

LONGITUDINAL STUDIES ON THE CHARACTERISTICS OF TCM CONSTITUTIONS AND RELATED FACTORS OF WOMEN IN HONG KONG

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ABSTRACT

Traditional Chinese Medicine Constitution (TCMC) is essential to reflect an individual's body-mind and health. Understanding TCMCs and their influencing factors would benefit the individual's health and disease prevention. Our previous cross-sectional studies have found the characteristics of TCMCs and related influencing factors simultaneously. However, longitudinal data on the development of characteristics of TCMC constitutions over time is limited. This follow-up study 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. We conducted a follow-up survey of Chinese women in Hong Kong to compare the characteristics of TCMCs and their factors at baseline with a 4-year interval. Of 81.5% among 249 participants were diagnosed with unbalanced TCMCs. Most of the constitutions were significantly increasing. Stepwise logistic analysis indicated that poorer health conditions (OR=1.37-2.56), negative effect on body-mind health (OR, 2.70-4.06), and negative emotion (OR, 2.57) were positively correlated with certain unbalanced TCMCs. Aging (OR, 0.91-0.93), regular exercise (OR=0.71), usage of TCM habits (OR=0.12), and menopause (OR, 0.37-0.39) showed inverse correlations with certain unbalanced constitutions. Based on the findings, we concluded that diverse factors could unbalance TCMC. At the same time, regular exercise and habit of regular usage of TCM might be potential protectors to regulate the normal constitution.

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Introduction

The original theory of the Traditional Chinese Medicine Constitution (TCMC) 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 life [1, 2]. TCMC is divided into the balanced constitution, which is known as the Normality constitution, and the Unbalanced/Biased constitution, which can be further classified into several subtypes such as Yang-deficiency, Yin-deficiency (ND), Phlegm-wetness (PW), Qi-

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deficiency (QDF), Wetness-heat, Blood-stasis (BS), Qi-depressed (QDP), etc. [2-4]. Congenital endowments mainly determine the type of TCMC development. Still, acquired factors, including individual factors (lifestyle, dietary habits, emotional status, and history of diseases) and environmental factors, may also play a critical role in the TCMC development over time. TCMCs are relatively stable and adjustable, and acquired factors greatly influence the development of individual TCMCs over time [5-7]. According to the TCM theory, individual unbalanced constitutions have a higher susceptibility to certain diseases than balanced constitutions, which 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 disease prevention.

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 the identification of related influencing factors [14]. This follow-up study focused to re-survey on 1) Investigating the changes in their health status, social demographic, lifestyle, characteristics and the factors influencing the development of TCMC types between baseline and follow-up with a 4-year interval, 2) To examine and predicting 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 surveyed 944 local women in Hong Kong who participated in our baseline study. Among them, 785 participants were a follow-up within a 4-year time interval (IRB reference Number: UW12-010). However, the completed questionnaire from participants was only 249. A response rate of 59.0% was achieved in the follow-up study. The follow-up rate of participants was relatively low due to unknown/ wrong telephone numbers, moving overseas, blocking unknown calls, etc. The participants and the lost-to-follow-up participants were similar in the baseline characteristics of age, occupation, marital status, reproductive history, and menopause.

Ethical Approval and Consent to Participate

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

Procedures

To eliminate bias and ensure the quality of investigation, our standardized procedures were used as earlier [14]. Online questionnaires and online consent forms were prepared. The information of this study was sent to the participants through e-mail, phone calls, messages, and WhatsApp, respectively. All the completed questionnaires were checked carefully, and missing items in the questionnaires were completed by telephonic inquiry.

Instrument and Outcome Measure

The follow-up questionnaire was prepared based on our study's earlier version [14], which was modified from the original version [15]. In the second part, we updated the relevant socio-demographic information and potential factors influencing TCMC formation. 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- analysis of variance (ANOVA), and two samples t-test were used to explore the characteristics between participants and non-participants. 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.

