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Correlation Between Anxiety and Eating Time of Shift Healthcare Workers after COVID-19

Zhen Yao[1], Xiaoxia Xie[1], Ruoxue Bai[1], Lan Li[1], Xu Zhang[1], Shaowei Li[2], Yanna Ma[2], Zhenliang Hui[2], Jun Chen[2,*]

[1]*Department of First Clinical Medicine, Shaanxi University of Chinese Medicine, Xianyang 712000, China*

[2]*Department of Encephalopathy, Shaanxi Provincial Hospital of Chinese Medicine, Xi'an 710000, China*

*Corresponding author

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Abstract: Objective: To investigate the effect of eating time on the anxiety of shift healthcare workers after COVID-19. Methods: The cluster sampling was used to select 101 shift healthcare workers from 2A hospitals in Xi'an. Self-rating anxiety scale (SAS), Morningness-Eveningness Questionnaire (MEQ) were used to evaluate the symptoms of anxiety, sleep pattern, respectively. Meanwhile, a special survey was conducted on the eating time of each shift mode. We used Kruskal-Wallis tests to present demographic data, Wilcoxon rank sum test to compare the differences of eating rhythms. And Logistic regression analysis was used to analyze the relationship between eating time and SAS scores. Result: Of the 101 shift healthcare workers, 24.8% experienced anxiety. Kruskal-Wallis tests revealed that the SAS scores of nurses were significantly higher than doctors (p=0.01). Doctor degree and masters had lower SAS scores than the others (p=0.04). Wilcoxon rank sum test showed that the eat midpoint and the time of last meal on night shift were all later than those on day shift and on rest day (p<0.01). Multivariable logistic regression analysis showed that time of last meal on day shift (β = 0.80, 95%CI 0.67-0.95), eat midpoint of night shift (β = 1.21, 95%CI 1.02-1.43), eat duration of rest day (β = 0.84, 95%CI 0.71-0.98), difference from the time of last meal between night shift and day shift (β = 1.33, 95%CI 1.11-1.59), difference from the time of last meal between night shift and rest day (β = 1.27, 95%CI 1.04-1.55) were significantly associated with SAS scores. Conclusion: Healthcare workers should have earlier last meal on night shift and longer eat duration on rest day. To make the eating rhythm more regular, thus preventing and reducing anxiety symptoms.

1. Introduction

In December 2019, COVID-19 broke out in Wuhan, Hubei Province, China. The causative agent of this outbreak was identified as a novel coronavirus (SARS-CoV-2). As of April 6, 2022, there were a total of 492 million confirmed cases worldwide, of which 6.159 million died [1]. Although it has

been more than 2 years since the outbreak of COVID-19, it is still not fully controlled. The emergence of delta, Omicron, and others [2] variants have continuously impacted people's physical and mental health. At present, the methods used to prevent the transmission of the new coronavirus mainly include wearing masks, maintaining social distance, nucleic acid detection and vaccination, which all play a relatively good role in China. There are multiple ways to block the spread of the virus, but there is no effective means of preventing the occurrence of massive psychological morbidity.

A study [3] found that approximately 4.44% of the isolated population had anxiety symptoms. Another study [4] found that 27.0% of clinical nurses had anxiety symptoms during the outbreak, which was much higher than that in the general isolated population. So as a “front-line soldier”—Healthcare workers (HCWs), we need to pay more attention. A study [5] has found that the shift pattern of HCWs disturb the circadian rhythm and then cause affective disorders. Early in the outbreak, HCWs were exposed to great psychological stress such as higher infection risk, material shortage, isolation from family friends, and heavy work content. Long term disorder of circadian rhythm, combined with sudden increased psychological stress after the outbreak, may be a major cause of increased anxiety among health care workers.

The current first-line treatments for anxiety are serotonin selective reuptake inhibitors (SSRIs), which mainly include sertraline and paroxetine et al, but long-term use suffers from inescapable side effects such as dizziness, headache, fatigue, nausea, anorexia, sexual dysfunction [6]. Compared with that, cognitive behavioral therapy (CBT), a safer and more effective novel method, has been widely accepted. One study [7] showed that patients with anxiety who received CBT had significantly improved symptoms and fewer relapses within 1-12 months compared with control group. CBT includes mindfulness guidance, self-compassion, and behavioral guidance et al [8]. Among them, behavioral habits may be more important than psychotherapy [9].

