

# Anxiety and Depression Symptoms of Patients in Fangcang Shelter Hospital During the COVID-19 Outbreak in China: a Web-Based Cross-Sectional Study

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## Research

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# Abstract

## Background

The COVID-19 pandemic is a major health crisis has led to adverse mental health consequences in the general public, medical staff, and individual in self isolation. In order to stop transmission of the virus and save lives, Fangcang shelter hospitals were developed and used for the first time in China. However, there is no research on mental health problems in Fangcang shelter hospitals patients during the COVID-19 outbreak. The aim of this study was to survey the prevalence and major influencing factors of anxiety, depression among the hospitalized Coronavirus Disease 2019 (COVID-19) cases in Fangcang shelter hospital.

## Methods

From February 23rd, 2020, to February 26th, 2020, we obtained the information of demographic data, clinical symptoms, and assessed the mental health status, sleep quality by using an online questionnaire including self-rating anxiety scale (SAS), self-rating depressive scale (SDS) and pittsburgh sleep quality index (PSQI) at Jiangnan Fangcang shelter hospital. We assessed the prevalence of anxiety, depression symptoms and poor sleep quality via the scores of SAS, SDS and PSQI. We explored the influencing factors of anxiety and depression in COVID-19 patients using multivariable logistic regression models.

## Results

We collected data from 307 COVID-19 patients in Jiangnan Fangcang shelter hospital. The prevalence of anxiety, depression symptoms were 18.6% and 13.4%, respectively. Poor Sleep quality, number of current physical symptoms  $\geq 2$  were independent risk factors for anxiety symptoms ( $P < 0.05$ ); female, family member confirmed COVID-19, number of current physical symptoms  $\geq 2$  were independent risk factors for depression symptoms ( $P < 0.05$ ). PSQI scores were significant positively associate with SAS scores and SDS scores ( $P \leq 0.05$ ).

## Conclusions

Anxiety and depression are common among the COVID-19 patients in Fangcang shelter hospital. Those with more current physical symptoms, poor sleep quality are more likely to have anxiety. Females, those with their family members diagnosed with COVID-19, more current physical symptoms are more vulnerable to depression symptom. Our findings can be used to formulate targeted psychological interventions to reduce adverse psychological impacts in Fangcang shelter hospital during the outbreak of epidemic disease in the future.

## Background

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Originating as a cluster of unexplained cases of pneumonia, Coronavirus Disease 2019(COVID-19), was first identified in Wuhan, Hubei Province, China since December 2019[1]. As the virus spreads increasingly worldwide, the Coronavirus Disease 2019(COVID-19) pandemic is a global health threat and has the most devastating consequences with an actual or potential impact on citizens of all nations [2].

In addition to physical damage for patients, Widespread outbreaks of infectious disease, such as Ebola virus disease (EVD) and severe acute respiratory syndrome (SARS), was also associated with psychological distress and symptoms of mental illness [3, 4]. Results from prospective studies consistently indicate psychological distress as a predictor for future health and disease outcomes [5]. As other infectious diseases, Preliminary evidence suggests that COVID-19 has also caused public panic and mental health stress; symptoms of anxiety and depression are common psychological reactions to the COVID-19 pandemic, and may be associated with socio-demographic, sleep quality [6–9]. However, previous studies focused mainly on the mental health of the COVID-19 epidemic among the general population, medical staff, and individuals in self isolation [10]. we know very little about the psychological effects of patients with COVID-19.[11]

To control the source of infection and save lives, China adopted strategies and tactics including establishment of Fangcang shelter hospitals in Hubei Province [12]. Fangcang shelter hospital is a novel public health concept which was developed and used for the first time in China to tackle the coronavirus disease2019 (COVID-19) outbreak [13]. The Fangcang shelter hospitals are large, temporary hospitals built by converting public venues, such as stadiums and exhibition centers, into health-care facilities to receive non-seriously ill individuals with positive SARS-CoV-2 RT-PCR tests from their families and communities, while providing disease monitoring, medical care, food, shelter, and social activities [13, 14]. To relieve the huge pressure on the health-care system, Fangcang shelter hospitals have also been crucial to the quick containment of COVID-19 in China, and provide an encouraging example for other countries [15]. As the COVID-19 pandemic spreads globally, Fangcang Shelter hospitals as part of the COVID-19 response in other countries not only China [13].

