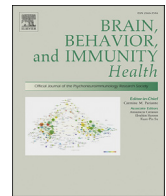


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Full Length Article

## Knowledge and attitudes of medical staff in Chinese psychiatric hospitals regarding COVID-19

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## ABSTRACT

On March 11, 2020, the World Health Organization (WHO) declared the novel coronavirus COVID-19 a pandemic. There are patients in psychiatric hospitals in China who have been infected with COVID-19, however, the knowledge and attitudes of psychiatric hospital staff towards infectious diseases and their willingness to work during the COVID-19 outbreak has not yet been investigated. This study was performed to assess the knowledge and attitudes of medical staff in two Chinese mental health centers during the COVID-19 outbreak. We included 141 psychiatrists and 170 psychiatric nurses in the study. We found that during the COVID-19 epidemic, 89.51% of the medical staff of the psychiatric hospitals studied had extensive knowledge of COVID-19, and 64.63% of them received the relevant training in hospitals. Furthermore, about 77.17% of participants expressed a willingness to care for psychiatric patients suffering from COVID-19 virus infection. Independent predictors of willingness to care for patients included advanced training and experience of caring for patients with COVID-19. In conclusion, this study suggests that increased attention should be paid to the knowledge and attitudes of medical staff at psychiatric hospitals during the COVID-19 outbreak.

## 1. Introduction

Since December 2019, the novel coronavirus disease (COVID-19) has spread from Wuhan city to other cities in China and around the world (Wang et al., 2020). On March 11, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic. As of March 15, 2020, there had been 81,058 confirmed cases and 3204 deaths due to the virus in China.

A cross-sectional epidemiological study in China reported that the weighted lifetime prevalence of psychiatric disorders excluding dementia was 16.6% (95% CI: 13.0–20.2) (Huang et al., 2019). It is estimated that tens of millions of people with psychiatric disorders in China are at risk of infection with the COVID-19 virus. More than one hundred patients with psychiatric disorders in Wuhan city have been infected with the virus. Psychiatric medical staff are faced with the task of treating psychiatric patients infected with COVID-19. The virus is highly infectious and has a

fatality rate of about 4% in China (Chen et al., 2020b). Because of the high risk of infection, psychiatric medical staff must work under great pressure when dealing with these patients. The knowledge and attitudes of medical staff in Chinese psychiatric hospitals regarding COVID-19 are important in achieving victory in the battle against the epidemic.

Previous studies have explored the knowledge and attitudes of medical staff towards infectious diseases and their willingness to work during an epidemic (Askarian et al., 2007; Sarani et al., 2016; Angelillo et al., 2001; Daugherty et al., 2009). Ma et al., reported on a study of the knowledge and attitudes of critical care clinicians during the 2009 H1N1 influenza pandemic. They found that only 82.3% of medical staff expressed a willingness to care for H1N1 patients. However, there is no study focused on psychiatric medical staff during an epidemic outbreak.

The purpose of our study was to assess the knowledge and attitudes of medical staff in Chinese mental health centers during the COVID-19 outbreak. In addition, we tried to identify independent factors affecting

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willingness to work with COVID-19-infected patients with psychiatric disorders, to formulate an effective strategy to improve the preparedness of staff.

## 2. Methods

### 2.1. Ethical approval

All research was conducted with integrity and in line with generally accepted ethical principles and approved by the Research Ethics Committee of Chaohu Hospital, Anhui Medical University (202001-kyxm-01), and Wuxi Mental Health Center, Nanjing Medical University (WUX-IMHCIRB2020-005). We conducted the survey with the agreement of the medical staff. All personal information of the medical staff involved in the survey has been kept confidential.

### 2.2. Survey questionnaire and protocol

Based on the study of Daugherty et al. (2009), a 33-item survey questionnaire was designed to assess the knowledge and attitudes of medical staff in Chinese psychiatric hospitals regarding the COVID-19 (see supplementary material). We produced and distributed the questionnaire and collected relevant data through the online survey tool Questionnaire Star, a professional online survey evaluation, and voting platform. Questionnaire Star permits questionnaire design, data collection, custom reporting, and analysis of results.

