Effects of sleep duration, perceived organisational support and personal resilience on anxiety in non-hospitalised residents during the COVID-19 pandemic: a survey study in Ningbo, China

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ABSTRACT

Objective This study assessed the association between sleep duration, perceived organisational support (POS), personal resilience and anxiety among non-hospitalised residents during the COVID-19 pandemic in Ningbo, China.

Methods In this cross-sectional study, an online survey was conducted from 27 January 2023 to 5 February 2023, involving non-hospitalised residents over 14 years old in Ningbo. We received 1938 valid responses. The study used the General Demographic Characteristics Scale, the Generalised Anxiety Disorder Scale, Brief Resilient Coping Scale and the POS questionnaire.

Results Among the 1938 valid questionnaires, 1068 (55.1%) participants reported anxiety. Multivariate logistic regression analysis revealed that high organisational support (β=–0.34, adjusted OR (aOR) 0.71, 95% CI 0.51 to 0.98, p=0.038), moderate resilience (β=–0.26, aOR 0.77, 95% CI 0.63 to 0.95, p=0.013), high resilience (β=–0.67, aOR 0.51, 95% CI 0.36 to 0.73, p<0.001) and sleep duration of ≥7 hours (β=–1.00, aOR 0.37, 95% CI 0.28 to 0.49, p<0.001) were significantly associated with anxiety. Participant characteristics were not associated with anxiety.

Conclusions During the COVID-19 pandemic, organisational support, personal resilience and adequate sleep duration were associated with anxiety among non-hospitalised residents. These findings highlight the importance of increasing organisational support, implementing interventions that promote resilience and stress management, ensuring sufficient rest and sleep duration, and helping residents better manage anxiety.

INTRODUCTION

The COVID-19 pandemic was a global public health crisis that posed significant threats to health and life. Before December 2022, China implemented a zero-COVID policy, distinguishing it from other countries’ epidemic response strategies. Measures such as the Wuhan lockdown in 2020, the dynamic zero removal policy, and the targeted prevention and control strategy effectively contained the regional clusters of COVID-19 between early 2020 and 2022. However, implementing China’s zero COVID-19 strategy has notably impacted the population’s mental health.

Psychological consequences, particularly anxiety, demand careful consideration. For instance, prolonged isolation at home and social distancing measures have led to feelings of isolation, loneliness and heightened symptoms of anxiety. Thus, the physical and mental health implications of the measures employed to curb the virus must be considered. The control policy was lifted in December 2022.

Since the Chinese government lifted restrictions on the COVID-19, the outbreak has escalated. As of 1 January 2023, reports indicated that the number of COVID-19 infections in China has reached 900 million, accounting for over 60% of the population. The COVID-19 pandemic has profoundly
impacted mental health, with anxiety being one of the most prevalent psychological outcomes.

Anxiety is defined as ‘a state of unease or worry caused by the expectation of a real or perceived threatening event or situation’. The literature suggests that depression, anxiety and stress were more prevalent in the general population during the pandemic. Globally, COVID-19 has led to a 27.6% increase in cases of major depression and a 25.6% increase in cases of anxiety. Adolescents of varying backgrounds also experience anxiety, depression and stress due to the pandemic. Deng’s findings indicated that 45% of COVID-19 patients experience depression, while 47% experience anxiety. Lam et al’s study found that during the peak of the COVID-19 epidemic, 60% of participants rated their anxiety levels as moderate to high. Numerous studies emphasised that moderate to high anxiety levels negatively impact mental health and work performance and can lead to physical dysfunction, depression and suicidal ideation.

Although factors contributing to anxiety during the pandemic have been previously studied, uncertainty about the virus, fear of infection, knowledge gaps and transmission to loved ones have increased anxiety levels. The impact on daily life and livelihoods, such as business closures, job losses and financial instability caused by the pandemic, may result in persistent worry and anxiety. Those with pre-existing medical conditions, such as respiratory problems or compromised immune systems, may experience heightened anxiety. Social isolation and loneliness have also aggravated anxiety during the pandemic. However, limited research has explored factors that reduce anxiety in individuals.

This study is based on evidence-based research and literature review and considers personal resilience and organisational support as crucial factors in protecting individuals from adversity and stress, enabling them to maintain mental health and well-being. Organisational support refers to resources and assistance an employer or organisation provides to promote employee well-being and mental health. Previous research has shown that higher levels of organisational support are associated with lower anxiety levels. Resilience refers to an individual’s ability to adapt and recover from adversity or stress. Studies demonstrated that nurses with higher levels of resilience exhibited less anxiety related to COVID-19. There was a relationship between sleep disorders and mental disorders such as anxiety and stress.

