



Chinese Medicine Constitution that Influences Sleep Quality and Fatigue among Chinese Nurses Working in Shifts in Japan and China

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ABSTRACT

Nurses who work in shifts may face poor sleep quality and oppressive fatigue. The purpose of this study was to clarify Chinese medicine constitution that influences sleep quality and fatigue among Chinese nurses engaged in shift work. Considering that these conditions might differ according to living environments, studies were conducted both in Japan and China. Data were gathered using the attributes of nurses, the Pittsburgh Sleep Quality Index to evaluate sleep quality, the *Jikaku-sho shirabe* to evaluate fatigue, and the Constitution in Chinese Medicine Questionnaire, which evaluates Chinese medicine constitution according to nine criteria. The survey was conducted via internet, with data analyzed from 100 Chinese subjects in Japan and 100 Chinese subjects in China. Increase in age, living in China, Qi-deficiency constitution and Blood-stasis constitution were causal factors for lower sleep quality. Sleep quality was significantly lower among nurses in China than those in Japan. The following factors were observed to be causal factors for increased fatigue: longer histories of working in shifts, living in Japan, poorer quality sleep, Qi-deficiency constitution, Yang- and Yin-deficiency constitution, Qi-stagnation constitution and Inherited special constitution. Nurses in Japan showed significantly greater fatigue at the end of a night shift than did those in China. It is suggested that adjustments of Qi-deficiency constitution and Blood-stasis constitution can improve sleep quality in nurses who work in shifts. We believe that improving sleep quality and making adjustments to the five types of Chinese medicine constitution can work to reduce fatigue.

KEYWORDS

Japan-China comparison, Chinese nurses who work in shifts, sleep quality, fatigue, Chinese medicine constitution

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1. BACKGROUND

The working environment of nurses is of increasing concern, as younger age, shift work, sleep disorders, and burnout have been identified as factors associated with

on-the-job near-misses by nurses (Saito et al., 2012). Nurses have also reported the prevalence of insomnia is 37.3% (Kageyama et al., 2002); suffering from sleep disorders, 70.5%; and use of insomnia medications,

30.2% (Nagasaka, & Ishizuka, 1997). A study on the relationship between work engagement and subjective symptoms among nurses found that work engagement was significantly higher among those without symptoms than those with symptoms for stiff shoulders, back pain, fatigue, chronic lack of sleep, upset stomach, depression, bowel irregularity, and loss of appetite (Nawa, & Takahashi, 2019).

Particularly among nurses engaged in shift work, the three most common symptoms were found to be sleep disturbance, fatigue, and gastrointestinal problems in Japan (Chiba, 2008). In China, in a study of female shift nurses, the sleep quality of nurses working night shifts was lower than those working in the daytime and evening shifts (Chang, & Chang, 2019). Sleep quality, moreover, is an influencing factor on fatigue (Fang, & Qi, 2009), and fatigue is one of the influencing factors on sleep quality (Shen, 2019), indicating that sleep quality and fatigue are mutually influencing factors. From the above, it is believed that nurses working on shifts sustain lower sleep quality and greater fatigue than do day-shift-only nurses, due to the formers' busier work environment and reversal of days and nights.

In recent years, with advancements in scientific research, traditional Chinese medicine has begun to be regarded as an important part of Chinese culture, and based on the classification of people in the Yellow Emperor's Classic of Internal Medicine, said to be the oldest extant Chinese medical text, a system of nine classifications has been adopted as the standard Chinese medicine constitutional classification. In other words, current Traditional Chinese Medicine (TCM) categorizes people's constitutions into nine specific types: Balanced, Qi-deficiency, Yang-deficiency, Yin-deficiency, Phlegm-dampness, Dampness-heat, Blood-stasis, Qi-stagnation, and Inherited special constitution (China Association of Chinese Medicine, 2009). The Balanced constitution, with a balanced body and mind, is the ideal type of health, while the other eight types of constitution are referred to as Biased constitutions. The Qi-deficiency constitution is a type characterized by reduced bodily functions and a lack of energy, making a person more prone to catching colds. The Yang-deficiency constitution is easily chilled due to a lack of yang (energy), and is sensitive to cold. The Yin-deficiency constitution is a water deficiency type that is relatively yin deficient and has a state of yin deficiency and internal heat. The Phlegm-

dampness constitution is a metabolic syndrome type that tends to accumulate phlegm (metabolic products) and moisture. The Dampness-heat constitution is a blemish type that is prone to skin blemishes due to stagnant moisture and heat. The Blood-stasis constitution is a type of pigmentation that is prone to the development of dark spots due to poor blood circulation. The Qi-stagnation constitution is a depressed type in which one tends to feel depressed, and the Inherited special constitution is an allergic type in which one tends to be hypersensitive (Suzuki, 2019).