From February 1–15, 2020, the questionnaire link was sent to 200 psychiatrists and nurses, and 10 psychiatrist groups (approximately 20 chat groups of between 8 and 120 participants) from the author's Wechat account. Wechat is the most widely used social media platform in China. Each member of the medical staff in the psychiatric hospitals was invited to answer the questionnaire and requested to forward the questionnaire link to others. A total of 311 questionnaires were collected.

### 2.3. Survey questionnaire

Data on the demographic characteristics of respondents, including age, sex, marital status, living status, the status of influenza vaccination, and profession, were recorded. The professional status of the respondents was categorized as a psychiatrist or nurse. The respondents were asked to report their experience of caring for COVID-19 patients, and on any relevant training they had received. They were also required to report the level of knowledge and the level of confidence in their ability to protect themselves and their patients from exposure to influenza at work. A 5-point Likert-scale (completely agree, agree, neither agree nor disagree, disagree and completely disagree) was used to categorize the answers. Finally, the respondents were asked to report their willingness to care for psychiatric patients infected with the COVID-19 virus.

### 2.4. Statistical analysis

The data were expressed as mean  $\pm$  standard deviation (SD). All Likert-scale responses were dichotomized into complete agree/agree versus neither agree nor disagree/disagree/completely disagree and expressed in proportions. Continuous variables were compared with the use of the Student's t-test or Mann-Whitney test. The chi-square test was used to compare categorical variables. For the determination of independent predictors for willingness to care for psychiatric patients suffering from COVID-19 infection, the odds ratio (OR) was estimated based on multivariate logistic regression analysis. Variables including profession, knowledge, and attitudes were added into the model using stepwise conditional forward entry if  $P < 0.1$  in the univariate analysis. An OR of less than 1 was associated with a lower likelihood of caring for psychiatric patients suffering from the COVID-19, while an OR of greater than 1 was associated with a higher likelihood of caring for the psychiatric patients suffering from the COVID-19.

## 3. Results

### 3.1. Characteristics of participants

A total of 311 questionnaires were collected and 141 psychiatrists and 170 psychiatric nurses were included in the study. The demographic data of the medical staff are shown in Table 1. The mean age of participants was  $33.74 \pm 8.08$  years, and the psychiatric nurses were younger than the psychiatrists ( $30.66 \pm 5.04$  for nurses vs.  $37.47 \pm 9.41$  for psychiatrists). There were more males among the psychiatrists (64.54%) compared to nurses (34.71%). There were significant differences in education between the psychiatrists and nurses ( $18.05 \pm 2.42$  years for psychiatrists vs.  $16.59 \pm 1.39$  years for nurses). More nurses were single compared with the psychiatrists (Table 1).

### 3.2. Knowledge of the risks of COVID-19 and protection strategies

Twenty-three respondents (7.40%) reported having experience of caring for suspected or confirmed COVID-19-infected patients, and 201 (64.63%) had finished a COVID-19 training program (Table 2). Although only 64.63% of respondents received training, 89.51% of participants said that they had adequate knowledge of the COVID-19 epidemic. Apart from the training program organized by their hospitals, various media (including the internet, television, and newspapers) were also major sources of knowledge. Moreover, significantly more physicians (38.30%) obtained their relevant knowledge from medical journals compared with nurses (7.06%, Table 2). Among 311 respondents, 246 (79.10%) reported having extensive knowledge, and 245 (78.78%) expressed confidence in their ability to protect themselves and their patients. Notably, although fewer psychiatrists were trained than psychiatric nurses (54.61% vs. 72.94%), a greater proportion of psychiatrists (84.39%) expressed confidence in their ability to protect themselves and their patients than nurses (74.12%) in the study (Table 2).

### 3.3. Predictors of willingness to care for psychiatric patients suffering from COVID-19 infection

A total of 240 respondents (77.17%) expressed a willingness to care for psychiatric patients suffering from COVID-19 infection. The most common reasons for being unwilling to care for these patients included concern about infection of family members (60/113, 53.09%) and themselves (55/113, 48.67%). Analyzing the data by the sex, age, education, and marital status of the respondents, univariate analysis showed no difference between their willingness to care for psychiatric patients suffering from COVID-19 infection (Table 3). In addition, there was no difference between psychiatrists and nurses in willingness to care for these patients after univariate analysis (Table 3). Logistic regression analysis revealed that advanced training, experience of caring for patients with COVID-19, and the confidence of knowing the risks and how to protect themselves and the inpatients were the independent variables associated with a greater likelihood of accepting to care for infected patients (Table 4).

