Longitudinal studies on the characteristics of TCM constitutions and related factors of adult Chinese women in Hong Kong

Yanhua He

University of Hong Kong

Youzhi Sun

The University of Hong Kong

Jessie Suet Mui Chan

The University of Hong Kong

Jeishu You

The University of Hong Kong Li Ka Shing Faculty of Medicine

Lei Jia

The University of Hong Kong Li Ka Shing Faculty of Medicine

Qi Wang

The University of Hong Kong Li Ka Shing Faculty of Medicine

Kumar Ganesan

Hong Kong University: University of Hong Kong <https://orcid.org/0000-0002-3198-6066>

Jianping Chen (✉ abchen@hku.hk)

The University of Hong Kong

Research

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Abstract

Background

Traditional Chinese Medicine Constitution (TCMC, Named Tizhi in Chinese) is essential to reflect an individual's body-mind and health. Understanding TCMCs and their influencing factors would be beneficial for improving the individual's health and disease prevention. Earlier our studies have found the characteristics of TCMCs and related influencing factors at a single time point, however, longitudinal data on the development of characteristics of TCMC constitutions over time is limited. Hence, this follow-up study was attempted to investigate the changes in characteristics of TCMCs and explore the factors influencing the development of individual TCMC types at baseline and follow-up.

Materials and methods

We conducted a follow-up cross-sectional survey of Chinese women in Hong Kong to compare with the characteristics of TCMCs as well as influencing factors related to each TCMC type at baseline with a 4-year interval by using the questionnaires with slight modifications. Statistical methods were employed as similar to that of the initial study including students' T-test, Chi-square test one way ANOVA, multiple stepwise logistic regression analysis, and association rules mining method.

Results

A response rate of 59.0% was achieved in the follow-up study. Of 81.5% among 249 participants were diagnosed with unbalanced TCMCs. Qi-deficiency constitution (QDF, 51.8%), Yang-deficiency (PD, 45.4%), and Phlegm-wetness (PW, 38.6%) were still the top three unbalanced TCMCs types and the Yin-deficiency (ND), Blood stasis (BS) and Qi-depressed (QDP) constitutions were significantly increasing. The percentage of owning 1 to 2 unbalanced TCMC types by individual decreased from 30.9% at baseline to 26.9% at follow-up, whereas having 3–6 unbalanced TCMC types had increased from 47.4% at baseline to 58.2% at follow-up. Results of the association mining rules showed the top three paired-unbalanced TCMC types were in QDP paired with QDF (93.75%), PW paired with QDF (85.42%), and PD paired with QDF (81.65%) respectively. Stepwise logistic analysis indicated that poorer health condition (OR, 1.37–2.56), suffering negative effect on body-mind health (OR, 2.70–4.06), negative emotion (OR = 2.57) was significantly positively correlated with certain unbalanced TCMCs. Aging (OR, 0.91–0.93), regular exercise (OR = 0.71) usage of TCM habit (OR = 0.12), and women who experienced menopause (OR, 0.37–0.39) showed inverse correlations with certain unbalanced constitutions.

Conclusion

Owned unbalanced and more complex TCMC types were the main characteristics of TCMCs in most adult Chinese women in Hong Kong with a 4-year interval during follow-up. QDF, PD, and PW constitutions were still the top three frequent unbalanced TCMC types at baseline and follow-up, but ND, BS, and QDP constitutions significantly increased during the menopausal stage. Poor health status, unhappy emotions, and/or suffering negative effects on body-mind health and suffering in the menopause stage may be the diverse factors for the development of unbalanced TCMC types, however, regular exercise and habit of regular usage of TCM might be potential protectors for maintaining in the normal constitution.

Introduction

The original theory of the Traditional Chinese Medicine Constitution (TCMC, named Tizhi in Chinese) originated from *The Yellow Emperor's Inner Classic*. TCMC refers to an integrated, metastable, and natural specialty of individuals in morphosis, physiological functions, and psychological conditions, which is formed based on innate and acquired endowments in the process of life [1, 2]. Generally, TCMC is divided into the balanced constitution which is known as Normality (*Pinghe* in Chinese) constitution, and Unbalanced/Biased (*Pianpo* in Chinese) constitutions which can be further classified into several subtypes such as Yang-deficiency, Yin-deficiency, Phlegm-wetness, Qi-deficiency, Wetness-heat, Blood-stasis, Qi-depressed, etc. [2-4].

The type of TCMC development is mainly determined by congenital endowments, nevertheless acquired factors including individual factors (lifestyle, dietary habits, emotion status, and history of diseases) and environmental factors may also play a critical role in the process of TCMC development over time. TCMCs are relatively stable and adjustable, and acquired factors greatly influence the development of individual TCMC over time [5-7]. According to the TCM theory, individual unbalanced constitutions have a higher susceptibility to certain diseases than balanced constitutions that have been confirmed by several investigators [8-10]. Understanding TCMC and its influencing factors are necessary for generating guidance for an individual's health protection and preventing diseases.

Earlier, numerous cross-sectional studies have found the distributions of TCMCs and their related influencing factors in adult Chinese at a single time point [10-13], however, longitudinal data on these fields are limited. Hence, further investigations are greatly required for changes in the characteristics of TCMCs and factors influencing TCMC type over time resulting in the prevention and management of unbalanced constitutions. A cross-sectional survey of 944 local Chinese women was conducted in Hong Kong during 2012-2013 and revealed the characteristics of TCMCs and identification of related influencing factors [14]. This follow-up article described our attempt to re-survey those participants with the aims of 1) To investigate the changes in their health status, social demographic, lifestyle, and characteristics of TCMCs and the factors influencing the development of TCMC types between baseline and follow-up with a 4-year interval, 2) To examine and predict the indicators resulted in the changes of TCMC type. This follow-up data provide scientific evidence for protecting health through the theory of TCMC.

Materials And Methods

Participants

We conducted a follow-up cross-sectional survey of 944 local women in Hong Kong who were participated in our initial study with a 4-year time interval. (IRB reference Number: UW12-010).

Procedures

Ethical approval was obtained in advance from the Research Ethics Board of the University of Hong Kong (UW16-236). To eliminate bias and ensure the quality of investigation, our standardized procedures were used as earlier [14]. Online-questionnaire and online consent forms were prepared on the website, which had the same consent as in the written versions. The information of this study was sent to the participants through e-mail, phone calls, phone messages, WhatsApp, respectively.

Participants who agreed to re-assess were filled in the informed consent and completed the questionnaire through one of the methods as follows.