Results and Discussion

Response Rates and Baseline Characteristics of Participants and Non-Participants

Among the 944 subjects recruited in the initial study, we successfully contacted 785 women, and 169 participants failed due to unknown/ wrong telephone numbers, moving overseas, or blocked unknown calls. Among 785 subjects, 422 were willing to participate in the follow-up survey, and 249 questionnaires were completed. A response rate of 59.0% was achieved (**Figure 1a**). Baseline-demographic characteristics of the 249 women who participated and of the 695 non-participated in the follow-up study were shown in **Table 1**. The participants and the lost-to-follow-up participants were similar in the baseline

characteristics of age, occupation, marital status, reproductive history, and menopause ($P>0.05$), only on the education level, which the follow-up participants had a higher education level ($P<0.05$) than those who did not participate.

Table 1. Comparison of characteristics of baseline and follow-up between the women who participated and those who did not participate in the follow-up study.

Characteristic	Baseline N (%)		P-values ^a	Follow-up N (%)	
	Participants (n=249) N (%)	Non-Participants (n=695) N (%)		Participants (n=249) N (%)	P-values ^b
^ψ Mean age, y(SD)	49.21 ± 7.71	49.62±8.46 ^ψ		53.21±7.71	
30-44	43(17.27%)	91(13.09%)	0.437	33(13.67%)	0.050
45-59	158 (63.05%)	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					
PS	4 (1.61%)	56(8.06%)	<0.001	N/A	N/A
LS	32(12.85%)	149(21.44%)			
US/SS	103(41.36%)	256(36.83%)			
UG/SD	74 (29.72%)	148(21.29%)			
PG	36(14.46%)	75(10.79%)			
State of health					
Good	93(37.35%)	243(34.96%)	0.216	82(32.93%)	0.050
Poor	156(62.65%)	452(65.04%)		167(67.07%)	
Emotional status					
happy	84(33.73%)	264(37.9%)	0.906	70 (28.57%)	0.001
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					
Full-time working	146(59.62%)	359(51.62%)	0.097	125(50.20%)	0.001
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	55(22.08%)	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					
Yes	111(44.57%)	328(47.19%)	0.478	184(73.89%)	0.001
No	138(55.42%)	367(52.81%)		65(26.10%)	
^c Exercise regular					
Yes	127(51.00%)	360(51.80%)	0.786	160(64.30%)	0.003
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.

Changes in the General Health and Lifestyle Characteristics

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 baseline, in which the percentage of good health status decreased from 37.35% to 32.93% [14]. Participants' emotional status became more stable due to the unhappy status dropping from 14.46% to 10.00%, whereas the ordinary proportion rose from 38.15% to 45.45%. A greater number of participants became housewives or retired at follow-up (44.58% versus 30.93%) compared to baseline. About 73 (29.32%) experienced menopause over the 4-year follow-up time. More than half (64.3%) of them had regular habits of exercise, which was higher than 51.00% at baseline. All participants had an assessment report including diagnosed TCMC types and TCM diet regimen for improving their 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 habitually used a TCM regimen, and most (68.09%) used the TCM regimen less than once a week.

