Association between mask wearing and anxiety symptoms during the outbreak of COVID 19: A large survey among 386,432 junior and senior high school students in China

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ABSTRACT

Aim: To evaluate the association between mask wearing practice and the risk of anxiety symptoms during the COVID-19 epidemic among Chinese students aged 12–18 years old.
Methods: Totally, 386,432 junior and senior high school students were recruited using a cluster sampling method across three cities of Henan Province in China during February 4–12, 2020. Mask wearing practice was defined according to its type and the behavior exhibited in relation to wearing a mask. Presence of anxiety symptoms was determined by Generalized Anxiety Disorder tool (GAD-7). Multiple logistic regression was performed to estimate the association between mask wearing and anxiety symptoms.
Results: Among the participants, compared with students who completely adhered to the all the mask wearing practice, students who did not adhere to all the mask wearing practice had 1.97 times more likely to suffer from anxiety symptoms (adjusted odds ratio (aOR) = 1.97; 95% confidence interval (CI): 1.74–2.22). Furthermore, compared with students who did not know the proper type of mask, students who knew the proper type of mask had a lower risk of anxiety symptoms (aOR = 0.78; 95%CI: 0.76–0.80). Students who adhered to proper behavior of mask wearing was associated with 34% decreased odds for anxiety symptoms (aOR = 0.68; 95%CI: 0.62–0.74).
Conclusions: To conclude, proper mask wearing may be an important attribute that play a significant role in reducing the risk of anxiety symptoms among junior and senior school student. However, since this study is a cross-sectional study, prospective studies are needed to further verify.

1. Introduction

In December 2019, novel coronavirus (COVID-19) has caused serious illness and death [1]. Due to its fast and wide transmission world-widely, it has been recognized as a global pandemic. COVID-19 has infected 124,535,520 confirmed cases, including 2,738,876 deaths as of 02:25 am GMT + 8, 26 March 2021 [2]. As during the 2003 SARS and 2014 Ebola virus disease outbreaks, which propelling psychosocial distress and risks for psychiatric disorders [3,4]. However, COVID-19 is more transmissible than SARS, and it only took 30 days to expand from Hubei to the rest of Mainland China. [5]. In order to reduce the spread of

diseases, governments around the world have adopted strict public health measures [6,7], which poses a major risk to public mental health during this health crisis [8]. Similarly, global education has been greatly affected due to the COVID-19 pandemic [9]. The overall prevalence of anxiety symptoms among junior and senior high school students was 9.89% in China during the outbreak of COVID-19 [10].

Wearing a mask can reduce the discharge of saliva and respiratory droplets from subclinical or mild COVID-19 patients, and help control COVID-19 [11–13]. During SARS period, in a case-control study conducted in Beijing, continuous wearing masks outdoors reduced the risk by 70% compared with people who did not wear masks [14]. Compared

with other protective measures, wearing mask is a necessity as an important person protection equipment, and it is perhaps the most-powerful psychological symbol for the general public [15]. In general, during the COVID-19 pandemic people have been using face masks more commonly and for longer periods [16]. The current available types of masks include non-medical cloth masks, medical masks and N95 masks [17]. However, depending on the type of face masks, the protection rate was different in the process of expiratory emissions [18]. In addition, the frequency of wearing face masks at workplaces and public places was 80.5% and 87.2% respectively, but the frequency of wearing face masks at social gatherings was only 47.5% [19]. Of note, during the on-going COVID-19 pandemic, recommendations and common practices regarding face mask use by the different health authorities (panel) have varied greatly [20,21].

The prevalence of self-reported psychological distress among students during the COVID-19 pandemic was relatively high, and frequency of wearing a face mask was factors associated with the mental health of adolescents [22]. As a province with the largest educational population in China, Henan province has an educational population of 28.53 million. The situation of epidemic prevention and control in the education system is very serious. Therefore, based on above evidences, we designed a cross-sectional survey that included 405,474 junior and senior high school students in Henan province during the COVID-19 epidemic to explore the relationship between mask wearing practice and the risk of anxiety symptoms. This may assist government agencies provide corresponding evidence for the government to take corresponding countermeasures to reduce the impact of the epidemic on the mental health of students.

