RESEARCH ARTICLE

Sleep status of psychiatric nurses: A survey from China

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Abstract

Aim: Our study aimed to evaluate the sleep status of psychiatric nurses in Chinese population and analyse the influencing factors.

Design: Cross-sectional, correlation design with logistic regression analysis.

Methods: We investigated 1,044 psychiatric nurses from seven psychiatric hospitals in China. Pittsburgh Sleep Quality Index and Maslach Burnout Inventory General Survey were used as main measures.

Results: The average Pittsburgh Sleep Quality Index score of 1,044 psychiatric nurses was 7.00 ± 3.59, and 38.63% of nurses had a total Pittsburgh Sleep Quality Index score >7. Our study found that middle-night shift nurses had poor sleep quality and sleep disorders are positively correlated with emotional exhaustion and cynical disregard for job burnout. Middle-night shift nurses showed 1.586 times more likely to suffer from sleep disorders than those non-middle-night shift. The higher the score of emotional exhaustion, the greater the risk of sleep disorders.

KEYWORDS
burnout, nurse, psychiatric, risk factor, sleep disorder

1 | INTRODUCTION

Sleep is a periodic physiological state characterized by a reduction or loss of consciousness, a temporary interruption of sensory activity and the disappearance of voluntary muscle activity throughout the body. As an important reference indicator of mental health, sleep is attracting increasing attention from healthcare practitioners and researchers. Abnormal or poor sleep can trigger a series of adverse effects, such as inattention, thought retardation, hypomnesis, mood changes, irascibility or depression, and other psychological problems (Rosado et al., 2015).

1.1 | Background

Sleep disorders are prevalent among healthcare workers. For example, in North and South America, Europe and Asia, 30%–49% of medical professionals complain of sleep disorders or insufficient sleep (Huth et al., 2013; Kalmbach et al., 2017; Kaneita & Ohida, 2011; Silva-Costa et al., 2015; Vela-Bueno et al., 2008). Qiu et al. used a meta-analysis to evaluate the incidence of sleep disorders among Chinese physicians and nurses. They analysed data from 31,749 healthcare professionals in 52 studies and found that 39.2% of Chinese healthcare professionals reported severe sleep disorders (Qiu et al., 2020).

In particular, nurses work during the night, as they have to provide round-the-clock care to the patients. This mode of work is characterized by irregular sleep and disruption of the sleep rhythm. Khatony et al. (2020) studied 540 nurses from six hospitals and found that 77.4% of these caregivers had poor sleep quality, and those working night shifts had more sleep problems. Shift work, especially night work, is one of the most common causes of circadian rhythm disturbances associated with significant changes in sleep and biological functions and can affect the physical and mental health of the nurses leading to reduced work performance (Costa et al., 2013; Ferri et al., 2016). So night shift nurses sleep significantly worse than day shift nurses (Ferri et al., 2016; Giorgi et al., 2017; Waage et al., 2014). However, most research has mainly focused on nurses in general hospitals, and there is minimal research on the sleep behaviour of nurses in psychiatric hospitals. Psychiatric nurses work in a challenging environment characterized by uncooperative patients with deranged behaviour. Nurses bear considerable psychological pressure and mental strain during the care process. Currently, research on the sleep status and possible risk factors of psychiatric nurses in China is limited.

Burnout is described as a syndrome of emotional exhaustion, depersonalization and reduced personal accomplishment (Maslach & Jackson, 1981; Maslach & Leiter, 2016). Some literature shows that the level of job burnout of Chinese nurses has been rising steadily in recent years, and its influence is as high as 68.1% in the existing literature (Huang, 2018; Yao et al., 2018). Across several studies, it appears that 21%–67% of mental health workers may be experiencing high levels of burnout (Oddie & Ousley, 2007; Rohlan, 2000; Siebert, 2005; Webster & Hackett, 1999). Psychiatric nurses have a high risk of burnout because they constantly interact with psychiatric patients and their families (Dickinson & Wright, 2008; Hamaideh, 2011; Patrick & Lavery, 2007). Yousefy et al. investigated the level of burnout among mental health nurses and found that nurses working in psychiatric departments had a higher degree of emotional exhaustion than those working in non-psychiatric units (Yousefy & Ghassemi, 2006). Insufficient sleep and sleep disorders can disrupt daily functioning and increase the risk of burnout that causes emotional distress (Chin et al., 2015; Soderstrom et al., 2012; Wolkow et al., 2019). Yang Song research shows that there is a significant positive correlation between nurses' job burnout and sleep quality (Song et al., 2020).