Based on the above research evidence on the public and medical staff, we speculate that the mental health of the Fangcang shelter hospitals patients may also be affected during the COVID-19 outbreak. Now, there is no research on mental health problems in Fangcang shelter hospitals patients during the COVID-19 outbreak in China. Well understanding of the psychosocial problems about Fangcang shelter hospitals patients, can provide important guidance to carry out timely psychological interventions for targeted populations in need and manage well Fangcang shelter hospital during the outbreak of epidemic disease in the future. For this purpose, the prevalence of anxiety and depression symptoms, and potential influencing factors contributing to anxiety, depression were detected.

## Methods

### Design, setting, Participants

This was a cross-sectional study performed via an anonymous online questionnaire from February 23rd to February 26th, 2020 in Jiangnan Fangcang shelter hospital, Wuhan, China. The designer and operator were doctors who worked in Jiangnan Fangcang shelter hospital. We aimed to survey the prevalence and major influencing factors of anxiety, depression among the hospitalized Coronavirus Disease 2019 (COVID-19) cases in Fangcang shelter hospital. All participants met inclusion criteria of COVID-19 diagnosis according to the guidance from National Health Commission of the People's Republic of China (NHCC) [16], and all study respondents volunteered to participate in the study and signed informed consent online. Exclusion criteria included previously diagnosed severe psychiatric illnesses (e.g. schizophrenia, bipolar disorder, anxiety disorder, depression disorder), inability to complete or failure to fully complete an online questionnaire, oral drugs can cause side effects associated with anxiety, depression, insomnia.

## Measures

The participants scanned the QR codes through their mobile phones and completed questionnaires. The study questionnaire, comprised five main components including demographic characteristics, clinical characteristics, Self-Rating Anxiety Scale (SAS), self-rating depression scale (SDS), Pittsburgh Sleep Quality Index (PSQI).

Among them, we collected the current physical symptoms and comorbidities which were designed on the basis of previous literature [17]. Participants had to indicate if they were currently experiencing any of the 14 listed physical symptoms (fever, cough, sputum production, shortness of breath, chest pain, fatigue, sore or discomfort throat, nasal congestion, conjunctival congestion, hemoptysis, headache, diarrhea, abdominal pain, myalgia or arthralgia). Comorbidities (chronic bronchitis or chronic obstructive pulmonary disease, asthma, hypertension, diabetes, coronary heart disease, cerebrovascular disease, connective tissue diseases, chronic renal disease, cancer) were also collected.

Anxiety and depression symptoms were assessed via the SAS and SDS questionnaire. The SAS and SDS questionnaire both contained 20 items consisting of four grades, with questions based on feelings of mood in the previous seven days. An aggregate score of 20 was then multiplied by 1.25, with higher scores indicating more severe levels of anxiety and depression [18]. Cut-off scores of  $\geq 50$  in SAS and  $\geq 53$  in SDS represent a positive screen of depression, anxiety symptoms [18].

Sleep quality was assessed via the PSQI questionnaire. PSQI questionnaire contains seven items that included sleep quality, sleep duration, sleep latency, habitual sleep efficiency, sleep disturbance, use of sleeping medications, and daytime dysfunction [19]. Each dimension scored between 0–3, with a total score ranging from 0–21, and a higher score imply lower sleep quality. Poor sleep quality was defined as a total score of  $\geq 6$  [20].

## Statistical analysis

All statistical analyses were performed using IBM SPSS AMOS version 25. Continuous data coincided with normal distribution were presented as mean  $\pm$  standard deviation ( $M \pm SD$ ), while those of non-normal distribution were described as  $M$  (Q1, Q3); t-tests were used for comparing the normal distributional

analyze the relation between scores of PSQI

questionnaire and SAS, SDS scores. Univariate analyses of anxiety and depression symptoms were performed using the chi-squared( $\chi^2$ ) tests; Any covariates that achieved  $P < 0.10$  for the bivariate analyses in the univariate analyses as inclusion criterion, the multivariable logistic regression models were built with forward LR variable selection method to identify independent factors associated with anxiety and depression, A  $P$ -value  $< 0.05$  was considered statistically significant.