2. Methods

2.1. Study participants

We designed a cross-sectional study in order to investigate the effect of mask wearing on anxiety symptoms of junior and senior high school students during the period of COVID-19. It was conducted between the 4th to 12th February 2020. Junior and senior high school students aged 12–18 years were recruited by using a cluster sampling method in Zhengzhou, Xinxiang, and Xinyang city of Henan Province, China, and invited to participate in the online survey through an online survey platform ("SurveyStar", Changsha Ranxing Science and Technology, Shanghai, China). First, the questionnaire can only be submitted after all the questions have been answered, and each account has only one opportunity to submit it. So, we can exclude duplicating answers. Second, by setting mandatory but unanswered questions or questions with inconsistent answers that cannot be successfully submitted, the quality of the answer sheet can be improved [23]. This questionnaire investigated Henan Province's elementary school students, junior and senior high school students, and college students totaling 1,051,190. Among them, junior high school students totaled 407,492. Students whose answering time ≤100 s was excluded ($n = 2003$), and missing values of birth month and day or participants aged <12 years or aged >18 years were excluded ($n = 19,057$). Finally, a total of 386,432 participants were included.

The study protocol was approved by the Ethics Committee of the Zhengzhou University (ZZUIRB2021-118). Students were advised to get their parents' permission before completing the questionnaire. All study participants consented for participation in this study.

2.2. Data collection

A standard questionnaire included questions on the basic socio-demographic information, the worried and fear levels, the proper type of mask, and the proper behavior of mask. Socio-demographic characteristics included gender, age, grade, and residential locations. The worried and fear levels (including "extremely" "very" "somewhat'" "not

so" and "not at all"), assigned a score to each response on 5-point Likert scale [24,25]. The internal consistency analysis suggested that Cronbach's Alpha = 0.760 and Bartlett <0.001 respectively. High level was defined as 4–5 points, moderate level was defined as 3 points, and low or none level was defined as 1–2 points. The proper type of mask was defined as surgical mask or N95/ KN95 respirator. The proper behavior of mask wearing was defined as not going out, wearing a mask whenever go out, or in crowded areas or when taking public transportation.

Anxiety symptoms were assessed by using the Chinese version of Generalized Anxiety Disorder tool (GAD-7). Evidence supported reliability and validity of the GAD-7 as a measure of anxiety in the general population [26,27]. Participants were asked how often seven symptoms had appeared in your life over the past two weeks on a 21-point scale ranging from "not at all" (0 points), "several days" (1 points), "more than half the days" (2 points) and "nearly every day" (3 points). The scores for symptom severity were 5–9 for mild, 10–14 for moderate, and 15–21 for severe [28]. A score of 10 or greater on the GAD-7 represents a reasonable cut point for identifying cases of GAD [29].

2.3. Statistical analysis

Descriptive statistics were conducted to describe the basic socio-demographic information, the worried and fear levels, the proper type of mask, and the proper behavior of mask. Continuous variables were shown as means ± standard deviations (SD), and categorical variables were expressed as frequencies (%). Student's *t*-test was performed to examine the difference in continuous variables, and the significance of the difference in categorical variables was assessed by chi-squared test. Several previous studies showed that improper mask wearing is another important attribute that play a significant role in increasing the risk of anxiety during the COVID-19 epidemic situation in teachers [30], thus, first, crude and multivariable-adjusted odds ratios (ORs) and their 95% confidence intervals (95% CIs) were estimated using logistic regression models to explore the relationship between mask wearing and anxiety symptoms stratified by gender and grade respectively. In the adjustment model, we adjusted the potential confounding factors including age, gender, residential location, worried level and fear level based on previous studies [29] and adjusted grade according to statistically different between the without anxiety group and the anxiety group to control our analysis. The collinearity diagnostic analysis results of worried level and fear level and GAD-7 scores showed that the condition index is less than 6 and VIF is less than 2. Furthermore, the effect of the interaction was detected by including the multiplicative interactions terms in the multivariate logistic regression models. Standardized partial regression coefficients are used to compare the relative contributions of independent variables to dependent variables. Considering that the type of mask wearing and the behavior of wearing a mask may have a synergistic effect on the prevalence of anxiety symptoms, we conducted an analysis to test the association between mask wearing practices and the risk of anxiety symptoms by multiple logistic regression. All data were analyzed using SPSS 21.0 (SPSS Inc., Chicago), and two-tailed *P* values <0.05 were considered statistically significant.