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

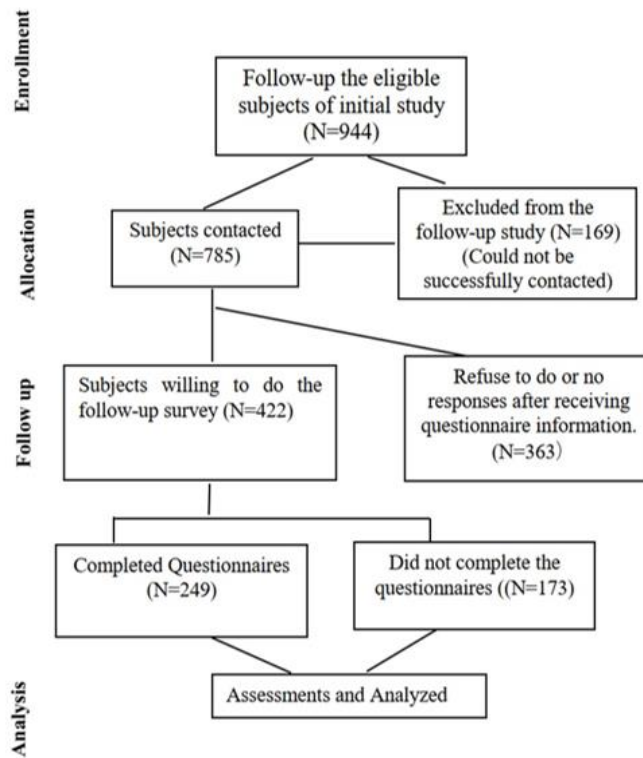
Items	Follow-up N (%)
[‡] Follow to TCM regimen diet to improve health	
Yes	41(16.47%)
No	187(75.10%)
Blank	21(8.43%)
Follow to diet regimen duration	
Yes (0.5 -2 years)	24(9.64%)
Yes (2 -4 years)	17(6.83%)
No	187(75.10%)
Blank	21(8.43%)
^a Usage TCM habit	
Yes	94(37.75%)
No	133(53.41%)
Blank	22(8.84%)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

[‡] All the participants had an assessment report which included 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.

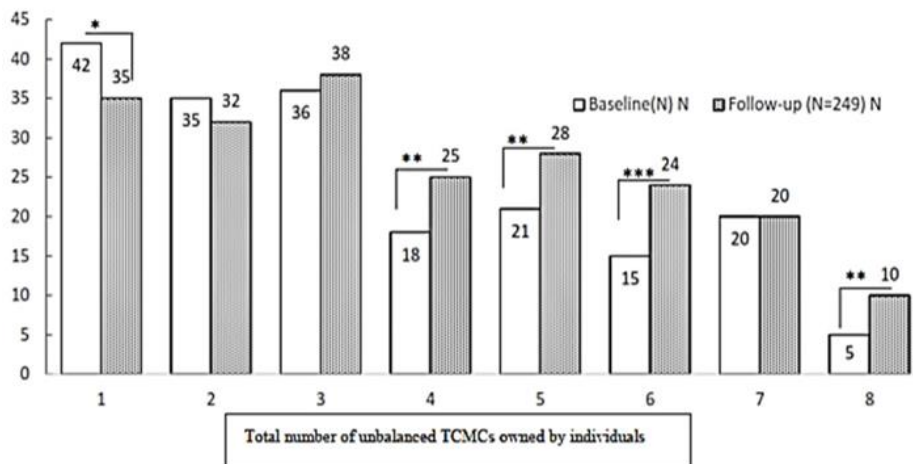
^a Definition for using TCM habits included those who took Chinese herbal prescriptions or received Chinese acupressure massage regular or before, with the duration from less than once a week to one time per day.

Diagnoses and Changes in the Distribution of TCMC Types

The distributions and changes in 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 QDF (51.8%), PD (45.4%) and PW (38.6%) were still the top three frequent unbalanced TCMC types in both baseline and follow-up. The most remarkable higher unbalanced types were ND, BS and 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%, and 75.00%, and they have not changed significantly. About 30 individuals with Normality constitution at baseline changed to unbalanced TCMC types during follow-up. On the other hand, 24 individuals with unbalanced TCMC types at baseline became normality constitution during follow-up (**Figure 1b**). 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 unbalanced TCMC types pairs at follow-up. The top three paired-unbalanced TCMC types were QDP paired with QDF (93.75%), PW paired with QDF (85.42%), and PD paired with QDF (81.65%).



a)



b)

Figure 1. a) Flow Diagram of participants’ response rate. b) Changes in the distribution of the total number of unbalanced TCMC types owned by individuals between baseline and follow-up.

* P<0.05; ** P<0.01; ***P<0.001 from T-Tests for comparing the total number of unbalanced TCMC types owned by individuals (at the same time) between baseline and follow-up.

