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Integrative Nutritional Counseling Combining Chinese Medicine and Biomedicine for Chinese Americans with Type 2 Diabetes: A Mixed-Methods Feasibility Study

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Abstract

Objectives: This study describes the development and feasibility of Integrative Nutritional Counseling (INC), a Chinese medicine (CM)+biomedicine-based nutrition curriculum for Chinese Americans with type 2 diabetes. Although Chinese Americans often incorporate CM principles into their diet, scant research has explored how to integrate CM with biomedical nutrition standards in a culturally appropriate manner or if such a program could improve diabetes self-management.

Design: This is a 1-month pre–post study design including three points of contact: baseline, in-person class, and 1-month follow-up.

Subjects: Participants ($n = 15$) were Cantonese-speaking/reading Chinese Americans diagnosed with type 2 diabetes who had used some form of CM/medicinal foods in the last 12 months.

Interventions and Outcome Measures: The INC program included baseline surveys and a CM intake interview conducted by a licensed acupuncturist. The acupuncturist generated a CM diagnosis, which was shared with the participant, and used this diagnosis to tailor brief nutrition education. To bolster this brief education, a bilingual registered dietitian provided a 2-h group education class in Cantonese to all participants, during which time participants also received a Chinese/English INC booklet. Participants completed surveys immediately after the class and at 1-month follow-up, with qualitative exit interviews.

Results: Participants reported improved attitudes and dietary habits aligning directly with INC, and improvement in biomedically valued measures of type 2 diabetes, such as weight loss, and CM-valued measures of digestion/elimination and hot/cold feeling. Satisfaction with INC was high, but challenges included confusion with some INC information, structural barriers, and comorbidities.

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Conclusions: Chinese Americans with type 2 diabetes and interventionists found integrative nutrition approaches acceptable and feasible. Future research should examine INC with a larger population and explore optimal delivery of INC given reported challenges.

Keywords: integrative medicine, Chinese American, type 2 diabetes, Chinese medicine, nutrition, mixed methods

Introduction

Type 2 diabetes mellitus (T2DM) is a rising problem in the United States[1] and globally. Chinese Americans are more likely to develop T2DM with lower body mass index and less obesity compared with White Americans and are more likely to have suboptimal T2DM self-management.[2,3] In addition, in the United States, 29% of Chinese Americans have low English proficiency, which is associated with low health literacy and lower health status compared with Whites and other ethnic minority groups.[4–9] Some culturally targeted diabetes education for Chinese Americans suggests promising improvements in patients' self-efficacy, diabetes knowledge, diabetes quality of life, diabetes distress,[10] and glucose control.[11,12] However, Chinese Americans have also been found to use complementary and integrative health therapies (CIH) at higher rates than the general U.S. population[13] and may not follow typical recommendations to restrict or measure food because these suggestions run counter to commonly used Chinese and Chinese medicine (CM)-based understandings of the healing nature of food.[4,12,14,15] For example, some Chinese Americans report that there are different kinds of T2DM, one ''hot'' and one ''cold,'' and one should try to eat cool or hot foods, respectively, to appropriately balance those conditions.[14] In addition, a person with biomedically diagnosed T2DM may, with reference to the CM paradigm, present with a range of distinct health imbalances reflecting a holistic assessment of their current overall health.

The idea of holistic equilibrium and balance underscores CM theories (for more information, see Kaptchuk[16]) that have existed for millennia. However, the form of CM that is widely used today traces its roots to the 1940s when Mao Zedong codified certain parts of CM, notably herbal medicine and acupuncture.[17,18] Named ''Traditional Chinese Medicine,'' this decades-old version of CM is the basis for licensed forms of CM used globally. However, in unlicensed venues and lay usage, CM also includes practices such as *tuina* (massage), bone setting, acupressure, *qigong*, *t'ai qi*, and dietary therapy/nutrition. Although not always included in formal CM training, many Chinese American laypeople and licensed practitioners continue to incorporate dietary therapies in their practices to improve overall health equilibrium within the person as a whole, bringing balance in a holistic way to the person's interconnected systems.[19]

Despite the fact that Chinese Americans use CIH at higher rates than the general population in the United States,[13] and that Chinese Americans are specifically interested in integrating CM and biomedicine for T2DM,[20] there are few biomedically tested guidelines to support such integration. Integrative Nutritional Counseling (INC)—the booklet and curriculum developed and tested in this study—was designed to address this gap with input from four stakeholder groups: licensed CM experts, unlicensed and lay CM experts, biomedical experts (e.g., primary care providers, nurses, dietitians), and Chinese American patients with T2DM. Development was guided by the PEN-3 Model, which makes culture explicit in designing health promotion materials.[21] Used in a variety of cultural contexts in Africa, the Middle East, the Caribbean, and among indigenous people and people of color in the United States, PEN-3 seeks and acknowledges individual and community beliefs and practices that may already be fostering positive health even if those practices are not typically recognized as health care. As such, both lay CM experts and Chinese American patients were included—to incorporate their knowledge and practice of dietary intake to support optimal health.