- 1) Online version: participants logged into our online version and completed the informed consent and questionnaire by an exclusive password through the internet.
- 2) Telephone: called individual and interpreted, obtained their informed consent, and collected the answers to each question,
- 3) E-mail: Sent the informed consent and questionnaires, and collected the consent, and completed questionnaires by way of an email.
- 4) Mailed letters: Consent and questionnaire were mailed with a postage-paid return envelope; and
- 5) Other: participants filled the informed consent and completed the questionnaire in the Specialist Clinical Centre, School of Chinese Medicine, The University of Hong Kong, or the TCM regimen workshop held by our research team in 18 districts of Hong Kong.

Furthermore, we sent reminders twice to non-respondents who agreed to follow-up this survey at fortnight intervals and to maximize the response rate. All the completed questionnaires were checked carefully and missing items in the questionnaires were completed by telephonic inquiry. When we received the completed questionnaires, all participants were given a diagnosis of their TCM constitutions and provided a useful regimen for health protection based on the TCM philosophy.

Instrument and outcome measure

The follow-up questionnaire was prepared based on the earlier version of our study that had been used. A structured questionnaire consisted of two main parts. The first part was the TCM Physical Constitution Scale as described in our earlier study [14], which was modified from the original version [15]. In the

second part, we had updated the relevant socio-demographic information, potential factors that influence TCMCs formation (e.g., weight, height, occupation, state of health, emotional status, changes in marital status, reproductive, lifestyle, physical exercise, and dietary habits). Two format questionnaires (website and written) were prepared and employed to validate the reliability and were adapted for the follow-up study.

Statistical analysis

All data were imported into SPSS 19.0 for the Windows version for further analysis. The statistical method employed in this follow-up study referred to our initial study [14]. The students' T-test, Chi-square test, one-way-ANOVA, and two samples t-test were used to explore the characteristics between participants and non-participants as well as compared the differences in social demographic, physical constitution, general health, and emotional status, lifestyle, individuals' TCMC types and its total number between baseline and follow-up (with two-tailed and with 0.05 as the level of significance). Those factors with p-values less than 0.25 were entered into multiple stepwise logistic regression analyses to explore the significant influencing factors associated with variations of an individual's TCMC type over the 4-year follow-up period. To identify influencing factors that predicted the changes among different kinds of TCM constitutions over time, baseline information collected in our initial study was used. The association rules mining method was used to explore the pairs of un-balanced TCMC Types of individuals with the minimum support of 0.2 and minimum confidence of 0.75.

Results

Response rates and baseline characteristics of participants and non-participants in the follow-up study

Among the 944 subjects recruited in the initial study, we successfully contacted 785 women, and 169 subjects were failed due to the following: unknown/ wrong telephone numbers, moved overseas, block unknown calls, or passed away (death). Among 785 subjects, 422 were willing to participate in the follow-up survey, 151 had no interest in performing the survey again and 212 had no responses after receiving the questionnaire with calls or messages even reminded twice. Finally, a total of 249 questionnaires were completed among 422 subjects, others gave up surveying even reminded twice. A response rate of 59.0% was achieved (**Figure1**). Baseline-demographic characteristics of the 249 women who participated and of that 695 non-participated in the follow-up study were shown in **Table 1**. The follow-up study was completed with the mean of a 4-year time interval after initial recruitment. The participants and the lost-to-follow-up participants were similar in the baseline characteristics at age, occupation, marital status, reproductive history, and menopause ($P>0.05$), only on the education level which the follow-up participants had higher education level ($P<0.05$) than those who did not participate.

Changes in the general health and lifestyle characteristics of the participants over the 4-year follow-up period

The changes in the general health and lifestyle characteristics at baseline and follow-up over time showed in **Table 1**. Overall, total general health was worse than that of baseline in which the percentage of good health status decreased from 37.35% to 32.93% according to the criteria of defining the state of health [14]. Participants' emotional status became more stable due to the proportion of unhappy status dropped from 14.46% to 10.00% whereas the proportion of ordinary rose from 38.15% to 45.45%. A greater number of participants became housewives or retired at follow-up (44.58% versus 30.93%) when compared to baseline. About 73 (29.32%) of them experienced menopause over the 4-year follow-up time.

More than half (64.3%) of them had regular habits of exercise (at least once per week with total time over 60 minutes) which was higher than 51.00% at baseline. All participants had an assessment report including diagnosed TCMC types and TCM diet regimen for improving the individual health. Therefore, lifestyle characteristics over 4 years were revealed in **Table 2**. Most of them (75.10%) did not follow the suggested diet regimen, 16.47% of the participants had followed around 2 years. During follow-up, ninety-four (37.75%) participants had the habit of using TCM regimen (including Chinese herbal prescription or TCM massage), and most of them (68.09%) used only the TCM regimen even less than one time a week.

Diagnoses and changes in the distribution of TCMC types among participants during the follow-up

The results of distributions and changes on TCMC types among the participants at baseline and follow-up were presented in **Table 3**. Among 249 participants, the percentage of Normality constitution decreased from 21.7% at baseline to 18.5% at follow-up, and participants diagnosed with unbalanced TCMC types were higher than at baseline (81.5% versus 78.3%). The types of unbalanced TCMCs were found to be persistent that Qi-deficiency (QDF, 51.8%), Yang-deficiency (PD, 45.4%) and Phlegm-wetness (PW, 38.6%) constitutions were still the top three frequent unbalanced TCMC types in both baseline and follow-up. The most remarkable higher unbalanced types were Yin-deficiency (ND), blood-stasis (BS) and Qi-depressed (QDP) constitutions, which increased from 28.1%, 32.5% and 30.5% at baseline to 37.6%, 36.5% and 34.5% during follow-up, respectively. Furthermore, compared individuals' types of TCMC constitutions of QDF, PD, PW, and QDP were 76.57%, 75.70%, 70.45%, 75.00% and they have not changed significantly. About 30 of individuals with Normality constitution at baseline changed to unbalanced TCMC types during follow-up (equivalent to an average annual incidence risk of 3.01 %). On the other hand, 24 of individuals with unbalanced TCMC types at baseline became normality constitution during follow-up (equivalent to an average annual recovery rate of 2.21 %). The prevalence of the total number of unbalanced TCMC types owned by individuals increased from baseline to follow-up. (**Figure 2**).

The percentage of owning 1 to 2 unbalanced TCMC types by one person at the same time decreased from 30.9% at baseline to 26.9% at follow-up, whereas having 3-6 unbalanced TCMC types had increased from 47.4% at baseline to 58.2% at follow-up. **Table 4** presents the results of using association mining rules to explore the pairs of unbalanced TCMC Types at follow-up. The top three paired-unbalanced TCMC types were QDP constitution paired with QDF constitution (93.75%), PW constitution paired with QDF constitution (85.42%), and PD constitution paired with QDF constitution (81.65%).