Eating behavior is one of the most basic behaviors for human survival activities. Eating time together with sleep rhythms, daytime activity, and basal metabolism constitute and regulate the circadian system in humans. Circadian rhythm is an essential regulator of various systems, such as monoamine signaling, immune function, HPA axis regulation, metabolic peptides, redox/ mitochondria/apoptosis and neurogenesis. These systems play an important role in developing emotional disorders such as anxiety [10]. In order to clarify whether circadian rhythms can be stabilized by altering feeding behavior, thus achieving a preventive and therapeutic effect on anxiety, we designed the following studies. In order to find out the relationship between eating behavior and anxiety disorder after COVID-19 outbreak, we designed the following research.

2. Materials and Methods

We conducted this cross-sectional study in order to investigate the association between eating time and anxiety disorder after epidemic from April, 2020 and December, 2020. Ten hospitals were selected from grade 2 A hospitals in Xi'an, Shaanxi Province, China by using a cluster sampling method. Questionnaires were distributed to HCWs of fever clinic and respiratory medicine in each selected hospital. Inclusion criteria: ① Aged between 20-50 years; ② At least night shifts per month; ③ At least 1 year of work; ④ Voluntary participation in this investigation was granted after informed consent. The study was approved by China Clinical Trials Institutional Review Board (ChiCTR2000033364). All participants have signed informed consent.

Self-Rating Anxiety Scale (SAS) was used to assess anxiety symptoms. SAS composed of 20 items the score of each item is 1-4 points, and the total score is 20-80 points as a result of the original score. The standard score is calculated by multiplying the original score by 1.25. The standard score is from 25-100. A score greater than or equal to 50 is defined as anxiety. The higher the score, the more serious the anxiety [11].

We also added the Morningness-Eveningness Questionnaire (MEQ) [12] to observe the sleep types of HCWs. The MEQ contains 19 items concerning sleep and wake times, preferred times for physical and mental activities, and subjective alertness. The response options include a mix of multiples choice options and using an ordinal scale to indicate preferred time for activity. The scale score ranges from 16 to 86 and the authors proposed a five-category classification: definitely evening type (16–30), moderately evening type (31–41), intermediate type (42–58), moderately morning type (59–69), and definitely morning type (70–86).

To investigate the eating time of the shift HCWs, the eating time of each meal during day shift day, night shift day, and rest day was collected in this study.

3. Statistical analyses

Data coding, cleaning and analysis were performed using Amos 24.0 and R Project 4.0.1.

Eat duration [13], time of last meal, eat midpoint [14] and difference from the time last meal (night shift-day shift: NDLM, rest day-day shift: RDLM, night shift-rest day: NRLM) was calculated according to the collected eating times as described previously.

First, the differences in SAS scores between different sociodemographic characteristics were analyzed using the Kruskal Wallis test, and the differences in the eating time on day shift, night shift, and rest day, were analyzed by the Wilcoxon rank sum test. The association between eating time and SAS scores was subsequently analyzed by logistic regression analysis. Finally, based on the results of univariate analysis, multivariate logistic regression model was established.

4. Result

A total of 120 questionnaires were sent out and 108 responses were received, of which 101 were valid. In the valid questionnaire, the average age of the surveyed population was 30.23±4.44 years old (86.1% female), including 38 doctors (37.6%) and 63 nurses (62.3%). The average score of SAS was 41.49±9.92, of which 56 (55.4%) exceeded the diagnostic criteria. The average score of MEQ was 47.21±9.49, including definitely evening type 5, moderately evening type 19, intermediate type 63, moderately morning type 14 and definitely morning type 0.

Kruskal-Wallis tests revealed that SAS scores of nurses were significantly higher than doctors ($p=0.01$). SAS scores of doctor and master degree are lower than other qualifications ($p=0.04$) (Table 1). Wilcoxon rank sum test (Table 2) revealed there was no significant difference in eat duration between night shift and rest day ($p=0.30$). But the eat duration of night shift (7.90±5.60h) was significantly shorter than that of the day shift (11.05±2.84h) (<0.01). The eat midpoint on the night shift (15:21±3:34) was significantly later than that on the day shift (13:02±1:39) and rest day (14:01±2:05) (<0.01). Meanwhile, eat last time on night shift (19:18±3:37) was significantly later than that on day shift (17:53±2:44) and rest day (18:24±2:50) (<0.01).

