

Difficulties of Prevention and Control Staff in COVID-19 Outbreak: A Cross-sectional Study Based on Five Provinces

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Abstract

Objectives: The aim of this study is to address the difficulties encountered by epidemic control staff in the early and middle stages of their efforts to combat COVID-19, compare the gaps among different types of institutions, and identify shortcomings in epidemic control.

Methods: Using multi-stage sampling, a survey of primary (“primary-urban” and “primary-rural”) and non-primary (“CDC”) public health workers involved in the prevention and control of COVID-19 in five provinces, including Hubei, Guangdong, Sichuan, Jiangsu and Gansu, was conducted from 18 February to 1 March 2020 through a self-administered questionnaire.

Results: A total of 9475 outbreak prevention and control workers were surveyed, of which 40.0% were from the primary-rural, 27.0% were from the primary-urban and 33.0% were CDC. Resources shortage was reported at 27.9%, with the primary-rural being the worst affected ($OR=1.201$, 95% CI : 1.073-1.345). Difficulties in data processing were reported at 31.5%, with no significant differences among institutions. Communication and coordination difficulties were reported at 29.8%, with the CDC being the most serious (the rural primary: $OR=0.520$, 95% CI : 0.446-0.606; the primary-urban: $OR=0.533$, 95% CI : 0.454-0.625). Work object difficulties were reported at 20.2%, with the primary-urban being the worst ($OR=1.368$, 95% CI : 1.199-1.560). Psychological distress was reported at 48.8%, with no significant differences among institutions.

Conclusions: Psychological distress is the most serious problem in the prevention and control of COVID-19, and the resources shortage in primary-rural, communication and coordination difficulties in CDC, and difficulties in working with the target population in the primary-urban deserve attention. This study will provide a scientific basis for improving the national public health emergency management system, especially for reducing the urban-rural differences in emergency response capacity.

Introduction

As of April 12, a total of 82,160 cases of COVID-19 had been diagnosed in China, and a total of 3,341 cases had died [1]. At present, the spread of COVID-19 in China has been basically interrupted [2]. All aspects of society and economy have been put to an unprecedented and severe test. As of March 13, China's investment in fighting the epidemic had reached 116.9 billion yuan, according to the State Council's joint prevention and control mechanism press conference [3]. As of April 7, the total number of medical staff assisting Hubei, China from other provinces has reached more than 42,600 [4]. There are also countless public health workers, community workers and volunteers who work on the front line of outbreak prevention and control.

Outbreak prevention and control staff are the important force in the fight against COVID-19 epidemic and are responsible for carrying out zero-distance sampling and testing, epidemiological investigation, close contact tracing, outbreak analysis, disinfection of the public environment, and community prevention and control [5]. The COVID-19 epidemic, while a great stage victory, has also exposed shortcomings and deficiencies in our public health sector. In the paper of comprehensively improving the ability to prevent, control and govern in accordance with the law and perfecting the national public health emergency management system, President Xi pointed out that the first line of defence should be weaved tightly and firmly by strengthening primary capacity-building for prevention and control in rural and community areas. Some scholars have proposed that public health expenditure should be tilted towards rural and backward areas, thereby narrowing the gap between urban and rural areas and regions in basic public health services and accelerating the process of equalization of basic public health services [6].

The fight against the COVID-19 epidemic is a major test of the national governance system and governance capacity. We should sum up the experience, learn from the lessons, in view of the shortcomings and deficiencies exposed by the epidemic, to tighten up the shortcomings, plug the loopholes and strengthen the weaknesses. The purpose of this study is to compare the gap between the primary and non-primary levels in the fight against the COVID-19 epidemic in China with the difficulties encountered by epidemic prevention and control staff in the early and middle stages of the epidemic, to identify shortcomings in epidemic prevention and control, and to provide a scientific basis for improving the national public health emergency management system.

Materials And Methods

Study design

This study was a cross-sectional study design using a self-administered questionnaire from February 18 to March 1, 2020 in five provinces including Hubei, Guangdong, Sichuan, Jiangsu and Gansu. These five provinces are located in Central China, South China, West China, East China and North China, with a cumulative number of confirmed cases (as of February 25) of 65,187, 1,347, 531, 631 and 91, respectively.