Therefore, this study investigated anxiety-related factors among non-hospitalised individuals after relaxing COVID-19 restrictions in Ningbo City. Specifically, the study examined the influence of organisational support, resilience and sleep duration on anxiety during the pandemic. The findings will inform interventions aiming to address the psychological impact of the pandemic on mental health.

METHODS
Participants and sampling
This cross-sectional study assessed potential factors for anxiety outcomes from 27 January 2023 to 5 February 2023, approximately 1 month after China lifted COVID-19 restrictions. Eligible participants were adult non-hospitalised residents of Ningbo. Participants were recruited online and answered the questionnaire by sharing a quick response code on WeChat, the most popular social networking site with more than 1.15 billion active users. This survey briefly described the purpose, background, procedures, voluntary nature, confidentiality, anonymity and precautions for completing the questionnaire. All participants gave informed consent. Minors aged 14–18 obtained the consent of their parents or guardians. The survey consisted of about 40 items. Respondents were asked to complete a 20–30 min online survey that included personal characteristics, anxiety, sleep and COVID-19-related experiences. Our research team reviewed 10% of the responses to ensure high data quality. The data were collected anonymously using software called Questionstar. Participants could withdraw from the study at any point during the survey.

For a study using the Generalised Anxiety Disorder Scale (GAD-7) as the primary measure, the sample size can be estimated using $n=Z^2×p×(1−p)/e^2$. Based on current literature, a threshold score of 10 or above indicates the presence of anxiety symptoms. According to global estimates, the prevalence of anxiety disorders is around 7.5%, ranging from 4.8% to 10.9%. To be conservative, we can use the midpoint of this range, which is 6%. Therefore, using $p=0.06$, a confidence level of 95% (corresponding to $Z=1.96$), and a margin of error of 5% ($e=0.05$), the calculated sample size is approximately 371 participants. Considering a 20% expected drop-out rate, the final adjusted sample size would be approximately 464 participants.

Measures
Demographic characteristics
The General Demographic Characteristics Scale considers age, sex, marital status, education, occupation, body mass index, and symptoms and time of COVID-19 infection; the presence of symptoms was categorised as yes, no or uninfected (yes: people diagnosed with COVID-19 usually present with symptoms such as fever, cough and sore throat; no: one of the above symptoms; uninfected: COVID-19 test strip negative). These are self-reported symptoms. Health habits included sleep duration, smoking and alcohol consumption.

The GAD-7 was used to identify residents with anxiety during the COVID-19 pandemic. GAD-7 is a brief anxiety symptom checklist developed by Spitzer et al., according to the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. The scale includes seven items, each divided into four levels from 0 to 3. The total GAD-7 score ranges from 0 to 21, where a higher score indicates more significant anxiety.
and 15 are the cut-offs for mild, moderate and severe symptoms of anxiety, respectively. The total score ≥10 was defined as GAD-7-positive. If the result was negative, it was judged as anxiety; if the result was less than 10, it was judged as negative. This scale had high reliability and validity for anxiety screening and a Cronbach’s alpha of 0.806.

The Brief Resilient Coping Scale (BRCS) was developed by Smith et al. It uses a 5-point Likert-type scale, ranging from 1 (does not describe me at all) to 5 (describes me very well). The average scores on the scale were divided into three categories: low resilience (1.00–2.99), moderate resilience (3.00–4.30) and high resilience (4.31–5.00). The BRCS has demonstrated excellent predictive validity, as it has been positively associated with work performance. It also showed excellent reliability, with a high internal consistency of 0.91 reported in earlier research and a Cronbach’s alpha coefficient of 0.894 in the current study.

The perceived organisational support (POS) questionnaire was developed by Eisenberger et al. It is an eight-item scale that indicates the level of care a work unit has for the well-being and job satisfaction of employees, their focus on work goals and values, their attention to employees’ opinions, the availability of help when employees encounter difficulties, and the pride the unit takes in their achievements. Each item is rated on a 5-point Likert scale (1 (strongly disagree) to 5 (strongly agree)). The mean scores obtained from the scale were then categorised into low, moderate and high organisational support (moderate: 3.0–4.8). Higher mean scores indicate higher levels of organisational support, with an excellent internal consistency of 0.95 in a previous study. In this study, Cronbach’s α was 0.903.

