

# Depression, Anxiety, and Insomnia of Chinese Quarantine People During the COVID-19 Pandemic

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### Abstract

To estimate the prevalence rate of depression, anxiety, and insomnia status of quarantine people, and to identify their associated socio-demographic risk and protective factors of mental health features. Self-report data of socio-demographic factors, PHQ-9, GAD-7 and ISI were collected online, the probable prevalence rate and the risk factors of adverse mental health status was evaluated. The rate of screening positive for depression, anxiety, and insomnia was 19.6%, 14.9%, and 14.2%, by using the cutoff value 5, 5, 8 respectively in a total of 10167 subjects. Female, low household income, diagnosed with any medical diseases, and bad attitude towards medical observation showed adverse mental health status of clinical depression, anxiety and insomnia ( $p < 0.01$ ). Spending less time to complete the survey showed lower risk for depression and anxiety ( $p < 0.001$ ). Young and unmarried participants presented high risk of depression ( $p < 0.05$ ). Adverse mental health status of depression, anxiety, and insomnia was common among quarantine people in Shenzhen. It needs to pay more attention to quarantine people who were female, in low income, suffering from any physical diseases and bad attitude towards medical observation. It is necessary to focus on their mental health of quarantine people in medical observation.

**Keywords:** Depression, Anxiety, Insomnia, COVID-19 Pandemic, Quarantine, Risk Factors

### Introduction

The coronavirus disease (COVID-19) has been still epidemic around the whole world since December 2019. Like other public health crises, COVID-19 may also threaten human beings' physical and mental health. China has taken the action of quarantine strategies to fight against the COVID-19 pandemics [1, 2]. Quarantine strategies may bring about the adverse effect on the individual and interpersonal level and burden on economics, society, and psychology except for being effective public health measures [3-5]. Depression, anxiety, and insomnia is very common mental health problems during pandemics [6-11]. Some papers have evaluated the prevalence rates of depression, anxiety, and the associated risk factors up to now, and elucidated that many people faced mental problems during pandemics [9, 10, 12, 13]. Many of these studies focused on general people and only a few studies paid attention to quarantine people [7, 14, 15]. Moreover, the findings were inconsistent in different studies. With the spreading of COVID-19 under control rapidly in China, meanwhile, the authority also paid attention to the prevention of imported cases. This study focused on quarantine people who came from high-risk epidemic areas and had to stay in isolated hotels alone or as a family unit in Long-gang District, Shenzhen for medicine observation for 14 days or more com-

plying with local regulations. We evaluated the prevalence rate of depression, anxiety, insomnia, and associated risk factors of these quarantine people. Based on the above, we hypothesized that quarantine people during COVID-19 were susceptible to mental problems and had associated risk or protective factors of depression, anxiety, and insomnia apart from being mentioned by previous articles.

### Methods

#### Participants

Participants in this study came from high-risk epidemic areas, who needed to stay in isolated hotels alone or as a family unit and be observed in medicine for 14 days or more in Long-gang District, Shenzhen City, China. During quarantine time for medical observation, they were free to contact with their friends or relatives by phones or internet, but had to stay in isolated hotels. From April 7, 2020, to September 31, 2020, 12789 people were quarantined in hotels. All the participants completed the survey of socio-demographic features and mental health status measured by self-reported questionnaires of Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder 7-item Scale (GAD-7) and Insomnia Severity Index (ISI) online by scanning the QR code (<https://www.wjx.cn>) after consenting.

## Measures

Socio-demographic factors, information on age, sex, education level, marital status, economic situation, any physical conditions, time spent completing the questionnaire and attitude toward medical observation were collected by online self-report. The data of education level were recoded into a binary variable to represent. Any physical conditions mean a quarantine person had or has suffering from medical diseases in the past or present. Time spent completing the questionnaire means how long did it take for quarantine people to complete the questionnaire. Attitude toward medical observation is about that participants were asked "To what extent do you understand the quarantine policy after informed of the reason of quarantine in isolated hotels". Good attitude means understanding well about quarantine policy for medical observation. Bad attitude means lack of understanding about quarantine policy for medical observation.