3. Results

3.1. Basic characteristics of participants

Among 386,432 junior and senior high school students aged 12–18 years were completed the online survey during the outbreak of COVID-19 in China. The overall anxiety symptoms prevalence was 9.84% among junior and senior high school students during COVID-19 pandemic in China. The prevalence was lower in females than males (9.61% vs. 10.05%), and the prevalence was lower in senior high school students than junior high school students (8.21% vs. 10.82%). The prevalence of anxiety symptoms was 11.23% in participants lived in rural regions, 9.52% in participants lived in Country-level city, and

8.78% found in participant lived in city. Table 1 showed the characteristics of participants by anxiety status. As compared to participants without anxiety symptoms, participants with anxiety symptoms were different from age, gender, grade, residential location, worried level, fear level, type of mask, and behavior of mask wearing (all $P < 0.05$).

3.2. The association between mask wearing and anxiety symptoms

In Table 2, 11.60% of students who did not know the proper type of mask to wear and 11.25% of students did not adhere to the proper behavior of mask wearing suffered from anxiety symptoms. As well as compared with students who did not know the proper type of mask, after adjusting for potential confounders, students who knew the proper type of mask were associated with a 22% (aOR = 0.78; 95%CI: 0.76–0.80) lower risk of anxiety symptoms. Similarly, students who exhibited the proper behavior of mask wearing had lower odds for anxiety symptoms than those who did not execute the proper behavior (aOR = 0.68; 95% CI: 0.62–0.74). The adjusted model showed that students who did not adhere to all the three parameters had 1.97 (95%CI: 1.74–2.22; $P_{trend} < 0.001$) times more risk of anxiety symptoms compared to their

Table 1
Characteristics of the study participants by anxiety status.

Characteristics	All participants n = 386,432	Without anxiety n = 348,401	With anxiety n = 38,031	P value
Age (years)	14.5 ± 1.7	14.5 ± 1.4	14.3 ± 1.7	<0.001
Gender (%)				
Male	200,768 (51.95)	180,582 (51.83)	20,186 (53.08)	<0.001
Female	185,664 (48.05)	167,819 (48.17)	17,845 (46.92)	
Grade (%)				<0.001
Junior	241,788 (62.57)	215,626 (61.89)	26,162 (68.79)	
Senior	144,644 (37.43)	132,775 (38.11)	11,869 (31.21)	
Residential location (%)				<0.001
City	167,693 (43.40)	152,972 (43.91)	14,721 (38.71)	
Rural	145,454 (37.64)	129,121 (37.06)	16,333 (42.95)	
Country-level city	73,285 (18.96)	66,308 (19.03)	6977 (18.35)	
Worried level (%)				<0.001
High	294,222 (76.14)	258,936 (74.32)	35,286 (92.78)	
Moderate	68,761 (17.79)	66,707 (19.15)	2054 (5.40)	
Low/none	23,449 (6.07)	22,758 (6.53)	691 (1.82)	
Fear level (%)				<0.001
High	199,919 (51.73)	167,764 (48.15)	32,155 (84.55)	
Moderate	133,789 (34.62)	129,517 (37.17)	4272 (11.23)	
Low/none	52,724 (13.64)	51,120 (14.67)	1604 (4.22)	
Type of mask wearing (%)				<0.001
Proper	247,758 (64.11)	225,809 (64.81)	21,949 (57.71)	
Improper	138,674 (35.89)	122,592 (35.19)	16,082 (42.29)	
Behavior of mask wearing (%)				0.001
Proper	381,260 (98.66)	343,811 (98.68)	37,449 (98.47)	
Improper	5172 (1.34)	4590 (1.32)	582 (1.53)	

Data were presented as mean (SD) normal distribution continuous variables and numbers (percentages) for categorical variables; P values calculated using student's t-test and chi-square.
Compared with No-anxiety, $P < 0.05$.

counterparts who observed all the measured parameters. Detailed information was displayed in Table 3.