Univariate logistic regression analysis showed (Table 3) that time of last meal on a day shift was significantly associated with SAS scores (β= 0.81, 95%CI 0.69-0.95). Eat midpoint on night shift day was significantly correlated with SAS scores (β= 1.25, 95%CI 1.07-1.46). Eat duration on rest day was significantly correlated with the SAS scores (β= 0.85, 95%CI 0.73-0.99). NDLM was significantly correlated with the SAS scores (β= 1.36, 95%CI 1.14-1.61). NRLM was significantly correlated with the SAS score (β= 1.27, 95%CI 1.06-1.53). The above variables remained statistically significant ($P < 0.05$) in their respective separate multivariate models after adjustment for sex, age, education, occupation, and MEQ score. Other eating times were not significantly associated with SAS scores.

Table 1: SAS scores were analyzed by stratification according to sociodemographic characteristics.

Sociodemographic Characteristics	n=101 (%)	SAS (mean±SD)	P
Gender			0.23
Man	14	37.14±13.11	
Woman	87	40.68±13.18	
Education			0.04
collage and high	8	40.31±7.16	
undergraduate	70	42.21±14.07	
master	19	34.54±10.31	
doctor	4	31.25±7.97	
Occupation			0.01
doctor	38	36.74±12.37	
nurse	63	42.26±13.29	
Average of night shifts per month			0.55
1~4	37	39.83±15.81	
5~9	52	40.38±10.29	
10~14	12	40.42±16.29	
BMI			0.08
≥24	22	41.82±12.77	
18-24	71	38.59±12.52	
<18	8	49.84±16.74	
Working Year			0.96
1~5	45	41.06±13.80	
6~10	38	39.90±13.69	
≥11	18	38.61±10.67	
Age			0.20
≤25	12	43.13±12.53	
26 to ≤30	47	40.82±13.28	
31 to ≤35	27	41.25±14.24	
>35	15	33.92±10.32	
MEQ			0.51
evening type	24	41.56±12.39	
intermediate type	63	40.36±13.66	
morning type	14	37.05±11.09	

Table 2: Difference in eating times between night shift, day shift and rest day.

	night shift	day shift	rest day	P-value[1]	P-value[2]
eat midpoint (hh:mm)	15:21±3:34	13:02±1:39	14:01±2:05	0.00	0.00
time of last meal (hh:mm)	19:18±3:37	17:53±2:44	18:24±2:50	0.00	0.00
eat duration(h)	7.90±5.60	11.05±2.84	8.75±3.33	0.00	0.30

Tip: P-value from Kruskal–Wallis tests; [1], Differences between night shift and day shift; [2], Differences between night shift and rest day.

Table 3: Univariate logistic regression analysis of the relationship between eating time and SAS

Eating time	Exp(B)	95%CI	P
Day shift			
Eat duration	0.88	0.75 ~1.04	0.12
Eat midpoint	0.77	0.58 ~1.02	0.07
Time of last meal	0.81	0.69 ~0.95	0.01
Night shift			
Eat duration	0.95	0.87 ~1.03	0.20
Eat midpoint	1.25	1.07 ~1.46	0.01
Time of last meal	1.19	0.98 ~1.46	0.08
Rest day			
Eat duration	0.85	0.73 ~0.99	0.03
Eat midpoint	1.08	0.86 ~1.37	0.51
Time of last meal	0.94	0.81 ~1.09	0.43
Difference from the time of last meal			
NDLM	1.36	1.14 ~1.61	0.00
RDLM	1.12	0.98 ~1.29	0.11
NRLM	1.27	1.06 ~1.53	0.01

Tip: NDLM, Difference from the time of the last meal (night shift-day shift); RDLM, Difference from the time of the last meal (rest day-day shift); NRLM, Difference from the time of the last meal (night shift-rest day).