Nine symptoms of depression over the last two weeks were measured by the Patient Health Questionnaire-9 (PHQ-9), which was a four-point Likert scale (0=Not at all, to 3=Nearly every day) [16]. The range of score was from 0 to 27, with higher scores representative of worse depression. A cut-off score of  $\geq 5$  means screening positive for depressive symptoms, and  $\geq 10$  means meeting the diagnostic criteria of clinical depression. Both of the cut-off scores were used in this study. And the reliability in this sample was good ( $\alpha=0.92$ ).

Symptoms of anxiety over the last two weeks were assessed by the Generalized Anxiety Disorder 7-item Scale (GAD-7) [17]. This 4-Likert scale range from 0 (Not at all) to 3 (Nearly every day) and all scores were 0-21, with higher scores indicating worse anxiety. A cut-off score of  $\geq 5$  means screening positive for anxiety symptoms, and  $\geq 10$  means meeting the diagnostic criteria of clinical anxiety. Both of the cut-off scores were used in this study. The reliability in the current sample was good ( $\alpha=0.94$ ).

Perception of insomnia was measured using the Insomnia Severity Index (ISI), which was a 4-Likert scale with higher scores indicative of severe insomnia [18, 19]. The score range from 0 to 28. A cut-off score of  $\geq 8$  means screening positive for insomnia symptoms, and  $\geq 15$  means meeting the diagnostic criteria of clinical insomnia. Both of the cut-off scores were used in this study. The reliability of this sample was good ( $\alpha=0.94$ ).

## Statistical Analysis

Statistical analysis was performed by using IBM SPSS Statistics version 25.0. Socio-demographic characteristics and the prevalence rate of depression, anxiety, and insomnia were described. All socio-demographic factors were then entered into a binary logistic regression model to determine their independent associations with clinical depression, anxiety, and insomnia, respectively. A  $p$ -value  $< 0.05$  was statistically significant.

## Ethics Statement

This current study was submitted to and approved by The Control and Prevention Command Office of COVID-19 Pandemic in Long-gang District, Shenzhen City, Guangdong Province (Document NO.: [2020]90). All participants provided informed

consent before completing the online survey, by reading the instruction of the survey and answering "yes" or "no", if choosing "no", they would not continue the study. Otherwise, the survey would go on. All adolescents under the age of 18 years were obtained consent from their parents or guardians.

## Results

Among 12789 participants, 2622 participants were excluded for the reasons of the incomplete data ( $n=498$ ), the age less than 15 years ( $n=686$ ), psychiatric history ( $n=222$ ), and time spent completing the survey less than 120s or more than 1800s ( $n=1216$ ). Finally, 10167 participants were recruited in this study with a valid response rate of 79.5%. The Fig. 1 showed the flowchart of participants recruitment.

Of 10167 people, the mean age of the sample was  $36.75 \pm 13.38$  years (range 15-86). The mean time taken for quarantine people to complete the survey was  $409.47 \pm 276$ s. The mean score of PHQ-9, GAD-7, and ISI was  $2.55 \pm 4.10$ ,  $1.86 \pm 3.37$ , and  $3.36 \pm 4.77$ , respectively. 19.6% was positive for depression, 14.9% screened positive for anxiety, and 14.2% screened positive for insomnia, if the cut-off value was 5, 5, 8, respectively. 6.4% met the diagnostic criteria of clinical depression, 4.2% was diagnosed with clinical anxiety, and 3.8% met the diagnostic criteria of clinical insomnia, if the cutoff value was 10, 10, 15, respectively. Table 1 showed the socio-demographic characteristics and the prevalence rates of depression, anxiety, and insomnia in detail.

Table 2 showed the association between socio-demographic features of quarantine people and clinical depression, anxiety, and insomnia. Male gender (OR=.68, 95% CI: .58-.80), married (OR=.80, 95% CI: .66-.95), and high income (OR=.35, 95% CI: .29-.42) were protective factors for depression, when compared to female, non-married, and low income. Compared with the younger whose age  $< 37$  years,  $\geq 37$  years (OR=.68, 95% CI: .56-.38) was significantly protective factor of clinical depression ( $p < 0.001$ ). To compare with no any medical conditions, diagnosed with any medical diseases (OR=2.30, 95% CI: 1.78-.96) showed higher risk of depression symptoms in quarantine people ( $p < 0.001$ ). To compare with spending time less than 409s to finish the survey,  $\geq 409$ s (OR=1.74, 95% CI: 1.45-2.07) was associated with high risk of depression ( $p < 0.001$ ). Good attitude to medical observation (OR=.32, 95% CI: .27-.38) was a protective factor for depression in quarantine people ( $p < 0.001$ ).