Influencing factors related to unbalanced TCMC types and their changes over the 4-year follow-up period.

The results of multiple factors ANOVA revealed the relationships between the participants' demographic characteristics, body-mind health, lifestyle characteristics, and the total number of unbalanced TCMC types in sub-groups and the changes of them from baseline to follow-up (**Table 5**). The factors of age, regular exercise, state of health, emotional, menopause, marital changed, suffering negative effect on body-mind health and the habit of using TCM had been confirmed as significant factors on the total number of unbalanced TCMC types during follow-up. Overall, the mean of the total number of unbalanced TCMC types had significantly higher than those at baseline in all related influencing factors. Based on these factors with p-values, less than 0.25 were entered into multiple stepwise logistic regression analyses to explore the significant influencing factors associated with variations of an individual's TCMC type over the 4-year follow-up period.

Eight stepwise logistic models (**Table 6**) were performed to identify the variables that affect individual certain TCMC formation. The results summarized as 1) Age, suffering negative effect on body-mind health and usage TCM habit were found as indicators that significantly influenced QDF constitution; 2) The factors of health status and usage TCM habit were found significantly influenced PW constitution; 3) Age, usage TCM habit and health status as indicators associated with PD constitution; 4) State of health and menopause were found influenced ND constitution; 5) BS constitution was significantly relevant to age, emotion, and menopause; 6) QDP constitution was closely related to the influencing factors of age, negative emotion, and menopause; 7) Factors of regular exercise, menopause and occupation were found significantly influenced WH constitution; and 8) Health status, emotion and usage TCM habit were found significantly influenced the change of Normality constitution.

Results of stepwise logistic regression to explore the predictors resulted in the changes between those unbalanced TCMC types increased (mean more complex TCMC types) and those unbalanced TCMC types became stable or decreased among individuals in baseline and follow-up were presented with **Table 7**. Poorer health status had a 3.52-fold increased risk to have more complex combined TCMC types when compared to those in a better state of health. During the 4-year follow-up period, those suffering negative emotion had also a 5.66-fold increased risk to have more complex TCMC types which were compared with those who had stable emotion. All those who had experienced menopause and exercise regularly having lower risks (OR of 0.34, 0.63) to suffer more complex TCMC types than those who did not reach or suffering in the perimenopausal stage and who did not exercise regularly respectively.

Discussion

To the best of our knowledge, this is the first study using 4-year longitudinal data to compare the changes in characteristics of TCM constitutions and the factors influencing the development of TCMC types over time. The main findings:

(1) A majority (83.14%) of the participants in this study aged over 45 and most of them suffering chronic diseases or dysfunction dystrophic diseases for a long time on or before baseline to the 4-year follow-up and data revealed the percentage of participants having unbalanced and more complex TCMC types in follow-up was higher than that of baseline. The aging population is expected to more obvious in Hong Kong in near future. A local survey has shown that 75% of local people aged 65 or over, and 45% of people aged 45 to 64 are suffering from one or more chronic diseases [16, 17]. The elderly healthcare issues are a big challenge for every government since the elderly are less healthy than the youth and therefore increased the government spending on their health care and has great impacts on the government's resources [18, 19]. "Treating disease before its onset" is the core theory of TCM in preventive diseases before occurrences. TCM theory focuses on strengthening the body's healthy qi to prevent diseases before occurrence through improving the balance of yin and yang [20]. Hence, it recommends that individuals should improve their health based on one's TCMCs assessments and through changing acquired factors such as lifestyle, dietary habit, and emotional status, etc. Therefore, using a TCM regimen to protect health and prevent aging is one of the effective health defenses for chronic diseases in an elderly population.

(2) The findings of this study proved that the distributions of TCMC types are both relatively stable and adjustable which accordant to that of developing acquired factors and changed the individual's constitutions over time. On one hand, QDF, PD, and PW constitutions were still the top three frequent unbalanced TCMC types at baseline and follow-up. However, ND, BS, and QDP constitutions are substantially increased in women and suffered during menopause. Firstly, most of the participants' acquired factors such as social-demographic, living environment, and lifestyle haven't changed that accounted for the consistency with some TCMCs types in the follow-up. The development of the QDF constitution is closely related to the lifestyle of Hong Kong dwellers' that caused the high pressure from work and living cost, lack of sleep, and fast-paced lifestyle resulting in damage to the healthy Qi. Similarly, suffering negative emotion might also a risk factor of formation of QDF constitution during the follow-up as well as unhappy emotion at baseline. Qi-deficiency always accompanies a morbid state characterized by unsmooth flow and obstruction of qi, which results in Qi-depression constitution, blockage of phlegm, dampness, and stagnant blood [21, 22]. These are accordant with the theory of all diseases that are born from Qi in the earliest and classic TCM book *The Yellow Emperor's Inner Classic* [23, 24]. The lifestyle of prolonged consumption of cold drinks, awaken at night time, and misusing cold air conditioners throughout the year are the key factors for the development of the Yang-deficiency constitution [2]. The prevalence of the Phlegm-wetness constitution is higher among the participants because Hong Kong is a city locates in the South China Sea and belongs to a subtropical zone with climate characteristics of hot-wet-damp. Secondly, the explanation for the remarkable increase of ND, BS, and QDP constitutions could be related to that most of the participants are suffering in the menopause stage during the follow-up period. Menopause is defined as the time in most women's lives that occurs between 49 and 52 years old when their [menstrual periods](#) stop permanently due to the natural depletion of ovarian oocytes [25, 26]. The diagnosis is typically made retrospectively after the woman has missed menses for 12 consecutive months. During this time, women often experience

menopausal syndrome including the symptoms of [hot flashes](#), [sweating](#), and reddening of the skin, [vaginal dryness](#), trouble sleeping, and mood changes [27, 28]. Clinical epidemiological studies found that Yin-deficiency, Blood-stasis, and Qi-depressed constitutions were the dominant unbalanced TCMC types in the women who were around menopause [29]. From *The Yellow Emperor's Inner Classic*, women who suffering menopause are mostly under the "seven-seven years" (at 49 years old) with the Physiological features of kidney fading, Chong-Ren deficiency and heavenly tenth (*Tian Kui Chinese*) deficiency resulted in liver-kidney depletion [30]. "Yin-Blood is the root of woman and liver is the congenital root of woman for blood storage" [31]. The primary physiological function of the liver is free coursing. It ensures the free movement of qi and prevents qi stagnation and its function, which is based on the abundance of yin-blood [32]. Losing free coursing of the liver generally causes disharmony of the qi and blood ensues the development of blood stasis [33]. In other words, menopausal women are more prone to have unbalanced TCMC types, including, ND, QDP, and BS constitutions, and develop the high menopausal syndrome. Hence, the proper adjustment and good health can help soothing or avoid suffering menopausal symptoms and reduce the discomfort during the period.