Despite growing interest in testing the safety and efficacy of Chinese medicinal herbs and foods for treating diabetes,[22–24] no previous research has integrated CM principles and nutrition for diabetes. As a culturally sensitive integrative behavioral intervention for Chinese Americans with T2DM, INC incorporates biomedically based nutrition recommendations alongside Chinese medicinal food concepts. Biomedically-based nutrition recommendations commonly use the MyPlate method that suggests meals of ~50% vegetables, ~25% proteins, and ≤25% carbohydrates.[25–27] From a Chinese nutritional perspective, foods can be ingested that move a person closer to holistic equilibrium because they contain energetic properties not recognized in biomedicine. In this study, these basic food properties were presented so patients could choose the most suitable vegetables, proteins, or carbohydrates for their Chinese medical condition while simultaneously staying within the constraints of the biomedically suggested ration of ~50% vegetables, ~25% proteins, and ≤25% carbohydrates.

This study used the framework from Bowen et al.[28] for testing the feasibility of INC among Chinese Americans with TD2M. Specifically, the authors assessed *acceptability* (participants' reactions to the intervention), *demand* (use of the intervention), and *limited efficacy* (testing in a convenience sample or with limited numbers or shorter time frame).[28]

Materials and Methods

Intervention

The INC curriculum integrating biomedical nutrition concepts for T2DM with Chinese medicinal foods for T2DM was developed through iterative rounds of decision-making by the research team (Fig. 1). Team members had expertise working in Chinese and Chinese American communities as an internal medicine physician, a licensed acupuncturist/medical anthropologist, a registered dietitian, a health communication scholar, and a Cantonese linguist. The final rendition of INC included a 44-page full-color magazine-style booklet printed in Chinese traditional characters and English, large posters of

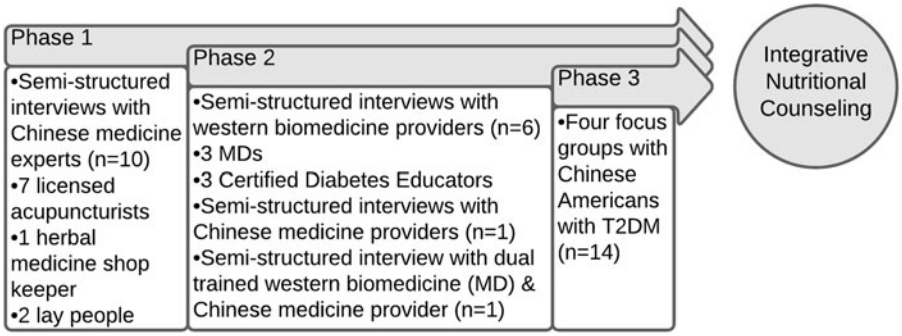

FIG. 1. Iterative INC guide and curriculum development. INC, Integrative Nutritional Counseling.

materials from the booklet, and instructions for how to teach INC in a 2-h group setting.

INC is designed to be culturally sensitive in two important ways. On a basic level, INC uses Chinese and English wording and including regularly available Chinese foods as examples and in pictures. More importantly, INC is culturally appropriate on a deeper level.[29] First, it includes culturally specific practical tips, such as categorizing dumplings as both protein and carbohydrate. Second, it tailors biomedically sound diet recommendations to three CM imbalance conditions: heat, dampness with heat, and cold/weakness (Fig. 2), each with corresponding INC food recommendations to address those imbalances (clear heat, clear heat/rid damp, nourish and warm). For example, a person with a heat condition is encouraged to eat more vegetables considered to have a cooling therapeutic profile within the CM paradigm, such as cucumbers or lettuce. By eating cooling vegetables rather than warming vegetables, a person using INC can control both their carbohydrate intake (biomedical perspective) and improve their equilibrium (CM perspective). INC has oversimplified professional CM individualized diagnoses (e.g., limiting to three basic diagnoses) and their corresponding treatments so that patients without extensive CM professional knowledge can still use it as a self-management tool (Fig. 3). To download INC, go to www.INCguide.org.

Research design

The authors chose a convergent design to triangulate data from a small sample. Open- and close-ended questions addressed acceptability, demand, and limited efficacy. This is a 1-month pre–post study design including three points of participant contact: baseline, in-person class, and 4-week follow-up. The baseline study visit included informed consent, survey administration, and a 30-min interview in Cantonese with a Cantonese bilingual licensed acupuncturist. The Chinese American acupuncturist used CM diagnostic techniques, including a clinical interview for symptoms and a tongue and pulse examination. The clinical interview was standardized using a CM-specific symptoms checklist adapted from Beinfield and Korngold's[30] organ-specific symptoms checklist (Appendix A1). Unlike a biomedical diagnosis of T2DM, a CM diagnosis is dynamic and depends on the patient's current holistic situation.

