Is Use of Traditional Chinese Medicine Associated with Non-adherence to Prescribed Western Rheumatic Medications among Chinese-American Patients? A Cross-Sectional Survey

Kai Sun, MD MS[1], **Jackie Szymonifka, MS**[2], **Henghe Tian, MD**[3], **Yaju Chang, MD**[4], **Jennifer C. Leng, MD MPH**[5], **Lisa A. Mandl, MD MPH**[6]

[1]Duke University Hospital, Durham, North Carolina, United States.

[2]New York University, New York, United States.

[3]New York University School of Medicine, New York, United States.

[4]Mount Sinai Beth Israel Hospital, New York, United States.

[5]Memorial Sloan Kettering Cancer Center, New York, United States

[6]Hospital for Special Surgery, New York, United States

Abstract

Background: Chinese-Americans are a fast-growing immigrant group with worse rheumatic disease outcomes compared to Caucasians and frequent use of Traditional Chinese Medicine (TCM). Whether TCM use is associated with lower adherence to western rheumatic medications is unknown.

Methods: Chinese-Americans actively treated for a systemic rheumatic disease were recruited from two Chinatown clinics. Socio-demographic, TCM use, and clinical data were gathered. Self-reported health status was assessed using Patient-Reported Outcome Measurement Information System (PROMIS®) short forms. Adherence was stratified using the 8-item Morisky Medication Adherence Scale. Factors independently associated with high adherence were identified using multivariable logistic regression.

Results: Among 230 subjects, median age was 55 (range 20–97), 65% were female, 71% had high school education, 70% were on Medicaid, and 22% reported English fluency. The most common rheumatic diagnoses were rheumatoid arthritis (41%), systemic lupus erythematosus (17%), and seronegative spondyloarthropathies (15%). Half reported TCM use in the past year, and 28% reported high adherence to western rheumatic medications. In multivariable analysis, high adherence was associated with TCM use (OR 3.96, p<0.001), being married (OR 3.69, p=0.004), medication regimen complexity (OR 1.13, p=0.004), older age (OR 1.06, p<0.001), and was negatively associated with anxiety (OR 0.94, p=0.001).

Corresponding author: Kai Sun, MD MS, Address: DUMC 2978, Durham, NC 27710, Telephone: 919-681-7417, Fax: 919-684-8358, kai.sun@duke.edu.

Conclusions: While adherence to western rheumatic medications was low in this cohort, interestingly, it was higher among TCM users compared to non-users. TCM use appears to represent a complementary rather than an alternate approach to disease management for these patients. Future studies should evaluate whether TCM use is associated with better disease outcomes.

Medication adherence is the extent to which patients take medicines as prescribed by their healthcare providers (1), and adequate adherence is crucial for the effective management of systemic rheumatic diseases (2). A non-adherence rate of around 50% has been reported in patients with various chronic diseases, and similar or even higher rates are found in those with rheumatic diseases (3) (4) (5). Non-adherence is especially common among ethnic minorities and immigrants (2) (6) and has been associated with the use of Complementary and Alternative Medicine (CAM) (7) (8) (9). At the intersection of these two low adherence groups are Chinese-Americans, one of the fastest growing immigrant populations in the US (10), who have high utilization of Traditional Chinese medicine (TCM), a form of CAM that includes both herbal and many non-herbal modalities such as acupuncture (11). Non-adherence to effective western rheumatic disease medications may be especially detrimental to Chinese-American rheumatology patients, as outcomes in lupus and rheumatoid arthritis are worse in Asian, and particularly Chinese, populations compared to Caucasians (12) (13). In addition, immigrants may be more susceptible to substituting CAM for western therapies, as they may subscribe to beliefs about illness and its causes and treatments that differ from conventional western practice, have more difficulty navigating the health system, or have challenges understanding the rationale for western medications due to limited English proficiency or other cultural barriers (14) (15). Adherence to western rheumatic disease medications among Chinese-American patients has not been previously studied, and whether TCM use is associated with adherence is unknown. In addition, whether acculturation or patient-reported outcomes impact adherence has not been explored.

Patients and Methods

Study setting and population.