(3) Health status was found as one of the most significant influencing factors for the development of TCMC types in both baseline and follow-up. According to TCM theory, Unbalanced TCMC types often damage physical and/or mental health even in the situation diagnosed with "no disease" in western medicines [2, 4]. The unbalanced constitutions naturally cause weak healthy qi that triggers more susceptibility to get diseases. Healthy qi is known as generating from parents (as innate essence) and food (as acquired essence) [1], and TCMCs are the comprehensive manifestations of the function of healthy qi [19]. In the follow-up, it has been recognized that participants who suffer from chronic diseases that can damage the healthy qi due to imbalanced of yin and yang resulted in unbalanced TCMCs. Furthermore, in the follow-up, the total number of unbalanced TCMC types owned by one person has increased (more complex TCMC types) that indicates TCMC types could be developed by an individual's health status. It is confirmed that the development of the disease can be influenced by TCMC types, which eventually change TCMC types. Earlier, a pilot study recruited 218 participants with hepatic disease resulting in phlegm and dampness in the meridian during the early stage. Thus, the constitution eventually alters into the different types of constitutions, ensuing Phlegm-wetness, Qi-deficiency, or Wetness-heat [34]. Su wen (Plain Questions) pointed out "the sufficient healthy qi is maintained endogenously, thus the body is not easy to be suffered by evil qi". Hence, the best way to preventing unbalanced TCMC types and diseases is to avoid contacting evil qi and maintaining the balance between yin and yang and regulate the constitution.

(4) Whether aging is a protective factor for unbalanced TCMC types still controversial. The data of baseline and follow-up preferred to support the aging that is a protective factor for the formation of Qi-deficiency, Yang-deficiency, blood stasis, and Qi-depressed and wetness-heat constitutions. Findings of two large studies involving 2043 and 8448 subjects showed there was no significant difference between elderly and younger people with the Phlegm-wetness constitution [35, 36]. However, a study with a 2168 sample size found that the unbalanced TCMC types of Qi-deficiency, Phlegm-wetness and blood-stasis, and Yang-deficiency among elderly people were higher than younger people [37]. Enjoying a leisure life

during retirement or a part-time job with proper manual working without suffering from high working pressures would reduce the consumption of qi-blood and keep the balance of Yin-Yang especially in the elderly population. Overstrain is easy to harm the physical body and consume qi-blood to cause essence-qi shortage thus develop unbalanced TCMC types [2]. A study analyzed data from a random sample of 1,546 people from ages 21 to 99 through a phone interview and filled out the questionnaire indicated that happiness and wellbeing are a U-shaped curve in the entire life, dipping down in middle age and inching up in older age [38]. The outcomes of this study are also consistent with this conclusion that participants suffered less unhappy emotion as they are aged, which would avoid liver-qi stagnation thus reducing some unbalanced TCMC occurrence. However, more researches are highly required to prove that aging is a protective factor of TCMC types.

(5) Emotional status found as a core factor influencing the development of TCMC types during the 4-year follow-up. Firstly, this study found the unhappy emotion and suffering negative effect on body-mind health that were risk factors for the formations of QDF, BD, QDP constitutions, and risk factor of more complex unbalanced TCMC types. Emotions can be defined as a positive or negative experience that is associated with a particular pattern of physiological activity as well as responses to significant internal and external events [39]. Emotional states are closely related to qi-blood, the yin-yang of the organs according to TCM theory. With consistent with the recognition of the book *The Yellow Emperor's Inner Classic* pointed out a negative effect on body-mind health that can consume Yin-blood secretly and gradually affecting a qi-blood variety of the viscera and most likely to form Qi-deficiency and Qi-depressed constitutions [23]. Our findings also confirmed that frequent emotional fluctuation could harm body-mind health most likely resulted in Qi-depressed constitution with high frequency paired with Qi-deficiency constitution owned by the individual. Qi-deficiency and depression can accumulate heart/liver to cause fire, as well as impaired Yin-consume the body fluid then leading to Yang heat diathesis or Yin deficiency diathesis. Qi stagnation can produce the blood-stasis constitution [40, 41]. Thus, Good mental status, conscious activities, and stable emotion are beneficial to the health, ensuing to prevent the disorder of qi movement that helps to avoid unbalanced TCMC types' occurrence.

(6) Lifestyle factors such as physical exercise or dietary habits play very important roles in the development of TCMC types over time. Lifestyle factor refers to the behavioral style such as food, daily life at home, work, hobby, physical exercise, etc. Proper daily activities would be beneficial to reduce the harmfulness to health [20, 35]. Proper physical exercise can move qi and blood that enhance the visceral function to more powerful and more healthy [7]. On the other hand, extreme and fewer exercises may weaken the circulation of qi-blood muscles to be flabby, and spleen-stomach dysfunction, thus the development of fat and damp-greasy constitution. This follow-up study re-confirmed that regular exercise is a protector of the wetness-heat constitution but not as for QDF, PD, and BS constitutions. Duration of the exercise and different kinds of physical exercise should be considered to affect the TCMC types. Hence, duration and types of physical exercises should be further investigated by individuals in forming TCMC types. Dietary habit may also be a contributory factor influenced TCMC types. All the participants had received TCM regimen dietary according to their diagnosed TCMC types to improve their health by individuals at the baseline, but the rate of the participants followed these regimen was low and duration

was short thus there was no significant difference in the TCMC types. Experts in different dynasties had paid much attention to the relationship between diet and good health. One of the well-known experts of Sun SiMao, a distinguished Taoist priest, and an expert of Chinese medicine in the Tang Dynasty pointed out that “The foundation of the settlement lies based on the food and how people take in” and “those who do not know to eat, then they are unfit to live” [42], hence, the diet is bare necessities of life and a guarantee of good health and long life. A follow-up has also observed that the habit of using regular TCM is a protector for keeping participants in normality constitution when compared with others in unbalanced TCMC types. On the other hand, those participants in the poorer health status of those diagnosed with Yang-deficiency, Qi-deficiency, or Phlegm-wetness constitutions or with more complexed unbalanced TCMC types tended to use TCM to improve their health. Today, most of the Hong Kong dwellers accept TCM medications and prefer to choose them for promoting chronic diseases such as dampness, qi-yin deficiency, or even as alternative meditations for cancer patients to reduce side effects or improve the quality of life [16, 17, 19, 43, 44]. We take into account and found that more complex unbalanced TCMC types reflected the poorer health status and usage of Chinese medicines aided to manage their unbalanced TCMC as alternative medications. However, the regular consumption of a healthy diet and TCM regimen for a longer time is needed to observe its effect on managing an individual’s unbalanced TCMC that is now underway.

