

A study on mental health status among the staff in a designated hospital for COVID- 19

Bangfang Wang

Shanghai Public Health Clinical Center

Jianjun Sun

Shanghai Public Health Clinical Center

Feng Gao

Shanghai Public Health Clinical Center

Jun Chen

Shanghai Public Health Clinical Center

Lei Shi

Shanghai Public Health Clinical Center

Lanying Li

Shanghai Public Health Clinical Center

Yongjun Tang

Shanghai Public Health Clinical Center

Kun Wang

The Second People's Hospital of Lu'an

Hongzhou Lu (✉ luhongzhou@fudan.edu.cn)

Shanghai Public Health Clinical Center Affiliated to Fudan University Shanghai, 201508

Research article

Keywords: COVID-19, designated hospital, staff, depression, panic disorder

Posted Date: April 30th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-23224/v1>

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Abstract

Background: We investigate the mental health status of all the staff members who worked for the designated hospital during the initial stage of COVID-19, so as to understand the severity of mental health problems, and analyze the risk factors.

Methods: Through the patients health questionnaire-9(PHQ-9) and panic disorder severity scales(PDSS), we surveyed the status of depression and panic disorder of the staff who participated in the prevention and treatment of COVID-19 in designated hospital in the early stage of epidemic. The data is described by the number of cases (percentage), median and interquartile range. The chi square test was used for categorical variables and the rank sum test was used for continuous variables. The risk factors of severe depression or panic disorder were analyzed by binary logistic regression test.

Results: Totally 702 questionnaires were sent out and 694(98.9%) was received and qualified, the median score of PHQ-9 among all the staff was 1 (IQR,0-4), 143(20.6%) of them had depression, 39 (5.6%) had serious depression; the median score of PDSS was 2 (IQR,0-5), 81 (11.7%) of them had panic disorder and 47(6.7%) of them had severe panic disorder; Among the people in different work lines, the first-line staff scored the highest: PHQ-9 score was 4 (0-8); PDSS score was 4 (1-9), which were significantly higher than the second-line and third-line staff ($P < 0.001$). Multivariate logistic regression analysis showed that the adjusted risk of severe depression in first-line staff was 6.63 fold($P < 0.001$); the risk of severe panic disorder was 2.62 fold ($P = 0.003$) higher than that of non-first line group.

Conclusions: Many staff in the designated hospital for COVID-19 have mental health problems. Among them, first-line workers are a high-risk group with severe depression and panic disorder, and further psychological intervention is needed for them.

Background

The novel coronavirus pneumonia (NCP) is a pneumonia caused by the severe acute respiratory syndrome coronavirus 2(SARS-CoV-2)[1]. It was firstly reported in Wuhan, Hubei province in December 2019[2]. Then the name of novel coronavirus pneumonia was revised to Coronavirus Disease 2019(COVID-19) by WHO[3]. The epidemic is characterized by human to human transmission[4], with high infectivity during incubation[5], so the prevention and control of the epidemic is facing more challenges[6]. At this stage, the global spread of COVID-19 continues to grow, and the full extent and severity of this outbreak remains to be seen[7]. Under this epidemic, health care workers are striving to fight for the COVID-19 and the epidemic could cause a parallel epidemic of fear, anxiety, and depression[8]. During the period of SARS in 2003, the mental health of many medical workers who participated in the control of coronavirus infection was affected[9-11]. As the total number of people infected by COVID-19 currently far exceeds those stricken by the 2003 SARS-CoV epidemic[12]. Since the outbreak of the COVID-19 epidemic, there have been some mental health research reports[12,13], mainly focused on the front-line medical staff and general public. However, COVID-19 is often admitted in designated hospitals, consequently, a number of medical care giver in the hospital and medical personnel are involved in the treatment, including laboratory technician, scientific researcher, administrator, and logistic service supporter. The mental health of all the staff members may be affected in the epidemic, but the research of this aspect is scarce.

Shanghai public health clinical center, as a designated medical center for the treatment of COVID-19 in Shanghai municipality, the medical staff need to contact the confirmed patients directly or indirectly, which may cause a series of psychological state changes. This study will investigate the mental health status of all the staff members who worked for the center during the initial stage of COVID-19, so as to understand the mental health problems such as depression and panic disorder, and analyze the risk factors, so as to help to make target intervention strategies.