According to the theory of Chinese medicine constitution, the constitution, as an important phenotype of vital activity, is closely related to health and illness. It not only indicates a person's state of health, but also bears significantly on the degree of susceptibility to a series of related disorders, reactivity following an illness, treatment efficacy, prognosis, and other factors (Zhu, 2014). Although the Chinese medicine constitution is relatively stable, as a person grows and ages, it can be affected by the external environment, mental state, nutritional status, exercise status, illness and so on, and it is necessary to adjust the constitution (Wang, 2008). In recent years, Chinese medicine constitution adjustment

by Chinese nurses and others has been conducted through diet, herbal remedies, foot bathing therapy, meridian flow, and other methods (Zhong, & Liu, 2015).

Chinese who work as nurses in Japan suffer from changes in their living environment, difficulties in coping with cultural and language barriers, as well as difficulties adapting to the work environment, which may cause changes in sleep quality and fatigue, as well as changes in the Chinese medicine constitution that may affect these factors. We therefore decided to target nurses residing in Japan and China.

In a previous study of Chinese nurses residing in Japan and China who worked shifts (Wang et al., 2022), both sleep quality and fatigue (at the end of the day shift and at the end of the night shift) showed significant differences between nurses in Japan and China. Furthermore, some of their subcategories were found to be associated with Chinese medicine constitution in both Japan and China. However, secondary analysis is necessary because correct statistical treatment was not performed using effect sizes (*d*-family for the size of the difference and *r*-family for the strength of the relationship). It is also necessary to clarify the causes of sleep quality and fatigue

by multiple regression analysis using Chinese nurses working in shifts, with the country of residence (Japan and China), Chinese medical constitution, and nurse attributes as explanatory variables, and sleep quality, fatigue at the end of the day shift, and fatigue at the end of the night shift, respectively, as object variables.

In this study, we aimed to examine the Chinese medicine constitution that affects sleep quality and fatigue among nurses in a previous study (Wang et al., 2022) of Chinese nurses living in Japan and in China who work in shifts. Then, through adjustments in the type of constitution, we sought suggestions for improving the sleep quality and reducing the sense of fatigue of shift-work nurses from the perspective of Chinese medicine constitution.

2. METHODS

This study employed a quantitative relational exploratory research design with a questionnaire survey. Chinese nurses engaged in shift work were recruited in Japan by posting on WeChat (Tencent) Group A Chat, a site in which Chinese nurses in Japan participate, and in China by posting on DingTalk (Alibaba) with the cooperation of Hospital B in Henan Province. The inclusion criteria were set to require having

worked in the country of residence for at least one year. An online survey using Google Forms (Google) in Japan and Questionnaire (Tencent) in China were conducted from May to June 2021. Since there were 100 participants in Japan, data collection in China was halted when the number of participants reached 100.

Structure of the internet survey

In addition to the basic attributes of nurses, the internet survey used scales to assess sleep quality, fatigue, and Chinese medicine constitution. The type of shift work was defined as two shifts (day and night shift) and three shifts (day shift, evening shift, and late-night shift). The number of years worked was rounded down to the nearest six months, and rounded up to the nearest year if the number of months worked exceeded six months.

1) Sleep quality

Sleep quality was assessed subjectively by the subjects using the Pittsburgh Sleep Quality Index (PSQI). The Japanese version of the PSQI was used in Japan, which was confirmed to have reliability and validity (Doi et al., 1998). In this study, Cronbach's coefficient alpha is .82, which reflects good internal consistency reliability. The Chinese version of the PSQI used in China, which was

confirmed to have reliability and validity (Liu et al., 2020). In this study, Cronbach's coefficient alpha is .83, which reflects good internal consistency reliability.

