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Comparison of the Indicators of Psychological Stress in the Population of Hubei Province and Non-Endemic Provinces in China During Two Weeks During the Coronavirus Disease 2019 (COVID-19) Outbreak in February 2020

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Background: During February 2020, the coronavirus disease 2019 (COVID-19) epidemic in Hubei Province, China, was at its height, requiring isolation of the population. This study aimed to compare the emotional state, somatic responses, sleep quality, and behavior of people in Hubei Province with non-endemic provinces in China during two weeks in February 2020.

Material/Methods: Questionnaires were completed by 939 individuals (357 men; 582 women), including 33 from Hubei and 906 from non-endemic provinces. The Stress Response Questionnaire (SRQ) determined the emotional state, somatic responses, and behavior. The Pittsburgh Sleep Quality Index (PSQI) was used to measure the duration of sleep and sleep quality.

Results: There were 939 study participants, aged 18–24 years (35.89%) and 25–39 years (35.57%); 65.92% were university students. During a two week period in February 2020, the emotional state and behavior of participants in Hubei improved, but the quality of sleep did not. Health workers and business people became increasingly anxious, but other professionals became less anxious. The data showed that most people in Hubei Province developed a more positive attitude regarding their risk of infection and the chances of surviving the COVID-19 epidemic.

Conclusions: During a two-week period, front-line health workers and people in Hubei Province became less anxious about the COVID-19 epidemic, but sleep quality did not improve. Despite public awareness, levels of anxiety exist that affect the quality of life during epidemics, including periods of population quarantine. Therefore, health education should be combined with psychological counseling for vulnerable individuals.

MeSH Keywords: Comparative Study • Coronavirus • Mental Health • Stress, Psychological

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Background

During February 2020, the outbreak of coronavirus disease 2019 (COVID-19) in Hubei Province, China, became a public health emergency of international concern. COVID-19 has been identified as a novel coronavirus isolated from airway epithelial cells in patients with pneumonia [1]. COVID-19 is one of several newly identified forms of coronavirus that can infect humans, and like severe acute respiratory syndrome (SARS) due to SARS CoV and Middle East respiratory syndrome (MERS), due to MERS-CoV, COVID-19 is a respiratory pathogen [1]. As of February 23, 2020, China had 77,150 confirmed new coronavirus infections, of which, 64,287 cases were reported in Hubei Province [2]. As of February 23, 2020, there were 2,592 deaths in China due to COVID-19 infection [2]. Also, as of February 23, 2020, more than 3,000 medical staff were infected with the COVID-19 virus [2].

In the early stages of COVID-19 infection, the virus spreads rapidly between people, and there is an asymptomatic period when the virus can be transmitted. These factors are of concern, particularly when infected individuals travel long distances. The growing number of people infected with COVID-19 increased awareness of mortality associated with infection, and the novel nature of the viral infection has resulted in anxiety in the population of Hubei Province and throughout China. During January and February 2020, the COVID-19 outbreak has begun to be controlled by the efforts and skill of medical staff throughout China. However, the psychological and emotional stress and the quality of life for people in both endemic and non-endemic areas in China have been significantly changed since the beginning of the COVID-19 virus epidemic [3].

Previous studies have shown that large outbreaks of novel or serious infectious diseases are associated with levels of anxiety that may be far greater than the risk of becoming infected or of mortality from infection [4]. In 2016, James et al. identified that epidemics of infection triggered anxiety and behaviors that were related to fear, which had long-term consequences [5]. In 2015, Omar et al. showed that misconceptions or incorrect perceptions about the modes of disease transmission were associated with mental distress and other negative psychological responses that included anxiety and panic, which indicated that public awareness was an important factor in controlling both the infectious disease and the effects of stress associated with the disease [6]. Perceived disease susceptibility and perceived disease severity may be associated with increased levels of mental distress and the adoption of preventive measures, including self-isolation [7].