Methods

Objectives

From January 15 to February 10, 2020, a total of 702 people who worked as physician, nurse, laboratory technician, scientific researcher, administrator, logistics service personnel in our hospital participated in this survey. The survey was conducted from February 8 to February 10, and each questionnaire was completed by the participant within 10-15 minutes. All subjects provided written informed consent(electronic version) prior to the initiation of study procedures.

Questionnaires

According to patients health questionnaire-9(PHQ-9) for depression self-assessment scale and panic disorder severity scale Chinese version(PDSS-CV) for panic disorder, the questionnaire of depression and panic disorder of medical staff in designated hospital of COVID-19 was adapted by mental health professionals. Both PHQ-9 and PDSS-CV are valid and reliable in Chinese population[14,15]. The contents of the questionnaire include: (1) basic characteristics of the staff, including occupations(physician, nurse, laboratory technician, scientific researcher, administrator, logistics service supporter), gender, age (18-30, 31-40, 41-50, or >50 years), working years(0-5, 6-10, 11-15, or >16 years), educational level (\leq undergraduate or \geq postgraduate), technical title (junior, intermediate, or senior). The different technical titles of respondents refer to the professional titles certificated by our hospital. (2) PHQ-9 self rating depression scale questions (comprising 9 items; range, 0-27); and (3) PDSS

panic disorder severity scale questions (comprising 7 domains; range, 0-28). According to the criteria of PHQ-9, the score is 0-4 for normal, 5-9 for mild depression, 10-14 for moderate depression, and more than 15 for severe depression. According to the criteria of PDSS, 0-3 is normal; 3-7 is borderline; 8-10 is slightly panic; 11-15 is moderately panic and more than 16 is markedly panic. Participants with PHQ-9 score more than 10 points, or PDSS score more than 11 points, we defined it as severe status of depression[13] or panic disorder[16]. Full-time staff in the department of hospital infection and control conduct questionnaire surveys(702 copies) through an online survey platform(Survey Star, Changsha Ranxing Science and Technology, Shanghai, China) to the participants, and the survey results were reviewed by two individuals. Eight copies of questionnaires were removed because of incomplete or contradictory in content.

Participants were asked about their work lines. The definition of work lines: the staff working in the isolation area was the first line; the staff working in fever clinic, outpatient and emergency department, laboratory were the second line; the staff who did not need to directly contact the COVID-19 patients, such as administrator and logistics supporter, were the third line.

Statistical analysis

The questionnaire results were input into Excel and analyzed by SPSS 24.0(IBM SPSS, Inc., Armonk, NY, USA). The data is described by the number of cases (percentage), median and interquartile range(IQR). The chi square test was used for categorical variables and the rank sum test was used for continuous variables. The risk factors of severe depression or panic disorder were analyzed by binary logistic regression test. The factors included in the multivariate model were selected based on a significance level of $p < 0.1$ in the univariate analyses. The test with $P < 0.05$ as the difference was statistically significant.

Results

In order to give a concise description of the development of the epidemic from January 15 to February 10, 2020 we presented the growth of cases in **Figure 1**(the data were available at: http://www.nhc.gov.cn/xcs/yqfkdt/gzbd_index.shtml;<http://wsjkw.sh.gov.cn/yqtb/index.html>). It showed the development trend of the COVID-19 epidemic in China between the end of January and the beginning of February 2020. During the survey period(February 8-February 10), 702 questionnaires were sent out, 694 (98.9%) were received and qualified. Six hundreds and fifty-six female(94.5%) participated in the questionnaire, and the highest proportion of people was 18-40 years(73%). The proportion of nurse and physician was the highest, accounting for 45.1% and 22.3%, respectively. The proportion of first-line personnel was 19.5%, second-line personnel was 7.2%, and third-line was 73.5%. The median score of PHQ-9 among all the staff was 1 (IQR,0-4), the median PDSS score was 2 (IQR,0-5). For the score of PHQ-9 among female staff was higher than that of male($p=0.03$); the score of nurse was much higher than that of physician($p<0.0001$) and staff with degree of undergraduate have much more score of PHQ-9 than that of postgraduate degree($p=0.03$). For the score of PDSS, nurse was still much higher than that of physician($p<0.0001$). Among the different work lines, the first-line scored the highest: PHQ-9 score was 4 (0-8); PDSS score was 4 (1-9), which were significantly higher than the second-line and third-line staff ($P < 0.001$). See more details in **Table 1**.