The PSQI is composed of a total of 18 questions about sleep during the past month, consisting of open questions and the Likert scale. Responses are categorized into seven factors (sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction), with each factor scored from 0 to 3 points. The overall PSQI score is calculated as the sum of these scores, which range from 0 to 21 points, with higher scores indicating poorer sleep quality.

2) Sense of fatigue

The *Jikaku-sho shirabe* (JSS) was used to assess subjects' subjective sense of fatigue at two time points, at the end of the most recent day shift and at the end of a night shift. The Japanese version of the JSS was used in Japan, which was confirmed to have reliability and validity (Tachi, 2003). In this study, Cronbach's coefficient alpha is .95, which reflects an excellent internal consistency reliability. The Chinese version used in China, which was confirmed to have reliability and validity (Wang et al., 2022). In this study, Cronbach's coefficient alpha is

.97, which reflects excellent internal consistency reliability.

The JSS consists of a total of 25 subjective complaints of fatigue categorized into five factors (sleepiness, instability, discomfort, sluggishness, and fuzziness). Each item has five response levels: "not at all applicable," "slightly applicable," "somewhat applicable," "fairly applicable," and "very applicable," which are respectively rated on a scale of 1 to 5 points. The total fatigue score ranged from 25 to 125, with higher scores indicating greater fatigue.

3) Chinese medicine constitution

The Chinese medicine constitution was evaluated using the classification of Chinese medicine constitution and judgment table (Constitution in Chinese Medicine Questionnaire: CCMQ). The Japanese version of the CCMQ was used in Japan, which was confirmed to have reliability and validity (Zhu et al., 2008). In this study, Cronbach's coefficient alpha is .90, which reflects excellent internal consistency reliability. The Chinese version of the CCMQ used in China, which was confirmed to have reliability and validity (China Association of Chinese Medicine, 2009). In this study, Cronbach's coefficient alpha is .95, which

reflects excellent internal consistency reliability.

The CCMQ consists of 60 items and nine types of Chinese medicine constitutions: (Balanced, Qi-deficiency, Yang-deficiency, Yin-deficiency, Phlegm-dampness, Dampness-heat, Blood-stasis, Qi-stagnation and Inherited special). Seven to nine questions were used for each type of Chinese medicine constitutions, with some duplication of items used for the different types of Chinese medicine constitutions. For each item, a 5-point scale consisting of “never,” “seldom,” “sometimes,” “often,” and “always,” was applied, with each rated between 1 to 5. The formula used for evaluating the nine types of Chinese medicine constitutions was: $[(\text{total number of items} - \text{number of items}) / \text{number of items} \times 4] \times 100$, with a total score ranging from 0 to 100 points. A subject is judged to have a Chinese medicine constitution if they score 60 points or more for the Balanced constitution and 40 points or more for the other eight types of Chinese medicine constitutions. An individual subject may simultaneously harbor more than one type of Chinese medicine constitution.

Data analysis

IBM SPSS Statistics 27.0 for Windows (IBM Japan) was used to perform statistical

analysis, with a significance level set at 5%. We examined whether differences existed between the basic attributes of nurses in Japan and China, using the following tests: an independent samples t-test for age, years of service, years of shift work, and number of monthly night shifts (including evening shifts); a chi-square test for the presence of a cohabitant (coded as 1 for no cohabitant and 0 for yes); and a Fisher's exact probability test was used for the proportion of shift work type (dummy variable coded 0 for two shifts and 1 for three shifts) and the proportion of men and women (dummy variable of 1 for women and 0 for men).

In order to examine whether and to what extent differences exist in feelings of fatigue between the two time points, we conducted a paired samples t-test for each of the five categories and the total fatigue score, calculating the effective size and 95% confidence intervals.

The Chinese medicine constitution set a dummy variable of 1 for applicable and 0 for not applicable. Correlation coefficients were calculated for sleep quality and each variable, and fatigue at two time points and each variable. Variables with a Spearman's rank correlation coefficient of .1 or higher were entered as explanatory variables, and multiple regression analysis was conducted

with sleep quality, fatigue at the end of a day shift, and fatigue at the end of the night shift as object variables using the forced entry method while diagnosing co-linearity. The variables with high risk of co-linearity were adjusted using the stepwise method, and the most suitable model selected to obtain the results of the analysis.