The study was conducted using multi-stage targeted sampling (according to the severity of the epidemic and urban/rural distribution), with 3–6 cities within each province, 3–6 districts and 5–12 streets or communes within each city. In the sampled administrative areas, staff from provincial, city and district CDC (including health education institutions) and primary health care institutions (including community health centers/stations, township health centers, and village health clinics) involved in the prevention and control of this epidemic were surveyed for this study. We classified the surveyed institutions into 3 categories: CDC and health education institutions (defined as “CDC”), community health centers/stations in urban (defined as “primary-urban”) and township health centers and village health clinics (defined as “primary-rural”).

Study subjects

Inclusion criteria for the subjects of this study: 1) age 18 years and above; 2) involved in work related to COVID-19 outbreak prevention and control. This study distributed a web link containing the questionnaire via WeChat and QQ instant messenger. All respondents were informed prior to the survey of the background, purpose, anonymity, and time required for the survey (approximately 8–12 minutes). A self-administered questionnaire was administered with the consent of the survey respondents. This study was approved by the Ethics Committee of the School of Public Health, Sun Yat-sen University (No. 2020-012).

Survey content

This study investigated demographic characteristics, epidemic prevention efforts, health status, work difficulties, perceptions of the epidemic, and emotional psychology. The elements used in this study are demographic characteristics, work difficulties and psychological distress. Demographic characteristics include 5 pieces of information: age, gender, child status (presence or absence of children and age of youngest child), job title, and type of institution (primary-rural, primary-urban, and CDC). Work difficulties also included 5 dimensions: resources shortage (5 entries), data processing (5 entries), communication and coordination (4 entries), target audience (3 entries), and psychological distress (4 entries). The work difficulty dimensions were multiple-choice except for the psychological distress dimension, which used a 5-point Likert scale (the higher the score, the more severe the situation). We evaluated each dimension comprehensively using bicategorical variables, with the psychological distress dimension set to 1 (more distress) if the mean score was 2.5 (50% of the maximum score) or higher, and 0 otherwise, and the other dimension set to 1 (more difficulty) if 50% or more of the number of entries were checked, and 0 otherwise.

Statistical analysis

The institution type was used as a grouping variable. Continuous variables (i.e., age) were described as mean \pm standard deviation (*Mean \pm SD*), and ANOVA was used for between-group comparisons. Qualitative variables were described as frequencies (proportions or rates) and compared between groups using Fisher's exact test. In the comprehensive analysis of work difficulty, logistic regression was used with bicategorical variables as dependent variable, institution type as independent variable, and the demographic characteristics as covariates. All the analyses were performed at $P < 0.05$ to indicate statistical significance.

Results

Basic characteristics of study subjects

A total of 9475 questionnaires were collected in this study, all of which were valid. Among them, 3786(40.0%) were from primary-rural, 2561(27.0%) from primary-urban and 3128(33.0%) from CDC. The average age was 38.7 years, with primary-rural being the oldest (39.9 years) and primary-urban being the youngest (36.4 years). The average percentage of females was 64.4%, with the highest percentage in primary-rural (78.25%) and the lowest percentage in CDC (58.12%). The average percentage of those without children or with children at primary level and below was 63.73%, with the highest percentage in primary-urban (77.20%) and the lowest in primary-rural (53.01%). The average percentage of primary and below titles was 61.45%, with the highest in primary-rural (77.79%) and the lowest in CDC (45.62%). The differences in the above variables among the three groups were statistically significant (all $P < 0.001$). (Table 1)

Table 1
Basic characteristics of the study subjects

	Total	Primary-rural	Primary-urban	CDC	<i>P</i> value
Sample size	9475	3786	2561	3128	
Age (y)	38.656 ± 9.704	39.891 ± 10.123	36.381 ± 9.031	39.022 ± 9.395	< 0.001
Sex					
Male	3378 (35.65)	1511 (39.91)	557 (21.75)	1310 (41.88)	< 0.001
Female	6097 (64.35)	2275 (60.09)	2004 (78.25)	1818 (58.12)	
Child status					
Absence	2161 (22.81)	621 (16.40)	776 (30.30)	764 (24.42)	< 0.001
Primary school and below	3877 (40.92)	1386 (36.61)	1201 (46.90)	1290 (41.24)	
Junior high school and above	3437 (36.27)	1779 (46.99)	584 (22.80)	1074 (34.34)	
Job title					
Primary and below	5822 (61.45)	2945 (77.79)	1450 (56.62)	1427 (45.62)	< 0.001
Intermediate	2682 (28.31)	718 (18.96)	930 (36.31)	1034 (33.06)	
Advanced	971 (10.25)	123 (3.25)	181 (7.07)	667 (21.32)	
Note: Continuous variables are expressed as mean ± standard deviation and categorical variables are expressed as frequencies (proportions).					