3.3. The association between mask wearing and anxiety symptoms stratified by gender

Among the participants who did not know the proper type of mask, study found that 9231 (11.91%) male students and 6851 (11.20%) female students were experiencing anxiety symptoms (Table 2). The adjusted model showed that male students who know the proper type of mask to wear were at lower risk of anxiety symptoms (aOR = 0.76 (95% CI: 0.73–0.78) compared to male students who didn't know that knowledge. Similar result was found among female students (aOR = 0.81; 95%CI: 0.78–0.83). Multivariable regression models showed that male students who exhibited the proper behavior of mask wearing had higher odds of anxiety symptoms compared to those did not exhibit proper behavior (aOR = 0.65; 95%CI: 0.58–0.72). Similarly, this association was significant in female students (aOR = 0.76; 95%CI: 0.65–0.89). Meanwhile, generalized linear model was performed using analysis the interaction on anxiety symptoms. Significant interaction effects of gender and the type of mask wearing on anxiety symptoms risk were found ($p < 0.001$). There was a significant interaction effects of gender and the behavior of mask wearing on anxiety symptoms risk were found (p < 0.001). These results suggested that gender and mask wearing practice have a synergistic effect on the prevalence of anxiety symptoms. We separately calculated the standardized partial regression coefficients of male and female. The standardized partial regression coefficients of the type of mask wearing on anxiety symptoms risk (male = −0.280, female = −0.214). The standardized partial regression coefficients of the behavior of mask wearing on anxiety symptoms risk (male = −0.437, female = −0.276). From the statistical results, the relationship between the mask wearing practice and anxiety symptoms risk is stronger among male (Data not shown). Furthermore, we found that a significant association between adhering to the two practices were more likely to have anxiety symptoms compared to students who adhered the two practices among male students (aOR = 2.09; 95%CI: 1.81–2.42). Female students who did not adhere to the two practices were more likely to have anxiety symptoms compared to students who adhered well to all the practices (aOR = 1.68; 95%CI: 1.35–2.10). Detailed information was showed in Fig. 1.

3.4. The association between mask wearing and anxiety symptoms stratified by grade

Overall, among the students who did not know the proper type of mask, study found that 11,832 (12.81%) junior students and 4250 (9.18%) senior students were experiencing anxiety symptoms (Table 2). The adjusted model showed that junior students who know the proper type of mask to wear were at lower risk of anxiety symptoms (aOR = 0.75 (95%CI: 0.73–0.77) compared to junior students who didn't know that knowledge. Similar result was found among senior students (aOR = 0.84; 95%CI: 0.81–0.88). Multivariable regression models showed that junior students who exhibited the proper behavior of mask wearing had higher odds of anxiety symptoms compared to those did not exhibit proper behavior (aOR = 0.72; 95%CI: 0.64–0.80). Similarly, this association was significant in senior students (aOR = 0.60; 95%CI: 0.52–0.70). Moreover, the interaction effects were observed between grade and the type of mask on anxiety symptoms risk ($p < 0.001$), and the interaction effects were also observed between grade and the behavior of mask wearing on anxiety symptoms risk (p < 0.001). These results suggested that grade and mask wearing practice have a synergistic effect on the prevalence of anxiety symptoms. We also separately calculated the standardized partial regression coefficients of junior and senior high school students. The standardized partial regression coefficients of the type of mask wearing on anxiety symptoms risk (junior = −0.289, senior = −0.186). The standardized partial regression

Table 2
Association between mask wearing practice and anxiety.