During outbreaks of infectious disease, the exacerbation of common mental disorders can lead to adverse health outcomes that affect the physical, social, emotional, or spiritual wellbeing by reducing functionality and quality of life, and can be associated with increased disease mortality [8]. In 2017, Huang et al. identified the major sleep disturbances that may result in severe health consequences, including depression and anxiety [9]. During January and February 2020 in Hubei Province in China, the medical staff have suffered the greatest pressure in the population due to long working hours, an increase in workload, and the challenge of treating patients with a novel viral infection, COVID-19, that cannot be prevented with a vaccine, cannot be treated and has an unknown pathogenesis [10,11]. Therefore, in addition to treating patients who are infected with COVID-19, non-infected members of the population also have a psychological stress response to COVID-19, which may have long-term health consequences. Public health data from previous similar epidemics can help to prevent or control events, such as epidemics, which can improve the health of a city, a country, or the population of the world [12]. Therefore, it is important to understand, monitor, and evaluate stress and psychological problems during epidemics, such as COVID-19 [13].

During February 2020, the COVID-19 epidemic in Hubei Province, China, included a 32-day quarantine period. This study aimed to compare the emotional state, somatic responses, sleep quality, and behavior of people in Hubei Province with non-endemic provinces in China during February 2020.

Material and Methods

Study participants

This study recruited 939 individuals (357 men and 582 women), including 33 participants from Hubei Province and 906 participants from non-endemic provinces in China. This study was approved by the local Ethics Committee. All study participants provided written informed consent to participate in the study voluntarily [14].

This study used questionnaires to compare the emotional state, somatic responses, sleep quality, and behavior of people in Hubei Province with other provinces in China during the height of the coronavirus disease 2019 (COVID-19) in two weeks in February 2020. The Stress Response Questionnaire (SRQ) was used to determine the emotional state, somatic responses, and behavior of the participants. The Pittsburgh Sleep Quality Index (PSQI) was used to measure the duration of sleep and sleep quality. The data from the questionnaires were compared between participants from Hubei and other provinces and between occupational groups, and age groups. Each subject filled out the same set of questionnaires. Questionnaires were completed at two points in time, separate by two weeks. The stratified cluster method was used to randomly select the

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Table 1. Demographic characteristics of the study participants.

Characteristics		Numbers	%
Gender	Men	357	38.02
	Women	582	61.98
Age group (years)	18–24	337	35.89
	25–39	334	35.57
	40–59	255	27.16
	≥60	13	1.38
Occupation	Students	312	33.23
	Medical staff	249	26.52
	Officials	50	5.32
	Service personnel	28	2.98
	Teachers	98	10.44
	Business manager	56	5.96
	Freelance	68	7.24
	Other jobs	78	8.31
Education	Junior high school and below	47	5.01
	High school	129	13.74
	Undergraduate course	619	65.92
	Postgraduate or above	144	15.34
District	Hubei Province	33	3.51
	Non-endemic province	906	96.49

study participants. Questionnaires were distributed and completed online. All subjects were able to understand the meaning of the question and answer it on their own.

Study questionnaires

The questionnaires included questions on emotional state, somatic (physical) responses, sleep quality, and behavior. The items of the SRQ and the dimensions of the PSQI questionnaire were adjusted for the study [15]. According to the psychological response, physiological response, and social response of psychological stress theory, 28 stress responses were scored, and the total score indicated the degree of the stress response. The index consisted of 19 self-assessment questions and five sleep assessment questions. In the questionnaires, six grades were used for symptoms and emotions that included not relevant (–3), significantly worse (–2), slightly worse (–1), the same (0), slightly improved (1), and significantly improved (2). The responses were recorded at an interval of two weeks. The subjects completed the questionnaires anonymously.

Statistical analysis

Data from the completed questionnaires were entered into Excel and analyzed using SPSS version 18.0 software (IBM Corp., Armonk, NY, USA). Quantitative variables were expressed as the mean±standard deviation (SD). Qualitative variables were expressed as numbers and percentages. The chi-squared (χ^2) test and analysis of variance (ANOVA) were used to compare the demographic and occupational differences between the study populations in Hubei Province and non-endemic provinces in China. A P-value<0.05 was considered to be statistically significant.