Following their diagnostic interview with the acupuncturist, participants attended a 2-h, small-group course taught in Cantonese by a Chinese American bilingual diabetes educator/registered dietitian with more than a decade of experience teaching traditional T2DM nutrition education classes to Chinese Americans. This class, however, was based on the INC curriculum. During the class, participants received the INC booklet and their individualized CM diagnoses, which placed them into one of three INC assignments (clear heat, clear heat/rid damp, warm). Participants completed surveys immediately following the class. Four weeks later, participants completed a follow-up interview. University of California San Francisco and University of San Francisco Institutional Review Boards approved the study.

Participants and setting

In San Francisco, where this research took place, Chinese Americans comprise 18.3% of the population,[31] and 62.9%

Chinese Medicine Diagnosis Samples	Corresponding INC Assignment
Spleen qi deficiency with **Dampness**. Kidney qi deficiency with kidney yin deficiency + dryness.	Primary: **Yellow** (Clear Heat & Rid Damp) Secondary: Red (Warming)
Stomach liver **Heat**, slight kidney deficiency	Primary: **Blue** (Clear Heat)
Large intestine dryness. Stomach yin **Deficiency** with **Deficiency** heat. Kidney yin **Deficiency**; kidney qi **Deficiency**. Spleen qi **Deficiency** with dampness **stagnation**.	Primary: **Red** (Warming) Secondary: Yellow (Clear Heat & Rid Damp)

FIG. 2. Conversion of Chinese medicine diagnoses to INC assignment. Presented are three sample Chinese medicine diagnoses as written by the Chinese medicine practitioner and then as translated into the corresponding INC assignment. Diagnoses of dampness typically led to a yellow INC assignment. Diagnoses of heat typically led to blue or sometimes yellow INC assignments. Diagnoses of deficiency typically led to red INC assignments.

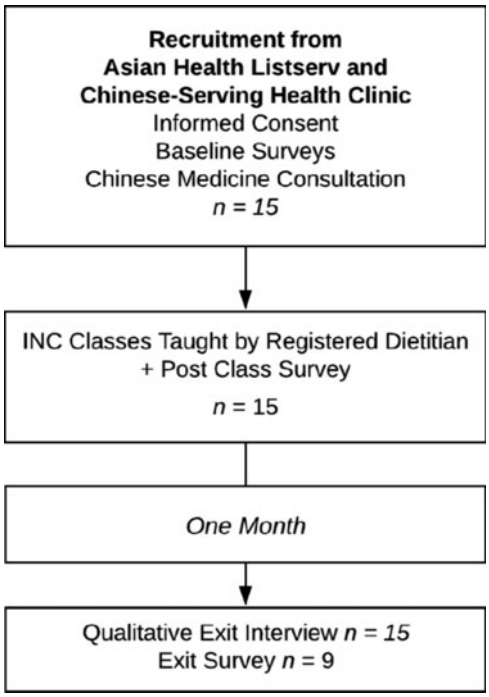

FIG. 3. Flow diagram of study participants.

are limited English proficient.[31] Study participants were a convenience sample targeting monolingual Chinese Americans recruited through physician recommendation at a predominantly Cantonese-serving public health clinic, passive Chinese-language advertising at a public safety net hospital, and an e-mail sent to an Asian health-oriented listserv. Recruitment materials described a research study including an educational class integrating Chinese and Western medicine nutrition for T2DM. Eligibility criteria included: (1) T2DM diagnosis; (2) ability to read Chinese/speak Cantonese; and (3) use of CM or CM diet principles within the previous 12 months. Participants chose one of three classes conducted in 2014–2015 at a university hospital conference room ($n=2$) or the Cantonese-serving clinic ($n=1$) and received a $30 gift card as an incentive. The recruitment period and intervention pilot were determined by budget and time constraints.

Measures

The baseline participant survey included questions about sociodemographics (e.g., age, sex, education, nativity), self-reported health status, and diabetes care. It also contained measures of acculturation (more Asian, bicultural, more Western) using the Suinn–Lew Asian Self-Identity Acculturation Scale[32] and preferences for Chinese or Western medicine (Chinese and Western Medical Beliefs Scale).[33,34]

At baseline and follow-up 4 weeks after the intervention, surveys assessed dietary intake with four questions about the quantity of vegetables, fruit, and white and brown rice consumed in the previous day. These surveys also included measures of diabetes self-care (Summary of Diabetes Self-Care Activities Measure,[35] which includes an item querying how many of the last 7 days the respondent followed a healthful eating plan), diabetes distress (two-item Diabetes Distress Scale short form),[11] and self-efficacy (modified five-item Heisler's Self-Efficacy Scale, assessing degree of difficulty with T2DM-related self-care activities).[36]

To measure satisfaction with INC immediately following the class, participants rated 14 statements about attitudes, beliefs, anticipated behavior, barriers, and communication on a 5-point Likert scale.

Qualitative interviews with stakeholders used a semi-structured interview guide developed by the research team to address key dimensions of feasibility and acceptability. Interviews with the acupuncturist and registered dietitian focused on their experiences delivering INC. Interviews with participants were conducted 4 weeks after the INC class. These interviews were audio-recorded, lasted ~ 30 min in duration, and addressed health changes, current diet, usage of the INC guide and assignment, and sharing INC with others.