## 4. Discussion

In this study, we demonstrated that, during the COVID-19 epidemic, 89.51% of the medical staff of psychiatric hospitals studied had extensive knowledge of COVID-19, and that 64.63% of them received relevant training in hospitals. In addition, 77.17% of participants were willing to care for psychiatric patients suffering from infection with the COVID-19 virus. Independent predictors of willingness to care for patients included advanced training, experience of caring for patients with COVID-19, and the confidence to know the risk and how to protect themselves and their patients.

In this study, we found that just over half of the participants had finished a COVID-19 training program. Previous studies have shown that

**Table 1**  
Demographic data of psychiatrists and nurses in Chinese psychiatric hospitals.

Characteristics	Total (n = 311)	Psychiatrists (n = 141)	Nurses (n = 170)	t/ $\chi^2$	P
Age (years)	33.74 ± 8.08	37.47 ± 9.41	30.66 ± 5.04	8.127	<0.001
Male (%)	202 (48.23)	91 (64.54)	59 (34.71)	27.473	<0.001
Education (years)	17.25 ± 2.06	18.05 ± 2.42	16.59 ± 1.39	6.663	<0.001
Marital Status (%)				2.623	0.269
	Single	141 (45.34)	57 (40.43)	84 (49.41)	
	Married	157 (50.48)	77 (54.61)	80 (40.06)	
	Other	13 (4.18)	7 (4.96)	6 (3.53)	

**Table 2**  
Knowledge of psychiatrists and nurses in Chinese psychiatric hospitals during the COVID-19 outbreak.

Question	Total (n = 311)	Psychiatrists (n = 141)	Nurses (n = 170)	$\chi^2$	P	
I have the experience caring for the patients with COVID-19	23 (7.40)	9 (6.38)	14 (8.24)	0.386	0.534	
I have finished COVID-19 training program	201 (64.63)	77 (54.61)	124 (72.94)	11.330	0.001	
I had the knowledge of COVID-19 <sup>a</sup>	273 (89.51)	115 (81.56)	158 (92.94)	9.308	0.002	
Sources of knowledge						
	Television	79 (25.40)	20 (14.18)	59 (34.70)	17.129	<0.001
	Newspaper	5 (1.61)	3 (2.13)	2 (1.18)	0.441	0.507
	Internet	201 (64.63)	89 (63.12)	112 (65.88)	0.257	0.612
	Scientific journal	66 (21.22)	54 (38.30)	12 (7.06)	44.990	<0.001
	Education	257 (82.64)	110 (78.01)	147 (86.47)	3.841	0.050
I am confident that I understand the risks of an epidemic for patients and medical staffs <sup>a</sup>	246 (79.10)	117 (82.97)	129 (75.88)	2.348	0.125	
I am confident that I know how to protect myself and my patients during an epidemic <sup>a</sup>	245 (78.78)	119 (84.39)	126 (74.12)	4.872	0.027	

Data are expressed as n (%).

<sup>a</sup> The percentages reflect a complete agree or agree response to each question.

**Table 3**  
Predictors of willingness to care for the psychiatric patients suffering from the COVID-19: univariate analysis.

	Unwillingness to care for the psychiatric patients suffering from the COVID-19 (n = 71)	Willingness to care for the psychiatric patients suffering from the COVID-19 (n = 240)	t/ $\chi^2$	P
Male sex	45 (63.38)	157 (65.41)	0.100	0.752
Age	33.89 ± 8.20	33.71 ± 8.07	0.164	0.870
Education	17.23 ± 2.24	17.26 ± 2.00	-0.119	0.906
Married	37 (52.11)	119 (49.58)	0.140	0.708
Profession			0.241	0.623
	Psychiatrists	34 (47.89)	107 (44.58)	
	Nurses	37 (52.11)	133 (55.41)	
I have the experience caring for patients with COVID-19	10 (14.08)	13 (5.42)	6.011	0.014
I have finished COVID-19 training program	30 (42.25)	171 (71.25)	20.153	<0.001
I am confident that I understand the risks of COVID-19 epidemic for the patients and medical staffs <sup>a</sup>	46 (64.79)	201 (83.75)	12.053	0.001
I am confident that I know how to protect myself and my patients during COVID-19 epidemic <sup>a</sup>	45 (63.38)	200 (83.33)	13.048	<0.001

Data are expressed as mean ± standard deviation (SD), or n (%).