Conclusion

Based on longitudinal data of this follow-up study, we could draw some main conclusions and provide a new view of thinking for protecting health through the theory of TCMC. Firstly, women having unbalanced TCMC and more complex unbalanced TCMC were higher in the follow-up than that of baseline. Secondary, the distributions of TCMC types were re-confirmed to be relatively stable and adjustable according to acquired factors that would cause the development of individuals' TCMC over time. Thirdly, follow-up data indicated that the women suffering from menopause got a high risk to form the unbalanced types of ND, BS, and QDP constitutions. Moreover, Poor health status, unhappy emotions, and/or suffering negative effects on body-mind health and suffering in menopause may be key factors for the development of unbalanced TCMC types, however regular exercise and habit of using TCM could be potential protectors for keeping them into the normality constitution.

Limitations Of The Study

There were some limitations of this article. One of the limitations is the participant's response rate in the baseline and follow-up, which are potentially affected a skewed assessment of the characteristics of TCMC types during follow-up. The second limitation is the participants who joined in the follow-up are not at the higher educational level. The finding in this study should be noteworthy interpreted with caution.

Study implications

This is the first time to re-assess the participants' TCMC and related influencing factors in a 4-year interval, implications in the development of TCMC theory, and produced a new regimen for health protection of the individual. Significant indicators related to unbalanced TCMC types were examined and provided scientific evidence for the management of unbalanced TCMCs. Moreover, this study accelerates the development of TCMC and guidance for health protection and disease prevention. Therefore, it is crucial and valuable to further investigate TCMC studies with a huge sample size, gender, and extend the age range that is highly required to establish a scientific way of living to improve an individual's TCMCs.

Abbreviations

ANOVA- analysis of variance

BS- Blood stasis

ND- Yin-deficiency

PD- Yang-deficiency

PW- Phlegm-wetness

QDF- Qi-deficiency constitution

QDP- Qi-depressed

TCMC- Traditional Chinese Medicine Constitution

Declarations

Consent for publication

We declare that the Publisher has the Author's permission to publish the relevant contribution.

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Not applicable.

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Ethical approval and consent to participate

The study was approved by the Institutional Review Board of the University of Hong Kong/ Hospital Authority Hong Kong West Cluster (HKU/HA HKW IRB, UW 16-236). All procedures performed in the study were in accordance with the ethical standards of HKU and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Competing interests

The authors declare no competing conflict of interests.

Authors' contributions: Yanhua He conceived of the design, carried out the study, and drafted the manuscript; Jianping Chen was in charge of the study work, advice in the study design; Qi Wang, Jessie Suet Mui Chan advised on the study design and expert advice in manuscript; Sun youzhi, Jessie You, Kumar Ganesan advised on the study design; Lei Jia participated in online version questionnaire design. All authors read and approved the final manuscript.

References

1. Jiang QY, Li J, Zheng L, Wang GH, Wang J. Constitution of traditional chinese medicine and related factors in women of childbearing age. *J Chin Med Assoc.* 2018;81:358–65.
2. Liang X, Wang Q, Jiang Z, Li Z, Zhang M, Yang P, Wang X, Wang Y, Qin Y, Li T, et al. Clinical research linking Traditional Chinese Medicine constitution types with diseases: a literature review of 1639 observational studies. *J Tradit Chin Med.* 2020;40:690–702.
3. Chen SL, Liu YT, Hsueh KC, Tang PL. Body constitution of traditional Chinese medicine caused a significant effect on depression in adult women. *Complement Ther Clin Pract.* 2021;42:101288.
4. Deng SM, Chiu AF, Wu SC, Huang YC, Huang SC, Chen SY, Tsai MY. Association between cancer-related fatigue and traditional Chinese medicine body constitution in female patients with breast cancer. *J Tradit Complement Med.* 2021;11:62–7.
5. GAO, M-y. LV A-p: The Humble Opinion on The Foundation of Forming The Constitution [J]. *Liaoning Journal of Traditional Chinese Medicine.* 2011;3:038.
6. Li L, Yao H, Wang J, Li Y, Wang Q. The Role of Chinese Medicine in Health Maintenance and Disease Prevention: Application of Constitution Theory. *Am J Chin Med.* 2019;47:495–506.
7. Liu Y, Pan T, Zou W, Sun Y, Cai Y, Wang R, Han P, Zhang Z, He Q, Ye F. Relationship between traditional Chinese medicine constitutional types with chemotherapy-induced nausea and vomiting in patients with breast cancer: an observational study. *BMC Complement Altern Med.* 2016;16:451.
8. Wu Y, Cun Y, Dong J, Shao J, Luo S, Nie S, Yu H, Zheng B, Wang Q, Xiao C. Polymorphisms in PPARD, PPARG and APM1 associated with four types of Traditional Chinese Medicine constitutions. *Journal*