Data analysis

For descriptive analysis, the authors calculated means for continuous variables and proportions for categorical measures at baseline and after the intervention. Bilingual Cantonese authors (D.C., S.H., and Q.R.) conducted, transcribed, and translated the interviews, which were checked by another author (G.L.). Chinese American authors conducted a thematic analysis[37] (E.Y.H., G.L., M.T.C., H.L.-C., S.H., Q.R.) using inductive and deductive approaches. The authors iteratively conducted open coding and constant comparison by writing analytical memos[38] and then sorting codes into larger themes, coming to consensus as a team. Qualitative data analysis software, ATLAS.ti 8.3.0 (Berlin), was used to organize data and locate examples related to feasibility and acceptability of INC.

Results

Participants

Fifteen participants enrolled in and completed the study (Fig. 3). Most were aged between 61 and 70 years (53%, $n=8$) and were female (67%, $n=10$) (Table 1). All were immigrants with most (87%, $n=13$) residing in the United States for more than 10 years, with fair or poor self-reported health (71%, $n=10$) and taking medication for T2DM (93%, $n=14$). Most (87%, $n=13$) reported that they knew what a diabetic diet was.

Acceptability: Chinese American participants

Surveys conducted immediately after the INC class indicated high satisfaction and intention to act. All participants agreed or strongly agreed with the statements ''I learned something new today about diabetes and diet,'' ''I feel confident that I will use the things I learned today,'' and ''In my next meal, I plan to use the things I learned today'' (Table 2).

Interviews conducted 4 weeks later demonstrated continued satisfaction with INC (Table 3). Participants appreciated cultural aspects of INC including the use of Chinese language, numerous color pictures of vegetables, and typically eaten Chinese foods. A majority (8/15) actively used the INC booklet during the last 4 weeks, reading or referring to the book when making dietary choices. Participants appreciated

Table 1. Characteristics of Participants ($n = 15$)

Characteristic	*Study participants,* n *(%)*
Age, years	
41–50	1 (6.7)
51–60	5 (33.3)
61–70	8 (53.3)
>70	1 (6.7)
Sex, female	10 (66.7)
Education	
Less than high school	6 (40.0)
Some high school	2 (13.3)
High school graduate or equivalent	1 (6.7)
Some college	4 (26.7)
College graduate	2 (13.3)
Nativity	
Hong Kong	2 (13.3)
Mainland China	12 (80.0)
Vietnam	1 (6.7)
Years in the United States	
Less than 10	2 (13.3)
10–20	5 (33.3)
20–30	4 (26.7)
More than 30	4 (26.7)
Acculturation measures[a]	
Asian self-identity mean score	1.87 ± 0.50
Values	
Asian identified	5 (35.7)
Bicultural	9 (64.2)
Behavioral tendencies	
Asian identified	4 (28.5)
Western identified	2 (14.3)
Bicultural	8 (57.1)
Chinese–Western medical beliefs	
Attitudes about Traditional Chinese Medicine	3.77 ± 0.78
Attitudes about Western medicine	4.12 ± 0.72
Self-reported health status[a]	
Excellent	0 (0)
Very good	2 (14.3)
Good	2 (14.3)
Fair	9 (64.3)
Poor	1 (7.1)
Takes pills for diabetes	14 (93.3)
Prefers foods you grew up eating	12 (80.0)
Rest of the family wants the food you are supposed to eat	7 (46.7)
Knows what a diabetic diet is	13 (86.7)

[a]Based on 14 respondents, missing $n = 1$.

Table 2. Average Rating of Intervention ($n = 15$)

Post-class statements	*Mean ± SD*[a]
1. The skills I learned during this class will improve my diabetes diet.	4.56 ± 0.53
2. I learned something new today about diabetes and diet.	4.67 ± 0.50
3. The class prompted me to evaluate my current eating habits.	4.67 ± 0.50
4. I feel confident that I will use the things I learned today.	4.67 ± 0.50
5. In my next meal, I plan to use the things I learned today.	4.44 ± 0.53
6. I have enough time to eat this diet.	4.33 ± 0.50
7. I have enough money to eat this diet.	4.22 ± 0.67
8. I have enough support from those around me to eat this diet.	4.33 ± 0.50
9. I feel ready to use this diet next time I eat out.	4.33 ± 0.71
10. I feel ready to use this diet next time I cook a meal.	4.38 ± 0.52
11. I plan to share details of what I learned today with a friend.	4.22 ± 0.67
12. I plan to share details of what I learned today with a family member.	4.67 ± 0.50
13. I plan to share details of what I learned today with my doctor or nutritionist.	4.00 ± 1.00
14. I plan to share details of what I learned today with my Chinese medicine provider.	4.11 ± 0.78

[a]Mean score across all participants on a 5-point Likert scale from strongly disagree (1) to strongly agree (5).
SD, standard deviation.

INC as a unified system, made by trusted experts, that could be used while shopping. Although few participants shared the INC materials with their doctors, 11 of 15 (73.3%) reported that they had shared either the INC materials or something they learned from INC with friends or family members.