Table 1. The demographic characteristics of people included in this analysis(n=694)

Demographic characteristics	Number(Percent)	PHQ-9 (M, Q1-Q3)	<i>P value</i>	PDSS (M, Q1-Q3)	<i>P value</i>
Gender			0.031		0.308
Male	38(5.5%)	0(0-2)		2(0-5)	
Female	656(94.5%)	1(0-4)		2(0-5)	
Age			0.026		0.063
18-30 years	253(36.5%)	1(0-4)		2(0-5)	
31-40 years	253(36.5%)	1(0-4)		2(0-5)	
41-50 years	150(21.6%)	0(0-3)		2(0-5)	
≥51 years	38(5.5%)	0(0-1.25)		1(0-3)	
Working years			0.005		0.015
0-5 years	185(26.7%)	1(0-3)		2(0-4)	
6-10 years	170(24.5%)	1(0-5.25)		3(1-6)	
11-15 years	122(17.6%)	1(0-4)		2(0-5)	
≥15 years	217(31.3%)	0(0-3)		2(0-5)	
Occupations			<0.0001		<0.0001
Physician	155(22.3%)	0(0-3)		2(0-5)	
Nurse	313(45.1%)	2(0-6)		3(1-6)	
Technician and researcher	101(14.6%)	0(0-2)		2(0-4)	
Administrator	70(10.1%)	0(0-2)		1.5(0-4)	
Logistic and Supporter &	55(7.9%)	0(0-1)		0(0-4)	
Technical title			0.004		0.006
Junior	454(65.4%)	1(0-4)		2.5(0-5)	
Intermediate	170(24.5%)	0(0-3)		2(0-4)	
Senior	70(10.1%)	0(0-2)		1(0-4.25)	
Educational level			0.029		0.063
≤undergraduate	548(79.0%)	1(0-4)		2(0-5)	
≥postgraduate	146(21.0%)	0(0-2)		2(0-4)	
Work lines			<0.0001		<0.0001
First line	135(19.5%)	4(0-8)		4(1-9)	
Second line	49(7.2%)	1(0-3)		2(1-5)	
Third line	510(73.5%)	0(0-3)		2(0-4)	

&, means logistics personnel, equipment and technical support personnel.

The status of depression and panic disorder among different groups of participants

There were 143 (20.6%) of them had depression, 39 (5.6%) of them had severe depression status; 81 (11.7%) of them had panic disorder, 47 (6.7%) of people had severe panic disorder. The depression rate was 18%(27/155) in physician while it was 32%(100/313) in nurse. The panic disorder rate for physician was 6%(9/155) and 19%(59/313) for nurse. For the severity degree of depression status among different occupations, nurse was much severe than that of physician($p<0.0001$). For the severity of panic disorder, nurse still had much severe degree than that of physician($p=0.0004$). Among the different work lines, the first-line staff had the highest degree of depression and panic disorder than that of the non first-line ($P<0.001$). See more in **Table 2**.

Table 2. The distribution of PHQ-9 and PDSS scores among participants with different characters

