart of estimated probabilities of dry mouth by perceived stress and friend support, accounting for other covariates.

support and strain may be less likely to affect physical health outcomes. We suspect that older adults are likely to be in long-term marriages and have normalized spousal support and strain that may not influence dry mouth independently.

Older Chinese immigrants tend to heavily rely on children and other family members for support and care.[28] Friends become more important after immigration to the United States, compared with their counterparts in China.[28] Friend support was suggested to be protective against dry mouth in this study. Besides that, the study did not find strong associations between family support, friend support, and dry mouth; instead, perceived stress was positively related with a higher likelihood of reporting dry mouth among US older Chinese adults. Despite this, there is some evidence of significant group differences by level of family or friend support in the relationship between perceived stress and dry mouth. The relationship between perceived stress and the odds of having dry mouth was the strongest among older adults with high family or friend support despite the absence of a strong, direct association between such support and dry mouth.

We speculate that family and friend support could potentially impact perceived stress; while perceived stress is related to dry mouth symptom, family or friend support could thus indirectly affect the perceived dry mouth symptoms. We speculate that too much social support might have negative consequences on oral health, as seen in social overload from traditional social networks resulting in negative psychological and behavioral consequences.[29] We also speculate that the type of support might make the difference between more stress and less. For instance, when too much unsolicited emotional support or advice is offered or perceived, it might create more stress than it relieved. It might also be possible that extended talk and rumination with family and friends could increase perceived stress and indirectly increase dry mouth.[30]

We acknowledge that having diabetes or heart disease was significantly associated with a relatively high likelihood of reporting dry mouth, accounting for perceived stress, social support, and social strain in this population. We speculate that poor health may lead to stress and dry mouth. Poor health may require medication intakes, resulting in increased risks of dry mouth. We also speculate that individuals with higher levels of education might be more likely to be aware of having certain oral health symptoms including dry mouth. Individuals with lower levels of education might consider dry mouth as a normal part of aging and may not report this symptom.

Findings should be interpreted with caution. Due to the cross-sectional nature of the data, we cannot rule out an inverse relationship between perceived stress and dry mouth. Generalizability of findings to other contexts might be limited given the sampling of older Chinese immigrants in one geographic region. Potential confounding factors including medications and oral health behaviors were not collected. The strength of significant ORs and the explained variance in dry mouth were relatively low.

Despite these limitations, this study is the first to examine the relationship between perceived stress and dry mouth and further investigate the role of social support and strain from different sources among US older Chinese adults. This study demonstrates the importance of examining immigrant oral health outcomes in later life, understanding this specific type of oral health outcome among older ethnic minority immigrants in a specific cultural group, and examining social support and social strain from different sources. It has theoretical and practical significance regarding how perceived stress may influence dry mouth in this context. Future studies should investigate the dynamic relationship between perceived stress and dry mouth over time within this population.

This study has implications for the medical and dental community. This study highlights the interconnections among perceived stress, social support, and dry mouth among older Chinese immigrants and the importance of considering psychosocial determinants of oral health symptoms and problems in later life with respect to treatment and health promotion efforts. We need to raise awareness among dental and healthcare providers of the potential role that perceived stress could play in promoting optimal oral health and improving quality of life in this growing population. Intervention strategies could start with the assessment of perceived stress in dental examinations and pay attention to social support of the patients when there is no other reason to cause

the stress and dry mouth in this vulnerable population. We could build community-based partnerships and design culturally and linguistically appropriate educational programs to disseminate information on dry mouth and its debilitating nature, with critical consideration of perceived stress, disease processes, and social support in this population.

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