Male gender (OR=.58, 95% CI: .47-.71), high income (OR=.29, 95% CI: .24-.36) were protective factors for clinical anxiety, when compared to female, low income. To compare with no any medical conditions, diagnosed with any medical diseases (OR=2.31, 95% CI: 1.74-3.07) was a higher risk factor of anxiety symptoms ( $p < 0.001$ ). Spending more time to finish the survey (OR=1.60, 95% CI: 1.31 - 1.97) showed higher risk of anxiety to compare with time  $< 409$ s ( $p < 0.001$ ). Good attitude to medical observation (OR=.37, 95% CI: .30 - .45) was a protective factor for anxiety in quarantine people ( $p < 0.001$ ).

Male gender (OR=.69, 95% CI: .56 - .85) and high household income (OR=.37, 95% CI: .29 - .46) had less risk of clinical insomnia ( $p<0.001$ ), when compared to female, low income. When compared with undiagnosed with any medical diseases, having medical diseases in the past or present of quarantine people (OR=3.20, 95% CI: 2.44 – 4.20) was a risk factor of insomnia ( $p<0.01$ ). Understanding well of medical observation (OR=.35, 95% CI: .28 - .43) was a protective factor for insomnia in quarantine people ( $p<0.001$ ). However, marital status and age showed no association with clinical anxiety and insomnia respectively among population in quarantine. Time taken for completing the survey in quarantine people showed no association with clinical insomnia. The above detailed data could be seen in Table 2.

## Discussion

This cross-sectional study examined the prevalence, risk, and protective factors of depression, anxiety, and insomnia in quarantine people during the COVID-19 pandemic in Shenzhen, China. There was a relatively high prevalence of depression, anxiety, and insomnia symptoms among quarantine people during the period of the COVID-19 pandemic in our findings. However, there was a relatively low prevalence of clinical depression, anxiety and insomnia. Female, low household income, having any medical diseases and bad attitude for medical observation showed adverse mental health status of clinical depression, anxiety and insomnia. The longer it took to complete the survey showed higher risk for clinical depression and anxiety. Younger quarantine people under the age of 37 years presented higher risk of depression. Married showed protective for depression in population under quarantine.

Quarantine people were thought of as being more stressed than common people [7, 8]. The rates of depression, anxiety, and insomnia found in the current study were similar to or less than those reported in previous worldwide prevalence studies related to COVID-19 [5, 10, 12, 20-23]. For example, Choi, E.P.H. found that 19% had depression and 14% had anxiety in their study by using PHQ-9 and GAD-7 evaluated the impacts of COVID-19 on the mental health of Hong Kong general citizens [12]. Wang reported 16.5% with moderate to severe depressive symptoms and 28.8% with moderate to severe anxiety symptoms in the survey of the general public in China (Wang et al., 2020a). Lei compared the prevalence of anxiety and depression among people affected by versus people unaffected by quarantine during the COVID-19 epidemic in southwestern China and found that 12.9% and 22.4% had anxiety and depression in the affected group, significantly higher than that in the unaffected group (6.7%, 11.9%) [13]. Tang reported 26.47% and 70.78% had probable depression and anxiety, respectively, significantly higher than our and others' findings [10]. It could be explained as follows. Firstly, the participants in this study are different from those in previous studies. Secondly, different studies used various scales for assessing mental health. Thirdly, the cut-off scores of scales used were different. The lower prevalence of depression, anxiety, and insomnia in the present study is probably explained as follows. Firstly, all participants in current study were not infected with COVID-19, which meant

safety and might soothe their psychological burden. Secondly, the quarantine Chinese returning from high-risk abroad during the COVID-19 pandemic would feel secure in their motherland under effective epidemic control at that time, and were isolated for medical observation in relatively comfortable hotels and serviced by physician and psychologist except for ordinary service staff. Thirdly, the benefits of the digital era and isolation taking family as a unit in the same hotel room could maintain social continuity.