Ethical considerations

This study was conducted with the approval of the Research Ethics Committee of Kyoto Koka Women’s University (approval number: 20MM1). Subjects were

informed that participation was voluntary; that they were not obliged to respond to items they did not want to answer; and that there would be no disadvantage or negative impact on their work due to interruption or nonparticipation. We asked the subjects to respond to the questionnaire anonymously, so that they could not be identified by their personal information or affiliation. The subjects understood that responding to the internet survey constituted consent. There were no conflicts of interest in this study.

3. RESULTS

Basic attributes of nurses

Table 1. Attributes of Chinese nurses working in shifts (Japan $n = 100$, China $n = 100$)

Variable	Japan	China	Hedges' g	95%CI		$p^a)$	
				LL	UL		
Sex (n)	Male	8	6			.783	
	Female	92	94				
Age (years)	Max.	58	45	5.123	-0.272	0.282	.971
	Min.	23	23				
	M (SD)	30.6 (5.3)	30.6 (4.9)				
Years worked (years)	Max.	22	20	4.109	-1.116	-0.540	< .001
	Min.	1	1				
	M (SD)	5.1 (2.8)	8.5 (5.1)				
Years of shift work (years)	Max.	19	16	3.413	-1.077	-0.504	< .001
	Min.	0.5	1				
	M (SD)	3.8 (2.9)	6.5 (3.9)				
No. of night shifts per month (No.)	Max.	11	13	1.928	-1.794	-1.169	< .001
	Min.	2	1				
	M (SD)	4.9 (1.4)	7.8 (2.3)				
Type of shift system (n)	Two shifts	94	17				< .001
	Three shifts	6	83				
Live w/housemate (n)	Yes	62	26				< .001
	No	38	74				

Note: CI = confidence interval; LL = lower limit; UL = upper limit.

a) Independent samples T-test or Fisher’s exact probability test.

The basic attributes of the Chinese nurses working in shifts are shown in Table 1. In Japan, these included eight males and 92 females, with an average age of 30.6 years. In China, these included six males and 94 females, with an average age of 30.6 years.

In Japan-China comparisons, the number of years worked and the number of shifts worked were significantly longer in China, and the number of night shifts per month was significantly higher in China. The effect size of the difference between Japan

and China was Hedges' $g = 4.109$ for years of work; Hedges' $g = 3.413$ for years of shift work; and Hedges' $g = 1.928$ for the number of monthly night shifts, indicating large effect size.

As regards the type of shift work, 6.0% of the respondents in Japan and 83.0% of the respondents in China worked three shifts, with three shifts being significantly more common in China. The presence of a housemate was 38.0% in Japan and 74.0% in China, with significantly more respondents in China having a housemate.

Fatigue at end of day shifts and night shifts

Table 2. Fatigue at the end of the day shift and at the end of the night shift among Chinese nurses working in shifts ($N = 200$)

Variable	$M (SD)$	r	Hedges' g	95%CI		M	t	$p^a)$	
				LL	UL				
Sleepiness	At end of day shift	2.85 (0.89)	.73	0.987	-0.635	-0.405	-0.51	-9.97	< .001
	At end of night shift	3.37 (1.04)							
Instability	At end of day shift	2.36 (0.87)	.79	0.932	-0.337	-0.152	-0.23	-5.40	< .001
	At end of night shift	2.59 (0.97)							
Discomfort	At end of day shift	2.43 (0.84)	.72	0.928	-0.598	-0.369	-0.45	-9.18	< .001
	At end of night shift	2.88 (0.98)							
Sluggishness	At end of day shift	2.76 (0.85)	.83	0.931	-0.367	-0.196	-0.26	-6.85	< .001
	At end of night shift	3.03 (0.97)							
Fuzziness	At end of day shift	2.60 (0.88)	.75	0.979	-0.508	-0.297	-0.39	-8.13	< .001
	At end of night shift	3.00 (1.03)							
Total fatigue score	At end of day shift	65.03 (19.81)	.81	22.001	-0.515	-0.324	-9.23	-9.64	< .001
	At end of night shift	74.25 (23.00)							

Note: CI = confidence interval; LL = lower limit; UL = upper limit.

a) Paired samples t-test.