Results

Demographic characteristics of the study participants

Table 1 summarizes the demographic characteristics of the study participants. Questionnaires were completed by 939 individuals (357 men and 582 women), including 33 from Hubei Province and 906 from non-endemic provinces. Of the 939 study participants, 35.89% were aged between 18–24 years, 35.57% were aged between 25–39 years. Of the study population, 65.92% were university students. The study participants were further divided into eight occupational groups, which included 312 students, 249 medical staff, 50 officials, 28 service personnel, 98 teachers, and 68 business managers, with the remaining occupations being freelancers and others.

Psychological findings of the study participants

Table 2 summarizes the psychological status of the study participants according to occupation. According to the results from the Stress Response Questionnaire (SRQ), the majority of study participants reported that their emotional state was unchanged during the two-week study period. However, teachers reported that their mental state improved for the specific question regarding fidgeting and not knowing what to do. However, after two weeks, <24% of medical staff and 19.64% of business managers reported increased anxiety regarding the coronavirus disease 2019 (COVID-19) epidemic, 10.84% of medical staff, and 17.86% of business managers reported more stress and anxiety due to increased work pressure. Officials showed more anxiety (20%) and fear (14%) regarding the COVID-19 epidemic when compared with people with other occupations.

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Table 2. The psychological status of the study participants according to occupation.

Responses	Condition	Occupations									χ^2	p-value
		Students	Medical staff	Officials	Service personnel	Teachers	Business manager	Free-lance	Other jobs	Total		
		N=312	N=249	N=50	N=28	N=98	N=56	N=68	N=78	N=939		
I feel worried	Not relevant	130 (41.67)	79 (31.73)	19 (38.00)	14 (50.00)	44 (44.90)	16 (28.57)	33 (48.53)	38 (48.72)	373 (39.72)	50.229	0.046*
	Sig. worse	14 (4.49)	16 (6.43)	3 (6.00)	2 (7.14)	4 (4.08)	5 (8.93)	2 (2.94)	4 (5.13)	50 (5.32)		
	Sl. worse	47 (15.06)	60 (24.10)	7 (14.00)	1 (3.57)	12 (12.24)	11 (19.64)	9 (13.24)	12 (15.38)	159 (16.93)		
	The same	51 (16.35)	50 (20.08)	5 (10.00)	5 (17.86)	17 (17.35)	11 (19.64)	15 (22.06)	14 (17.95)	168 (17.89)		
	Sl. improved improved	44 (14.10)	29 (11.65)	6 (12.00)	4 (14.29)	14 (14.29)	7 (12.50)	6 (8.82)	9 (11.54)	119 (12.67)		
	Sig. improved	26 (8.33)	15 (6.02)	10 (20.00)	2 (7.14)	7 (7.14)	6 (10.71)	3 (4.41)	1 (1.28)	70 (7.45)		
I feel anxious	Not relevant	229 (73.40)	174 (69.88)	39 (78.00)	19 (67.86)	76 (77.55)	34 (60.71)	54 (79.41)	61 (78.21)	686 (73.06)	56.554	0.012*
	Sig. worse	16 (5.13)	5 (2.01)	1 (2.00)	2 (7.14)	1 (1.02)	2 (3.57)	1 (1.47)	0 (0.00)	28 (2.98)		
	Sl. worse	20 (6.41)	24 (9.64)	3 (6.00)	1 (3.57)	5 (5.10)	2 (3.57)	0 (0.00)	2 (2.56)	57 (6.07)		
	The same	21 (6.73)	25 (10.04)	3 (6.00)	3 (10.71)	8 (8.16)	13 (23.21)	8 (11.76)	7 (8.97)	88 (9.37)		
	Sl. improved improved	12 (3.85)	12 (4.82)	2 (4.00)	0 (0.00)	6 (6.12)	1 (1.79)	4 (5.88)	7 (8.97)	44 (4.69)		
	Sig. improved	14 (4.49)	9 (3.61)	2 (4.00)	3 (10.71)	2 (2.04)	4 (7.14)	1 (1.47)	1 (1.28)	36 (3.83)		
Fidgeting and not knowing what to do	Not relevant	191 (61.22)	165 (66.27)	36 (72.00)	18 (64.29)	73 (74.49)	31 (55.36)	50 (73.53)	51 (65.38)	615 (65.50)	59.457	0.006**
	Sig. worse	19 (6.09)	3 (1.20)	0 (0.00)	3 (10.71)	1 (1.02)	1 (1.79)	1 (1.47)	0 (0.00)	28 (2.98)		
	Sl. worse	26 (8.33)	19 (7.63)	2 (4.00)	0 (0.00)	7 (7.14)	6 (10.71)	0 (0.00)	5 (6.41)	65 (6.92)		
	The same	36 (11.54)	34 (13.65)	6 (12.00)	4 (14.29)	5 (5.10)	10 (17.86)	14 (20.59)	13 (16.67)	122 (12.99)		
	Sl. improved improved	25 (8.01)	14 (5.62)	2 (4.00)	2 (7.14)	9 (9.18)	3 (5.36)	1 (1.47)	7 (8.97)	63 (6.71)		
	Sig. improved	15 (4.81)	14 (5.62)	4 (8.00)	1 (3.57)	3 (3.06)	5 (8.93)	2 (2.94)	2 (2.56)	46 (4.90)		
I feel frightened	Not relevant	192 (61.54)	120 (48.19)	30 (60.00)	18 (64.29)	60 (61.22)	28 (50.00)	47 (69.12)	47 (60.26)	542 (57.72)	49.958	0.048*
	Sig. worse	10 (3.21)	8 (3.21)	1 (2.00)	1 (3.57)	2 (2.04)	2 (3.57)	1 (1.47)	4 (5.13)	29 (3.09)		
	Sl. worse	16 (5.13)	31 (12.45)	5 (10.00)	1 (3.57)	7 (7.14)	10 (17.86)	2 (2.94)	3 (3.85)	75(7.99)		