Acceptability: provider delivery of INC

The acupuncturist who met with all the participants reported that the symptom checklist was useful in guiding patient conversations. Because the visit was similar to what she would have done in a usual CM intake interview, she was quickly able to generate a CM diagnosis. When converting this individualized diagnosis into one of the three INC assignments (clear heat, clear heat/rid damp, warm), it became apparent that most participants ($n = 14/15$) needed both a primary and secondary assignment (Fig. 2). This realization generated a change in the protocol in which participants were instructed to focus mainly on nutrition education for their primary assignment, but that dietary choices appropriate for their secondary assignment could be utilized as well.

The registered dietitian was able to successfully deliver INC after 2 h of training with the research team and reported appreciation of the high quality of the full-color INC guide with large font and many pictures of Chinese foods. However, she reported an inability to answer some questions specific to CM that she was posed during the class and suggested future classes be co-taught with a CM provider who could answer those questions.

Demand: participant successes and challenges using INC

Dietary successes. The 4-week follow-up survey was administered to 9 of the original 15 study participants. No changes were observed for most survey measures (Table 4). In contrast, in qualitative interviews of 15 participants, all but 2 participants (86.7%) reported making a behavior change including eating less oil/fried foods, desserts, or

Table 3. Patient Acceptability Exemplary Quotes

Participant	*Exemplary quote*
Jiamin, female, age: 61–70 years	''Previously I usually listened to others. So now there is a system, so you can, wherever you need to turn to you can turn to the page, and you feel, 'Ah, this is pretty well put,' then follow [the system], yeah. That is, there is a, how do I say it? [It's] systematic, yeah, that is, it tells you which foods you should eat more of, which foods you should eat less of. That is, there is, is, is a book that teaches you how to do it.''
Yiru, female, age: 71+ years	''[Chinese medicine information is] spread out all over China and we do not know which one is right … I cannot understand the English academic articles … so, I cannot understand it [Chinese medicine information].''
Yanqin, female, age: 51–60 years	''I show my relatives. I loaned them the book and when they were done I took it back.''
Wendi, female, age:51–60 years	''I told [my friend] I only have one [book] and I don't know whether I can get another one.''

carbohydrates, and eating more vegetables, or performing more physical activity. Twelve (80%) participants either reduced white rice consumption or increased brown rice consumption. Twelve (80%) participants reported that they tried to eat more vegetables and/or tried to conform to the MyPlate proportions. Participants also discussed dietary changes based on the INC suggestions, including suggested carbohydrate to vegetable and protein proportions, mixing white and brown rice, increasing physical activity, and eating fewer desserts (Table 5).

Dietary challenges. Some participants reported increased dietary intake of recommended foods. However, close reading of the text revealed that one third (5/15) mentioned increasing ''fruits and vegetables'' together as being part of the overall practice of ''eating healthier,'' despite emphasis in the guide that fruits raise blood glucose levels. Participants also reported challenges avoiding foods they especially liked, such as pineapple, taro, and spring rolls, or not enjoying some suggested foods such as bitter melon, collard greens, and brown rice (Table 5).

INC assignment successes and challenges. At 1-month follow-up, some participants forgot their INC assignment, despite its being reinforced in the class with multiple modalities (e.g., colored stickers on take-home materials). Other participants disagreed with their INC assignment. In exit interviews, a majority of participants (8/15) were able to remember both their primary and secondary INC assignment, 5 remembered only one correctly, and 2 could not remember at least one assigned assignment. Two people actively questioned or disagreed with their assignment, although they could remember it (Table 5).

Structural challenges and comorbidities. Participants reported a number of comorbidities, such as high cholesterol, that also motivated a desire to alter dietary intake. Conversely, some participants reported structural problems such as missing teeth (and needing soft foods) or food insecurity that made dietary changes difficult to follow (Table 5).

Patient-reported outcome measures: limited-efficacy testing

Exit interviews asked participants to report on any changes they noticed to their T2DM since beginning the study. Participants reported various signs that INC was leading to T2DM improvement, with assessments stemming from both biomedical and CM standards. Although HbA1C was not measured nor explicitly asked about in interviews, seven participants (46.7%) attributed reductions in their blood glucose levels to INC-related changes. Similarly, although participants were not asked specifically about weight, some reported losing weight (Table 6).

Participants also volunteered symptom improvement related to their CM assignments, despite this not being explicitly addressed in the interview questions. In response to

Table 4. Intervention Outcome Measures, Baseline Versus Postintervention ($n=9$)

Outcome measure	*Baseline % or mean (95% CI)*	*Postintervention % or mean (95% CI)*
Food recall, %		
Yesterday I ate …		
Vegetables ≥two times	88.9 (51.8–99.7)	88.9 (51.8–99.7)
Fruit ≥two times	55.6 (21.2–86.3)	66.7 (29.9–92.5)
White rice ≥one time[a]	66.7 (29.9–92.5)	55.6 (21.2–86.3)
Brown rice ≥one time	57.1 (28.9–82.3)	77.8 (40.0–97.2)
Diabetes self-care—diet, mean	5.00 (4.26–5.74)	5.00 (4.13–5.87)
Diabetes distress,[a] mean	2.89 (2.06–3.72)	2.94 (2.21–3.67)
Diabetes self-efficacy, mean	76.89 (64.14–89.64)	80.00 (72.47–87.53)

[a]Lower score is more optimal.
CI, confidence interval.