Resources shortage

We found that outbreak prevention and control staff encounter multiple resource deficiencies in their work. Resources shortage were reported for protective gear (87.4%), own skills (38.5%), manpower (47.1%), funding (20.3%) and reagents (8.0%). In particular, CDC had a higher rate of reporting inadequate manpower and reagents than the primary (all $P < 0.01$), and conversely, the primary had a higher rate of reporting inadequate protective equipment ($P < 0.001$). Comparing the two types of the primary institutions found that primary-urban had a higher rate of reporting inadequate protective equipment ($P = 0.009$), while primary-rural had a higher rate of reporting inadequate own skills, manpower, funding and reagents (all $P < 0.01$). Among the protective equipment, deficiencies were reported, in descending order, for N95 masks (80.5%), medical surgical masks (80.4%), protective clothing (77.5%), medical goggles (57.0%), medical alcohol (47.9%), forehead thermometers (43.6%) and gloves (37.3%). (Table 2)

Table 2
Resources shortage

	Total <i>n</i> (%)	Primary-rural (%)	Primary-urban (%)	CDC (%)	<i>P</i> value	Primary vs. CDC <i>P</i> value*	Primary-rural vs. Primary-urban <i>P</i> value*
Protective equipment	8280 (87.39)	90.62	92.50	79.28	< 0.001	< 0.001	0.009
Self-skill	3645 (38.47)	43.16	28.47	40.98	< 0.001	< 0.001	< 0.001
Manpower	4459 (47.06)	45.69	41.66	53.13	< 0.001	< 0.001	0.002
Funding	1927 (20.34)	24.64	14.76	19.69	< 0.001	0.278	< 0.001
Reagents	761 (8.03)	8.80	5.23	9.40	< 0.001	0.001	< 0.001
Protective equipment							
N95 mask	6663 (80.49)	76.61	80.71	85.65	< 0.001	< 0.001	< 0.001
Surgical masks for medical use	6654 (80.38)	81.54	81.43	77.78	0.001	< 0.001	0.918
Protective clothing	6419 (77.54)	76.03	82.57	74.84	< 0.001	< 0.001	< 0.001
Medical goggles	4714 (56.95)	63.43	58.08	46.90	< 0.001	< 0.001	< 0.001
Medical alcohol	3964 (47.89)	53.40	46.01	42.06	< 0.001	< 0.001	< 0.001
Epidural gun	3611 (43.62)	56.87	38.88	29.84	< 0.001	< 0.001	< 0.001
Medical gloves	3088 (37.30)	44.94	35.46	28.51	< 0.001	< 0.001	< 0.001
*The P values were corrected for multiple comparisons. "Total" column was presented as frequency (reporting rate). "Primary-rural", "Primary-urban", and "CDC" columns were presented as reporting rates.							

Data processing

We found that outbreak prevention and control staff encounter multiple situations of data processing difficulties in their work. The reported difficulties in the data processing were: excessive documentation (63.8%), cumbersome and time-consuming data filling (49.8%), cumbersome and time-consuming work accounts (36.9%), time-consuming transmission of information (25.7%) and inconvenient transmission of documents (14.4%). Among them, CDC had a higher rate of reporting difficulties such as cumbersome and time-consuming data filling, time-consuming information reporting and inconvenient document information transmission than the primary (all $P < 0.01$). Comparing the two types of primary institutions found no statistical difference in the reported rate of difficulty in processing data. (Table 3)