Table 2 shows fatigue at the two time points (at the end of the day shift and end of

the night shift). A strong correlation existed and a significant difference was found

between the two time points in all five categories and total fatigue. The effect size of the difference in the five categories between the two time points was in the range of $0.928 \leq \text{Hedges' } g \leq 0.987$, and the effect size of the difference in total fatigue

between the two time points was Hedges' $g = 22.001$, which indicate large effect size. In both cases, fatigue at the end of the night shift was greater than fatigue at the end of the day shift.

Correlations between each variable and sleep quality and fatigue

Table 3. Correlation between sleep quality and fatigue (at the end of day shift and night shift) and each variable (N = 200)

Variable	Sleep quality		Feeling of fatigue at end of day shift		Feeling of fatigue at end of night shift	
	r ^{a)}	p ^{b)}	r ^{a)}	p ^{b)}	r ^{a)}	p ^{b)}
Age (years)	.150	.035	.125	.078	.039	.586
Sex (male, female)	-.038	.594	-.074	.301	.008	.905
Years of nursing experience (years)	.233**	< .001	.134	.059	.078	.272
Years of night shift work (years)	.246**	< .001	.150*	.034	.086	.225
Number of night shifts per month (No.)	.302**	< .001	-.025	.728	-.003	.961
Country of residence (Japan, China)	-.317**	< .001	.050	.482	.123	.084
Types of shift work (two-shift system, three-shift system)	.246**	< .001	-.023	.746	-.049	.490
Presence or absence of housemate	-.034	.632	.083	.243	.110	.121
Sleep quality			.342**	< .001	.323**	< .001
BC	.278**	< .001	.371**	< .001	.350**	< .001
QDC	.396**	< .001	.490**	< .001	.492**	< .001
YADC	.287**	< .001	.493**	< .001	.457**	< .001
YIDC	.256**	< .001	.595**	< .001	.538**	< .001
PDC	.350**	< .001	.550**	< .001	.499**	< .001
DHC	.274**	< .001	.523**	< .001	.531**	< .001
BSC	.349**	< .001	.521**	< .001	.531**	< .001
QSC	.290**	< .001	.562**	< .001	.491**	< .001
ISC	.290**	< .001	.562**	< .001	.491**	< .001

Note: Balanced constitution = BC; Qi-deficiency constitution = QDC; Yang-deficiency constitution = YADC; Yin-deficiency constitution = YIDC; Phlegm-dampness constitution = PDC; Dampness-heat constitution = DHC; Blood-stasis constitution = BSC; Qi-stagnation constitution = QSC; Inherited special constitution = ISC.

a) *p < .05, **p < .001, b) Spearman's rank correlation coefficient.

The correlation coefficients between each variable and the Chinese medicine constitution are shown in Table 3 for sleep quality and fatigue.

For sleep quality, the correlation coefficients with sex and presence of a housemate were $r < .1$, but the correlation coefficients with all other variables were $r > .1$ or higher. For fatigue at the end of the day

shift, the correlation coefficients with age, years of nursing experience, years of shift work, sleep quality, and nine types of Chinese medicine constitution were $r > .1$. The correlation coefficients for fatigue at the end of the night shift were $r > .1$ for country of residence, presence of a housemate, sleep quality, and the nine types of Chinese medicine constitution.

Variables that cause sleep quality and fatigue

Table 4. Multiple regression analysis with sleep quality as the object variable ($N = 200$)

Explanatory variable	RC	SE	SPRC	p^a)
Age (years)	0.084	0.037	0.141	.026*
Country of residence (Japan = 1, China = 0)	-1.733	0.418	-0.287	< .001*
BC	0.425	0.708	0.044	.549
QDC	1.154	0.488	0.190	.019*
YADC	-0.142	0.479	-0.023	.768
YIDC	-0.003	0.555	<.001	.996
PDC	0.486	0.550	0.077	.378
DHC	0.315	0.539	0.052	.560
BSC	1.659	0.540	0.268	< .001*
QSC, ISC	-0.336	0.522	-0.055	.521

Coefficient of determination (R^2) = .301

Adjusted coefficient of determination (adjusted R^2) = .264

Note: Balanced constitution = BC; Qi-deficiency constitution = QDC; Yang-deficiency constitution = YADC; Yin-deficiency constitution = YIDC; Phlegm-dampness constitution = PDC; Dampness-heat constitution = DHC; Blood-stasis constitution = BSC; Qi-stagnation constitution = QSC; Inherited special constitution = ISC; RC = regression coefficient; SE = standard error; SPRC = standardized partial regression coefficient.

a) * $p < .05$, ** $p < .001$

The results of the multiple regression analysis with sleep quality as the object variable are shown in Table 4. The R^2 for the optimal model was .301 and the adjusted R^2 was .264. The causes of poor sleep quality

were determined to be age (increase in), country of residence (working in China), Qi-deficiency constitution, and Blood-stasis constitution.