Table 5. Demand: Participant Successes and Challenges Using Integrative Nutritional Counseling Exemplary Quotes

Participant	*Exemplary quote*
Theme: Dietary Successes	
Yue, female, age: 61–70 years	''Well, after our class about Chinese traditional medicine, and the diabetes meal guide, when I went home I followed the guidelines, trying to follow it the best I could. Then, following the examples of food portions for every meal every day, having some vegetables, having some protein, having some carbohydrates, like this. In addition, for rice, I try my best not to eat white rice. That is, mix it, mix two types together, mix some red rice and mix some brown rice, and eat it like this. So, this time when I went to see the doctor, s/he also felt happy with my blood sugar that it went down…. The blood sugar decreased and also, the second time I went to see the nutritionist, s/he was very happy, seeing that my blood sugar went down…. Plus, I also, my exercise, I've gone out a lot more…. Every day, I participate in dancing in the plaza [where elder women like to frequent], haha. We dance, dancing and listening to music at the same time, which makes my mood very happy.''
Winnie, female, age: 41–50 years	''I used to have desserts, but now I would avoid them. For example, I will have them three or four times a week before, but now, once a week.''
Suk Yi, female, age: 61–70 years	''If I eat outside, I will have little bit meat, and little more vegetables, not just have the chow mein.''
Theme: Dietary Challenges	
Jialei, gender not reported, age: 51–70 years	''I think it is, you cannot say it is difficult, but if you say it is easy, it is also not … Because some things are not very tasty…. Bitter melon. Very bitter. Actually I know that bitter melon is very useful, but, when I eat it, it is also very, the mouth is very bland.''
Ruihua, male, age: 61–70 years	''They said to eat half a bowl of rice and vegetable altogether. If that is so, I will starve to death. I can't do it, I will die. I can't do it. I must have two bowls of rice and a big plate of vegetables, any kind of vegetables. I must have a big plate of vegetables, maybe some fish, a plate of fish like that…. I liked to eat oily stuff before, like chicken skin because it is oily and smooth [good mouthfeel]. Now I am stricter. I don't dare to eat those any more.''
Theme: INC Assignment Successes and Challenges	
Qing, female, age: 51–60 years	''The Chinese medicine doctor, I had said yes, in a year, my palms basically sweat 350 days out of 365 days…. When I went back home I realized I might have said too much about my weakness in being too 'cool.' Maybe I myself don't think I myself am too 'cool.' Because I don't even use ginger. Maybe it's because I don't use ginger that I'm too 'cool.' So my first thought was, 'Wow! There are so few things I can eat.' And then I ignored it [recommended diet], and I am the yellow diet, but I still followed that. Then, if you told me what advice I had [for the diet] now that we're talking about it, I would say, now that I have carefully read this guide over and digested it, I can now ask, like now I can ask you: maybe I am not really like this, this red body type. There's nothing to eat [for my type], everything you ask me to eat is so hot!''
Sidi, male, age: 61–70 years	''Now when I make my own soup, I would mainly make the soup with clear heat property. As to those with enriching function, heated property, I try to avoid making those kinds of soups.''
Theme: Structural Challenges and Comorbidities	
Chuan, male, age: 61–70 years	''I try to avoid anything that has high cholesterol…. When I hear that it [the food] has cholesterol like red meat, I won't eat it…. I used to eat it. I don't avoid certain foods so much. From now on I start to avoid certain foods because I have heart problems and cholesterol. My blood vessels are clogged…. Now I don't dare to eat things like beef sirloin, pigs' hands, barbeque pork, barbeque duck and red meat. I don't even eat seafood, not even shrimp.''
Linxi, female, age: 61–70 years	''Yes, I am a medicine pot. These pills I stopped already because I felt dizzy. I don't dare to go out … Every day I go for my morning exercise. I walk but sometimes I felt dizzy and I don't dare to go out. Now I stopped this medicine. On the 18th I took the medicine to see the doctor. He said I can stop and next time when I go see the doctor, let's see what he will arrange for you.''

INC, Integrative Nutritional Counseling.

Table 6. Patient-Reported Outcome Measures Exemplary Quotes

Participant	*Exemplary quote*
Qing, female, age: 51–60 years	''Now I go to the 24 Hour [gym] twice a week at least, the Samba and dance till I feel tired, dance for a long time. Now I feel like my belly is slimmer''
Yiru, female, age: 71+ years	''I feel like it warms my stomach. Also, from what I excrete, there was a little bit of liquid before, but after I ate … the suggested vegetables, it became much better, more solid. So, I feel, these fruits and vegetables are right for me.''
Yue, female, age: 61–70 years	''And after I follow the guide, after having the warming foods [like the guide said], and dancing. When I danced before, my feet and hands were always cold. But now, since I have some more warming foods and have less cold foods, my feet and hands gradually turned warm, not as cold as before.''

the question, ''has anything improved,'' Yiru explained that after following the warming diet, her bowel movements were more solid (Table 6). Two additional participants mentioned digestive improvements as signs that following INC was working. For other participants (such as Yue), knowing the INC assignment allowed for dietary changes that addressed the body's feeling of temperature and psychological state (Table 6). Like digestion, having warm/cold extremities is often considered a sign that one's body is imbalanced according to CM.