Mask wearing practice	Type of mask wearing		P$_{interaction}$	Behavior of mask wearing		P$_{interaction}$
	Improper	Proper		Improper	Proper	
Total						
Cases/participants	16,082/138674	21,949/247758		582/5172	37,449/381260	
cOR (95% CI)	1.00 (ref)	0.74 (0.73–0.76)		1.00 (ref)	0.86 (0.79–0.94)	
aOR (95%CI)	1.00 (ref)	0.78 (0.76–0.80)		1.00 (ref)	0.68 (0.62–0.74)	
Gender			<0.001			<0.001
Male						
Cases/participants	9231/77509	10,955/123259		398/3349	19,788/197419	
cOR (95% CI)	1.00 (ref)	0.72 (0.70–0.74)		1.00 (ref)	0.83 (0.74–0.92)	
aOR (95%CI)	1.00 (ref)	0.76 (0.73–0.78)		1.00 (ref)	0.65 (0.58–0.72)	
Female						
Cases/participants	6851/61165	10,994/124499		184/1823	17,661/183841	
cOR (95% CI)	1.00 (ref)	0.77 (0.74–0.79)		1.00 (ref)	0.95 (0.81–1.10)	
aOR (95%CI)	1.00 (ref)	0.81 (0.78–0.83)		1.00 (ref)	0.76 (0.65–0.89)	
Grade			<0.001			<0.001
Junior						
Cases/participants	11,832/92366	14,330/149422		368/3113	25,794/238675	
cOR (95% CI)	1.00 (ref)	0.72 (0.70–0.74)		1.00 (ref)	0.90 (0.81–1.01)	
aOR (95%CI)	1.00 (ref)	0.75 (0.73–0.77)		1.00 (ref)	0.72 (0.64–0.80)	
Senior						
Cases/participants	4250/46308	7619/98336		214/2059	11,655/142585	
cOR (95% CI)	1.00 (ref)	0.83 (0.80–0.86)		1.00 (ref)	0.77 (0.67–0.89)	
aOR (95%CI)	1.00 (ref)	0.84 (0.81–0.88)		1.00 (ref)	0.60 (0.52–0.70)	

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; cOR, crude odds ratio
cOR: Unadjusted.
aOR: Adjusted for age, gender, grade, residential location, worried level and fear level.
P$_{interaction}$ is based on the interaction effect.

Table 3
Association between mask wearing practices and the risk of anxiety.

Mask wearing practices	Cases/ participants	cOR (95%CI)	aOR (95%CI)
Type & behavior			
P & P	21,708/245320	1.00 (ref)	1.00 (ref)
P & I	241/2438	1.13 (0.99–1.29)	1.35 (1.16–1.53)
I & P	15,741/135940	1.35 (1.32–1.38)	1.28 (1.25–1.31)
I & I	341/2734	1.47 (1.31–1.65)	1.97 (1.74–2.22)
P$_{trend}$		<0.001	<0.001

Abbreviations: cOR, crude odds ratio; aOR, adjusted odds ratio; CI, confidence interval; P & P, proper type & proper behavior; P & I, proper type & improper behavior; I & P, improper type & proper behavior; I &I, improper type &improper behavior; ref., reference.
cOR: Unadjusted.
aOR: Adjusted for age, gender, grade, residential location, worried level and fear level.

coefficients of the behavior of mask wearing on anxiety symptoms risk (junior = −0.341, senior = −0.529). From the statistical results, the relationship between the type of mask wearing and anxiety symptoms risk is stronger among junior high school students. However, the relationship between the behavior of mask wearing and anxiety symptoms risk is stronger among senior high school students (Data not shown). We found that a significant association between adhering to the two practices were more likely to have anxiety symptoms compared to students who adhered the two practices among junior students (aOR = 1.82; 95% CI: 1.56–2.12). Senior students who did not adhere to the two practices were more likely to have anxiety symptoms compared to students who adhered well to all the practices (aOR = 2.30; 95%CI: 1.88–2.80). Detailed information was showed in Fig. 2.