Table 5. Multiple regression analysis using fatigue at the end of the day shift as object variable (N = 200)

Explanatory variable	RC	SE	SPRC	p ^{a)}
No. of years engaging in shift work	0.592	0.294	0.109	.045*
BC	6.059	3.89	0.096	.121
QDC	3.509	2.688	0.089	.193
YADC	4.647	2.638	0.115	.080
YIDC	8.012	3.017	0.202	.009*
PDC	4.327	3.028	0.105	.155
DHC	3.783	2.961	0.095	.203
BSC	2.421	2.989	0.060	.419
QSC, ISC	6.467	2.914	0.161	.028*

Coefficient of determination (R²) = .485

Adjusted coefficient of determination (adjusted R²) = .461

Note: Balanced constitution = BC; Qi-deficiency constitution = QDC; Yang-deficiency constitution = YADC; Yin-deficiency constitution = YIDC; Phlegm-dampness constitution = PDC; Dampness-heat constitution = DHC; Blood-stasis constitution = BSC; Qi-stagnation constitution = QSC; Inherited special constitution = ISC; RC = regression coefficient; SE = standard error; SPRC = standardized partial regression coefficient.

a) *p < .05, **p < .001

The results of multiple regression analysis with fatigue at the end of the day shift as the object variable are shown in Table 5. The R² for the optimal model was .485 and the adjusted R² was .461. The causes of increased fatigue at the end of the

day shift were determined to be years of shift work (lengthening of shifts), Yin-deficiency constitution, Qi-stagnation constitution, and Inherited special constitution.

Table 6. Multiple regression analysis using fatigue at the end of night shift as object variable (N = 200)

Explanatory variable	RC	SE	SPRC	p ^{a)}
Country of residence (Japan = 1, China = 0)	11.010	2.802	0.240	< .001**
Sleep quality	1.072	0.466	0.141	.022*
BC	6.941	4.569	0.095	.130
QDC	10.027	3.201	0.218	.002*
YADC	6.307	3.078	0.135	.042*
YIDC	3.014	3.535	0.065	.395
PDC	5.247	3.558	0.110	.142
DHC	3.177	3.481	0.069	.363
BSC	5.233	3.567	0.111	.144
QSC, ISC	3.256	3.380	0.070	.337

Coefficient of determination (R²) = .491

Adjusted coefficient of determination (adjusted R²) = .464

Note: Balanced constitution = BC; Qi-deficiency constitution = QDC; Yang-deficiency constitution = YADC; Yin-deficiency constitution = YIDC; Phlegm-dampness constitution = PDC; Dampness-heat constitution = DHC; Blood-stasis constitution = BSC; Qi-stagnation constitution = QSC; Inherited special constitution = ISC; RC = regression coefficient; SE = standard error; SPRC = standardized partial regression coefficient.

a) *p < .05, **p < .001

The results of multiple regression analysis with fatigue at the end of night shifts as the object variable are shown in Table 6. The R^2 for the optimal model was .491 and the adjusted R^2 was .464. The causes of increased fatigue at the end of the night shift were country of residence (working in Japan), sleep quality (poor), disposition to Qi-deficiency constitution, and disposition to Yang-deficiency constitution.

4. DISCUSSION

Attributes and fatigue of Chinese nurses working in shifts

Although no significant difference was observed between the average ages of Chinese nurses in Japan and in China, the maximum age was 58 years in Japan as opposed to 45 years in China. The lower age for China is explained by the retirement age for female nurses in China, which until 2022 had been set at 50 years (60 years for males), and therefore younger than the retirement age in Japan. The number of years of service and shift work were significantly longer in China than in Japan. This is explained by nursing students requiring longer time to obtain a nursing license in China after graduating from a nursing training school, as opposed to the time required to obtain a nursing license

after coming to Japan and working at a Japanese medical institution.