In this regard, our study analysed sleep disorders among clinical nurses working in mental hospitals in Mainland Chinese population. We also evaluated the differences in sleep disorders with varying gender, age, marital status, educational background, professional status, years of working and middle-night shift, and the factors associated with sleep disturbances in nurses. The correlation between sleep disorders and burnout was analysed. In order to provide a reliable basis for managers to attach importance to the sleep status of psychiatric nurses.

1.2 | Research question

Sleep disorders are common among nurses; however, most current research has focused on nurses in general hospitals, with few large-scale studies on nurses' sleep problems in psychiatric hospitals in China. Therefore, our study aimed to evaluate the sleep status of psychiatric nurses and identify associated factors.

This study was conducted to answer these questions: Do psychiatric nurses have sleep problems? What are the factors of sleep disorders in psychiatric nurses? Does the night shift affect the sleep of psychiatric nurses? Is job burnout related to the sleep disorders of nurses in psychiatric department?

2 | METHODS

2.1 | Design

We used a cross-sectional study design to investigate the sleep status of nurses from seven psychiatric hospitals in Chinese population. The exclusion criteria were nurses on maternity leave, marital leave, sick leave and personal leave, and nurses whose sleep was affected by other reasons, such as illness, family history of sleep disorders, alcohol consumption and medication.

2.2 | Participants

A total of 1,044 psychiatric nurses who met the criteria were included in the study. However, 94 questionnaires that lacked key

variables and were filled in irregularly were eliminated. As such, 950 research subjects were analysed. The effectivity rate of the questionnaires was 90.1%. The total sample consisted of 950 participant nurses and of them, 803 (84.5%) were females. Age of the nurses ranged between 18–57 years (mean = 31.93, SD = 8.152). Participants' years of general experience as a nurse ranged from 1–43 years (mean = 11.00, SD = 8.902). There were 631 (66.4%) participants had middle-night shifts, while 319 (33.6%) participants had no middle-night shifts over a 1-month period. The total sleep time of psychiatric nurses was between 2.5–12 hours per day (mean = 6.71, SD = 1.07). The average PSQI score was 7.00 ± 3.59. Of the 950 participants, 367 subjects (38.63%) with a total PSQI score greater than 7.

2.3 | Assessment instruments

2.3.1 | Pittsburgh sleep quality index (PSQI)

The PSQI is widely used to quantify the subjective sleep quality of respondents over a period of nearly a month (Buysse et al., 1989, 1991; Dong et al., 2017; Tsai et al., 2005; Wong & Fielding, 2012). There are 18 self-assessed items, divided into 7 factors, including sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, the use of sleeping medications and daytime dysfunction. Each factor is scored according to the levels 0–3. The final score ranges from 0 (better sleep)–21 (worst sleep). Higher scores indicate worse sleep quality. A total PSQI score >7 indicates the presence of a sleep disorder. This is the reference threshold for sleeping quality problems in Chinese adults. The scale has good internal consistency, retest reliability and validity. The Cronbach alpha coefficient for this questionnaire was 0.842 (Buysse et al., 1989; Liu et al., 1996).

2.3.2 | The Maslach Burnout Inventory General Survey (MBI-GS)

The scale contains 15 items (Maslach & Jackson, 1981), including 3 dimensions of emotional exhaustion, cynicism and professional efficacy. The emotional exhaustion subscale includes 5 items, the cynicism scale has 4 items, and the third subscale is professional efficacy which includes 6 items. Emotional exhaustion refers to an individual's belief that all his or her emotional resources have been exhausted, lack of impulse to work, frustration, tension and even fear of work. Cynicism refers to deliberately keeping one's distance from one's work and from other people involved in it, being unenthusiastic and disengaged in one's work, and expressing doubt about the meaning of one's work. Low professional efficacy means that individuals have a negative evaluation of themselves and believe that they cannot effectively perform the job. Scoring is done on a 7-point rating scale ranging from 0–6. The 0 was "never," 1 was "sometimes per year or less often," 2 was "once a month or less often," 3 was

"several times a month," 4 was "once a week," 5 was "several times a week," and 6 was "daily." High levels of burnout correspond to high scores for emotional exhaustion, high scores for cynicism and low scores for professional efficacy. Cronbach's alpha of the scale found in the literature was 0.850 (Yao et al., 2018).