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Table 2 continued. The psychological status of the study participants according to occupation.

Responses	Condition	Occupations									χ^2	p-value
		Students	Medical staff	Officials	Service personnel	Teachers	Business manager	Free-lance	Other jobs	Total		
		N=312	N=249	N=50	N=28	N=98	N=56	N=68	N=78	N=939		
I feel frightened	The same	46 (14.74)	45 (18.07)	4 (8.00)	3 (10.71)	11 (11.22)	10 (17.86)	12 (17.65)	12 (15.38)	143 (15.23)	49.958	0.048*
	Sl. improved improved	31 (9.94)	31 (12.45)	3 (6.00)	3 (10.71)	10 (10.20)	4 (7.14)	4 (5.88)	10 (12.82)	96 (10.22)		
	Sig. improved	17 (5.45)	14 (5.62)	7 (14.00)	2 (7.14)	8 (8.16)	2 (3.57)	2 (2.94)	2 (2.56)	54 (5.75)		
I feel nervous and uneasy	Not relevant	203 (65.06)	134 (53.82)	32 (64.00)	19 (67.86)	67 (68.37)	27 (48.21)	50 (73.53)	51 (65.38)	583 (62.09)	51.177	0.038*
	Sig. worse	10 (3.21)	7 (2.81)	2 (4.00)	1 (3.57)	2 (2.04)	1 (1.79)	1 (1.47)	4 (5.13)	28 (2.98)		
	Sl. worse	15 (4.81)	27 (10.84)	2 (4.00)	0 (0.00)	6 (6.12)	10 (17.86)	2 (2.94)	5 (6.41)	67 (7.14)		
	The same	42 (13.46)	45 (18.07)	6 (12.00)	5 (17.86)	9 (9.18)	11 (19.64)	9 (13.24)	8 (10.26)	135 (14.38)		
	Sl. improved improved	30 (9.62)	21 (8.43)	3 (6.00)	0 (0.00)	7 (7.14)	2 (3.57)	5 (7.35)	6 (7.69)	74 (7.88)		
	Sig. improved	12 (3.85)	15 (6.02)	5 (10.00)	3 (10.71)	7 (7.14)	5 (8.93)	1 (1.47)	4 (5.13)	52 (5.54)		
I don't think I can succeed even if I try hard	Not relevant	235 (75.32)	173 (69.48)	35 (70.00)	24 (85.71)	78 (79.59)	34 (60.71)	58 (85.29)	57 (73.08)	694 (73.91)	51.132	0.038*
	Sig. worse	7 (2.24)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (1.47)	2 (2.56)	10 (1.06)		
	Sl. worse	12 (3.85)	10 (4.02)	1 (2.00)	0 (0.00)	2 (2.04)	2 (3.57)	0 (0.00)	2 (2.56)	29 (3.09)		
	The same	38 (12.18)	39 (15.66)	9 (18.00)	3 (10.71)	11 (11.22)	15 (26.79)	6 (8.82)	12 (15.38)	133 (14.16)		
	Sl. improved improved	11 (3.53)	14 (5.62)	0 (0.00)	1 (3.57)	3 (3.06)	5 (8.93)	2 (2.94)	4 (5.13)	40 (4.26)		
	Sig. improved	9 (2.88)	13 (5.22)	5 (10.00)	0 (0.00)	4 (4.08)	0 (0.00)	1 (1.47)	1 (1.28)	33 (3.51)		
I've been smoking or drinking a lot lately	Not relevant	267 (85.58)	191 (76.71)	31 (62.00)	21 (75.00)	78 (79.59)	31 (55.36)	52 (76.47)	55 (70.51)	726 (77.32)	84.981	0.000**
	Sig. worse	5 (1.60)	0 (0.00)	3 (6.00)	1 (3.57)	0 (0.00)	0 (0.00)	2 (2.94)	1 (1.28)	12 (1.28)		
	Sl. worse	4 (1.28)	3 (1.20)	0 (0.00)	1 (3.57)	1 (1.02)	5 (8.93)	2 (2.94)	3 (3.85)	19 (2.02)		