Patients were recruited from two private practice rheumatology clinics in New York City's Chinatown, staffed by three board-certified rheumatologists, all of whom are Chinese-Americans fluent in Mandarin Chinese. The clinics serve a predominantly first generation immigrant Chinese-American population, and clinic volume varies between 20–40 patients per rheumatologist per day. These clinics do not provide any form of TCM. Inclusion criteria were Chinese ethnicity, age 18 or above, fluency in English or Mandarin Chinese, actively followed at least yearly for a systemic rheumatic disease for which the patient is prescribed at least one non-*Pro Re Nata* (PRN) western medication by the rheumatologist. Patients were excluded if they were pregnant or nursing or had significant cognitive impairment. We wanted to focus on patients with an ongoing relationship with their rheumatologist and are being treated for a chronic rheumatic disease, therefore we excluded those followed for <6 months in the practice for a newly diagnosed rheumatic disease or followed for <3 months for a previously diagnosed rheumatic disease.. Those with primary fibromyalgia, neck or back pain, soft tissue diseases were excluded as these conditions are often only treated with

as-needed medications, and non-adherence does not tend to cause permanent damage. Those with osteoporosis were also excluded as factors influencing adherence in this asymptomatic condition may differ significantly from those in systemic autoimmune diseases. Lastly, patients only prescribed intravenous medications were excluded as we were most interested in adherence to medications outside of the clinic setting. All instruments were administered by an English/Mandarin bilingual researcher and were available in both written English and Chinese. This study was approved by the institutional review board at Hospital for Special Surgery.

Data collection.

Cross-sectional data were obtained through questionnaires and medical record review. All medical record reviews were performed by a single rheumatology fellow who is fluent in Mandarin and English, and who was board certified in rheumatology by the end of the study.

Demographics and clinical factors—Patients reported socio-demographic information as well as perception of efficacy and side-effects of western rheumatic disease medications prescribed by their rheumatologists. Perceived efficacy and side-effects were assessed on a 5-point Likert scale with the questions "How effective do you think western medicine prescribed by your rheumatologist has been?", and "Have you had any side effects from western medications prescribed by your rheumatologist?" In addition, insurance status, rheumatologic diagnosis, disease duration, Charlson comorbidities up to the index visit (16), and current active medications were obtained through chart review by the primary investigator. Rather than including a simple count of medications used, a medication regimen complexity index was calculated according to standard methods based on route and frequency of administration, with a higher score indicating a more complex regimen (17).

Acculturation—Acculturation, or the degree immigrant populations assimilate to American culture, was assessed using the Marin and Marin Acculturation Scale (18). This scale has 12 items measuring 3 domains including language use, media use, and ethnic social relations utilizing a 5-point Likert scale. Scores range from 12 to 60, and higher scores indicate higher levels of acculturation. This scale was originally developed for the Hispanic population and has been translated into Chinese and validated among Chinese-Americans (19).

Adherence to Western Medications—All conventional medications are considered western medications in this study (in contrast to TCM). Adherence to all western rheumatic disease medications prescribed by each participant's rheumatologist was measured using the validated and licensed Chinese or English version of the 8-item Morisky Medication Adherence Scale (MMAS-8) (20) (21), which was used with permission. This scale has 7 questions with binary answers and one question answered on a 5-point Likert scale. Scores range from 0–8, and <6 points is considered low, 6-<8 medium, and 8 high adherence. Scores were analyzed as a dichotomous variable (high vs medium/low adherence). As patients tend to over-report adherence based on self-reported measures, we opted to group medium and low adherence groups together in the analysis, a common practice with the

MMAS-8 in the literature (22) (23) (24). The MMAS-8 has been validated for use in patients with chronic diseases including rheumatic diseases (21) (25) (26).

TCM Use—TCM use was assessed using a survey adapted from an instrument developed for Chinese-American cancer patients (27). Use of 11 TCM modalities in the past 12 months was assessed, including oral and topical Chinese herbs, acupuncture (insertion of needles into strategic points in the body based on TCM theory), acupressure (applying physical pressure to acupuncture points), moxibustion (burning herbs above the skin to apply heat to acupuncture points), *tuina* (Chinese therapeutic massage), cupping (applying local suction to the skin using a heated cup), *guasha* (applying pressured strokes over lubricated skin with a smooth edged instrument to produce light bruising), *taichi* (martial arts that uses controlled slow movements), *qigong* (exercises that integrate various posture, deep breathing, and medication), food therapy (dieting rooted in Chinese understandings of healing and damaging properties of foods), and other (28).