2.4 | Statistical analysis

Statistical analyses were conducted using Statistical Package for Social Sciences (SPSS) V.23.0 (IBM). Descriptive statistics were used to all data. Continuous variables are expressed as means and standard deviations, and independent sample t test was used for comparison between two groups. The average of multiple groups of samples is compared using analysis of variance, such as analysis of different ages, years of working and professional status for nurses with sleep problems. Comparison of categorical variables was done using the chi-squared test. The strength and direction of relationships between sleep disorders and job burnout were determined using Pearson correlation coefficients. The influencing factors of sleep disorders were analysed by the logistic regression analysis. And significance was set at $p < .05$.

2.5 | Ethics

Participation in this study was entirely voluntary and anonymous. Participants had the right to withdraw their participation at any time without any explanation. Participants received a small gift, and their confidentiality of the personal information was maintained. Without signing the personal consent form, the completion of the instrument was deemed to be consent to participate. The study was reviewed and approved by the Ethics Committee of Suzhou Psychiatric Hospital, and other hospital also gave their prior consent for the research.

3 | RESULTS

3.1 | Demographic characteristics, normal sleep, abnormal sleep

No evident statistical relevance between the gender, age, educational background, professional status and marital status was observed. The relationship between middle-night shift and job burnout between the two groups was statistically significant. Among the nurses with normal sleep, the PSQI score of middle-night shift nurses (mean = 4.83, SD = 1.74) was higher than that of non-middle-night shift nurses (mean = 4.48, SD = 1.94) ($p = .026$). However, for nurses with sleep disorders, the PSQI did not vary between the middle-night shift (mean = 10.59, SD = 2.29) and non-middle-night shift nurses (mean = 10.84, SD = 2.93) ($p = .453$). Shift work has an effect on individuals with normal sleep, but has no effect on individuals with

poor sleep. Besides, nurses with sleep problems had higher scores of emotional exhaustion and cynicism compared to those with no sleep problems. The scores of professional efficacy were lower in nurses with sleep problems than in those with no sleep problems.

In the present study, Cronbach's alpha for the PSQI scale was 0.767. Cronbach's alpha of the emotional exhaustion dimension, cynicism dimension and professional efficacy dimension of MBI-GS were, respectively, 0.937, 0.935 and 0.936. For further details, see Table 1.

3.2 | Comparison of sleep disorder detection rates for different research subjects

Table 2 shows that sleep disorders are related to age and years of working (p < .05). The difference between total PSQI scores of groups aged 30 years or below and those aged 41 years and above

was statistically significant (p = .000). The total PSQI score of the age group 31–40 years was statistically different from that of the age group older than 41 years (p = .012). However, there was no significant difference in total PSQI score between participants aged 30 years or below and those aged 31–40 years. We only found a statistically significant difference in the total PSQI score between the nursing working years aged 10 years or below and those aged 11–20 years (p = .012). There was no statistically significant difference in sleep disorders between the gender, educational background, professional status and marital status.

3.3 | Relevance between sleep disorders and job burnout

Table 3 shows that sleep disorders were positively correlated with emotional exhaustion and cynicism in the dimension of job burnout.

TABLE 1 Demographic characteristics, normal sleep and abnormal sleep

	PSQI ≤ 7 (N = 583)	PSQI > 7 (N = 367)	χ²/t	p
Gender				
Male	94	53	0.487	.485
Female	489	314		
Age (M ± SD)	31.71 ± 8.33	32.28 ± 7.86	−1.05	.294
Years and working	1.70 ± 9.09	11.49 ± 8.58	−1.33	.184
Educational background				
Middle school	2	4	1.981	.371
High or technical school	91	55		
College or university graduate	490	308		
Marital status				
Unmarried	179	108	2.063	.559
Married	391	250		
Divorced	13	8		
Widowed	0	1		
Professional status				
Registered Nurse	186	112	5.322	.15
Primary	232	133		
Intermediate	138	110		
Senior/deputy	27	12		
Middle-night shift				
Yes	365	266	9.842	.002**
No	218	101		
Maslach Burnout Inventory General Survey				
Emotional exhaustion (M ± SD)	1.52 ± 1.01	2.30 ± 1.37	−9.506	.000**
Cynicism (M ± SD)	1.14 ± 1.07	1.72 ± 1.39	−6.786	.000**
Professional efficacy (M ± SD)	3.68 ± 1.61	3.37 ± 1.52	3.003	.003**