## Results

# General characteristics and prevalence of anxiety and depression

A total of 307 patients participated in our study, among them, 57 (18.6%) had anxiety and 41 (13.4%), 260 (84.7%) had PSQI-defined poor sleep quality; the top three coexisting illness were hypertension(16.0%), chronic bronchitis or chronic obstructive pulmonary disease(13.0%), diabetes(4.6%), please refer to Fig. 1; Currently asymptomatic patients were 20; the top three Currently physical symptoms were cough (26.4%), shortness of breath (24.4%), sore or discomfort throat(17.9%), please refer to Fig. 2.

The data of demographic, clinical characteristics and the differences in incidence of anxiety and depression symptoms among different groups are shown in Table 1. Based on  $P < 0.10$  as screening covariates, family member confirmed COVID-19( $\chi^2 = 3.334$ ,  $P = 0.068$ ), number of current physical symptoms( $\chi^2 = 18.760$ ,  $P < 0.001$ ), symptoms change after hospitalization( $\chi^2 = 5.952$ ,  $P = 0.051$ ), poor sleep quality( $\chi^2 = 5.449$ ,  $P = 0.020$ ) were related factors of anxiety symptom, please refer to Table 1; Gender( $\chi^2 = 17.169$ ,  $P < 0.001$ ), education level( $\chi^2 = 5.264$ ,  $P = 0.072$ ), smoking history( $\chi^2 = 4.039$ ,  $P = 0.044$ ), drinking history( $\chi^2 = 3.024$ ,  $P = 0.082$ ), family member confirmed COVID-19( $\chi^2 = 4.707$ ,  $P = 0.030$ ), number of current physical symptoms( $\chi^2 = 14.812$ ,  $P < 0.001$ ), Symptoms change after hospitalization( $\chi^2 = 4.696$ ,  $P = 0.096$ ), Poor sleep quality( $\chi^2 = 4.696$ ,  $P = 0.046$ ) were the related factors of depression symptom, please refer to Table 1.

Table 1  
General characteristics of the sample

Characteristics	Anxiety	No anxiety	$\chi^2$	$p$	Depression	No depression	$\chi^2$	$p$
Gender			1.627	0.202			17.169	< 0.001
Male	28	146			11	163		
Female	29	104			30	103		
Age(year)							0.799	0.671
≤ 44	28	128			20	136		
45-59	25	94	1.288	0.525	18	101		
≥ 60	4	28			3	29		
Marital status			2.762	0.251			3.002	0.238
Single	5	32			5	32		
Married	46	205			31	220		
Divorced or widowed	6	13			5	14		
Education level			0.074	0.964			5.264	0.072
Middle school or below	14	58			13	59		
High school	14	65			14	65		
College or above	29	127			14	142		
BMI (kg/m <sup>2</sup> )			0.274	0.872			0.869	0.647
≤ 24	25	119			22	122		
24-28	24	97			14	107		
≥ 28	8	34			5	37		
Comorbidity			0.993	0.319			0.021	0.885
Yes	29	109			18	120		
No	28	141			23	146		
Smoking history			0.752	0.386			4.039	0.044

Characteristics	Anxiety	No anxiety	$\chi^2$	$p$	Depression	No depression	$\chi^2$	$p$
Yes	10	57			4	63		
No	47	193			37	203		
Drinking history			1.099	0.294			3.024	0.082
Yes	10	60			5	65		
No	47	190			36	201		
Inpatient days			0.070	0.966			1.424	0.491
$\leq 7$	7	34			5	36		
8-14	9	39			4	44		
$\geq 14$	41	177			32	186		
Family member confirmed COVID-19			3.334	0.068			4.707	0.030
Yes	32	107			25	114		
No	25	143			16	152		
Current nucleic acid result			2.010	0.156			0.747	0.388
Negative	36	132			25	143		
Positive	21	118			16	123		
Number of current physical symptoms			18.760	< 0.001			14.812	< 0.001
$\leq 1$	22	173			15	180		
$\geq 2$	35	77			26	86		
Symptoms change after hospitalization			5.952	0.051			4.696	0.096
Better	46	191			35	202		
Worse	5	8			3	10		
Unchanged	6	51			3	54		

Characteristics	Anxiety	No anxiety	$\chi^2$	$p$	Depression	No depression	$\chi^2$	$p$
Poor sleep quality			5.449	0.020			3.971	0.046
Yes	54	206			39	221		
No	3	44			2	45		

BMI, Body Mass Index; chi-square test for categorical variables.