Patient Reported Health Status Measures—Patient reported outcomes in 9 domains were measured using the Patient Reported Outcomes Measurement Information System (PROMIS®) short forms (29) (30). Domains included ability to participate in social roles and activities (SRA) (v2.0, 10-item), instrumental support (v2.0, 2-item) (i.e. functional aspects of supportive interpersonal relationships), cognitive general concerns (v1.0, 4-item) (i.e. abilities with respect to cognitive tasks such as memory and thinking), anxiety (v1.0, 7-item), depression (v1.0, 8-item), fatigue (v1.0, 7-item), sleep disturbance (v1.0, 4-item), pain interference (v1.1, 6-item), and physical function (v1.2, 10-item). All domains were assessed using English or linguistically validated Chinese versions of PROMIS® short forms depending on the participant's language preference (30). Raw scores were converted to T-scores through the HealthMeasures Assessment Center Scoring Service (31). A T-score of 50 corresponds to the U.S. population mean, and higher scores indicate more of that domain. Therefore, higher scores indicate worse outcomes for all domains, except in social health, instrumental support, and physical function, where lower scores indicate worse outcomes. A difference in T-score of 5, equivalent to a half standard deviation, is considered clinically significant (32) (33).

Statistical analysis.

Sample size calculations were informed by literature review. Based on estimated values that TCM users comprise of 70% of Chinese rheumatology patients, and high adherence rate of 45% among TCM users compared to 65% among nonusers (34) (35) (36), a sample size of 228 would provide 80% power at 5% alpha error to detect a 20% difference in rate of high adherence between TCM users and non-users.

Categorical variables were summarized by percentages, while continuous variables were summarized as means (standard deviation) or medians [interquartile range], as appropriate. Categorical comparisons were made using chi-squared tests and continuous variables were compared using t-tests or Wilcoxon rank-sum tests, as appropriate. PROMIS® scores were compare between those with high and medium/low adherence in bivariate analysis. Multivariable logistic regression was used to generate multivariable odds ratios for high

adherence, and the relationship between TCM use and high adherence was specifically examined. Stepwise selection was used for multivariable logistic regression, requiring 0.10 significance for entry and 0.05 significance to remain in the final model. Differences between herb and non-herb TCM users were explored. Statistical analyses were performed using STATA (version 14.2 College Station, TX) and SAS (version 9.4 Cary, NC).

Results

Out of 262 eligible patients approached, 230 (88%) consented to participate. Characteristics of participants are shown in Table 1. Median age was 55 (range 20–97), 65% were female, 71% had high school or less education, and 70% were on Medicaid (federally funded insurance for those with low incomes). Almost all (96%) were born outside of the US, and among those, 47% lived in the US for 20 or more years but only 22% reported English fluency. Median Marin and Marin acculturation score was very low at 15 (IQR 14–22). The most common rheumatologic diagnoses were rheumatoid arthritis (41%), systemic lupus erythematosus (17%), and seronegative spondyloarthropathies (15%). Disease modifying agents were prescribed for 191 (83%), biologics for 60 (26%), and steroids for 62 (27%) patients. One hundred and eleven (48%) patients were prescribed more than one western rheumatic disease medication. Median time since rheumatologic diagnosis was 4 years (range 0.2–52). Median Charlson comorbidity score was 1 (range 0–6; higher scores indicate more comorbidities).

Use of any form of TCM in the past year was reported by 115 patients (50%), and the most common modalities were *tuina* massage (47%), acupuncture (45%), and herbs (37%). Full descriptions of TCM use and comparisons of TCM users with non-users have been published previously (37).

High adherence to prescribed rheumatologic medications was found in 65 (28.3%), while 86 (37.4%) and 79 (34.4%) had medium and low adherence, respectively. Among TCM users, 36.5% reported high adherence compared to 20% of nonusers (p-value = 0.005). Demographic and clinical characteristics of those with high versus medium/low adherence are shown in Table 2 and supplemental Table 2a. In bivariate analysis, high adherence was associated with TCM use, older age, being married or cohabitation, having lived in the US for 20 or more years, older age at immigration, unemployment, and not having disability. Those with high adherence also took a more complex medication regimen and had better scores in patient-reported sleep, anxiety, and instrumental support. There were no significant differences in acculturation scores, length of rheumatic disease diagnosis, perceived side effects or efficacy from western rheumatic disease medications between the adherence groups. Analyses also showed no significant difference between adherence groups with respect to number of TCM modalities used, frequency of TCM use, or use of herb vs. non-herb TCM modalities (data not shown). In multivariable analysis adjusting for demographic and clinical confounders significant in in univariate analysis, TCM use remained significantly associated with having high adherence to prescribed western rheumatologic medications (OR 3.96 [95% CI 1.86–8.40], p-value <0.001). In addition, being older, married, having a more complex rheumatic disease medication regimen, and less anxiety

were also independently associated with high adherence in the multivariable logistic model (Table 3).