Table 3
Data processing, communication and coordination, and target audiences

	Total <i>n</i> (%)	Primary- rural (%)	Primary- urban (%)	CDC (%)	<i>P</i> value	Primary vs. CDC <i>P</i> value*	Primary- rural vs. Primary- urban <i>P</i> value*
Data processing							
Excessive documentation	6040 (63.75)	63.63	63.84	63.81	0.982	0.946	0.946
Cumbersome and time-consuming data filling	4720 (49.82)	47.99	49.39	52.37	0.002	0.001	0.282
Cumbersome and time-consuming work accounts	3500 (36.94)	37.64	35.85	36.99	0.362	0.946	0.305
Time-consuming transmission of information	2433 (25.68)	23.77	22.10	30.91	< 0.001	< 0.001	0.122
Inconvenient transmission of documents	1367 (14.43)	12.86	12.26	18.09	< 0.001	< 0.001	0.488
Communication and coordination							
Poor inter-agency coordination	3346 (35.31)	26.70	36.70	44.60	< 0.001	< 0.001	< 0.001
Poor intra-departmental coordination	2091 (22.07)	19.31	18.74	28.13	< 0.001	< 0.001	0.580
Unclear assignments from superiors	1740 (18.36)	14.53	15.97	24.97	< 0.001	< 0.001	0.116
Unclear overtime incentive system	3851 (40.64)	36.90	36.78	48.34	< 0.001	< 0.001	0.937
Target audiences							
Uncooperative	3800 (40.11)	39.28	46.47	35.90	< 0.001	< 0.001	< 0.001
Verbal abuse/intimidation by work targets	1297 (13.69)	12.57	18.00	11.51	< 0.001	< 0.001	< 0.001
Concerns about survey reliability	3402 (35.91)	34.57	35.38	37.95	0.019	0.008	0.520
*The P values were corrected for multiple comparisons. "Total" column was presented as frequency (reporting rate). "Primary-rural", "Primary-urban", and "CDC" columns were presented as reporting rates.							

Communication and coordination

We found that outbreak prevention and control staff encounter a variety of difficult communication and coordination situations in their work. Communication and coordination difficulties were reported as poor inter-agency coordination (35.3%), poor intra-departmental coordination (28.1%), unclear assignments from superiors (18.4%), and unclear overtime incentive system (40.6%). Of these, all of the above coordination and communication difficulties were higher reported by CDC compared with the primary institutions (all $P < 0.001$). Comparing the two types of primary institutions found that primary-urban had a higher rate of reporting difficulties with poor intra-departmental coordination ($P < 0.001$). (Table 3)

Target audience

We found that outbreak prevention and control workers encounter a variety of difficult situations with the target audience they work with. The rates of reported difficulties with target audience were: uncooperative (40.1%), verbal abuse/intimidation by work targets (13.7%), and concerns about survey reliability (36.0%). Of these, CDC had a higher rate of reporting concerns about survey reliability than the primary (P

< 0.001). Comparing the two types of primary institutions found that primary-urban had a higher rate of reporting difficulties with uncooperative and verbal abuse/intimidation by work targets ($P < 0.001$). (Table 3)

Psychological distress

We found that the epidemic control staff encountered multiple situations of psychological distress in their work. The levels of each type of psychological distress were: being treated differently at work (2.4 points), feeling aggrieved at work (2.6 points), family members not understanding (1.9 points) and worrying about routine work outside of the epidemic (2.6 points). Among them, CDC had higher levels of being treated differently at work and feeling aggrieved at work than the primary (both $P < 0.001$). While the primary had higher levels of worrying about routine work outside of the epidemic ($P = 0.003$). Comparing the two types of primary institutions found that primary-urban had a higher rate of reporting distress with family members not understanding ($P = 0.002$), and primary-rural had a higher rate of reporting distress with worrying about routine work outside of the epidemic ($P = 0.003$). (Table 4)

Table 4
Psychological distress

	Total <i>M ± SD</i>	Primary- rural <i>M ± SD</i>	Primary- urban <i>M ± SD</i>	CDC <i>M ± SD</i>	<i>P</i> value	Primary vs. CDC <i>P</i> value*	Primary- rural vs. Primary- urban <i>P</i> value*
Being treated differently at work	2.437 ± 0.984	2.395 ± 1.002	2.383 ± 0.909	2.527 ± 1.013	< 0.001	< 0.001	0.741
Feeling aggrieved at work	2.572 ± 1.003	2.539 ± 1.013	2.506 ± 0.945	2.665 ± 1.029	< 0.001	< 0.001	0.405
Family members not understanding	1.867 ± 0.883	1.849 ± 0.904	1.903 ± 0.867	1.857 ± 0.870	0.046	0.654	0.002
Worrying about routine work outside of the epidemic	2.640 ± 0.990	2.692 ± 0.999	2.608 ± 0.963	2.604 ± 0.999	< 0.001	0.003	0.003

* The P values were corrected for multiple comparisons. M ± SD indicates mean ± standard deviation.