** p < .01.

Variable	Number	PSQI > 7	Detection rate (%)	M ± SD	t/F	p
Gender						
Male	147	53	36.05	10.27 ± 1.95	−1.507	.136
Female	803	314	39.10	10.73 ± 2.55		
Age group						
≤30	531	195	36.72	10.36 ± 2.10	6.43	.002[**]
31–40	264	113	42.80	10.67 ± 2.43		
≥41	155	59	38.06	11.66 ± 3.36		
Years and working						
≤10 years	586	214	36.52	10.35 ± 2.14	3.194	.024[*]
11–20 years	209	97	46.41	11.11 ± 2.83		
21–30 years	123	46	37.40	10.88 ± 2.83		
>30 years	32	10	31.25	11.90 ± 3.04		
Educational background						
Middle school	6	4	66.67	10.75 ± 2.22	0.012	.988
High or technical school	146	55	37.67	10.62 ± 2.57		
College or university graduate	798	308	38.60	10.67 ± 2.47		
Marital status						
Unmarried	287	108	37.63	10.39 ± 2.28	1.036	.356
Married	641	250	39.00	10.79 ± 2.54		
Others	22	9	40.91	10.33 ± 3.08		
Professional status						
Registered Nurse	298	112	37.58	10.63 ± 2.57	0.636	.592
Primary	365	133	36.44	10.53 ± 2.22		
Intermediate	248	110	44.35	10.76 ± 2.61		
Senior/deputy	39	12	30.77	11.50 ± 2.48		

[**]$p < .01$.; [*]$p < .05$.

	Emotional exhaustion	Cynicism	Professional efficacy
PSQI each factor			
Sleep quality	0.345[**]	0.275[**]	−0.102
Sleep latency	0.119[*]	0.063	−0.048
Sleep duration	0.096	−0.031	0.059
Habitual sleep efficiency	−0.007	−0.061	0.027
Sleep disturbances	0.253[**]	0.241[**]	−0.026
The use of sleeping medications	0.279[**]	0.305[**]	−0.096
Daytime dysfunction	0.440[**]	0.360[**]	−0.034
Total score	0.432[**]	0.319[**]	−0.060

[**]$p < .01$.; [*]$p < .05$.

The emotional exhaustion dimension score was positively correlated with sleep quality, sleep latency, sleep disturbances, use of sleeping medications, daytime dysfunction and total PSQI score, indicating that poor sleep was associated with a weak correlation of job burnout. The total score of the cynicism dimension was also positively correlated with the PSQI total score, sleep quality, sleep disturbances, use of sleeping medications and daytime dysfunction, indicating that the more serious the sleep disorder was, the more serious the negative work attitude of individuals towards the working objects was and the more severe the job burnout was. We did

not find any correlation between the total scores of the professional efficacy dimension and the PSQI.

3.4 | Logistic regression analysis of multiple factors influencing sleep disorders

Table 4 shows that through the logistic regression (input method), middle-night shift and emotional exhaustion were independent variables for sleep disorders. In other words, the nurse with middle-night shift showed 1.586 times more likely to suffer from sleep disorders than those non-middle-night shift. The higher the score of emotional exhaustion dimension, the greater the risk of sleep problems.

4 | DISCUSSION

The purpose of our study was to evaluate the sleep status of psychiatric nurses and identify associated factors using PSQI and MBI-GS. Our results showed that the overall occurrence rate of sleep disorders of psychiatric nurses was 38.63%. The average PSQI score of psychiatric nurses was 7.00 ± 3.59, indicating that the sleep quality of psychiatric nurses involved in the study was poor.