With regard to the type of shift work, the percentage of hospital wards with two shifts was 94% in Japan and 17% in China, showing a significant difference between Japan and China. According to a survey of night shifts in Japan, 39.3% of hospital wards operated on two shifts (Japan Federation of Medical Worker's Unions, 2019). This may be because the hospitals and wards where data were collected for this study were necessarily limited to those where Chinese nationals were able to work. Although no statistical data are available on the types of shift work in China, it has been reported that the three-shift system predominates (Xu, & Gu, 2014). That is also consistent with the findings of this study.

Regarding the presence or absence of a housemate, the number of nurses with a housemate was significantly higher in China than in Japan. Since Chinese nurses work in their own country, more nurses there tend to live with their families, as opposed to Chinese nurses in Japan, who reside far from their hometowns.

In a study of nurses working two 12-hour shifts, those having longer day work hours were more associated with greater physical activity, fatigue, and sleepiness than

those working day or night shifts (Oriyama et al., 2019). In this study, total fatigue, sluggishness, fuzziness, and sleepiness were also significantly greater at the end of a night shift than at the end of a day shift. However as the number of hours worked could not be determined, a precise comparison was not possible. Night shift nurses were found to be more anxious and depressed than day shift nurses, suggesting that nurses who indicate anxiety and depression receive less social support (Zou et al., 2016). In this study, instability and discomfort were significantly stronger at the end of the night shift than at the end of the day shift, consistent with the previous study. Night shift nurses are concerned with safely performing their daily multiple tasks while suppressing their own emotions (Nishida et al., 2018), which may be one reason for the increase in instability and discomfort.

Variables causing poor sleep quality in shift work nurses

In a previous study, Yang-deficiency and Qi-deficiency constitutions were most likely to cause sleep disturbances (Wu, 2007). Because the Balanced constitution had a positive effect on sleep quality and the other eight Biased constitutions had a negative effect on sleep quality, adjusting

Biased constitutions and converting them to a Balanced constitution is an effective way to improve sleep quality (Yan et al., 2017). In the present study, the causes of poor sleep quality were Qi-deficiency constitution and Blood-stasis constitution. Since Qi-deficiency constitution is a common influencing factor in insomnia, with the main symptoms insufficiency of qi, weak qi and breathing, and decreased function of internal organs (Zhang et al., 2006). Thus adjusting Qi-deficiency constitution can improve the quality of sleep. In the Blood-stasis constitution, blood fluency is congested in the cerebral spinal cord, inhibiting brain function and causing insomnia and dreams. Thus adjusting the Blood-stasis constitution can improve sleep quality (Liu, 2002). The results of this study regarding Qi-deficiency constitution and Blood-stasis constitution are consistent with the previous study, while Yang-deficiency constitution was not found to be a cause of poor sleep quality in this study.

Besides Chinese medicine constitution, increasing age and country of residence (working in China) were also causes of lower sleep quality. Sleep quality was lower in China than in Japan. A study of nurses working shifts in ICUs (Guo et al., 2021) found significant differences in sleep quality

according to age, which is consistent with the results of this study. At one university hospital in China, 82.8% of nurses had participated in such activities as study groups or conferences at their hospital or their ward on the first day of their night shift (Xu et al., 2015). We believe that this may serve as one of the triggers of poor sleep quality among Chinese nurses working two shifts, as they are unable to secure rest time and adjust their sleep rhythm following a night shift.

Variables causing increased fatigue in shift work nurses

In a previous study (Hao, 2013) on factors affecting chronic fatigue syndrome and its relationship to Chinese medicine constitution, people with Qi-deficiency, Yin-deficiency, Qi-stagnation, and Yang-deficiency constitutions were more likely to develop a disease. In this study, the Yin-deficiency, Qi-stagnation, and Inherited special constitutions were the cause of fatigue at the end of a day shift, whereas Qi-deficiency and Yang-deficiency constitutions were causes of fatigue at the end of a night shift. We believe that adjusting the Qi-deficiency, Yin-deficiency, Yang-deficiency, Qi-stagnation, and Inherited-special constitutions from the perspective of

Chinese medicine can reduce fatigue in shift nurses. The results of this study, except for the Inherited special constitution, are consistent with previous studies. We believe this is partly because we did not stipulate at the time of recruiting subjects for this study that they had to have no particular underlying disease (such as allergies) that affect the results of the Inherited-special constitution, also known as allergy type (Liang et al., 2020).