Variables	Number	PQH-9				P value	PDSS					P value
		D0	D1	D2	D3		P0	P1	P2	P3	P4	
		N (%)	N (%)	N (%)	N (%)		N (%)	N (%)	N (%)	N (%)	N (%)	
Gender					0.204						0.472	
Male	38	34(89)	2(5)	0(0)	2(5)	27(71)	10(26)	0(0)	1(3)	0(0)		
Female	656	517(79)	102(16)	17(3)	20(3)	409(62)	167(25)	34(5)	36(5)	10(2)		
Age					0.278						0.601	
18-30 years	253	194(77)	42(17)	8(3)	9(4)	154(61)	65(26)	14(6)	15(6)	5(2)		
31-40 years	253	203(80)	32(13)	8(3)	10(4)	155(61)	69(27)	12(5)	13(5)	4(2)		
41-50 years	150	119(79)	27(18)	1(1)	3(2)	95(63)	38(25)	8(5)	8(5)	1(1)		
≥51 years	38	35(92)	3(8)	0(0)	0(0)	32(84)	5(13)	0(0)	1(3)	0(0)		
Working years					0.055						0.139	
0-5 years	185	158(85)	19(10)	3(2)	5(3)	121(65)	47(25)	5(3)	11(6)	1(1)		
6-10 years	170	120(71)	36(21)	6(4)	8(5)	96(56)	47(28)	15(9)	7(4)	5(3)		
11-15 years	122	96(79)	16(13)	5(4)	5(4)	75(61)	32(26)	4(3)	8(7)	3(2)		
≥15 years	217	177(82)	33(15)	3(1)	4(2)	144(66)	51(24)	10(5)	11(5)	1(0)		
Educational level					0.056						0.219	
≤undergraduate	548	424(77)	88(16)	16(3)	20(4)	336(61)	141(26)	29(5)	32(6)	10(2)		
≥postgraduate	146	127(87)	16(11)	1(1)	2(1)	100(68)	36(25)	5(3)	5(3)	0(0)		
Occupations					<0.0001						0.0004	
Physician	155	128(83)	22(14)	1(1)	4(3)	103(66)	43(28)	3(2)	5(3)	1(1)		
Nurse	313	213(68)	68(22)	14(4)	18(6)	169(54)	85(27)	22(7)	29(9)	8(3)		
Technician and researcher	101	94(93)	7(7)	0(0)	0(0)	75(74)	23(23)	3(3)	0(0)	0(0)		
Administrator	70	62(89)	6(9)	2(3)	0(0)	50(71)	12(17)	5(7)	2(3)	1(1)		
Supporters[¶]	55	54(98)	1(2)	0(0)	0(0)	39(71)	14(25)	1(2)	1(2)	0(0)		
Technical title					0.027						0.163	
Junior	454	347(76)	73(16)	14(3)	20(4)	270(59)	123(27)	23(5)	29(6)	9(2)		
Intermediate	170	142(84)	25(15)	3(2)	0(0)	117(69)	36(21)	8(5)	8(5)	1(1)		
Senior	70	62(89)	6(9)	0(0)	2(3)	49(70)	18(26)	3(4)	0(0)	0(0)		
Work lines					<0.0001						<0.0001	
First line	135	78(58)	30(22)	11(8)	16(12)	62(46)	35(26)	14(10)	16(12)	8(6)		
Second line	49	40(82)	7(14)	1(2)	1(2)	32(65)	13(27)	2(4)	2(4)	0(0)		
Third line	510	433(85)	67(13)	5(1)	5(1)	342(67)	129(25)	18(4)	19(4)	2(0)		

PHQ-9: D0, normal; D1 for mild depression; D2 for moderate depression; D3 for severe depression. PDSS: P0, normal; P1, borderline; P2, slightly panic; P3, moderately panic; P4, markedly panic.

[¶] Supporters, means logistics personnel, equipment and technical support personnel.

Risk factors for the staff with severe depression and panic disorder in designated hospital

By binary logistic regression test, univariate analysis showed that compared with staff with undergraduate, postgraduate staff had a lower risk of serious depression; participants with intermediate technical title had a lower risk than junior title; compared with physicians, nurses had a higher risk; the first-line workers had much more risk of severe depression than the third-line. After multivariate analysis, only found that the first-line workers had much more risk for severe depression than the third-line workers ($P < 0.001$). Other variables have no statistical significance, see **Table 3**. For the first-line staff, the risk of severe depression was 6.6 times [(95%CI 3.1-14.3), $P < 0.001$] higher than the non first-line (the combination of second line and third line).