Our findings are consistent with the results by An et al. (2016) who found that psychiatric nurses have sleep problems, but they used a different research method. According to the definition of insomnia defined by DSM-IV, Feng-Rong An et al. investigated the insomnia rate of nurses in two mental hospitals in China based on three elements: difficulty initiating sleep (DIS), difficulty maintaining sleep (DMS) and early morning awakening (EMA). The study found that the prevalence rates of DIS, DMS and EMA were 57.1%, 56.3% and 57.1%, respectively. Our results are also similar to those of Hans (Han et al., 2016), who investigated 2033 nurses in the Third Affiliated Hospital of Harbin Medical University and found that the rate of occurrence of nurses' sleep disorders was 42.9%. However, our results were significantly lower than those of other general hospital nurses (Dong et al., 2017; Zhang et al., 2008; Zhao et al., 2013). They found that the incidences of sleep disorders were 75.9%, 62.68% and 63.9%, respectively. This discrepancy may be explained by different work areas with a varied workload, unit culture and nurse characteristics. In general hospitals, nurses attend mainly to non-psychiatric cases that are likely to demand more attention, especially when they are severe or critical hence higher stress levels, greater pressure and greater risk of sleep disorders. In contrast, psychiatric nurses are mainly faced with mental illness patients, and there is less pressure to sane life, so the incidence of sleep problems

TABLE 4 Logistic regression analysis of multiple factors influencing sleep disorders

Variable and assignment	B	SE	Wald	p	OR	95% C.I. for OR	
						Lower	Upper
Gender (1 = male and 2 = female)	0.203	0.205	0.986	.321	1.225	0.820	1.831
Age group							
≥41			0.355	.837			
≤30	−0.117	0.568	0.043	.836	0.889	0.292	2.707
31–40	−0.228	0.517	0.194	.659	0.796	0.289	2.193
Years and working							
>30 years			2.821	.420			
10 years	0.647	0.703	0.846	.358	1.910	0.481	7.580
11–20 years	0.926	0.672	1.901	.168	2.524	0.677	9.413
21–30 years	0.467	0.476	0.961	.327	1.595	0.627	4.059
Middle-night shift (1 = yes; 0 = no)	0.461	0.174	7.011	.008[**]	1.586	1.127	2.232
Professional status							
Senior/deputy			1.581	.664			
Registered Nurse	−0.038	0.483	0.006	.938	0.963	0.373	2.483
Primary	−0.076	0.464	0.027	.871	0.927	0.373	2.302
Intermediate	0.200	0.434	0.213	.644	1.222	0.522	2.861
Emotional exhaustion	0.613	0.096	40.404	.000[**]	1.845	1.528	2.229
Cynicism	−0.091	0.093	0.969	.325	0.913	0.761	1.095
Professional efficacy	−0.073	0.047	2.396	.122	0.929	0.847	1.020
Constant	−2.456	0.736	11.136	.001[**]	0.086		

[**]$p < .01$.

may be lower than that of non-psychiatric nurses. But psychiatric nurses still have sleep disorders; this finding underscores the need for further evaluation of the sleep disturbances of psychiatric nurses.

We grouped people with sleep disorders by age and working years. Our results showed that the sleep quality of psychiatric nurses with years of working between 11 years–20 years was significantly worse than that of nurses with years of working 10 years or below. This result was similar to those of Hans (Han et al., 2016). Other study showed that the prevalence of poor sleep quality was higher in nurses with longer years of work experience (Zeng et al., 2020). Maybe they face career and professional growth demands as they seek promotions and educational opportunities (An et al., 2016). Our study found that people over the age of 41 slept worse. But Giorgi et al. noted that there was no relationship between age and nurses' sleep problems (Giorgi et al., 2017). Apart from the needs of different populations, discrepancy in measures and socio-demographic characteristics may be part of the reason for the differences between studies.

The nurses' work schedules have rotating shifts that ensure the provision of care at all times. And nurses who work night shifts had already highlighted the presence of impaired sleep quality (Giorgi et al., 2017; Wisetborisut et al., 2014). Some studies have reported significantly poorer sleep quality of night shift nurses compared to the day and no night-rotating workers (Burch et al., 2005; Garde et al., 2009; Khatony et al., 2020; Mcdowall et al., 2017; Waage et al., 2014) . Our results were consistent with these findings, as we found that nurses performing shift work had insufficient sleep when compared to those who did not perform shift work. The risk of sleep problems was 1.586 times higher among middle-night shift nurses than among non-middle-night shift nurses. However, a 2017 study by Beebe et al. (2017) did not report any significant difference in sleep quality between the night shift and daytime shift nurses. The sleep problem of night shift nurses may be due to the disruption of the circadian rhythm by the night shift work leading to a decline in the quality of sleep (Kang et al., 2015). Night shift work may cause sleep deprivation, which in turn alters the daily levels of alertness and job performance, contributing to fatigue (Boivin & Boudreau, 2014; Ferri et al., 2016). Thus, we can infer that if shift work patterns were more respectful of nurses' health and well-being, nurses could have a better quality of life.