We found female was faced with higher risk of general psychological problems such as depression, anxiety and insomnia. Similar findings were presented by previous studies which showed that female seemed particularly stressful, depressive and anxious than male during the COVID-19 pandemic [1, 22, 24]. This can be due to the coping styles, the gender disadvantage across the life course and cultural and social norms [25, 26]. However, little research has elucidated the gender difference in mental health.

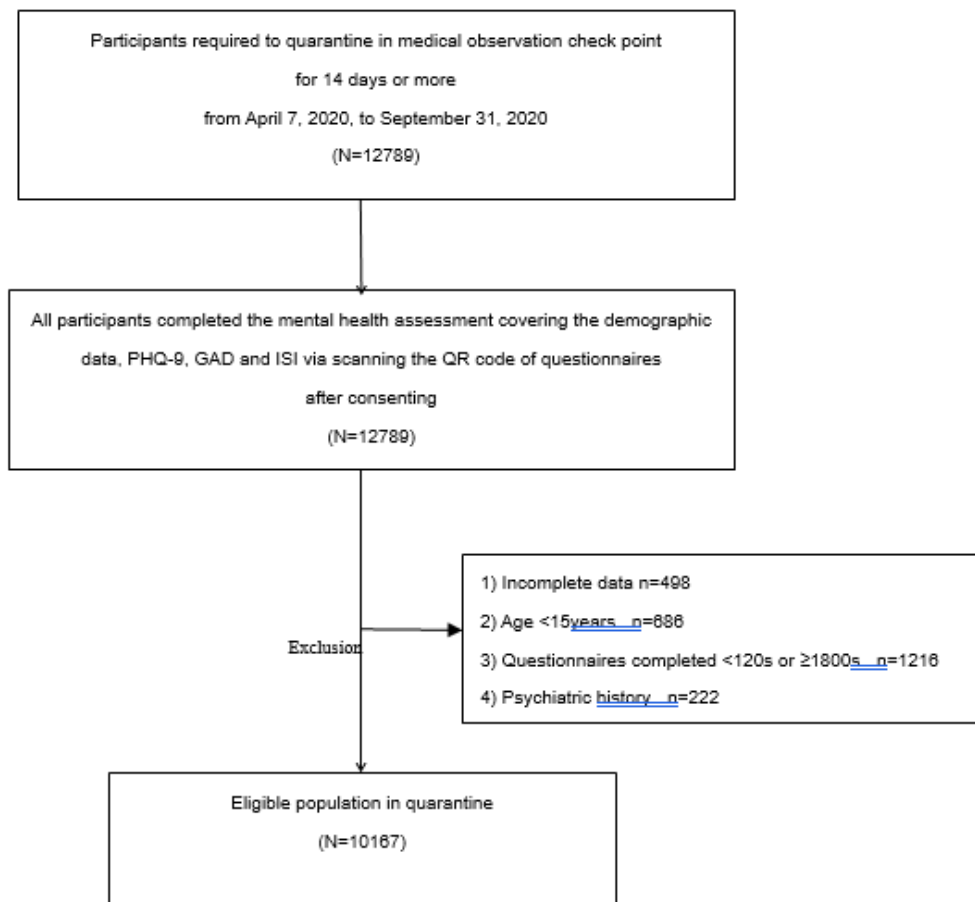
Lower average household income was significant associated with higher scores on depression and anxiety, similar findings were shown in other studies [13, 21, 22]. Income inequality has a negative impact on mental health, which was identified by one systematic review and meta-analysis [27]. Younger in this study could be more likely to encounter with mental problems than the older (>37 years old), which was consistent with previous studies [22, 28]. It could be due to these explanations for uncertain working conditions, serious financial burden and larger restriction for younger quarantine people, which also need to be explored in future [22]. In this study, the longer it took for quarantine people to complete the survey was an associative risk factor of depression and anxiety. We explained that it might be difficult and needed to pay more attention to complete a task for depressive or anxious subjects. We found hardly any studies exploring the relationship between time spent completing a survey and mental health via literature searches, so it needed to be verified in future studies. Besides, our study showed that quarantine people who were lacking of understanding of medicine observation had higher risk of depression, anxiety, and insomnia, compared with participants who understood completely why needed to be isolated in hotels and what should do quarantine people as imported cases during COVID-19 epidemics. The relationship between attitude for medical observation and mental health might be evaluated firstly in the study. The risk of adverse mental health status in quarantine people in Shenzhen in current study raised significantly with chronic physical diseases, similar result was also showed in Ping's findings [29].