4. Discussion

This is a large-scale cross-sectional epidemiological study based on the data from junior and senior high school students in Henan Province, which has the largest educational population in China. Our findings indicated that the improper mask wearing practice were found to be
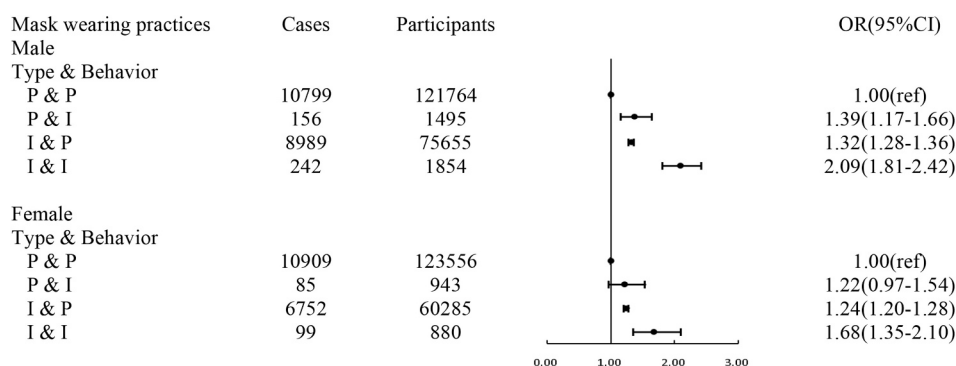

Mask wearing practices	Cases	Participants		OR(95%CI)
Male				
Type & Behavior				
P & P	10799	121764		1.00(ref)
P & I	156	1495		1.39(1.17-1.66)
I & P	8989	75655		1.32(1.28-1.36)
I & I	242	1854		2.09(1.81-2.42)
Female				
Type & Behavior				
P & P	10909	123556		1.00(ref)
P & I	85	943		1.22(0.97-1.54)
I & P	6752	60285		1.24(1.20-1.28)
I & I	99	880		1.68(1.35-2.10)

Fig. 1. Association between mask wearing practices and anxiety by gender. Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; P & P, proper type & proper behavior; P & I, proper type & improper behavior; I & P, improper type & proper behavior; I & I, improper type & improper behavior.
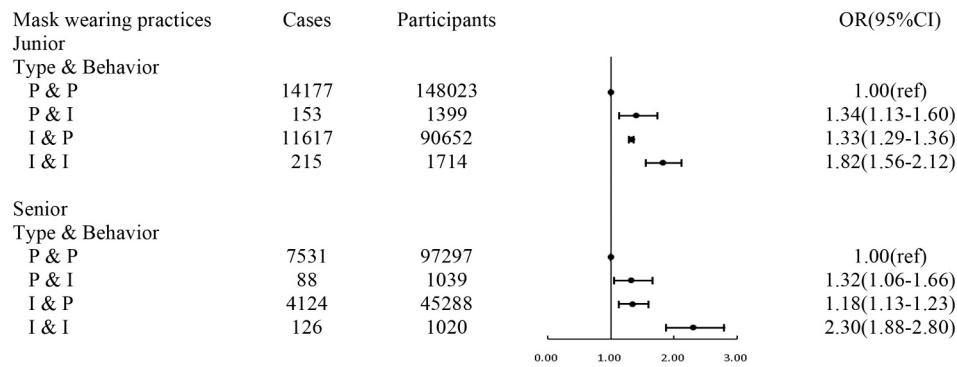
Mask wearing practices	Cases	Participants	OR(95%CI)
Junior			
Type & Behavior			
P & P	14177	148023	1.00(ref)
P & I	153	1399	1.34(1.13-1.60)
I & P	11617	90652	1.33(1.29-1.36)
I & I	215	1714	1.82(1.56-2.12)
Senior			
Type & Behavior			
P & P	7531	97297	1.00(ref)
P & I	88	1039	1.32(1.06-1.66)
I & P	4124	45288	1.18(1.13-1.23)
I & I	126	1020	2.30(1.88-2.80)

Fig. 2. Association between mask wearing practices and anxiety by grade. Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; P & P, proper type & proper behavior; P & I, proper type & improper behavior; I & P, improper type & proper behavior; I & I, improper type & improper behavior.

associated with the risk of anxiety symptoms in 386,432 junior and senior high school students during the COVID-19 outbreak. After adjusting the potential confounders, compared with students who completely adhered to the all the mask wearing practice, students who did not adhere to all the mask wearing practice had 1.97 times more likely to suffer from anxiety symptoms among junior and senior high school students.