## Risk factors for anxiety and depression

The multivariate logistic regression analyses to predict risk factors of anxiety and depression are presented in Table 2. Poor Sleep quality (odds ratio [OR], 3.655, 95% confidence interval [CI], 1.074 ~ 12.433;  $P=0.038$ ), number of current physical symptoms  $\geq 2$  (OR, 3.504; 95% CI, 1.919 ~ 6.398;  $P<0.01$ ) were independent risk factors for anxiety symptoms, Omnibus test of model coefficients showed that model was significant, ( $\chi^2 = 23.905$ ,  $P=0.001$ ), the goodness of fit of model with Hosmer and Lemeshow test showed was perfect ( $\chi^2 = 0.118$ ,  $P=0.943$ ), please refer to Table 2; female (OR, 5.878; 95% CI, 2.657 ~ 13.005;  $P<0.001$ ), family member confirmed COVID-19 (OR, 2.81; 95% CI, 1.337 ~ 5.911;  $P=0.006$ ), number of current physical symptoms  $\geq 2$  (OR, 4.145; 95% CI, 1.994 ~ 8.616;  $P<0.001$ ) were independent risk factors for depression symptoms, Omnibus test of model coefficients showed that model was significant, ( $\chi^2 = 40.508$ ,  $P=0.001$ ), the goodness of fit of model with Hosmer and Lemeshow test showed was perfect ( $\chi^2 = 4.344$ ,  $P=0.630$ ), please refer to Table 2.

Table 2  
Multivariate logistic regression analysis of factors influencing anxiety and depression

variables	$B$	$s_{\bar{x}}$	Walds	$P$	OR (95%CI)
Models for anxiety					
Poor Sleep quality (yes vs no)	1.296	0.625	4.304	0.038	3.655 (1.074 ~ 12.433)
Number of current physical symptoms ( $\geq 2$ VS $\leq 1$ )	1.254	0.307	16.657	< 0.001	3.504 (1.919 ~ 6.398)
Models for depression					
Gender (female vs male)	1.771	0.405	19.111	< 0.001	5.878 (2.657 ~ 13.005)
Family member confirmed COVID-19 (yes vs no)	1.034	0.379	7.431	0.006	2.811 (1.337 ~ 5.911)
Number of current physical symptoms ( $\geq 2$ VS $\leq 1$ )	1.422	0.373	14.506	< 0.001	4.145 (1.994 ~ 8.616)

B, Partial regression weight; OR,  $s_{\bar{x}}$ , Standard of error, OR, odds ratio; CI, confidence interval; Multivariate logistic regression analyses with forward stepwise variable selection

# Correlational analyses of scores between SAS, SDS and PSQI

The scores of SAS and SDS of participants were ( $42.92 \pm 7.30$ ) and SDS ( $39.77 \pm 10.11$ ), scores of PSQI was 9(7,12). By using Spearman correlation tests, PSQI scores were significant positively associate with SAS scores( $r = 0.177, P = 0.002$ ) and SDS scores( $r = 0.327, P = 0.001$ ). Details are shown in Fig. 2.