Figure 1

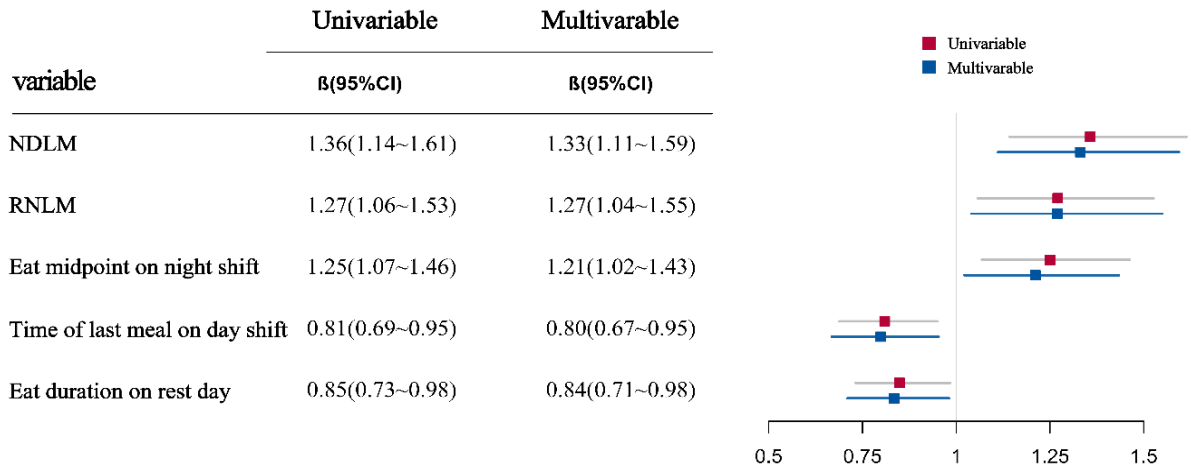

Figure 1: Logistic regression analysis of eating time and SAS score; NDLM, Difference from the time of the last meal (night shift-day shift); NRLM, Difference from the time of the last meal (night shift-rest day).

5. Discussion

In the early stage of the outbreak, most of the general population was in housebound isolation, while HCWs were required to work at their hospitals. Relative to other occupations, HCWs are at greater risk of acquiring SARS-CoV-2 and thus of greater psychological stress. We found that the prevalence of anxiety disorder among shift HCWs was 24.8%. There was a reduction in the prevalence of anxiety compared to a previous study [15]. This may be related to the timing of the investigation. The timing of that investigation was in January-February 2020, closer to the beginning of the outbreak, whereas after April of the same year, the COVID-19 was under control and anxiety

was generally alleviated throughout the society. However, it is also much higher than the general population prevalence of 7.3% [16]. A study showed that deterioration of HCWs' mental health can cause a decrease in the quality of services [17]. This illustrates that the anxiety disorder of shift HCWs, still cannot be ignored.

We found that nurses were more anxious than doctors, which is consistent with previous studies[18]. Compared with doctors, nurses have more opportunities to contact patients, and the risk of infection is higher than that of doctors, so psychological pressure is greater. Doctor and master degree were less likely to experience anxiety than other qualifications. This may be due to the fact that highly educated HCWs with greater expertise as well as greater learning ability can quickly master and apply measures to prevent and prevent COVID-19, and thus can be calmer in the face of the COVID-19.

Long-term shift pattern has changed the eating habits of HCWs. It has been found that night shift workers are more likely to have irregular meal times [19]. This is consistent with our results. We found that eat midpoint and time of last meal on night shift were later than those on day shift and rest day. This illustrates a disordered eating time rhythm in HCWs, with a later shift in eating times on night shift days.

The later last meal HCWs eat on day shift, the less severe the anxiety symptoms. Meanwhile, the earlier HCWs eat on night shift, the less severe the anxiety symptoms. Previous studies have shown that irregular mealtimes may affect mental health by affecting metabolic changes in humans [20]. Regular eating time can also reduce the disturbance of circadian rhythm, thereby reducing the incidence of anxiety [10]. Therefore, combining the characteristics of healthcare workers eating later on the night shift may illustrate that the more regular the HCWs eat, the less anxiety symptoms. Meanwhile, this type of regularity requires that the time of last meal on night shift need earlier than that on day shift and rest day. We also found that the longer eat duration on the rest day, the lighter the anxiety symptoms. Shift workers tend to have longer sleep periods on rest days, which results in a reduced duration of eating. Longer feeding durations on resting days help to complement this reduction, thus making overall eating times more regular. Shift workers tend to have a longer period of sleep during the rest days and consequently a shorter time to eat. Longer eat duration on resting days may help to complement this reduction, thus making overall eating times more regular.

In conclusion, after the COVID-19 outbreak, shift HCWs need to eat earlier on night shift and have long eat duration on rest days. This can make eating rhythm more stable so as to prevent and alleviate anxiety symptoms.

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