	The same	20 (6.41)	40 (16.06)	12 (24.00)	4 (14.29)	14 (14.29)	18 (32.14)	12 (17.65)	15 (19.23)	135 (14.38)		
	Sl. improved improved	5 (1.60)	5 (2.01)	1 (2.00)	0 (0.00)	3 (3.06)	1 (1.79)	0 (0.00)	3 (3.85)	18 (1.92)		
	Sig. improved	11 (3.53)	10 (4.02)	3 (6.00)	1 (3.57)	2 (2.04)	1 (1.79)	0 (0.00)	1 (1.28)	29 (3.09)		

* p<0.05; ** p<0.01; Sl. – slightly; Sig. – significantly.

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Table 3. The mean scores of the emotional state, somatic responses, sleep quality, and behaviors of the study participants in Hubei Province, China during two weeks in February 2020 during the coronavirus disease 2019 (COVID-19) epidemic.

	Mean scores				
	18–24 yrs N=337	25–39 yr N=334	40–59 yrs N=255	>60 yrs N=13	Total N=939
Emotional state	0.114	0.251	0.904	3.000	0.392
Somatic responses	–0.190	0.031	0.231	2.333	0.014
Sleep quality	–0.433	0.039	–0.121	1.333	–0.148
Behaviors	0.012	0.629	0.622	0.200	0.412

Sleep scores in the different age groups

Table 3 shows the mean sleep scores of the study participants from the Pittsburgh Sleep Quality Index (PSQI) questionnaire. The results showed that in the two weeks of the study, sleeping disorders were significantly increased in people aged 18–24 years (-0.433). However, behaviors were significantly improved in people aged between 25–39 years (0.629), and the emotional and behavioral condition were improved in people aged 40–59 years (0.904 and 0.622).

Table 4 shows the findings of the responses of the study participants for the three specific questions from the PSQI questionnaire on sleep during the two-week study period. For the question regarding the ability to fall asleep in 30 minutes, there were significant differences between the age groups, with this problem being significantly increased in study participants aged between 25–39 years (P=0.030). For the question regarding having to get up at night and go to the bathroom, there were significant differences between the age groups, with this problem being significantly increased in study participants aged between 25–39 years (P=0.001). For the question regarding difficulty in staying awake during the day, most people responded that this was not relevant. During two weeks in February 2020, the study participants in the 18–24 year study group had reduced sleep quality (9.19%) when compared with other age groups.