Discussion

To our knowledge this is the first study that examines adherence to western medications for systemic rheumatic diseases in the Chinese-American immigrant population. We were surprised to find that, contrary to our initial hypothesis, TCM use was independently associated with high adherence to prescribed western rheumatic disease medications, with OR 3.96 (95% CI 1.86–8.40). Although western-trained physicians may view conventional western medicine and TCM as competing therapies (38), our data suggest that TCM is not an alternate but rather complementary approach to disease management in this population. While it is well known that many ethnic Chinese patients view TCM as mainstream medical practice, the fact it is not being used to replace prescribed western therapy among Chinese-Americans is a novel observation (39).

Interestingly, we found that having a more complex medication regimen, a likely proxy for more severe rheumatic disease, was also independently associated with high adherence. Other studies have shown significant association between higher disease activity and better adherence (40). It is possible that patients in our cohort with more complex medication regimens and therefore likely more severe rheumatic disease may be incentivized by this severity to be more involved with their health, and both TCM use and increased adherence to western rheumatic disease medications may result from this increased engagement.

Part of the association we find between TCM use and adherence to western rheumatic disease medications may also be due to the healthy adherer effect. This principle states that adherent people have different behavior not only with respect to the use of medications, but also are more likely to engage in healthier lifestyles, avoid risky behaviors, and use nonpharmacological therapies such as diet, exercise, as well as CAM in order to improve their health. This factor can confound associations between adherence and outcomes in longitudinal studies, but provides a plausible explanation for some of the association between TCM use and adherence found in our cross-sectional study (41). Whether the healthy adherer effect is an important factor in this poorly acculturated Chinese American population warrants further study.

Overall, nonadherence to conventional western rheumatic diseases medications is substantial in this group – only 28% reported high adherence to prescribed western rheumatic disease medications. This is in the lower end of the range of adherence rates reported (25–70%) in studies of rheumatology patients (42) (5) (43). The wide range in rates is attributable in part to heterogeneous methods of assessment, including self-report, pharmacy refill data, and electronic device monitoring (5). The overall low adherence rate in our cohort is similar to rates among disadvantaged, ethnic minority rheumatoid arthritis patients, where only 21% of the patients were at least 80% adherent to disease modifying agents using electronic monitoring (43). It will be especially important to include Chinese-Americans in future adherence studies, as ethnic Chinese are known to have both higher prevalence and severity in a number of rheumatic diseases (13) (12). Because poorly acculturated patients are

underrepresented in clinical research studies (44), improved understanding of this population through successful enrollment in research studies will help identify ways to reduce existing health disparities, an essential goal of the Healthy People 2020 campaign (45). In addition, factors associated with adherence in this population may provide important lessons for the care of other immigrant groups, among whom use of traditional remedies is commonplace (46) (47).

There are several limitations to this study. First, patients were recruited from rheumatology clinics in New York City's Chinatown who speak English or Mandarin Chinese, and therefore are unlikely to be representative of all Chinese immigrants in the US. Second, medication adherence was measured by self-report, which is prone to overestimation of adherence (2). However, this is a conservative bias, and adherence may be even lower than our estimated rate. Third, we did not assess disease activity, which may impact adherence. However, we did measure a wide range of patient-reported outcome domains, as data suggest that medication taking behaviors correlate with patients' perceptions of disease severity, not only physician derived disease activity scores (48). Finally, limitations exists surrounding variable selection for multivariable modeling, and odds ratios in the final model may be an overestimation of actual effect size (49).

Major strengths of the study are that both the researcher and the primary rheumatologists are ethnically and linguistically concordant with the study subjects, thereby minimizing the linguistic and cultural barriers that can be major confounders in studies of immigrant populations (50). We also used instruments with existing linguistically valid Chinese translations and were able to capture important data from an otherwise hard-to-reach population. We included a broad representative sample of systemic rheumatic diseases, as evidence suggests specific disease is not an important contributor to adherence (2).

Our findings should be confirmed by additional studies among more diverse Chinese immigrant populations. Future longitudinal studies should evaluate whether TCM use is associated with disease activity and adherence over time. Qualitative studies are also needed to identify additional barriers and facilitators of adherence and further characterize patient beliefs in TCM and western medicine in this understudied population. In particular, why some patients use both TCM and western medicine while others reject western medicine in favor of TCM should be investigated. The finding that TCM use is associated with high adherence is thought-provoking, and these data could be used to generate hypotheses for novel interventions which leverage and integrate traditional cultural beliefs in less acculturated patient populations to improve adherence to western medications and holistic patient care. By understanding that TCM tends to be a complementary rather than alternative therapy in this patient population, practitioners may consider being more open to discussing and acknowledging TCM use, thereby enhancing positive therapeutic relationships with this challenging patient population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

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Significance and Innovations

- This is the first study to examine medication adherence among Chinese-American rheumatology patients and its association with Traditional Chinese Medicine (TCM) use.