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.

Influencing Factors Related to Unbalanced TCMC Types and Their Changes

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 their changes from baseline to follow-up (**Table 5**). The factors of age, regular exercise, state of health, emotion, menopause, marital changes, suffering negative effects on body-mind health, and the habit of using TCM had been confirmed as significant factors in the total number of unbalanced TCMC types during follow-up. Overall, the mean of the total number of unbalanced TCMC types was significantly higher than at baseline.

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

Variables	Baseline		p ^a	Follow-up group		p ^b	p ^c
	Total number of unbalanced TCMC types			Total number of balanced TCMC types			
	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
Menopause changed ^d					
Yes	N/A	N/A	3.58	2.03	0.247
No			4.08	2.19	
Suffering negative effects on body-mind health ^e					
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. ^aComparison of those sub-groups variables of baseline; ^bComparison of those sub-groups variables of follow-up; ^cComparison of those sub-groups variables of baseline against a follow-up. ^dMenopause 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. ^eA definition for suffering negative effects on body-mind health were those who self-reported suffering new and/or old diseases, working/living stress, frustration with family members' health problems and/or accidents, or financial problem.

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 effects on body-mind health, and usage of TCM habits was found as indicators that significantly influenced QDF; 2) The factors of health status and usage of TCM habits were found significantly influence PW; 3) Age, usage TCM habit and health status as indicators associated with PD; 4) State of health and menopause were found influenced ND; 5) BS was significantly relevant to age, emotion, and menopause; 6) QDP 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, 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 and those unbalanced TCMC types became stable or decreased among individuals in baseline and follow-up were presented in **Table 6**. Poorer health status had a 3.52-fold increased risk of more complex combined TCMC types compared to those in a better state of health. During the follow-up, those suffering negative emotions also had a 5.66-fold increased risk of having more complex TCMC types. All those who had experienced menopause and exercised regularly had lower risks (OR of 0.34, 0.63) of more complex TCMC types than those who did not reach or suffer in the perimenopausal stage and did not exercise regularly, respectively.

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 effects 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
Unbalanced TCMC types increased (became more complex) and stable or decreased by individuals				
Log-likelihood=362.068, chi-square=64.160 (4 d. f.), p<0.05				
Suffering negative effects 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.

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 this study's participants were over 45. Most of them suffer chronic or dysfunctional dystrophic diseases for a long time on or before baseline to the 4-year follow-up. Data revealed the percentage of participants having unbalanced and more complex TCMC types in follow-up was higher than that of baseline. 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]. "Treating disease before its onset" is the core theory of TCM in preventive diseases before occurrence. Therefore, using a TCM regimen to protect health and prevent aging is one of the effective health defenses for chronic diseases in the elderly population.

(2) The findings of this study proved that the distributions of TCMC types are both relatively stable and adjustable, accordant to that of developing acquired factors and changed the individual's constitutions over time. On the 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 who suffered during menopause. Firstly, most of the participants' acquired factors such as social demographic, living environment, and lifestyle haven't changed, which 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' which caused the high pressure from work and living costs, lack of sleep, and fast-paced lifestyle resulting in damage to the healthy Qi. Similarly, suffering negative emotions might also be a risk factor for developing QDF. QDF always accompanies a morbid state characterized by unsmooth flow and obstruction of qi, resulting in QDP, phlegm blockage, dampness, and stagnant blood [18, 19]. The prolonged consumption of cold drinks, awakening at night time, and misusing cold air conditioners throughout the year are the key factors for the development of PD [2]. The remarkable increase in ND, BS, and QDP could be related to the fact that most participants are suffering in the menopause stage during the follow-up period. Clinical and epidemiological studies found that Yin-deficiency, BS, and QDP were the dominant unbalanced TCMC types in women around menopause [20]. "Yin-Blood is the root of woman and liver is the congenital root of woman for blood storage" [21]. The primary physiological function of the liver is free coursing. Losing free coursing of the liver generally causes disharmony of the qi, and blood ensues in the development of BS [22]. In other words, menopausal women are more prone to have unbalanced TCMC types, including ND, QDP, and BS, and develop high menopausal

syndrome. Hence, the proper adjustment and good health can help soothe or avoid suffering menopausal symptoms and reduce the discomfort during the period.