Emotional state, somatic responses, sleep quality, and behavior

Table 5 shows that there were 622 study participants with emotional conditions, 497 with somatic responses, 527 with reduced sleep quality, and 471 with behavioral changes. For some conditions, during the two-week study period, the condition became serious and some became better, particularly for sleeping sleep quality 36.43% of study participants reported severely impaired sleep quality, and only 20.3% improved. The same findings occurred with somatic or physical conditions, which became worse in 39.44% and improved in 29.78%. Behavior improved during the two-weeks study period (95% CI, 0.102–0.722).

Attitudes about the risk of infection with COVID-19 and recovery from infection

Table 6 summarizes the attitudes of the study participants regarding their concern of the risk of being infected and the chances of recovery after been infected with COVID-19. For the question regarding whether during the outbreak, the study participants believed that they were likely to be infected with COVID-2019, people in Hubei Province had a significantly higher score (2.94±0.83) when compared with study participants in the non-endemic provinces (F=9.407; P<0.01). Also, 51.52% and 24.24% of the study participants in Hubei Province thought they were possibly or likely to be infected, respectively. For the non-endemic districts, only 44.81% and 9.05% of study participants thought they were possibly or likely to be infected, respectively. For the question regarding whether they believed they would recover from infection with COVID-2019, there was no significant difference between the study participants in Hubei Province (96.97%) or the study participants from non-endemic provinces (94.48%).

Discussion

The aim of this study was to compare the emotional state, somatic responses, sleep quality, and behavior of people in Hubei Province with non-endemic provinces in China during the height of the coronavirus disease 2019 (COVID-19) epidemic during two weeks in February 2020. The Stress Response Questionnaire (SRQ) was used to determine the emotional state, somatic responses, and behavior of the participants. The Pittsburgh Sleep Quality Index (PSQI) was used to measure the duration of sleep and sleep quality. This study compared eight different occupational groups and identified differences in the emotional state, somatic responses, sleep quality, and behavior.

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Table 4. The findings of the responses of the study participants for the three specific questions from the Pittsburgh Sleep Quality Index (PSQI) questionnaire for two weeks in February 2020 during the coronavirus disease 2019 (COVID-19) epidemic.

Questions	Responses	Age					χ^2	p-value
		18–24 years	25–39 years	40–59 years	>60 years	Total		
		N=337	N=334	N=255	N=13	N=939		
Unable to fall asleep within 30 minutes	Not relevant	206 (61.13%)	183 (54.79%)	164 (64.31%)	9 (69.23%)	562 (59.85%)	26.855	0.030*
	Significantly worse	29 (8.61%)	12 (3.59%)	11 (4.31%)	0 (0.00%)	52 (5.54%)		
	Slightly worse	30 (8.90%)	33 (9.88%)	16 (6.27%)	1 (7.69%)	80 (8.52%)		
	The same	53 (15.73%)	77 (23.05%)	50 (19.61%)	2 (15.38%)	182 (19.38%)		
	Slightly improved	6 (1.78%)	17 (5.09%)	8 (3.14%)	0 (0.00%)	31 (3.30%)		
	Significantly improved	13 (3.86%)	12 (3.59%)	6 (2.35%)	1 (7.69%)	32 (3.41%)		
Had to get up at night and go to the bathroom	Not relevant	235 (69.73%)	174 (52.10%)	137 (53.73%)	7 (53.85%)	553 (58.89%)	37.196	0.001**
	Significantly worse	12 (3.56%)	6 (1.80%)	8 (3.14%)	0 (0.00%)	26 (2.77%)		
	Slightly worse	14 (4.15%)	26 (7.78%)	14 (5.49%)	0 (0.00%)	54 (5.75%)		
	The same	58 (17.21%)	105 (31.44%)	80 (31.37%)	5 (38.46%)	248 (26.41%)		
	Slightly improved	5 (1.48%)	10 (2.99%)	6 (2.35%)	0 (0.00%)	21 (2.24%)		
	Significantly improved	13 (3.86%)	13 (3.89%)	10 (3.92%)	1 (7.69%)	37 (3.94%)		
Difficulty in staying awake during the day	Not relevant	241 (71.51%)	211 (63.17%)	185 (72.55%)	11 (84.62%)	648 (69.01%)	30.25	0.011*
	Significantly worse	8 (2.37%)	1 (0.30)	2 (0.78%)	0 (0.00%)	11 (1.17%)		
	Slightly worse	23 (6.82%)	15 (4.49%)	10 (3.92%)	0 (0.00%)	48 (5.11%)		
	The same	45 (13.35%)	83 (24.85%)	46 (18.04%)	1 (7.69%)	175 (18.64%)		
	Slightly improved	9 (2.67%)	11 (3.29%)	8 (3.14%)	0 (0.00%)	28 (2.98%)		
	Significantly improved	11 (3.26%)	13 (3.89%)	4 (1.57%)	1 (7.69%)	29 (3.09%)		