Comprehensive analysis

The five dimensions of work difficulties were reported as psychological distress (48.8%), data processing (31.5%), communication and coordination (29.8%), resources shortage (27.9%), and target audience (20.2%). The adjusted model showed that there were statistically significant differences among institutions in terms of resources shortage, coordination and communication, and target audience. Of these, resources shortage was more frequently reported in primary-rural ($OR = 1.201$, 95% *CI*: 1.073–1.345); Communication and coordination difficulties in CDC were reported at higher rates (primary-rural: $OR = 0.520$, 95% *CI*: 0.446–0.606, primary-urban: $OR = 0.533$, 95% *CI*: 0.454–0.625); Primary-rural reported higher rates in difficulties of target audience ($OR = 1.368$, 95% *CI*: 1.199–1.560). (Table 5)

Table 5
Comparative analysis of the five dimensions of work difficulties across institutions

	Resources shortage <i>OR(95%CI)</i>	Data processing <i>OR(95%CI)</i>	Communication and coordination <i>OR(95%CI)</i>	Target audiences <i>OR(95%CI)</i>	Psychological distress <i>OR(95%CI)</i>
Institution, reporting rate (%)					
Total	27.9	31.5	29.8	20.2	48.8
CDC	28.8	34.1	40.9	19.6	50.7
Primary- rural	32.1	30.6	22.8	18.4	48.0
Primary- urban	20.7	29.6	26.8	23.4	47.5
Unadjusted					
Institution (ref.=CDC)					
Primary- rural	1.171(1.056,1.298)**	0.850(0.768,0.940)**	0.389(0.338,0.448)***	0.927(0.822,1.046)	0.899(0.818,0.988)*
Primary- urban	0.643(0.569,0.728)***	0.812(0.726,0.909)***	0.458(0.393,0.534)***	1.253(1.103,1.422)**	0.880(0.793,0.977)*
Adjusted#					
Institution (ref.=CDC)					
Primary- rural	1.201(1.073,1.345)**	1.010(0.904,1.129)	0.520(0.446,0.606)***	1.085(0.952,1.237)	0.996(0.898,1.104)
Primary- urban	0.713(0.629,0.810)***	0.916(0.815,1.029)	0.533(0.454,0.625)***	1.368(1.199,1.560)**	0.901(0.809,1.003)
#The variables adjusted were age, gender, child status and job title.					
* <i>P</i> < 0.05, ** <i>P</i> < 0.01, *** <i>P</i> < 0.001.					

Discussions

This study, based on a survey of 9475 outbreak prevention and control staff, explored possible work difficulties in the early and middle stages of major outbreak prevention and control work, and found that the highest reporting rate was psychological distress (48.8%), the middle reporting rate was data processing difficulties (31.25%), communication and coordination difficulties (29.8%) and resource shortage (27.9%), and the lowest reporting rate was target audience difficulties (20.2%). A comparative analysis among different institutions found higher rates of resources shortage in primary-rural, higher rates of communication and coordination difficulties in CDC, and higher rates of target audience difficulties in primary-urban.

The mental health problems of outbreak prevention and control staff cannot be ignored. The psychological distress was found as the most serious in this study, with a reporting rate of nearly half (48.8%). And there was no variation among institutions, suggesting that despite the differences in the content of outbreak prevention and control work in different institutions, all faced high levels of psychological distress. Mental health problems of clinical staff in outbreak prevention and control have raised concern [7]. This study found that the mental health problems of epidemic prevention and control workers engaged in public health-related work are also of concern, and further explored their specific sources of distress, such as: being treated differently at work, feeling aggrieved at work, family members not understanding and worrying about routine work outside the epidemic. These psychological distresses directly affect epidemic prevention on the one hand, and pose mental health hazards to staff on the other. In the future, the comprehensive protection of epidemic prevention and control staff should be improved, and humanistic care should be strengthened so that they can work with peace of mind and efficiency [8]. In addition,

the current psychological intervention for epidemic workers focuses on clinical health care staff, and the psychological relief and intervention for epidemic prevention and control staff cannot be ignored.