The number of years of shift work was a cause of increased fatigue, and the greater the number of years of shift work, the stronger the sense of fatigue at the end of a day shift. There have been no previous studies on the relationship between the feeling of fatigue and the number of shift work years or the causes of fatigue. The sense of fatigue at the end of the night shift was stronger in Japan than in China. This may be due to the longer night shift hours worked by nurses in Japan, and barriers in culture, language, and communication due to an environment different from that of their home country. Fatigue at the end of a night shift was also a cause of poor sleep quality. When sleep quality declines, fatigue intensifies. It can be inferred that improving the quality of sleep can also reduce feelings of fatigue (Troynikov et al., 2018).

Cultural considerations regarding country of residence and Chinese medicine constitution of nurses

This study clearly identified country of residence and Chinese medicine constitution as factors in the causes of poor sleep quality and increased fatigue at the end of night shifts. Culture refers to “the beliefs and values shared among members of a group/organization in order to adapt to their environment (latent culture) and the patterns of acts that are regulated by them (explicit culture)” (Hohashi, 2019). As globalization progresses, many foreign nurses are working in Japan and need to adapt to different cultural environments, such as customs and nursing systems. Given that residing in Japan is a cause of increased fatigue and that Japan has a workplace culture of collectivism, as opposed to individualism in China (Omura et al., 2018), it will be necessary to provide support to encourage adaptation to latent and manifest cultures that cause transcultural stress, and so on.

In addition, although Chinese medicine constitution is an aspect of Chinese culture, Chinese medicine and Chinese medicine nursing are beginning to be emphasized in Japan (Imanaka, 2020; Wu, 2020). In 2011, the model core curriculum in Japan was

revised to “be able to provide an overview of the characteristics and current use of Wakan Yaku and Kampo medicines (the Japanese names for Chinese herbal medication).” On the other hand, however, basic education in Chinese medicine and nursing has not progressed (Nakano et al., 2013). Nurses should understand the nine types of Chinese medicine constitutions and the regimen for each constitution, and then learn how to know their own constitution and self-care to maintain and improve their health.

Future issues for this study

Differences in fatigue at the end of day shifts and night shifts were examined, but the exact number of hours worked needed to be clarified and examined in more detail. According to the country of residence, significant differences in respective sleep quality were found among nurses working two shifts. We believe that this is due to Chinese nurses’ inability to secure rest periods and adjust their sleep rhythms after working night shifts, which causes poor sleep quality. Clarifying the specific causes will be an issue for the future. It will also be necessary to clarify the specific methods and effects of adjusting the Chinese medical

constitution responsible for sleep quality and fatigue.

5. CONCLUSION

Chinese medicine nursing is a practical science that enables symptom relief, disease prevention, treatment, and cure through the comprehensive diagnosis of a person's general condition and improvements in the physical constitution and environment. Although Chinese medicine and Western medicine reflect completely different ways of thinking, they share a common target and purpose, and the need exists for construction of a knowledge system linking Chinese and Western medicine. In this study, the authors investigated nine varieties of constitutions within Chinese medicine that may affect the sleep quality and fatigue of Chinese nurses working in shifts in Japan and China. Sleep quality can be improved through adjustments in Qi-deficiency constitution and Blood-stasis constitution. The results suggest that fatigue can be alleviated through adjustments in Qi-deficiency constitution, Yang-deficiency constitution, Yin-deficiency constitution, Qi-stagnation constitution, and Inherited special constitution. Furthermore, differences were observed between nurses working in China and those working in

Japan, making clear the need for culturally sensitive support. It will be desirable to improve the issues of sleep quality and fatigue from the perspective of Chinese medicine constitution.

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AUTHOR CONTRIBUTIONS

Substantial contributions to conception, data collection, analysis, and writing: Zhixia Wang, Naohiro Hohashi, and Xiaoyu Wu. Manuscript revisions: Naohiro Hohashi.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

DATA AVAILABILITY STATEMENT

The data are not publicly available due to privacy or ethical restrictions.

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