* p<0.05; ** p<0.01;

The study questionnaires were completed by 939 individuals (357 men and 582 women), including 33 people from Hubei Province and 906 people from non-endemic provinces. During February 2020, the emotional state and behavior of participants in Hubei Province improved, but the quality of sleep did not. Health workers and business people became increasingly anxious, but other professionals became less anxious. The data showed that most people in Hubei Province developed a more positive attitude regarding their risk of infection and the chances of surviving the COVID-19 epidemic. Students and service

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Table 5. Summary of the responses on the emotional state, somatic responses, sleep quality, and behaviors of the study participants in Hubei Province, China during two weeks in February 2020 during the coronavirus disease 2019 (COVID-19) epidemic.

Indicators of psychological stress	Score	Number	%	95% confidence interval (CI)
Emotional state (N=622)	Became serious (–1)	235	37.78	(–0.02–0.805)
	Did not change (0)	143	22.99	
	Improved (+1)	244	39.23	
Somatic responses (N=497)	Became serious (–1)	196	39.44	(–0.301–0.329)
	Did not change (0)	153	30.78	
	Improved (+1)	148	29.78	
Sleep quality (N=527)	Became serious (–1)	192	36.43	(–0.369–0.073)
	Did not change (0)	228	43.26	
	Improved (+1)	107	20.30	
Behaviors (N=471)	Became serious (–1)	141	29.94	(0.102–0.722)
	Did not change (0)	214	45.44	
	Improved (+1)	116	24.63	

* Those who were asymptomatic have been removed.

Table 6. Attitudes on the risk of infection and recovery from infection from the coronavirus disease 2019 (COVID-19) virus in Hubei Province and non-endemic provinces in China during two weeks in February 2020.

		District		Total (N=939)	χ^2	p-value
		Hubei province (N=33)	Non-endemic province (N=906)			
During the outbreak, do you think you are likely to be exposed to COVID-2019?	Absolutely not	2 (6.06%)	145 (16.00%)	147 (15.65%)	11.526	0.009**
	Unlikely	6 (18.18%)	273 (30.13%)	279 (29.71%)		
	Possibly	17 (51.52%)	406 (44.81%)	423 (45.05%)		
	Likely	8 (24.24%)	82 (9.05%)	90 (9.58%)		
If you were infected by COVID-2019, do you think you can recover?	Absolutely not	1 (3.03%)	20 (2.21%)	21 (2.24%)	3.259	0.353
	Unlikely	0 (0.00)	30 (3.31%)	30 (3.19%)		
	Possibly	21 (63.64%)	453 (50.00%)	474 (50.48%)		
	Likely	11 (33.33%)	403 (44.48%)	414 (44.09%)		

* p<0.05; ** p<0.01.

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personnel developed a worse mood, while the mood of medical staff improved, and it is possible that difficulties in adjusting to life at home during periods of quarantine may have contributed to the deterioration in the mood of students and service personnel [16].