<sup>a</sup> The percentages reflect a complete agree or agree response to each question.

**Table 4**  
Predictors of willingness to care for the psychiatric patients suffering from the COVID-19.

Variable	OR	95% CI	P
Profession	0.875	0.515–1.488	0.623
Finishing COVID-19 training program	3.387	1.959–5.856	<0.001
Experience of caring for patients with COVID-19	0.349	0.146–0.835	0.018
Confident to know the risks of COVID-19 epidemic for the patients and medical staffs <sup>a</sup>	2.978	1.647–5.384	<0.001
Confident to know how to protect themselves and their patients <sup>a</sup>	2.889	1.601–5.213	<0.001

<sup>a</sup> The percentages reflect a complete agree or agree response to each question. OR, Odds Ratio; CI, Confidence Interval.

training by hospitals and related organizations plays a vital role in the prevention of infectious diseases (Kanjee et al., 2011; Sachan et al., 2012; Anuradha and Dandekar, 2014; Paudyal et al., 2008). Hidiröglu et al. (2010) reported that it is important to empower healthcare workers by supporting their ability to acquire and use evidence-based information. Other studies have suggested that the implementation of appropriate education and protective measures improved staff members' willingness to work (Sergachis et al., 2011; Qureshi et al., 2005). Our study also revealed that advanced training was an independent variable associated with a greater likelihood to be willing to care for psychiatric patients suffering from the COVID-19. Therefore, we recommend that psychiatric hospitals in China should strengthen the training of staff on COVID-19-related information and practice. Some psychiatrists learned

about COVID-19 from medical journals. Many research studies of COVID-19 have been published since the outbreak began (Bai et al., 2020; Xu et al., 2020; Wu and McGoogan, 2020) and psychiatrists can better understand the etiology, pathology, and treatment of COVID-19 from these reports. In addition, we must better understand the epidemiological characteristics of COVID-19.

This study demonstrated that, during the COVID-19 epidemic, only 7.40% of the medical staff of the psychiatric hospitals studied had experience of caring for suspected or confirmed patients with COVID-19. In the early days of the COVID-19 outbreak, doctors from departments of infectious diseases, intensive care medicine, and respiratory medicine devoted themselves to the fight against the epidemic. Psychiatrists provided support mainly through the psychological intervention hotline during this period (Liu et al., 2020; Chen et al., 2020a; Duan and Zhu, 2020) since psychiatrists and psychiatric nurses lacked the clinical experience and skills to combat the epidemic.

In the study, only 77.17% of participants expressed a willingness to care for psychiatric patients suffering from COVID-19 infection. This percentage differed from other studies on this subject in China. Ma et al., reported that more than 82% of respondents were willing to care for H1N1 patients. Compared with the H1N1 epidemic, COVID-19 has shown more infectivity and a higher fatality rate (Luo et al., 2020). In addition, the detailed characteristics of COVID-19 are currently unknown. These reasons may explain why more than 20% of the interviewed medical staff expressed a reluctance to treat psychiatric patients with COVID-19 infection. Notably, the most common reasons for unwillingness to care for the patients included a concern about infection of family members and themselves. With a deeper understanding of COVID-19, we believe that the number of medical staff who are willing to treat these patients would gradually increase.

Finally, this study had several limitations. First, we could not exclude the possible impact of selection bias. However, we enrolled the participants through Wechat, the most widely used social tool in China, which has a powerful friend's network. This makes it possible to administer questionnaires via WeChat using a convenience sampling method (Zhang et al., 2017). Second, this study was conducted in two psychiatric hospitals, possibly limiting the generalization of findings to other hospitals, for example, the psychiatry departments of general hospitals. Finally, the results of this study are based on a self-reported questionnaire. Previous studies have suggested that self-reported practice might not represent actual practice (Brunkhorst et al., 2008). Therefore, more research is needed to confirm the findings of this study.

## 5. Conclusion

This study raises some important concerns about the adequacy of knowledge of the medical staff of psychiatric hospitals about COVID-19 during the outbreak. There is a clear need for training programs, to improve the understanding of the risks and prevention strategies among critical care clinicians. This should, in turn, improve the confidence of clinicians to provide the right care to their patients and protect themselves as well.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.bbih.2020.100064>.