**Statistical analysis**

Data processing analyses were performed using R V.4.3.0 (2023-04-21) with Storm Statistical Platform (www.medsta.cn/software). Means, frequencies and SDs were used to quantify the data. To investigate anxiety as the dependent variable, a single-factor logistic regression analysis was conducted to identify single-variable factors with significant statistical effects (p<0.2) on anxiety. Personal characteristics, sleep duration, organisational support, resilience or other factors were then included as independent variables in a multiple logistic regression analysis to explore their influence on anxiety. When conducting multiple logistic regression analysis, consideration is given to the correlation between different factors. If two factors are highly correlated, they may produce multicollinearity problems. Hence, variable screening or selection must be performed in multiple logistic regression analyses to determine the most important factors for predicting anxiety. Multiple logistic regression was used to calculate ORs and 95% CIs for the association between organisational support, resilience, sleep duration parameters and odds of anxiety. A trend analysis was conducted on the independent variable of personal resilience. A p<0.05 indicated statistical significance.

**Strengthening the Reporting of Observational Studies in Epidemiology statement**

The Strengthening the Reporting of Observational Studies in Epidemiology guidelines were followed.

**Patient and public involvement statement**

No patients or public members participated in the study design or analysis.

**RESULTS**

We invited 2000 participants and received 1950 questionnaires. We excluded respondents with unusual responses or missing data to verify data quality. Ultimately, 1938 valid questionnaires were collected and processed anonymously. We considered anxiety the dependent variable using the chi-square test, binary logistic regression analysis and other methods to investigate how these factors contribute to anxiety and whether they can be potential protective factors against anxiety during a pandemic.

**Characteristics and anxiety scores**

Among the 1938 residents who completed the questionnaire between 27 January 2023 and 5 February 2023, the incidence of anxiety was 55.1%. Most of the residents were women (1091/1938, 56.3%). Of the 1938 respondents, 1390 (71.7%) were married and 288 (14.9%) had a master’s or graduate degree. Smokers accounted for 731 (37.7%). Nasopharyngeal swabs were administered to 1938 respondents. Three-quarters (75.0%) of those tested for COVID-19 were positive; 73 cases (3.8%) were negative. Of the 1938 respondents, 1068 (55.1%) felt anxious. Descriptive data for all variables are shown in online supplemental table 1.

The total GAD-7 score, which represents the overall level of generalised anxiety symptoms, has a minimum score of 0 and a maximum score of 18, with an average of 8.17 and an SD of 5.886. The average scores for each item ranged from 0.52 to 1.84, with SD ranging from 0.63 to 1.069 (online supplemental table 2). Single-factor logistic regression analysis determined the association between variables and anxiety levels.

Females were more likely to experience anxiety than males (OR 1.21, 95% CI 1.01 to 1.45, p=0.036), with 56.3% of females experiencing anxiety compared with 43.7%. Age and marital status did not significantly impact anxiety levels. Education and body mass index were not associated with anxiety. Self-employed households had a lower likelihood of anxiety compared with students. Smoking status and alcohol consumption did not have significant effects on anxiety levels. Being COVID-19 positive and the duration of symptoms did not significantly impact anxiety. However, individuals who reported having moderate organisational support had a lower likelihood of experiencing anxiety than those with low organisational support.
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mental table 1).

Participants who slept for 7 hours or more had a significantly reduced risk of experiencing anxiety compared with those who slept for less than 7 hours (online supplemental table 1).

Multivariate logistic regression analysis determined the relationship between variables and anxiety level. We incorporated anxiety-related factors (p<0.2) with significant statistical effects from the univariate analysis into a binary logistic regression analysis. Participants with medium organisational support were not significantly less likely to experience anxiety than participants with low organisational support (adjusted OR, aOR 0.88, 95% CI 0.72 to 1.08, p=0.222). The incidence of anxiety in the high organisational support group was significantly lower than in the low organisational support group (aOR 0.71, 95% CI 0.51 to 0.98, p=0.038). Anxiety was significantly lower in the moderately resilient group than the less resilient group (aOR 0.877, 95% CI 0.63 to 0.95, p=0.013). The high resilience group had significantly lower rates of anxiety than the low resilience group (aOR 0.51, 95% CI 0.36 to 0.73, p<0.001). The level of anxiety decreased significantly with the increase in resilience (p<0.001). Participants who slept ≥7 hours had significantly lower odds of experiencing anxiety than those who slept less than 7 hours (aOR 0.37, 95% CI 0.28 to 0.49, p<0.001; online supplemental table 3).