There is a recognized association between cognition and emotion that may explain the improved psychological state of medical staff who had a scientific understanding of the epidemic [17,18]. Their medical training and daily work require them to be calm and objective when faced with emergencies, which may result in a more objective way of thinking and a controlled way of behaving during crises, such as an epidemic [19,20]. The reason for the improved mood and behavior of most business managers and freelancers in the two weeks during the COVID-19 epidemic may be explained by their relatively relaxed lifestyle, which may have contributed to their optimism [21–23]. The findings from the present study showed that during the two-week study period during the COVID-19 epidemic, people with different occupations had significantly different coping mechanisms that may have affected their emotional state, somatic responses, sleep quality, and behavior, as well as their attitudes to contracting COVID-19 and recovering from infection.

In the present study, after two weeks, the 95% confidence interval (CI) of both the emotional state and behaviors became more positive in the study group from Hubei Province. Despite the large numbers of patients affected by COVID-19, during the study period, there began to be a gradual return to work with increasing numbers of people recovering from infection, and the accuracy of official public information improved, all of which gave the population some confidence. However, for some people, somatic or physical changes became worse during the two-week period, which may have been due to three main factors. First, the publication of several online media reports significantly prolonged the time people spent browsing their mobile phones, which may have affected their normal sleep schedule. The lack of evidence-based scientific and medical knowledge of the population can be difficult to distinguish from speculation and rumor that may cause fear and anxiety in large populations [24]. Secondly, the amount of activity and workload for some occupations reduced due to quarantine and self-isolation during the COVID-19 outbreak, resulting in a lack of normal social activities, which would have resulted in feelings of stress and isolation [25–27]. Third, when previously employed people are required to stay at home for a long time, their income decreases, which results in anxiety [28,29].

In the present study, during the two weeks of the study, the 18–24 year age group had the lowest sleep quality scores when measured using the PSQI questionnaire, and the average score for all the study participants was negative, indicating that sleep quality deteriorated during two weeks as COVID-19 epidemic progressed. The symptoms of inability to fall asleep within 30 minutes and difficulty in staying awake during the day may have been due to three main factors, Firstly, in 2017, Akcali et al. [30] showed that anxiety was a common cause of insomnia, and it may be assumed that the stress response to COVID-19 might lead to physical dysfunction which can include sleep dysfunction [31]. Secondly, during the outbreak of COVID-19, the government strongly recommended all the citizens to stay at home as much as possible, but the government did not include a recommendation to maintain daily physical activities while staying home. Physical activity is an important factor in maintaining psychological wellbeing, including the normal sleep cycle [27]. Thirdly, especially for the 18–24 year age group, who may have been working or studying at home during the two-week study period, their sleeping habits would have changed without the need to wake up early in the morning, which may have resulted in poor sleep quality and duration from staying up late and sleeping late into the morning.

The findings from this study showed a significant difference between the study group from Hubei Province and the non-endemic provinces in China during two weeks during the COVID-19 epidemic regarding the degree of anxiety for becoming infected and the belief that they would recover from infection with COVID-19 ($p<0.01$). For the study participants in the non-endemic districts in China, there were no significant differences regarding these beliefs. Most study participants were confident that they were likely to recover once infected. During the epidemic of COVID-19 in Hubei Province, the government's response has included the building of two new hospitals in Wuhan, providing information to the population, and increasing the provision of medical care. The role of the media has changed, and now broadcasts the number of people who recover from COVID-19 infection each day, all of which may re-assure the population, reduce levels of anxiety, and increase their confidence. Importantly, evidence-based scientific and medical information has been provided to the population of Hubei Province and throughout China to provide awareness of COVID-19, which may reduce some of the fear caused by a lack of knowledge of this new infectious disease [33].

Conclusions

During February 2020, the coronavirus disease 2019 (COVID-19) epidemic in Hubei Province, China, included a 32-day quarantine period. This study aimed to compare the emotional state, somatic responses, sleep quality, and behavior of people in Hubei Province with mon-endemic provinces in China during February 2020. During two weeks in February 2020, front-line health workers and people in Hubei Province became less anxious about the COVID-19 epidemic, but sleep quality did not

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improve. Despite public awareness, levels of anxiety exist that affect the quality of life during epidemics, including periods of population quarantine or self-isolation. Therefore, health education should be combined with psychological counseling for vulnerable individuals that include people in the general population and specific occupations.

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Conflict of interest

None.

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