- of Genetics Genomics. 2010;37:371–9.
9. Zhu Y, Wang Q, Deng Q, Cai J, Song X, Yan X. [Relationships between constitutional types of traditional Chinese medicine and hypertension]. *Zhong xi yi jie he xue bao = Journal of Chinese integrative medicine*. 2010;8:40–5.
 10. Mo F-F, Zheng G-Y, Wu L-N, Fang F-F, Liu C-P, Ling C-Q, Li M. Relationships between constitutional types of traditional Chinese medicine and motion sickness in 145 ocean sailors. *Zhong xi yi jie he xue bao = Journal of Chinese integrative medicine*. 2011;9:390–4.
 11. Wang Q, Zhu Y-b, Origasa H, Du J, Pang G, Song X, Qian H, Xue H, Zho J. Study on related influencing factors of phlegm-wetness constitution in Chinese medicine. *JOURNAL-BEIJING UNIVERSITY OF TRADITIONAL CHINESE MEDICINE*. 2008;31:10.
 12. Wang J, Wang Q, Li L, Li Y, Zhang H, Zheng L, Yang L, Zheng Y, Yang Y, Peng G. Phlegm-dampness constitution: genomics, susceptibility, adjustment and treatment with traditional Chinese medicine. *The American Journal of Chinese Medicine*. 2013;41:253–62.
 13. Zhu Y, Wang Q, Deng Q, Cai J, Song X, Yan X. Relationships between constitutional types of traditional Chinese medicine and hypertension. *Zhong xi yi jie he xue bao = Journal of Chinese integrative medicine*. 2010;8:40–5.
 14. Sun Y, Liu P, Zhao Y, Jia L, He Y, Xue SA, Zheng X, Wang Z, Wang N, Chen J. Characteristics of TCM constitutions of adult Chinese women in Hong Kong and identification of related influencing factors: a cross-sectional survey. *Journal of translational medicine*. 2014;12:140.
 15. Qi W. Identification of the Nine Constitutions in Chinese Population. Bei Jing: Science Press; 2011.
 16. Wong W, Lam CL, Su YC, Lin SJ, Ziea ET, Wong VT, Wai LK, Kwan AK. Measuring body constitution: validation of the Body Constitution Questionnaire (BCQ) in Hong Kong. *Complement Ther Med*. 2014;22:670–82.
 17. Low CT, Lai PC, Li HD, Ho WK, Wong P, Chen S, Wong WC. Neighbourhood effects on body constitution-A case study of Hong Kong. *Soc Sci Med*. 2016;158:61–74.
 18. Mafauzy M. The problems and challenges of the aging population of Malaysia. *The Malaysian journal of medical sciences: MJMS*. 2000;7:1.
 19. Zhang Z, Chuang Y, Ke X, Wang J, Xu Y, Zhao Y, Bian Y. The influence of TCM constitutions and neurocognitive function in elderly Macau individuals. *Chin Med*. 2021;16:32.
 20. Yan C, Luo Z, Li W, Li X, Dallmann R, Kurihara H, Li YF, He RR. Disturbed Yin-Yang balance: stress increases the susceptibility to primary and recurrent infections of herpes simplex virus type 1. *Acta Pharm Sin B*. 2020;10:383–98.
 21. Ma K, Chen J, Kuang L, Bi J, Cheng J, Li F, Sun X, Nie X, Liu Y, Luo R, Zhao X: Qi-Deficiency Related Increases in Disease Susceptibility Are Potentially Mediated by the Intestinal Microbiota. *Evid Based Complement Alternat Med* 2018, 2018:1304397.
 22. Zhao Z, Gong W, Dong J, Liu L, Tang Z, Mohammadtursun N, Lu L, Li M, Lü Y, Mo S, et al. Kidney-Qi deficiency diagnosed by Deng's diagnosis standard was not correlated with aging based on clinical observation of 90 participants. *J Tradit Chin Med*. 2019;39:267–74.

23. Zhang WB, Wang Z, Song XJ. [Analysis on the defensive function of defensive qi in Huangdi Neijing (The Yellow Emperor's Inner Classic)]. *Zhongguo Zhen Jiu*. 2021;41:343–7.
24. Goh YL, Liu J, Zhao B. Use of the Layer Analysis Method of the Yellow Emperor's Inner Classic in modern society. *J Acupunct Meridian Stud*. 2014;7:331–6.
25. Johnson A, Roberts L, Elkins G. Complementary and Alternative Medicine for Menopause. *J Evid Based Integr Med*. 2019;24:2515690x19829380.
26. Takahashi TA, Johnson KM. Menopause. *Med Clin North Am*. 2015;99:521–34.
27. Deshpande MSV. MENOPAUSE AND THE WORK LIFE BALANCE. *International Education and Research Journal* 2017, 3.
28. Takahashi TA, Johnson KM. Menopause. *Med Clin North Am*. 2015;99:521–34.
29. Wang M. Explore the relationship between TCM constitution types and TCM syndromes of women with perimenopausal syndrome[D]. Chengdu University of Traditional Chinese Medicine, school of clinical medicine; 2010.
30. Jin X, Ding L, Xia D, Chen P. [Effects of acupoint catgut embedding combined with auricular point pressure on menopausal syndrome of liver-kidney deficiency type and estradiol]. *Zhongguo Zhen Jiu*. 2017;37:836–9.
31. Zhang LW, Guo Q, Fang R, Lin L, Ye BH, Zheng KL, Lin M, Yang ZY, Fang JQ, Li CD: Traditional Chinese Medicine-Guided Dietary Intervention for Male Youth Undergoing Drug Detoxification: A Randomized Controlled Trial. *Evid Based Complement Alternat Med* 2019, 2019:3870316.
32. Zhang J, Liu Y, Xu Y. Soothing liver-qi stagnation method for cancer-related depression: A protocol for systematic review and meta-analysis. *Medicine*. 2020;99:e22797.
33. Gao H, Shang YZ, Xia T, Qiao MQ, Zhang HY, Ma YX. The correlation between neurosteroids and neurotransmitters with liver yang rising and liver qi stagnation types of premenstrual syndrome. *Gynecol Endocrinol*. 2014;30:913–7.
34. GUO, Y-m. JIANG H-h: Reinforcing Body Resistance to Treat the Sub-health. *Chinese Archives of Traditional Chinese Medicine*. 2007;8:068.
35. Zhen SLCGW. Clinical Investigation on TCM Constitution of Diabetes Patients in Xianyang Area [J]. *Journal of Shaanxi College of Traditional Chinese Medicine*. 2010;4:020.
36. Wang Q, Zhu Y. Epidemiological investigation of constitutional types of Chinese medicine in general population: based on 21,948 epidemiological investigation data of nine provinces in China. *China Journal of Traditional Chinese Medicine Pharmacy*. 2009;24:7–12.
37. Wu CYLW, Wang NN, Xu Z, Li J, Wang Q. The epidemiological investigation of Traditional Chinese Medicine Constitution among 2043 people in regions of Jiangsu province. *ZhongGuoZhong Yi Ji Chu Yi XueZaZhi*. 2009;15:138–40.
38. Thomas ML, Kaufmann CN, Palmer BW, Depp CA, Martin AS, Glorioso DK, Thompson WK, Jeste DV. Paradoxical trend for improvement in mental health with aging: a community-based study of 1,546 adults aged 21–100 years. *J Clin Psychiatry*. 2016;77:e1019.

39. Cabanac M. What is emotion? *Behavioural processes* 2002, 60:69–83.

40. Liao YC, Chou CY, Chang CT, Li TC, Sun MF, Chang HH, Tsai FJ, Yen HR. Qi deficiency is associated with depression in chronic hemodialysis patients. *Complement Ther Med*. 2017;30:102–6.

41. Zhao AM, Qiu WR, Mao LJ, Ren JG, Xu L, Yao MJ, Bilinski K, Chang D, Liu JX. The efficacy and safety of Jiedu Tongluo granules for treating post-stroke depression with qi deficiency and blood stasis syndrome: study protocol for a randomized controlled trial. *Trials*. 2018;19:275.

42. Li M, Liang Y. Sun Simiao, super physician of the Tang Dynasty. *Journal of Traditional Chinese Medical Sciences*. 2015;2:69–70.