There were several limitations in this study. First, it is difficult to make causal inferences due to the cross-sectional design of this study. Second, this study mainly used self-reported questionnaires to measure psychiatric symptoms and did not make clinical diagnosis by using structured clinical interview and functional neuroimaging. Third, there were relatively fewer socio-demographic factors in the current study, which could not describe the overall associative risk or protective factors of mental problems.

The findings of this study were based on a large sample size which probably reflected the emotional health and sleep condition of quarantine people during COVID-19 effectively. We targeted on risk participants with depression, anxiety, or insomnia according to these results, supplied a mental secure manual, and kept inquiry via WeChat in the daily or by face to face in necessary. Many medical measures were taken immediately and no adverse incidents occurred among quarantine people in isolated hotels in this study. In the coming future, we will try to recommend Internet cognitive behavior therapy for quarantine people with adverse mental health status, which is an effective

treatment based on evidence for mental problems, can avoid face to face contact and prevent the spread of infection during the pandemic [30, 31, 32].

To sum up, it could be concluded that depression, anxiety, and insomnia symptoms were common among quarantined people as imported cases. We need to pay more attention to quarantine people who are female, in low-income, suffering from physical diseases, and barely understanding for medical observation. In addition, it is necessary to focus on their mental health of quarantine people in medical observation.



**Figure:1** Flowchart of sample recruitment

**Table 1. Socio-demographic characteristics and depressive, anxiety, and insomnia symptoms (N=10167)**

Demographics		N	mean ±SD /%	Scales	N	mean ±SD /%
Age*	Age≥37years	10167	36.75 ± 13.38	PHQ-9	10167	2.55 ± 4.10
	Female	5485	53.9	GAD-7	10167	1.86 ± 3.37
	Education	4810	47.3	ISI	10167	3.36 ± 4.77
	(College and above)	5521	54.3	PHQ-9≥5	1996	19.6
	Married	5720	56.3	GAD-7≥5	1512	14.9
	Household income (>7000RMB/month)	8562	84.2	ISI≥8	1445	14.2
	Any chronic medical disease(yes)	768	7.6	PHQ-9≥10	650	6.4
	Time*	10167	409.47 ± 276s	GAD-7≥10	422	4.2
	Time≥409s	3619	35.6	ISI≥15	389	3.8
	Attitude (good)	7994	78.6			

Note\*: the cutoff age was defined with the mean age of the population in quarantine; the cutoff time was defined with the mean time a quarantine person took to complete the survey. The age <37 years means “younger”. The time <409s means “shorter”.

**Table 2. Comparison of the association between demographics of quarantine people and adverse mental health status (N=10167)**

Variable	Depression			Anxiety			Insomnia		
	B	OR	95%CI	B	OR	95%CI	B	OR	95%CI
<b>Gender</b>									
Female	Reference			Reference			Reference		
Male	-.38	.68***	.58 - .80	-.55	.58 ***	.47 - .71	-.37	.69***	.56 - .85
<b>Age</b>									
≥37years	-.39	.68***	.56 - .38						
<37years	Reference								
<b>Marital status</b>									
Married	-.23	.80*	.66 - .95						
Single/divorced/widowed	Reference								
<b>Household income</b>									
high	-1.06	.35***	.29 - .42	-1.23	.29***	.24 - .36	-1.01	.37***	.29 - .46
low	Reference			Reference			Reference		
<b>Physical conditions</b>									
yes	.83	2.30***	1.78 - 2.96	.84	2.31***	1.74 - 3.07	1.16	3.20**	2.44 - 4.20
no	Reference								
<b>Time required</b>									
≥409s	.55	1.74***	1.45 - 2.07	.47	1.60***	1.31 - 1.97			
<409s	Reference								
<b>Attitude</b>									
understanding	-1.14	.320***	.27 - .38	-1.01	.37***	.30 - .45	-1.06	.35***	.28 - .43
No understanding	Reference								

Note:\*  $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ . OR: odds ratio; 95% CI:95% Confidence Interval.

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## Data Availability Statement

All data requests should be the corresponding authors for consideration. Considering the raw data contained the information of name, address, mobile phone number, and ID number, the government do not allow to share the original date.

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