Table 3. The risk factors for severe case of depression (PHQ-9 score ≥ 10)

Variables	Category	Severe cases	Total cases (%)	<i>P</i> value	AOR(95%CI)	<i>P</i> value
Age	18-30 years	17	253(7%)	NA		
	31-40 years	18	253(7%)	0.861		
	41-50 years	4	150(3%)	0.087		
	≥ 51 years	0	38(0%)	0.998		
Gender	Male	2	38(5%)	NA		
	Female	37	656(6%)	0.922		
Working years	0-5 years	8	185(4%)	NA		
	6-10 years	14	170(8%)	0.133		
	11-15 years	10	122(8%)	0.164		
	≥ 15 years	7	217(3%)	0.564		
Educational level	\leq undergraduate	36	548(7%)	NA	1	NA
	\geq postgraduate	3	146(2%)	0.047	0.59(0.12–2.99)	0.524
Technical title	Junior	34	454(7%)	NA	1	NA
	Intermediate	3	170(2%)	0.013	0.32(0.08–1.25)	0.102
	Senior	2	70(3%)	0.171	0.56(0.09–3.50)	0.537
Occupations	Physician	5	155(3%)	NA	1	NA
	Nurse	32	313(10%)	0.012	0.94(0.20–4.38)	0.937
	Technician and researcher	0	101(0%)	0.996	0.00(0.00– ∞)	0.996
	Administrator	2	70(3%)	0.883	0.85(0.12–6.06)	0.867
	Logistics and supporter	0	55(0%)	0.997	0.00(0.00– ∞)	0.997
Work lines	First line	27	135(20%)	NA	1	NA
	Second line	2	49(4%)	0.019	0.27(0.06–1.25)	0.093
	Third line	10	510(2%)	0.000	0.12(0.06–0.27)	0.000

\square , refers to the *P* value for each category vs the reference. AOR, Adjusted odds ratio; CI, confidence interval.

By univariate logistic regression test, the risk for severe panic disorder in nurse was much higher than that in physician, and second-line workers was significantly lower than that in first-line. After multivariate analysis, the risk for severe panic disorder in the first-line staff was significantly higher than that in the third line ($P = 0.001$). Other variables had no statistical significance, see **Table 4**. For the first-line personnel, the risk of serious panic is 2.6 fold [(95%CI 1.4-4.9), $P = 0.003$] higher than that of the non first-line (the combination of the second line and third line).

Table 4. The risk factors for severe case of panic disorder (PDSS score ≥ 11)

Variables	Category	Severe cases	Total cases (%)	P value [‡]	AOR(95%CI)	P value
Age	18-30 years	20	253 (8%)	NA		
	31-40 years	17	253 (7%)	0.609		
	41-50 years	9	150 (6%)	0.476		
	≥51 years	1	38 (3%)	0.266		
Gender	Male	1	38 (3%)	NA		
	Female	46	656 (7%)	0.317		
Working years	0-5 years	12	185 (6%)	NA		
	6-10 years	12	170 (7%)	0.830		
	11-15 years	11	122 (9%)	0.412		
	≥15 years	12	217 (6%)	0.687		
Educational level	≤undergraduate	42	548 (8%)	NA	1	NA
	≥postgraduate	5	146 (3%)	0.078	1.23(0.33–4.49)	0.759
Technical title	Junior	38	454 (8%)	NA		
	Intermediate	9	170 (5%)	0.199		
	Senior	0	70 (0%)	0.997		
Occupations	Physician	6	155 (4%)	NA	1	NA
	Nurses	37	313 (12%)	0.008	2.96(0.89–9.87)	0.077
	Technician and researchers	0	101 (0%)	0.996	0.00(0.00–∞)	0.996
	Administrators	3	70 (4%)	0.883	1.52(0.32–7.32)	0.600
	Logistics and supporters	1	55 (2%)	0.477	0.68(0.07–6.71)	0.740
Work lines	First line	24	135 (18%)	NA	1	NA
	Second line	2	49 (4%)	0.032	0.34(0.08–1.53)	0.160
	Third line	21	510 (4%)	0.000	0.32(0.17–0.63)	0.001

[‡], refers to the P value for each category vs the reference. AOR, Adjusted odds ratio; CI, confidence interval.

Discussion

Since the end of January 2020, the number of confirmed cases, deaths related to COVID-19 has continued to escalate, with a sharp increase in the number of cumulative cases both in Shanghai and throughout the country[17,18]. Now, the epidemic of COVID-19 has posed a severe threat to the global public health and the prevention and control is full of challenge[19]. It is the background of the staff fighting for the epidemic in Shanghai public health clinical center. In any biological disaster, themes of fear, uncertainty, and stigmatisation are common[20]. As for the COVID-19, which is human-to-human transmissible, associated with high morbidity, and potentially fatal may intensify the perception of personal crisis[21]. The health workers may also experience fear of contagion and spreading the virus to their families, friends, or colleagues[20]. Therefore, the medical staff and their hospital colleagues have corresponding psychological pressure, which affects their own mental health[22].