43. Jin X, Ruiz Beguerie J, Sze DM-y, Chan G. Ganoderma lucidum (Reishi mushroom) for cancer treatment. *Cochrane Database of Systematic Reviews* 2009, 2.

44. Sun Y, Liu P, Zhao Y, Jia L, He Y, Xue SA, Zheng X, Wang Z, Wang N, Chen J. Characteristics of TCM constitutions of adult Chinese women in Hong Kong and identification of related influencing factors: a cross-sectional survey. *J Transl Med*. 2014;12:140.

Tables

Table1. Comparison of characteristics of baseline and follow-up between the women who participated and those who did not participate in the follow-up study.

Baseline N (%)		Follow-up N (%)			
Characteristic	Participants (n=249) N (%)	Non-Participants (n=695) N (%)	<i>P</i> values a	Participants (n=249) N (%)	<i>P</i> values b
Ψ Mean age, y(SD)	49.21 ± 7.71	49.62±8.46Ψ	0.437	53.21±7.71	0.050
30-44	44(17.66%)	91(13.09%)		33(13.67%)	
45-59	158 (63.45%)	415(59.71%)		165 (66.27%)	
60-65	28(11.26%)	106(15.25%)		26 (10.44 %)	
> 65	21(8.43%)	83(11.94%)		24 (9.64%)	
Educational level			<0.001	N/A	N/A
PS	4 (1.61%)	56(8.06%)			
LS	31(12.45%)	149(21.44%)			
US/SS	102(40.96%)	256(36.83%)			
UG/SD	73 (29.31%)	148(21.29%)			
PG	36(14.46%)	75(10.79%)			
State of health			0.216		0.050
Good	93(37.35%)	243(34.96%)		82(32.93%)	
Poor	156(62.65%)	452(65.04%)		167(67.07%)	
Emotional status			0.906		0.001
happy	84(33.73%)	264(37.9%)		70 (28.57%)	
unhappy	36(14.46%)	63(9.07%)		25(10.00%)	
ordinary	95(38.15%)	248(35.68%)		114(45.45%)	
Blank	34(13.65%)	110(15.83%)		32(12.85%)	
Occupation			0.097		0.001
Full-time working	146(59.62%)	359(51.62%)		125(50.20%)	
part-time working	26(10.44%)	64(9.21%)		11(4.41%)	
housewife/no working	77(30.93%)	268(38.56%)		111(44.58%)	
Marital status					

Never married	54(21.68%)	136(19.56%)	0.437	47(18.88%)	0.491
Married/committed	167(67.07%)	485(69.78%)		168(67.47%)	
Divorced/widowed	27(10.84%)	73(10.50%)		34(13.84%)	
Reproductive history					
Never	85(34.14%)	204(29.35%)	0.160	69(27.71%)	0.124
Yes	164(65.86%)	491(70.64%)		180(72.29%)	
Menopause status					0.001
Yes	111(44.57%)	328(47.19%)	0.478	184(73.89%)	
No	138(55.42%)	367(52.81%)		65(26.10%)	
^c Exercise regular					0.003
Yes	127(51.00%)	360(51.80%)	0.786	160(64.30%)	
No	122(49.00%)	335(48.20%)		61(24.50%)	

Note: *P* values are from Student's *T*-tests ($P < 0.05$) (age) and Chi-square Tests ($P < 0.05$) for education, state of health, occupation, marital status, reproductive history, and menopausal status; all tests are two-sided. Data marked with ^ψ are presented as mean (standard deviation) and the others are presented as frequency (%); ^a Comparison of baseline characteristics between those women who participated and those who did not participate; ^b Comparison of characteristics of baseline and follow-up among those women participated; ^c Definition for regular exercise was those had exercised at least once per week with total time over 60 minutes.

Abbreviations: PS: Primary school or below; LS: Lower Secondary; US/SS: upper secondary/specialized secondary; UG/SD: Undergraduate/sub-degree course; PG: Postgraduate or above.

Table 2. Lifestyle characteristics with a 4-year interval at follow-up (N=249)

Items	Follow-up N (%)
^Ψ Follow to TCM regimen diet to improve health	
Yes	41(16.47%)
No	187(75.10%)
Blank	21(8.43%)
Follow to diet regimen duration	
Yes (0.5 -2 years)	24(9.64%)
Yes (2 -4 years)	17(6.83%)
No	187(75.10%)
Blank	21(8.43%)
^a Usage TCM habit	
Yes	94(37.75%)
No	133(53.41%)
Blank	22(8.84%)
Using TCM duration	
≥ 7/week	4(4.26%)
3~6/week	13(13.83%)
1-2/week	13(13.83%)
≤ 1week	64(68.09%)

^Ψ All the participants had an assessment report which including diagnosed TCMC types and diet regimen of TCM to improve their health or adjusted their unbalanced TCMC type by individuals, here were those who self-reported and followed this diet regimen.

^a Definition for using TCM habit included those who took Chinese herbal prescription or received Chinses acupressure massage regular or before, with the duration from less than once a week to one time per day.

Table 3. Changes in the distribution of TCMC types among the participants at baseline and follow-up

TCMC Type	Baseline		Follow-up		Unchanged TCMC types (Matched by individuals)	Unchanged Rate
	N	%	N	%		
QDF	119	47.8	129	51.8	91	76.47%
PD	107	43.0	113	45.4	81	75.70%
ND	70	28.1	93	37.6	46	65.71%
PW	88	35.3	96	38.6	62	70.45%
WH	80	32.1	87	34.9	47	58.75%
BS	81	32.5	91	36.5	56	69.14%
QDP	76	30.5	86	34.5	57	75.00%
ISC	54	21.7	50	20.1	37	70.37%
N	54	21.7	46	18.5	24	44.44%

Abbreviations: QDF, Qi-deficiency constitution; PD, Yang-deficiency constitution; ND, Yin-deficiency constitution; PW, Phlegm-wetness constitution; WH, Wetness-heat constitution; BS, Blood-stasis constitution; QDP, Qi-depressed constitution; ISC, Inherited Special constitution; N, Normality constitution.

**P* from chi-square tests ($P < 0.05$) comparing the distribution of TCMC types in baseline and follow-up.

Table 4. Using association rules mining explored the pairs of unbalanced TCMC Types (Follow-up participants, N=249)

TCMC Types(X)	Amount of TCMC Type(X)	TCMC →	Amount of TCMC Type(Y)	Support (X) (%)	Confidence (X=> Y) (%)	
	N		N		N	
QDP	80	☒→	QDF	75	30.12%	93.75%
QDP	80	☒→	PW	63	25.30%	78.75%
QDP	80	☒→	PD	62	24.90%	77.50%
PW	96	☒→	QDF	82	32.93%	85.42%
PD	109	☒→	QDF	89	35.74%	81.65%
BS	89	☒→	QDF	68	27.31%	76.40%

The minimum amount of TCMC type is 80, minimum support of 0.2, and minimum confidence of 0.75.