## Author contribution

Concept and design: K. Zhang, H. Liu. Acquisition, analysis, and interpretation of data: Y. Shi, J. Wang, Y. Yang, Z. Wang, G. Wang, K. Hashimoto, K. Zhang. Drafting of the manuscript: K. Zhang. Critical revision of the manuscript: K. Hashimoto, H. Liu. Statistical analysis: Y. Shi, J. Wang, Y. Yang, K. Zhang. Supervision: K. Zhang, H. Liu.

## References

- Angelillo, I.F., Viggiani, N.M.A., Greco, R.M., Eito, D., 2001. HACCP and food hygiene in hospitals: knowledge, attitudes, and practices of food-services staff in Calabria, Italy. *Infect. Control Hosp. Epidemiology* 22 (6), 363–369.
- Anuradha, M., Dandekar, R.H., 2014. Knowledge, Attitude and Practice among food handlers on food borne diseases: a hospital based study in tertiary care hospital. *Int. J. Biomed. Adv. Res.* 5 (4), 196–198.
- Askarian, M., McLaws, M.L., Meylan, M., 2007. Knowledge, attitude, and practices related to standard precautions of surgeons and physicians in university-affiliated hospitals of Shiraz, Iran. *Int. J. Infect. Dis.* 11 (3), 213–219.
- Bai, Y., Yao, L., Wei, T., Tian, F., Jin, D.Y., Wang, M., 2020. Presumed asymptomatic carrier transmission of COVID-19. *J. Am. Med. Assoc.* <https://doi.org/10.1001/jama.2020.2565>, 2020 Feb 21.
- Brunkhorst, F.M., Engel, C., Ragaller, M., Welte, T., Rossaint, R., Gerlach, H., Mayer, K., John, S., Stuber, F., Weiler, N., Oppert, M., Moerer, O., Bogatsch, H., Reinhart, K., Loeffler, M., Hartog, C., German Sepsis Competence Network (SepNet), 2008. Practice and perception—a nationwide survey of therapy habits in sepsis. *Crit. Care Med.* 36 (10), 2719–2725.
- Chen, H., Guo, J., Wang, C., Luo, F., Yu, X., Zhang, W., Li, J., Zhao, D., Xu, D., Gong, Q., Liao, J., Yang, H., Hou, W., Zhang, Y., 2020a. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet* 395 (10226), 809–815.
- Chen, Q., Liang, M., Li, Y., Guo, J., Fei, D., Wang, L., He, L., Sheng, C., Cai, Y., Li, X., Wang, J., Zhang, Z., 2020a. Mental health care for medical staff in China during the COVID-19 outbreak. *Lancet Psychiatr.* [https://doi.org/10.1016/S2215-0366\(20\)30078-x](https://doi.org/10.1016/S2215-0366(20)30078-x), 2020 Feb. 18.
- Daugherty, E.L., Perl, T.M., Rubinson, L., Bilderback, A., Rand, C.S., 2009. Survey study of the knowledge, attitudes, and expected behaviors of critical care clinicians regarding an influenza pandemic. *Infect. Control Hosp. Epidemiol.* 30 (12), 1143–1149.
- Duan, L., Zhu, G., 2020. Psychological interventions for people affected by the COVID-19 epidemic. *Lancet Psychiatr.* [https://doi.org/10.1016/S2215-0366\(20\)30073-0](https://doi.org/10.1016/S2215-0366(20)30073-0), 2020 Feb 18.
- Hidiroglu, S., Ay, P., Topuzoglu, A., Kalafat, C., Karavus, M., 2010. Resistance to vaccination: the attitudes and practices of primary healthcare workers confronting the H1N1 pandemic. *Vaccine* 28 (51), 8120–8124.
- Huang, Y., Wang, Y., Wang, H., Liu, Z., Yu, X., Yan, J., Yu, Y., Kou, C., Xu, X., Lu, J., Wang, Z., He, S., Xu, Y., He, Y., Li, T., Guo, W., Tian, H., Xu, G., Xu, X., Ma, Y., Wang, L., Wang, L., Yan, Y., Wang, B., Xiao, S., Zhou, L., Li, L., Tan, L., Zhang, T., Ma, C., Li, Q., Ding, H., Geng, H., Jia, F., Shi, J., Wang, S., Zhang, N., Du, X., Du, X., Wu, Y., 2019. Prevalence of mental disorders in China: a cross-sectional epidemiological study. *Lancet Psychiatr.* 6 (3), 211–224.
- Kanjee, Z., Catterick, K., Moll, A.P., Amico, K.R., Friedland, G.H., 2011. Tuberculosis infection control in rural South Africa: survey of knowledge, attitude and practice in hospital staff. *J. Hosp. Infect.* 79 (4), 333–338.
- Liu, S., Yang, L., Zhang, C., Xiang, Y.T., Liu, Z., Hu, S., Zhang, B., 2020. Online mental health services in China during the COVID-19 outbreak. *Lancet Psychiatr.* [https://doi.org/10.1016/S2215-0366\(20\)30077-8](https://doi.org/10.1016/S2215-0366(20)30077-8), 2020 Feb 18.
- Luo, H., Tang, Q., Shang, Y., Liang, S.B., Yang, M., Robinson, N., Liu, J.P., 2020. Can Chinese medicine be used for prevention of corona virus disease 2019 (COVID-19)? A review of historical classics, research evidence and current prevention programs. *Chin. J. Integr. Med.* <https://doi.org/10.1007/s11655-020-3192-6>, 2020 Feb 17.
- Ma, X., He, Z., Wang, Y., Jiang, L., Xu, Y., Qian, C., Sun, R., Chen, E., Hu, Z., Zhou, L., Zhou, F., Qin, T., Cao, X., Zn, Y., Syn, R., Zhang, X., Lin, J., Ai, Y., Wu, D., Du, B., China Critical Care Clinical Trial Group (CCCCTG), 2011. Knowledge and attitudes of healthcare workers in Chinese intensive care units regarding 2009 H1N1 influenza pandemic. *BMC Infect. Dis.* 11(1), 24.
- Paudyal, P., Simkhada, P., Bruce, J., 2008. Infection control knowledge, attitude, and practice among Nepalese health care workers. *Am. J. Infect. Contr.* 36 (8), 595–597.
- Qureshi, K., Gershon, R.R.M., Sherman, M.F., Straub, T., Gebbie, E., McCollum, M., Erwin, M.J., Morse, S.S., 2005. Health care workers' ability and willingness to report to duty during catastrophic disasters. *J. Urban Health* 82 (3), 378–388.
- Sachan, R., Patel, M.L., Nischal, A., 2012. Assessment of the knowledge, attitude and practices regarding biomedical waste management amongst the medical and paramedical staff in tertiary health care centre. *Int. J. Sci. Res. Publ.* 2 (7), 1–6.