- While medication non-adherence has been associated with the use of complementary and alternative medicine in some patient populations, TCM use in our population is independently associated with high adherence to prescribed western rheumatic disease medications and represents a complementary rather than alternative approach to disease management in this population.

- Our results provide important cultural insights into this rapidly growing but understudied immigrant population. Our data may help generate novel interventions that leverage and integrate traditional cultural beliefs in less acculturated patient populations to improve medication adherence and holistic patient care.

Table 1.

Demographic and clinical characteristics of the 230 patients enrolled.

Patient Characteristics	Values
Age, years, median [IQR]	57 [44–66]
Female, n (%)	149 (65)
High school education, n (%)	164 (71)
Medicaid, n (%)	161 (70)
Born outside of the US, n (%)	220 (96)
Marin and Marin acculturation score, median [IQR]	15 [14–22]
Rheumatologic diagnosis, n (%)	
Rheumatoid arthritis	95 (41)
Systemic Lupus Erythematosus	40 (17)
Spondyloarthropathies	34 (15)
Sjogrens syndrome	27 (12)
Gout/Pseudogout	13 (6)
Other [*]	21 (9)
Disease duration, years, median [IQR]	4 [2–8]
Rheumatic medications, n (%)	
Disease modifying anti-rheumatic drugs (DMARDs)[§]	191 (83)
Biologics or small molecule [†]	60 (26)
Steroids	62 (27)

IQR = interquartile range; SD = standard deviation;

[*] Other diagnoses included myositis (5), systemic sclerosis (3), undifferentiated connective tissue disease (3), inflammatory osteoarthritis (2), palindromic rheumatism (2), juvenile idiopathic arthritis (2), polymyalgia rheumatic (1), relapsing polychondritis (1), iritis (1), panniculitis (1);

[§] DMARDs included hydroxychloroquine (100), methotrexate (70), leflunomide (39), sulfasalazine (28), mycophenolate (9), azathioprine (4);

[†] biologics included adalimumab (28), etanercept (16), certolizumab (3), tocilizumab (2), golimumab (1), secukinumab (1), tofacitinib (2), otezla (1)

Table 2.

Comparing patient characteristics between those with high vs. medium/low adherence.

Patient characteristics	High adherence (n=65)	Medium/low adherence (n=165)	p-value
Age, years, median [IQR]	61 [57–69]	53 [38–64]	<0.001
Unemployed, %	19	8	0.01
Disability, %	2	9	0.04
Married/live with a partner, %	83	66	0.01
20 years living in the US, %	62	41	0.005
Immigration age, years, mean (SD)	42 (14)	35 (13)	0.001
Medication Regimen Complexity, median [IQR]	14 [10–19]	10 [7–15]	<0.001
Rheumatic Medication Regimen Complexity, median [IQR]	8 [6–12]	7 [5–10]	0.01
Traditional Chinese medicine use, %	65	44	0.005
Sleep disturbance, median T-score [IQR]	49 [42–53]	53 [45–56]	0.02
Cognitive general concerns, median T-score [IQR]	33 [26–38]	37 [30–40]	0.04
Anxiety, median T-score [IQR]	43 [36–55]	52 [42–57]	0.02
Depression, median T-score [IQR]	43 [37–55]	50 [37–57]	0.09
Pain interference, median T-score [IQR]	57 [50–63]	57 [52–63]	0.8
Fatigue, mean T-score (SD)	50 (10)	52 (10)	0.07
Physical function, median T-score [IQR]	42 [37–52]	45 [39–52]	0.11
Ability to Participate in SRAs, median T-score [IQR]	60 [52–62]	58 [51–66]	0.7
Instrumental support, median T-score [IQR]	51 [47–56]	47 [45–51]	0.007

IQR = interquartile range; SD = standard deviation; SRA = social roles and activities

Table 3.

Multivariable logistic regression to examine factors independently associated with high adherence to prescribed western rheumatic medications.

Variable	Odds Ratio	95% Confidence Interval	p-value
Age, years	1.06	1.03–1.09	<0.001
Married	3.69	1.52–9.0	0.004
Rheumatic Medication Regimen Complexity Score	1.13	1.04–1.22	0.004
Anxiety, T-score	0.94	0.91–0.97	0.001
Traditional Chinese medicine use	3.96	1.86–8.40	<0.001

Variables considered include age, employment status, disability, marital status, years lived in US, immigration age, medication regimen complexity, rheumatic medication regimen complexity, TCM use, PROMIS scores in sleep, cognitive concerns, anxiety, and instrumental support. These are all variables significant in bivariate analysis.