Our study showed that students who knew the proper type of mask were associated with the decreased risk of anxiety symptoms among junior and senior high school students. To our knowledge, wearing proper type of mask can reduce the discharge of saliva and respiratory droplets from subclinical or mild COVID-19 patients [11]. As such study has shown a stronger decline in daily Covid-19 growth rates in 15 U.S. states after requiring face mask use in public could help in mitigating the spread of COVID-19 [31]. Obviously, wearing mask is a necessity as an important person protection equipment, it is perhaps the most-powerful psychological symbol for the general public [15]. Therefore, the study can suggest propaganda about proper type of mask wearing in schools to effectively fight anxiety symptoms. In addition, we also found that the students who knew the proper behavior of mask wearing were also reduced the risk of anxiety symptoms. Previous studies had indicated that frequency of wearing a face mask had protective associations with mental health among children and adolescents during the COVID-19 pandemic [22]. Another data showed that face mask group seemed less worried [32]. This suggests that we need to strengthen the promotion of proper behavior of mask wearing to reduce the risk of anxiety symptoms. Of note, some studies have found that mask increased anxiety and stress [33]. The shortage of mask supply and wearing discomfort may confuse the association between mask and the risk of anxiety symptoms during the COVID-19 pandemic. Thus, the supply of masks should be guaranteed and we also need to further improve the design for comfort.

The association between the type and behavior of mask wearing, and risk of anxiety symptoms by gender group showed that wearing a mask may contribute to control the anxiety symptoms among junior and senior high school students. The results after gender stratification analysis are similar to the main results. We also discussed that the association between the type and behavior of mask wearing, and risk of anxiety symptoms by grade and found the similar results with the main results, too. So, our results were essentially robust. In general, moderate anxiety is a necessary condition for people to adopt preventive behaviors. On the other hand, some people never feel anxious, so they act recklessly. However, because the COVID-19 virus is too serious, people are generally afraid of it, and masks may be the most powerful psychological protection at present [15]. Therefore, during this period, students who knew proper mask wearing practice were associated with the decreased risk of anxiety symptoms. However, Lee et al. demonstrated that none of the 1500 adults enrolled in their study, correctly completed all the necessary steps to apply a face mask [34]. Therefore, effort is required to enhance the proper practice of using face mask, and support the policy of mask wearing practice in safeguarding the psychological well-being of the junior and senior high school students.

To our knowledge, this study examined the association between wearing masks and anxiety symptoms in a large representative sample of junior and senior school students in China, and may provide information for schools in other regions with similar health systems. Secondly, as a province with the largest education population in China, which is representative of students' anxiety symptoms during the period of the COVID-19 to some extent. Thirdly, we used the standardized questionnaire (GAD-7) to diagnose anxiety symptoms, which is a simple and highly effective self-assessment tool for anxiety symptoms.

Nevertheless, there are some limitations that should be considered when interpreting our results. First, although the multivariable-adjusted logistic regression models were performed to estimate the association between mask-wearing and anxiety symptoms, the possibility of other potential confounding factors remain cannot be ruled out, such as the cognitive level of the COVID-19, which may affect the prevalence of anxiety symptoms. Second, since this is a cross-sectional design, it lacks temporality and cannot be determined whether it is a causal association. Third, the participants in this study were junior and senior high school students, which may limit the extension of our findings to other grade students. Fourth, it is not clear how many students declined the invitation. The characteristics of those who did not submit the questionnaire and the response rate of each cluster were not accurately obtained, and there might be a certain degree of selection biases. The fifth limitation of this study is the unknown validity of the questionnaire regarding worried level and fear level. Finally, recall bias and social desirability bias may be caused by the self-reported property of the research.

In this large sample cross-sectional study, it was found that mask wearing may be an intervention indicator to reduce the anxiety symptoms during COVID-19 epidemic among junior and senior school students. Based on these findings, promoting the proper wearing of masks may be considered as part of the prevention of anxiety symptoms in the follow-up work.

Author statement

Role of funding source

Availability of data and material

All relevant data and material that support the findings of this study are available on request from Ms. Cuiping Wu (wucuiping@zzu.edu.cn).

Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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