Through this survey, 694(98.9%) questionnaires were received. We found that most participants were female(95%), were nurses(45%), were aged 18-40 years(73%), were undergraduate(65%), with a junior technical title(79%). There were 143 (21%) of them had depression, 39 (6%) of them had severe depression status; 81 (12%) of them had panic disorder, 47 (7%) of people had severe panic disorder. The mental health status of health caregivers in a biological disaster is complicated. A study reported that, nearly 90% of health care workers who were in high-risk settings had psychological symptoms during the acute SARS outbreak[9]. Sources of distress may include feelings of vulnerability or loss of control and concerns about health of self, spread of virus, health of family and others, changes in work, and being isolated[23]. Challenges and stress can subsequently trigger common mental disorder, such as anxiety and depression[24].

Our findings also indicate that, not only the rate of depression or panic disorder but also the severity of depression or panic disorder among nurse were much higher than that of physician. Nurses treating patients with COVID-19 are likely exposed to the highest risk of infection because of their close, frequent contact with patients and working longer hours than usual[25]. Both the working pressure and physical exhaustion are risk factors

for panic disorder[26]. During the SARS outbreak, a study[23] conducted among health care workers in emergency departments also showed that nurses were more likely to develop distress than physicians.

Among the different work lines, the front-line was an independent risk factor for worse mental health outcomes. This is consistent with the analysis published before[13,27]. For the health care worker in first line, they have to face the suffering and death of patients with COVID-19 and their risk of being infected is high while no effective vaccine or medicine for the virus. As for the rate(20%) of depression among front-line staff in our study is lower than the figure(50%) of health care workers fighting in Hubei province[13] which is the epicenter affected by COVID-19. In the initial stage of epidemic of COVID-19, predictable shortages of supplies and an increasing influx of suspected and confirmed cases of COVID-19 contribute to the pressures and concerns of health care workers in Wuhan[13], and they have been facing enormous pressure, including a high risk of infection and inadequate protection from contamination, overwork, patients with negative emotions, a lack of contact with their families, and exhaustion[27]. However, before the epidemic outbreak in Shanghai, local health committee and designated hospital had made full preparations for the prevention and control of COVID-19. The reserve of protective materials and medical equipment is sufficient, and the medical staff can provide backup for the designated hospital at any time. Therefore, the burden and severity of COVID-19 in Shanghai is much lower than that in Hubei Province, especially in Wuhan city. It's not surprising that participants in our study have a less serious mental health problem. However, compared with the general public, the mental health status of those front-line workers are affected severely and now the National Health Commission of China published a national guideline of psychological crisis intervention for COVID-19[27]. This will provide psychological protection for medical workers in China.

There are also some shortcomings in this study: in the survey, the marriage, family background and other public health emergency experiences of the participants were not obtained, and the background mental illness history, smoking and drinking habits of the participants were not found. Therefore, the potential factors behind the differences in scores of mental health assessment were not fully analyzed.

Conclusions

Many staff in the designated hospital for COVID-19 have mental health problems. Among them, first-line workers are a high-risk group with severe depression and panic disorder, and further psychological intervention is needed for them.

List Of Abbreviations

COVID-19: coronavirus disease 2019; PHQ-9: patients health questionnaire-9; PDSS: panic disorder severity scales; SARS: severe acute respiratory syndrome; WHO: world health organization; IQR: interquartile range.

Declarations

Ethics approval and consent to participate

The research protocols were approved by the Ethics Committee of Shanghai

Public Health Clinical Center. The written informed consent(electronic version) was obtained from all the study participants.

Consent for publication Not applicable.

Availability of data and materials All data generated or analysed during this study are included in this published article and its supplementary information files(S1 File).

Competing interests The authors declare that they have no competing interests.