## Discussion

This cross-sectional study enrolled 307 participants firstly found the prevalence of anxiety, depression, poor sleep quality two months after the COVID-19 epidemic for Fangcang shelter hospital in China. Overall, 18.57%, 13.36%, 84.69% of the participants had symptoms of anxiety, depression, poor sleep quality, respectively. Compared with previous studies in the initial stage COVID-19 epidemic in China, which reported the occurrence of moderate to severe depressive, anxiety symptoms were 16.5%, 28.8% among the general population, respectively[8]; and symptoms of depression, anxiety were 50.4%, 44.6% among health care workers treating patients with COVID-19[21], this is in sharp contrast to a low prevalence of anxiety, depression in our study. Similarly, the same period study, conducted in China, which showed that prevalence rates of anxiety, depression of total participants (including medical health workers and nonmedical health workers) were 10.4%,10.6% [22]. Hence, the prevalence rates difference in anxiety and depression might be caused by different research time. With the COVID-19 epidemic outbreak, the National Health Commission of China (NHC) has performed psychological crisis intervention into the general deployment of disease prevention and mental health professionals and expert groups Provide psychological intervention for different sub-populations, including patient isolation in Fangcang hospitals [13, 23]. Early psychological crisis intervention reduced the prevalence rates of negative psychological outcomes caused by the COVID-19 outbreak. In addition, using the summary t tests, both scores of SAS ( $42.92 \pm 7.30$ ) and SDS ( $39.77 \pm 10.11$ ) in the participants of our study were higher than the scores in Chinese norms(SAS,  $29.78 \pm 10.07, n = 1158$ ;SDS,  $33.46 \pm 8.55, n = 1340$ )[24] (both  $P < 0.05$ ), it indicates more severe levels of anxiety and depression in COVID-19 patients admitted to Fangcang hospital than general public. Clearly, anxiety and depression symptoms were common response to the COVID-19 outbreak, and patients in shelter Fangcang hospital had severe levels of anxiety, depression symptoms. The possible reason for these may be related to the uncertainty of the epidemic progression and feared that the disease was hard to recover [25].

After multivariate logistic regression analyses, our study further indicated the risk factors associated with anxiety and depression symptoms. Having poor sleep quality and presenting more current physical symptoms were risk factors for patient in shelter Fangcang hospital with anxiety symptoms. Sleep is an important time for the recuperation and rejuvenation of the brain. Unfortunately, a substantial body literature showed stressful life events and outbreaks of infectious disease including COVID-19 can affect the sleep quality[21, 26–29], 84.69% of the participants in our study with the poor sleep quality demonstrate it again. Using the correlation analysis, we also found levels of anxiety symptoms are associate with sleep quality in COVID-19 patients admitted to shelter Fangcang hospital. Syntheses of longitudinal studies suggested sleep quality were bidirectionally related to anxiety [30]. There were large data investigating the effect of sleep quality on the anxiety symptom in other populations such as shift-workers, firefighters, paramedics, her odds of anxiety symptoms, greater anxiety were

associate with poorer sleep quality [31–35]. Similarly, anxiety affects sleep quality because anxious people find it hard to fall asleep and wake up frequently [30]. In addition, we found patients with more symptoms were more vulnerable to anxiety symptoms. The possible reasons are as follows: firstly, common symptom of COVID-19 such as fever, short of breath, headache can induce anxiety symptom [36]; secondly, patients with more symptoms are more serious than asymptomatic patients, and the prevalence of anxiety is also related to the severity of the disease [37, 38]; lastly, patient with more symptoms were more worried about the progression of illness.

Another finding from the present study was female, family member confirmed COVID-19, more current physical symptoms were more likely to have anxiety symptom. As early as 1970s, Myrna Weissman underscored the gender difference in depression, and noted that women more easily experience depression than men [39], since then, there was a proliferation of research and theories on gender differences in depression. A recent meta-analysis after analyzing these researches showed that females are more vulnerable to not only depression disorders but also depression symptoms [40]. There now is consensus that the gender difference in depression has a multifactorial etiology, for example, there is a confluence of hormonal and neurodevelopmental changes that vary by sex during the pubertal transition and may influence the gender difference in depression [40]. In addition, when patient's family members were also diagnosed COVID-19, patients were more vulnerable to depression symptoms, owing to greater family burden and psychological distress[41, 42]. Compared to patients with less physical symptoms, patients with more physical symptoms were more likely have depression symptoms, because they were more severe and prevalence of depression symptom in relation to the severity of the disease [38].

We also found that poor sleep quality was not independent risk factor for depression symptom, but the scores of PSQI was positively associate with SDS. Is there a contradiction? -but perhaps not. We consider because of weak correlation, so there was a difference in poor sleep quality between depression group and no depression group from the univariate analysis.