Table 5. Changes in the total number of unbalanced TCMC types in sub-groups with significant influencing factors between baseline and follow-up

Baseline	Follow-up group						
Variables	Total number of unbalanced TCMC types		p ^a	Total number of balanced TCMC types		p ^b	p ^c
	Mean	SD		Mean	SD		
age			0.062			0.032	0.018
30-44	3.51	2.05		3.85	2.30		
45-59	3.21	2.01		4.09	2.08		
>=60	3.5	2.31		3.28	2.03		
Occupation							
Full time working	3.15	1.96	0.359	4.19	2.13	0.281	0.034
Part time working	3.07	2.09		3.21	2.43		
House wife/retire	2.94	2.1		3.78	2.10		
Emotional status							
unhappy	3.25	2.14	0.044	3.77	2.15	0.029	0.04
ordinary	3.75	1.81		3.65	2.19		
happy	2.84	2.12		3.42	2.02		
Blank	3.83	2.12		4.26	2.25		
State of health							
Good	2.09	2.13	0.001	3.27	2.17	0.007	0.02
Poor	3.42	2.54		3.97	2.11		
Exercise habit							
Yes	3.02	2.09	0.038	3.56	2.16	0.407	0.096
No	3.58	1.99		3.98	2.13		
Marital changed							
Yes	N/A	N/A		3.87	2.39	2.39	
No				3.71	2.07	2.07	
^d Menopause changed							

Yes	N/A	N/A	3.58	2.03	0.247
No			4.08	2.19	
^e Suffering negative effect on body-mind health					
Yes	N/A	N/A	4.05	2.11	0.028
No			3.03	1.97	
Usage TCM habit					
Yes	N/A	N/A	3.76	2.26	0.011
No			3.25	2.05	0.048

Note: Data are listed only *P*-Values from one-way-ANOVA or 2 samples *t*-test less than 0.25 when compared at baseline against follow-up over 4 years. ^a Comparison of those sub-groups variables of baseline; ^b Comparison of those sub-groups variables of follow-up; ^c Comparison of those sub-groups variables of baseline against a follow-up. ^d Menopause is defined as the time in most women's lives when [menstrual periods](#) stop permanently due to the natural depletion of ovarian oocytes from aging and missed menses for 12 months. Menopause changed to refer to those women who had experienced menopause. ^e A definition for suffering negative effect on body-mind health were those who self-reported suffering new and/or old diseases, or working/living stress, or frustrated with family members healthy problem and/or accident, or financial problem.

Table 6. Association of TCMC Types and significant influencing factors at follow-up (results of stepwise logistic regression)

Variables	OR	S.E.	95%CI	P-value
Model 1: Outcome: Qi-deficiency (QDF) constitution				
Log-likelihood=259.29, chi-square=53.56 (3 d. f.), p<0.05				
Age	0.93	0.02	0.89-0.96	0.001
Suffering negative effect on body-mind health	2.70	0.41	1.21-6.02	0.000
Usage TCM habit	3.56	0.37	1.73-7.25	0.000
Model 2: Outcome: Phlegm-wetness (PW) constitution				
Log-likelihood=297.30, chi-square=12.53 (2 d. f.), p<0.05				
State of health	1.37	0.39	1.17-1.80	0.001
usage TCM habit	3.28	0.35	1.65-6.50	0.001
Model 3: Outcome: Yang-deficiency (PD) constitution				
Log-likelihood=271.53, chi-square=38.30 (3 d. f.), p<0.05				
Age	0.94	0.02	0.90-0.97	0.001
State of health	1.93	0.67	1.03-3.60	0.038
Usage TCM habit	3.28	0.35	1.65-6.50	0.001
Model 4: Outcome: Yin-deficiency (ND) constitution				
Log-likelihood=178.02, chi-square=4.7(2 d. f.), p<0.05				
State of health	2.21	0.37	1.08-4.54	0.001
Menopause	0.39	0.32	0.21-0.71	0.003
Model 5: Outcome: Blood-stasis (BS) constitution				
Log-likelihood=261.56, chi-square=31.36(3 d. f.), p<0.05				
Emotional status	2.56	0.34	1.33-4.94	0.005
Menopause	0.37	0.35	0.19-0.73	0.004

Age	0.91	-0.1	0.88-0.95	0.001
Model 6: Outcome: Qi-depressed (QDP) constitution				
Log-likelihood=231.84, chi-square=52.52(3 d. f.), p<0.05				
Suffering negative				
effect on body-mind health	3.64	0.42	1.59-8.31	0.003
Menopause	0.43	0.34	1.25-4.72	0.009
Age	0.92	0.02	0.88-0.96	0.001
Model 7: Outcome: Wetness heat (WH) constitution				
Log-likelihood=253.20, chi-square=20.86(3 d. f.), p<0.05				
Exercise regularly	0.71	0.35	0.49-0.98	0.004
Occupation	0.69	0.37	0.47-0.93	0.004
State of health	2.56	0.34	1.32-4.94	0.005
Model 8: Normality(N) constitution				
Log-likelihood=196.56, chi-square=19.64(3 d. f.), p<0.05				
Suffering negative effect on body-mind				
health	4.06	0.38	1.90-8.68	0.000
State of health	0.42	0.39	0.20-0.91	0.028
Usage TCM	0.12	-2.09	0.03-0.55	0.006

Table 7. Influencing factors on the changes between those unbalanced TCMC types increased (became more complex) and those unbalanced TCMC types became stable or decreased by individuals at baseline and follow-up (results of the stepwise logistic regression)

Variables*	OR	S.E.	95%CI	P value
Log-likelihood=362.068, chi-square=64.160 (4 d. f.), $p<0.05$				
Suffering negative effect on body-mind health	5.66	0.98	1.92-88.00	0.009
State of health	3.52	0.52	1.26-9.85	0.010
Menopause status	0.34	0.47	0.14-0.86	0.022
Exercise regularly	0.63	0.16	0.46-0.86	0.004

* Those factors with p -values less than 0.25 (including state of health, occupation, emotional status, menopause status, exercise habit, and using TCM habit) between these two groups were entered into multiple stepwise logistic regression analysis to explore the significant influencing factors related to the changes of unbalanced TCMC types over the 4-year follow-up period.

Figures

Figure 1

Flow Diagram of participants' response rate

Figure 2

Changes in the distribution of the total number of unbalanced TCMC types owned by individuals between baseline and follow-up