In this study, we identified a weak-to-moderate association between sleep quality and job burnout among psychiatric nurses in China. Nurses with sleep disorders are more likely to suffer from job burnout. In the study population, sleep disorders were positively correlated with job burnout in the dimensions of emotional exhaustion and depersonalization. Also some studies have been grossly overlooked that chronic insufficient sleep is a critical risk factor for job burnout (Gillet et al., 2020; Stewart & Arora, 2019). Nurses with poor quality of sleep are more prone to irritability, lack of energy, excessive fatigue at work, loss of enthusiasm for work, and extreme avoidance of work. Our regression analysis found that the dimension of emotional exhaustion was an important risk factor for sleep disorders. The significant relationship between sleep quality and job

burnout indicates that good sleep quality may alleviate stress and enhance the emotional experience of nurses in daily nursing duties. Our findings could provide the potential intervention targets for psychiatric nurses. In order to relieve the experience of job burnout, improving sleep quality seems to be a link that cannot be ignored (Giorgi et al., 2017). However, the regression analysis of this study showed that gender, age, years of working, professional status, the dimension of depersonalization and personal accomplishment were not major risk factors affecting sleep in psychiatric nurses. Contrary to our findings, Dong's research on sleep disturbances and its influencing factors among 5,012 Chinese clinical nurses showed that nurses who were female, had many years of service and served in primary and intermediate units are more prone to sleep problems (Dong et al., 2017). The inconformity of these conclusions may be related to the differences in sample size, living neighbourhoods, survey time, occupation and age. Therefore, more in-depth research is needed in the future.

5 | LIMITATION OF THE STUDY

This study has several limitations. First, this is a cross-sectional study that cannot determine the cause-and-effect relationship between sleep disorders and night shifts. Second, our study sample had fewer male nurses than their female counterparts, but this gender disparity could reflect the nursing occupation that mainly consists of female workers. The results of this study are similar to previous studies on sleep, job burnout and shifts in some aspects, so the results of the study have some reference significance.

6 | CONCLUSIONS

This research indicates that the overall occurrence rate of sleep disorders among psychiatric nurses in China mental health institutions is high, and night shift work is associated with poor sleep quality. We have also found that sleep disorders are positively correlated with emotional exhaustion and cynical disregard for job burnout. Our results show that nurses who work middle-night shift are 1.586 times more likely to suffer from sleep disorders than nurses who do not work. The higher the emotional exhaustion score, the greater the risk of sleep disorders.

7 | RELEVANCE TO CLINICAL PRACTICE

Sleep disorders among nurses have become a major psychological health problem that requires urgent intervention. Our study findings suggest that nursing managers should formulate a reasonable work plan based on the factors affecting sleep disorders to relieve occupational stress and reduce the incidence of sleep disorders in nurses. When the nurses are not well rested, the nurse leaders should consider the potential risks of the patient. Possible interventions include

sleep education for nurses, including organizing-sponsored courses to learn sleep well (Khatony et al., 2020). Other measures, for example reasonable scheduling, reducing the work intensity and the negative emotions of nursing staff, can be appropriately transformed and appropriately improved the treatment of nursing staff and opportunities for promotion and learning; however, with more detailed measures, we are looking forward to more in-depth research in the future.

CONFLICT OF INTEREST

No conflict of interest was disclosed for each author.

AUTHOR CONTRIBUTIONS

Xiaoli Lyu, Kan Li, Qin Liu, Caiyi Zhang, Xiangdong Du: conception and design, analysis and interpretation of data. Xiaoli Lyu, Xinda Wang, Zhong Yang, Yang Yang, Qun Yang, Hao Wang, Nian Yuan, Caifang Ji, Fanzhen Kong, Weiqin Li, Ming Yin, Zhe Li, Siyun Zou, Xueli Zhao, Xiaojia Fang: acquisition of data and drafting the manuscript. Xiaoli Lyu, Kan Li, Qin Liu: revising the manuscript. Caiyi Zhang, Xiangdong Du: Supported in the preparation of the manuscript, reviewing and editing. Supervised the conceptualization, collection and evaluation of the study. Given final approval of the version to be published.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author.

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