This study has limitations. Firstly, this is a cross-sectional design, the time frame is short and future longitudinal approach studies are need for follow up and intervention, secondly, psychological assessment was based on an online survey and on self-report tools. The use of clinical interviews is encouraged in future studies to draw a more comprehensive assessment of the problem. Thirdly, it is not a multinational, multicenter study, lack of data support from other Fangcang shelter hospitals.

## Conclusions

In conclusion, our results identify the prevalence rates and risk factors of anxiety, depression symptoms among patients in the Fangcang shelter hospital. Anxiety and depression are common among the COVID-19 patients in Fangcang shelter hospital. Those with more physical symptoms,poor sleep quality are more vulnerable to anxiety symptom. Females and those with their family members diagnosed with COVID-19, more current physical symptoms are more vulnerable to depression symptom. The poorer the sleep quality is, the more serious symptoms of anxiety and depression there will be. Our findings can be used to

formulate psychological interventions to reduce adverse psychological impacts in Fangcang shelter hospital during the outbreak of epidemic disease in the future.

## Declarations

## Ethics approval and consent to participate

This study was approved by the ethics committees of the First Affiliated Hospital of Zhengzhou University(no.2020-KY-169) All participants provided their online informed consent.

## Consent for publication

Consent for publication is not applicable.

## Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

## Competing interests

The authors declare that they do not have a conflict of interest.

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## Authors' contributions

Ling-Ling DAI, Xi WANG, Tian-Chi JIANG and Peng-Fei LI, designed this study. Ling-Ling DAI and Zhe CHENG collected the data. Yu Wang, Shujun WU searched the literature. Liu-Qun Jia, Meng Liu, and Lin An analyzed the data.