(3) Health status was one of the most significant influencing factors for developing TCMC types in both baseline and follow-up. In the follow-up, it has been recognized that participants who suffer from chronic diseases that can damage the healthy qi due to imbalanced 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, indicating an individual's health status could develop TCMC types. It is confirmed that TCMC types can influence the development of the disease [23, 24]. 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, QDF, or Wetness-heat [25].

(4) Whether aging is a protective factor for unbalanced TCMC types is still controversial. The findings of baseline and follow-up studies both support that aging is a protective factor for forming QDF, Yang-deficiency, BS, and QDP and wetness-heat constitutions. The findings of two large studies involving 2043 and 8448 subjects showed no significant difference between elderly and younger people with PW [26, 27]. However, a study with a 2168 sample size found that the unbalanced TCMC types of QDF, PW and BS, and Yang-deficiency among older people were higher than in younger people [28]. Overstrain can easily harm the physical body and consume qi-blood to cause an essence-qi shortage, thus developing unbalanced TCMC types [2]. A study analyzed data from a random sample of 1,546 people from ages 21 to 99, indicating that happiness and well-being are a U-shaped curve in the entire life, dipping down in middle age and inching up in older age [29, 30]. However, more research is required to prove that aging is a protective factor against TCMC types.

(5) Emotional status was found as a core factor influencing the development of TCMC types during the 4-year follow-up. Firstly, this study found that unhappy emotion and suffering negatively affected body-mind health, which were risk factors for the formations of QDF, BD, QDP constitutions, and risk factors of more complex unbalanced TCMC types. Our findings also confirmed that frequent emotional fluctuation could harm body-mind health, likely resulting in a QDP with high frequency paired with a QDF owned by the individual. Qi stagnation can produce BS [31, 32]. Thus, Good mental status, conscious activities, and stable emotions are beneficial to the health, ensuing to prevent the disorder of qi movement that helps to avoid unbalanced TCMC types of occurrences.

(6) Lifestyle factors such as physical exercise or dietary habits play critical roles in the development of TCMC types over time. Proper physical exercise can move qi and blood, enhancing the visceral function to make it more powerful and healthier [7, 33]. 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 confirmed that regular exercise protects the wetness-heat constitution but not for QDF, PD, and BS. Hence, individuals forming TCMC types should further investigate the duration and types of physical exercises. Dietary habits may also be a contributory factor influencing TCMC types. All the participants had received a TCM regimen dietary according to their diagnosed TCMC types to improve their health by individuals at the baseline, but the rate of the participants following these regimens was low, and the duration was short; thus, there was no significant difference in the TCMC types. 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 with a poorer health status than those diagnosed with ND, QDF, or PW with more complex unbalanced TCMC types tended to use TCM to improve their health. Today, most Hong Kong dwellers accept TCM medications and prefer to choose them for cancer patients to reduce side effects or improve their quality of life [16, 17, 34-37]. We have accounted for and discovered more complex and unbalanced types of TCMC that reflect the poorer health status and usage of Chinese medicines to help treat 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.

Limitations of the Study

The first limitation is the relatively high attrition rate of the follow-up study, potentially affecting 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 a higher educational level.

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 produce a new regimen for health protection of the individual. Significant indicators related to unbalanced TCMC types were examined and provided scientific evidence for managing 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 huge sample sizes and gender and extend the age range that is highly required to establish a scientific way of living to improve an individual's TCMCs.

Conclusion

Based on the longitudinal data of this follow-up study, we 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 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 women suffering from menopause got a high risk of forming the unbalanced types of ND, BS, and QDP constitutions. Moreover, Poor health status, unhappy emotions, and 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.

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