Discussion

This mixed-methods study of a 2-h, in-person course integrating biomedical nutrition with CM shows promise for positive attitude and behavior change among Chinese Americans with bicultural values. Four weeks after the INC class, participants qualitatively reported positive changes in dietary intake and health outcomes, including better blood glucose measurements, better digestion, better hot/cold balance, decreased weight, and more positive mood. Provider acceptability was high, with both the dietitian and acupuncturist delivering the intervention with minimal training. Future work should examine INC implementation by a team that includes both a diabetes educator and CM practitioner, solidifying the integration between the two forms of medicine. This model would include, for example, both types of providers being present for the group class and for the diagnostic session.

INC was found to respect traditional culture, while also promoting evidence-based biomedical guidance of T2DM management. Regarding demand,[28] participants generally were accepting of mixing biomedical nutrition recommendations with CM recommendations, as evidenced by the numerous participants who shared the INC guidebook with friends and family. When participants used their INC assignments, they reported improvement using a vocabulary of hot/cold balance, confirming previous studies indicating the importance of and desire for guidance around addressing hot/cold balance in the context of T2DM management.[14] The goal of the INC curriculum was to provide a biomedically sound and culturally responsive education program that patients would use to promote dietary behavior change. Thus, a primary focus of the INC curriculum was adherence to CM principles. However, exit interviews illustrated that the actual INC assignments may not have been the most salient new information for participants. Instead, participants equally discussed other behaviors such as increasing exercise and vegetable/fruit intake, trying new vegetables, or avoiding sweets. (Notably, Chinese Americans with T2DM may struggle to identify fruits as carbohydrates because of a tendency to eat fruits over other sweet desserts.[39]) This observation suggests that the CM diagnosis was not the most resonant lesson, which may be a reflection of a general lack of other diabetes education in this population or an increased responsiveness to education messages when they are framed in a familiar cultural context. Future research should explore whether INC assignments are more accessible to Chinese Americans with foundational knowledge of hot/cold balance and to what extent patients actually engage with that portion of the program.

After only 1 month, patients identified their behavior changes as positively affecting their blood glucose measurements. From a CM standpoint, imbalances of hot/cold and dampness are often manifest by problems with overall mood/energy, physical sensations of hot/cold, and changes to digestion. CM providers also typically ask about one's digestion in diagnostic questioning. Thus, it is not surprising that participants paid attention to and reported on their digestion as a way of tracking overall improvement in health. In future work, digestive symptoms may offer an opportunity for self-assessment of positive dietary change.

Overall, based on limited-efficacy testing,[28] participants were highly satisfied with the INC class and the diagnosis provided by the acupuncturist, but 1 month may not be adequate to detect clinically measurable changes in important outcomes. Future studies should increase the numbers of participants and time between intervention and exit testing and examine INC as a well-integrated component of clinical care, rather than as stand-alone T2DM self-management education.

Conclusions

The authors created and pilot-tested a Chinese-language, integrative nutrition guide and curriculum to elicit behavior change toward optimal T2DM management. Preliminary findings suggest that patients were highly satisfied, incorporated nutrition suggestions, and recommended the guide to family and friends. As a brief culturally relevant intervention, INC could be incorporated into existing T2DM self-management education if participants were able to obtain a CM diagnosis soon before the onset of the education; this structural barrier could be addressed by better integration between CM providers and biomedical providers. The study findings are limited. Small sample size does not allow us to determine whether observed behavioral changes were statistically significant. Without a control group or randomized participation, it is not clear whether the intervention was

causally related to positive changes observed. Follow-up surveys were only collected from a subset of participants. Despite the limitations of this study, INC shows promise as a more culturally appropriate approach to supporting behavior change among Chinese Americans with T2DM than simply translating existing T2DM nutrition education. Future studies are needed to assess the impact of INC on patient-centered and clinically relevant outcomes, including attitudes, health behaviors, dietary adherence, weight, and glycemic control. INC may address an important unmet need for culturally relevant approaches to providing support for T2DM self-management among Chinese Americans.

Authors' Contributions

E.Y.H., G.L., and S.H.: project conceptualization, data collection, data analysis, writing, reviewing/approval of article. M.T.C.: data analysis, writing, reviewing/approval of article. D.C. and H.-L.C.: data collection, data analysis, writing, reviewing/approval of article. E.Y.H. and S.P.: project conceptualization, data analysis, reviewing/approval of article. Q.R.: data collection, writing reviewing/approval of article. H.K.S.: project conceptualization, data collection, writing, reviewing/approval of article.