- Sarani, H., Balouchi, A., Masinaeinzhad, N., Ebrahimitabas, E., 2016. Knowledge, attitude and practice of nurses about standard precautions for hospital-acquired infection in teaching hospitals affiliated to Zabol University of Medical Sciences (2014). *Global J. Health Sci.* 8 (3), 193–198.
- Stergachis, A., Garberson, L., Lien, O., D'Ambrosio, L., Sangaré, L., Dold, C., 2011. Health care workers' ability and willingness to report to work during public health emergencies. *Disaster Med. Public Health Prep.* 5 (4), 300–308.
- Wang, C., Horby, P.W., Hayden, F.G., Gao, G.F., 2020. A novel coronavirus outbreak of global health concern. *Lancet* 395 (10223), 470–473.
- Wu, Z., McGoogan, J.M., 2020. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. *J. Am. Med. Assoc.* <https://doi.org/10.1001/jama.2020.2648>, 2020 Feb 24.
- Xu, Z., Shi, L., Wang, Y., Zhang, J., Huang, L., Zhang, C., Liu, S., Zhao, P., Liu, H., Tai, Y., Bai, C., Gao, T., Song, J., Xia, P., Dong, J., Zhao, J., Wang, F.S., 2020. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. *Lancet Respir. Med.* [https://doi.org/10.1016/S2213-2600\(20\)30076-X](https://doi.org/10.1016/S2213-2600(20)30076-X), 2020 Feb 18.
- Zhang, X., Wen, D., Liang, J., Lei, J., 2017. How the public uses social media Wechat to obtain health information in China: a survey study. *BMC Med. Inf. Decis. Making* 17 (2), 66.