The problem of resources shortage in primary-rural is of concern. The resources shortage problem found in this study is serious (27.9% reporting rate) and the highest reporting rate in primary-rural, suggesting that resources allocation in primary-rural needs to be optimized in the early and middle stages of epidemic. Admittedly, the resources shortage in China occurred mainly in the early stage of epidemic. Because with the development of the epidemic, the capacity and transfer of epidemic prevention materials work in an orderly manner, which gradually ensure that China's reserve materials are sufficient. Resources shortage was mainly manifested in insufficient emergency material reserves and the capacity of health emergency response teams needs to be improved. Government financial support for health emergencies should be increased and the allocation of resources for health emergencies optimized. Vulnerable areas with relatively insufficient financial support (e.g., the primary-rural identified in this study) are often the focus of health emergency work. The introduction, training and training of health emergency staff should be strengthened, and drills and training in on-site epidemiological investigation are important ways to improve health emergency response capacity [9].

Communication and coordination difficulties in CDC institutions need attention. The communication and coordination difficulties found in this study are serious (the reporting rate is 29.8%), and the highest reporting rate is found in CDC, suggesting that the reform of China's CDC institutions needs to pay attention to information communication and transportation coordination. As the core backbone of the public health network, the work of CDC institutions involves more communication and coordination. Communication and coordination difficulties are mainly manifested in unclear overtime incentive system and poor communication between and within departments, which will directly affect the implementation of epidemic prevention and control and its effectiveness. To address communication and coordination difficulties, we should put the staff overtime incentive performance programs [10] and the multi-departmental joint prevention and control mechanisms at different levels [11] into the construction of the emergency system for public health emergencies.

Difficulties of the target audiences in primary-urban were relatively prominent. The difficulties of working targets found in this study were relatively serious (the reporting rate is 20.2%), and the reporting rate is highest in primary-urban, suggesting that the focus of public education on public health in China should be on primary-urban. Difficulties of target audiences are mainly manifested in concerns about the reliability of the survey and the uncooperative, which will directly affect the effect of blocking the transmission route and protecting vulnerable groups in epidemic prevention and control. In order to address the difficulties of the target audiences, vigorous efforts should be made to promote community awareness of public health and emergency work, so that the community can understand the relevant work, reduce misunderstandings and promote prevention and control work. For key populations with a lower level of education, we should use appropriate methods to publicize and popularize core information on the prevention and control of infectious diseases, cultivate their good hygiene habits and healthy lifestyles, and raise the overall population's awareness of the prevention and control of infectious diseases [12].

There are limitations to this study. First, the multi-stage sampling according to geographic distribution and the severity of the epidemic may be subject to selection bias, leading to an increased risk of extrapolating the findings to other parts of the country. Second, this study used a self-administered questionnaire, which may be subject to reporting bias. Third, this study was a cross-sectional survey and it cannot yet be assumed that the work difficulties identified were only in the context of preventing and controlling the COVID-19 epidemic.

Conclusions

In summary, China's epidemic prevention and control personnel have played an important role in the fight against the COVID-19 epidemic. We found that the most serious in the prevention and control work was psychological distress. The resources shortage in primary-rural, the communication and coordination difficulties in CDC, and the difficulties of working with the target audiences in primary-urban were worthy of attention. This study will provide a scientific basis for improving the national public health emergency management system, especially for reducing the urban-rural disparity in emergency response capacity.

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of the School of Public Health, Sun Yat-sen University (No. 2020-012). All participants were informed of the background, aims, anonymous nature and length of the survey. Participants were well informed that completing the questionnaire signified their informed consent.

Consent for publication

Not applicable.

Availability of data and materials

The datasets during and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

JG, YH, and ZD conceived the research questions, designed the questionnaire, assembled the team of collaborators, and conducted quality control. HY, HZ, XW, JX, YL, SL and LM coordinated the field work and collected data. ZD conducted the statistical analysis. ZD and JG drafted the manuscript. YH revised the manuscript and gave scientific comments. ZD and JG finalized the manuscript. All authors assisted in questionnaire design, data collection, data interpretation, and gave comments to intellectual content of the manuscript.

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