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(*Appendix follows* →)

Appendix

Appendix A1. Chinese Medicine Self-Assessment Health Profile

INSTRUCTIONS: Mark the symptoms you have experienced during the last 6 months. Circle those that have been most troublesome.

Heat

___ fever
___ dry mouth
___ extreme thirst (craving cold foods/drink)
___ sores or infections with green or yellow pus
___ pain with sensation of heat or burning
___ yellow, green, or foul smelling discharge
___ red eyes, ears, nose, lips, face, skin
___ feeling of heat
___ aggravation from alcohol, fried, or spicy foods, and heat environment

Deficient moisture

___ parched, thirsty
___ extreme dryness of skin
___ scant secretions and urination
___ uncomfortable feeling of heat in the body
___ low afternoon fever with sweating
___ constipation
___ hot flashes
___ night sweats
___ unstable blood sugar, emotional lability

Cold

___ lack of thirst
___ listless and weak
___ cold feeling in limbs
___ pale face with cold, clammy hands and feet
___ loose stool (especially after eating cold/raw food)
___ profuse urination
___ edema
___ craving for warm, cooked foods
___ craving for hot drinks
___ pain aggravated by cold
___ pale, purplish skin, nail beds, lips, or tongue

Dampness

___ dizziness or fullness in head
___ nausea with phlegm in chest or throat
___ thick, sticky secretions
___ firm, mobile lumps, cysts
___ enlarged lymph nodes
___ sticky or greasy stool
___ worse in humid environment or from eating sticky, greasy, oily foods, milk products, eggs, sugar

Damp heat

___ dryness or thirst—no desire or ability to drink
___ feeling of heat in stomach or chest
___ sticky yellow or green discharge
___ hot flashes with profuse perspiration
___ fever or heat not relieved by sweat/drink
___ loose or sticky stool
___ burning, red, oozing sores
___ worse from heat and/or humidity, and sweet, spicy, or oily foods

Deficient *qi*

___ weak, lethargic, weary
___ apathy
___ dull thinking or feeling
___ excessive need for sleep
___ susceptible to cold, flu, allergies
___ prolonged recovery following illness
___ pasty, pale complexion
___ shortness of breath
___ aversion to talking
___ perspires easily with exertion
___ easily chills
___ perspires easily while at rest
___ atony or prolapse
___ constant diarrhea or lack of bowel control
___ hemorrhoids, varicose veins
___ dizzy or weak after meal/bowel movement
___ well-being followed by sudden exhaustion

Diminished essence

___ profound weakness
___ atrophy of muscles and organs
___ sagging or wrinkling of skin
___ diminished sexual arousal and pleasure
___ infertility or early menopause
___ repeated miscarriages
___ loosening or loss of teeth
___ early thinning or graying of hair
___ decline of memory, vision, or hearing
___ progressive loss of weight or emaciation
___ compromised immunity

(*Appendix continued*)

Spleen network

___ tender muscles
___ slow digestion or indigestion
___ variable appetite
___ frequent abdominal gas or bloating
___ loose stool
___ lingering hunger after meals
___ hard to gain, lose or regulate weight
___ difficulty focusing, distractable
___ overwhelmed by details, upset by changes
___ lethargy and inertia
___ prolapse
___ lack of muscle tone or strength
___ water retention, puffiness, heaviness
___ easy bruising
___ prolonged or heavy menstruation
___ easily worried, obsessed

Lung network

___ weakness of chest
___ respiratory allergies
___ runny nose or stuffy sinuses
___ frequent, lingering cold
___ coughs, throat clearing, laryngitis
___ morning attacks of coughing or sneezing
___ constant phlegm in chest or throat
___ shortness of breath, chest pain
___ wheezing from fatigue or exertion
___ dryness and tightness of skin
___ skin rashes, eczema, hives
___ sensitive to wind, cold, and dryness
___ stiffness of joints and muscles
___ easily disappointed or offended
___ urge to urinate after laughing, coughing, or sneezing

Kidney network

___ puffiness around eyes
___ diminished libido
___ lack of sexual secretions
___ loss or thinning of pubic hair
___ early cessation of menses, irregular cycle
___ disorder of urination
___ rigidity of spine and joints
___ difficulty conceiving or carrying to term
___ weak or sore low back, hips, knees, or feet
___ lack of stamina and endurance
___ diminished motivation and apathy
___ forgetfulness and mental dullness
___ puffiness or swelling of feet and ankles
___ weak vision, dull hearing
___ low humming or buzzing in ears (tinnitus)
___ sore throat from fatigue or in the morning
___ easily defeated and disgruntled

Spleen–Kidney disharmony

___ slow digestion, sluggish intestines
___ weak gums and loose teeth
___ dryness and thirst with water retention
___ sore, swollen joints, and muscles
___ heaviness, weakness, and soreness
___ loose or dry, small stool with bloating
___ frequent, scanty, or difficult urination, bowel movement
___ easily chilled in back, belly, legs or arms
___ craves salty or sweet foods
___ edema
___ rheumatism
___ cystitis, urethritis, vaginitis, leucorrhea
___ prostatic hypertrophy or prostatitis
___ distractible, insecure, volatile, or apathetic