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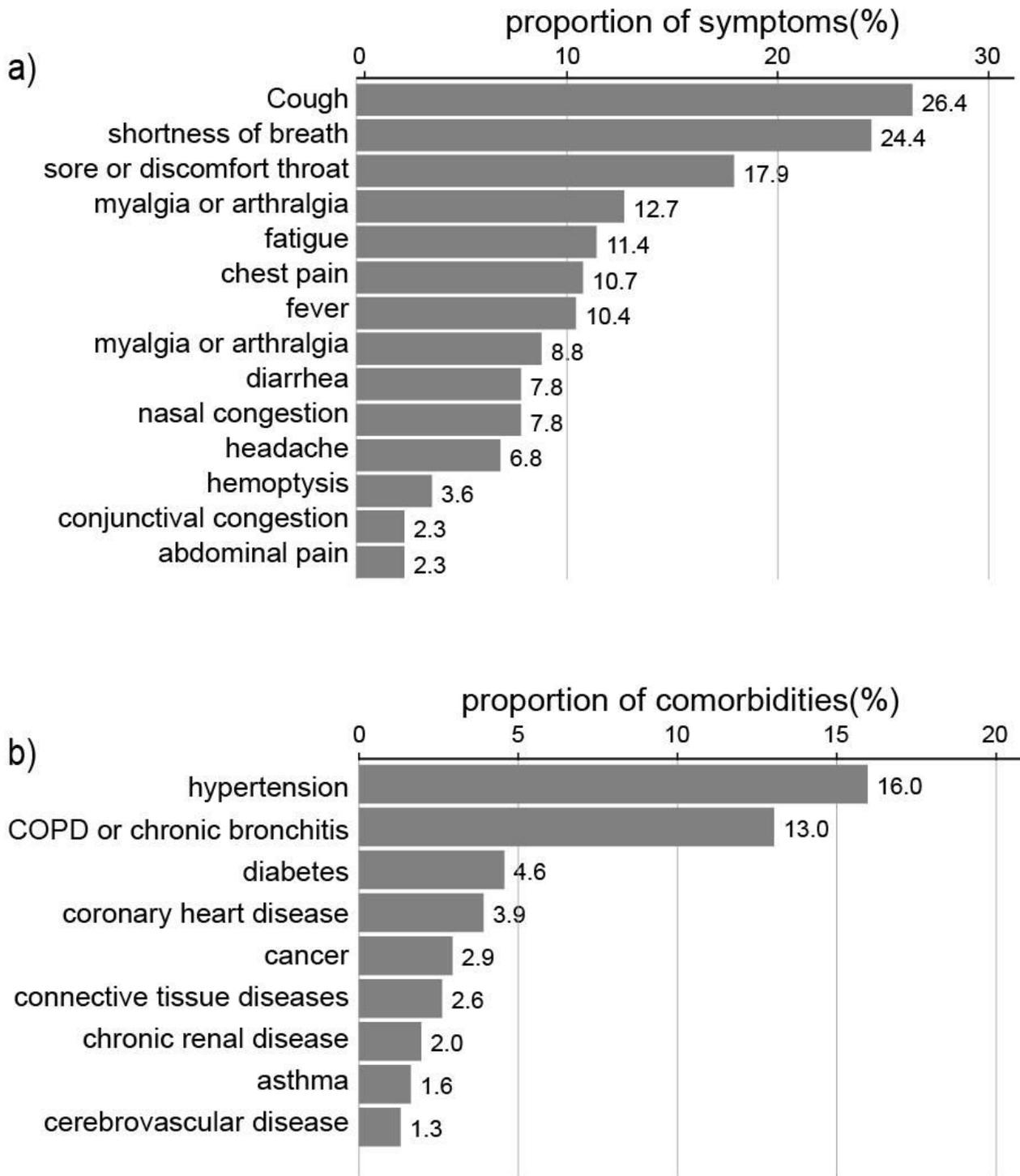
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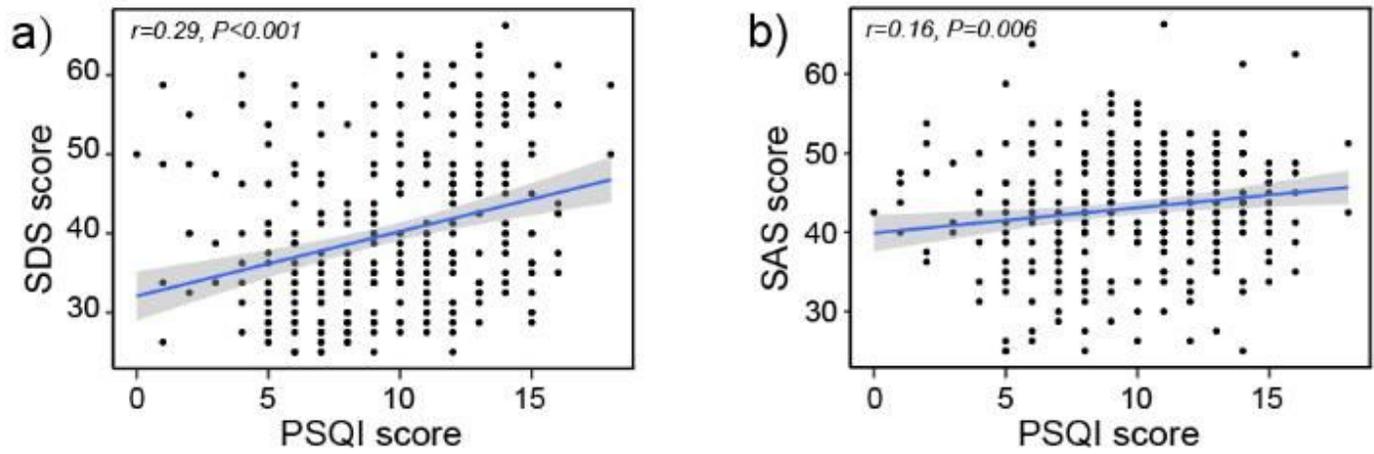
## Figures

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**Figure 1**

a: Histogram of the frequency distribution of Comorbidities. b: Histogram of the frequency distribution of current physical symptoms. COPD: chronic obstructive pulmonary disease.



**Figure 2**

a) Spearman correlation between PSQI scores and SAS scores. b) Spearman correlation between PSQI scores and SDS scores. Oblique lines are fitting lines. The grey areas indicate a 95 % confidence interval of fitting lines.