Funding This study was supported by the grant of the research of novel regimen for COVID-19(The second batch of tackling of key scientific and technical problems launched by Shanghai Science and Technology Commission) . The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Authors' contributors BFW, JJS, KW and HZL conceived and designed the study; BFW and JJS, FG, JC, LS, LYL,YJT collected the data. JJS, BFW and KW analyzed the data; JJS, BFW and KW, HZL interpreted the results; JJS and BFW wrote the first draft; JJS, BFW, KW and HZL contributed to the final version. All authors have read and approved the manuscript.

Acknowledgments

We give our cordial thanks to the colleagues of Shanghai Public Health Clinical Center who participated in our research.

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Figures

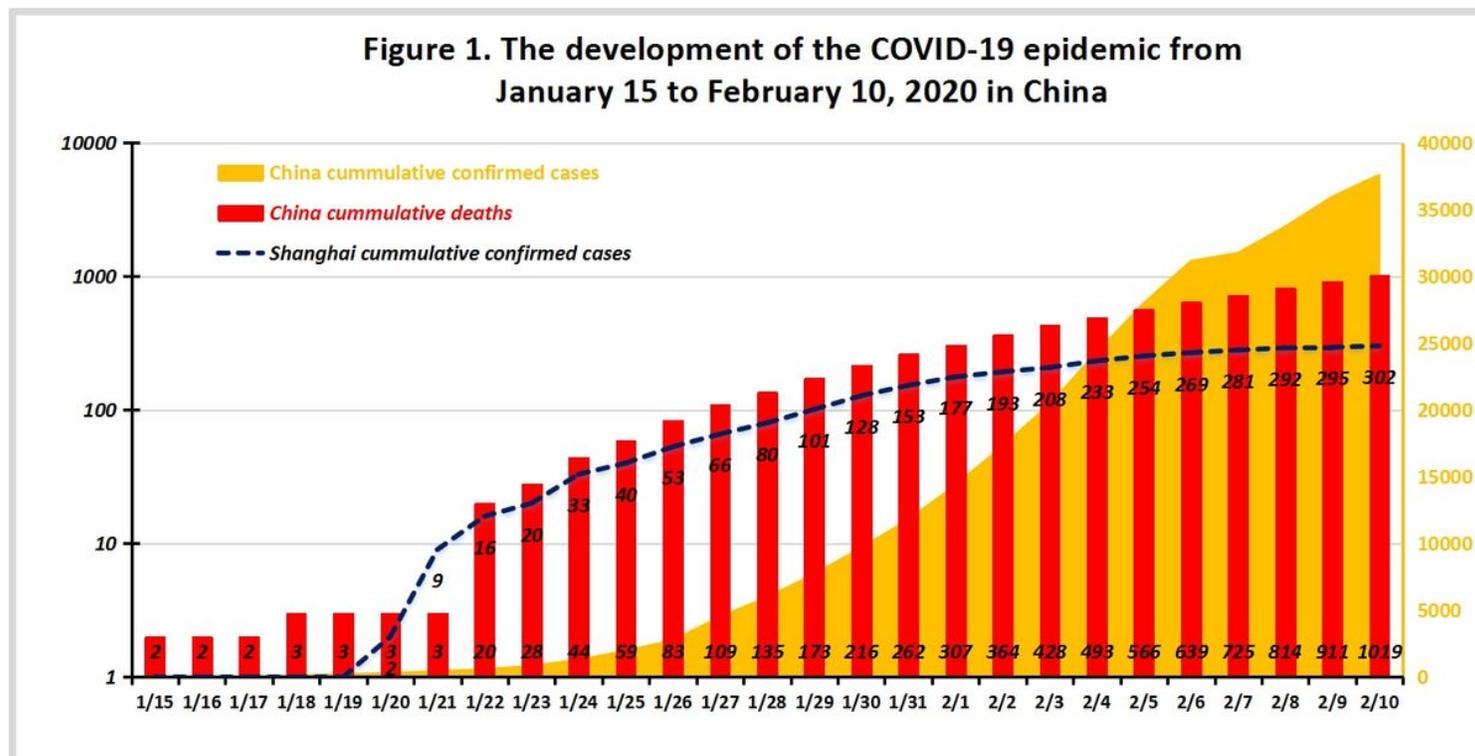


Figure 1

The development trend of the COVID-19 epidemic in China between the end of January and the beginning of February 2020.