These results suggest that anxiety levels are associated with organisational support, resilience and sleep duration. Participants who have organisational support, sleep longer and possess higher resilience levels tended to have lower odds of experiencing anxiety.

DISCUSSION
In December 2022, the Chinese government lifted COVID-19-related restrictions. Because of the high infectivity of COVID-19, the outbreak in China posed a severe threat to health and life. This study assessed anxiety in Ningbo residents during the COVID-19 pandemic from December 2022 to January 2023. With anxiety as the dependent variable, the anxiety factors were explored using univariate and multivariate logistic regression analysis. We evaluated the associations between organisational support, resilience, sleep duration and the odds of anxiety.

Stress and uncertainty in the social environment might increase the incidence of anxiety. A study in Hong Kong reported increased anxiety disorders during the pandemic. The present study’s findings suggest that sleep duration, organisational support and resilience are significantly associated with anxiety levels.

Participants who reported having organisational support demonstrated significantly lower odds of experiencing anxiety than those who did not have organisational support. This finding underscores the potential protective effect of social support within the work environment on psychological health. From the point of view of social psychology, organisational support can reduce individual work pressure, thus reducing the occurrence of anxiety. Organisational support can improve individual emotional states, reduce anxiety and improve employee mental health. One reason is the sample characteristics of the study. During the pandemic, most residents in this study who suffered COVID-19 symptoms faced the risk of unemployment. Therefore, residents were eager to obtain the support of the unit. This finding is consistent with previous findings suggesting that workplace support reduces employee anxiety levels and that this effect persists over time. Another study found that workplace support improves employee mental health and reduces anxiety and depression. Organisational support had a protective effect against anxiety. Hence, establishing an effective unit security system and implementing effective social and organisational support strategies might reduce anxiety during the pandemic.

Resilience was also a significant factor in predicting anxiety levels. Participants with moderate and high levels of resilience had significantly lower odds of experiencing anxiety than those with low resilience. This finding aligns with resilience theory, which suggests that individuals with higher levels of resilience are better equipped to adapt to and cope with stressful situations, thereby reducing their vulnerability to anxiety. Earlier studies showed that low levels of resilience could make individuals more susceptible to job stress, leading to increased anxiety levels. The results of this study are consistent with these findings. Resilient individuals often have a more optimistic attitude, which can help them reframe and reinterpret stressful events more adaptively. They are more likely to view challenges as opportunities for growth and learning rather than overwhelming threats. This mindset can contribute to lower levels of anxiety.

The decreasing trend in anxiety levels with increasing resilience further supports the notion that resilience is crucial in moderating anxiety symptoms. This finding highlights the importance of fostering resilience in individuals to minimise the impact of stressors and enhance psychological well-being.

Participants who reported sleeping for at least 7 hours had significantly lower odds of experiencing anxiety than
those who slept less than 7 hours. This finding is consistent with previous research highlighting the importance of adequate sleep in promoting mental well-being and reducing anxiety symptoms. Therefore, lack of sleep may be one of the reasons that may lead to anxiety. Hence, during the pandemic, residents’ sleep should receive attention. Psychological intervention and drug treatment can be offered for individuals who do not get enough sleep.

Limitations

This was the first study in China of Ningbo to assess anxiety among respondents who were not hospitalised at the advent of the COVID-19 pandemic. A strength was that we used a robust and validated tool (the GAD-7). Nevertheless, our findings should be understood in the context of several limitations. First, the study relied on self-report measures, which may be subject to recall bias, especially for sleep duration; without sleep device instruments, sleep duration estimates might be inaccurate. Future research could consider using objective measures of sleep duration and more comprehensive assessments of organisational support and resilience.

Second, cross-sectional designs have inherent weaknesses, and the study’s short duration may affect the reliability. Longitudinal studies are needed to understand the temporal relationships between sleep, organisational support, resilience and anxiety. Finally, the study sample consisted of a specific population; therefore, generalisability to other populations should be made with caution.

Conclusions

A significant proportion of respondents were affected by anxiety. This study contributes to the growing body of research on the mental health impact of the pandemic and provides insights. Improving sleep, enhancing organisational support and fostering resilience might reduce anxiety symptoms and promote psychological well-being.

Supplemental material

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