

Analysis of Coping Ability and Mental Health of Medical Staff on COVID-19 in Henan, China

Songyang Cui

Zhengzhou University

Lei Yin

Zhengzhou First People Hospital

Yuanyuan Shi

Second Affiliated Hospital of Zhengzhou University

Mengying Fan

Zhengzhou University

Xiu Yang

Zhengzhou University

Lulu Zhang

Zhengzhou University

Linlin Li (✉ 13623850209@163.com)

Zhengzhou University <https://orcid.org/0000-0001-7076-2594>

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Abstract

Backgrounds Outbreak of COVID-19 imposed great pressure on the professional work and psychological health of medical staff, especially in the early stage. This study aims to assess the coping ability and mental health status of medical workers and find influencing factors on them during the early stage of the COVID-19 outbreak.

Methods A cross-sectional study was conducted among medical staff in Henan from January 29th to February 4th with a total of 1739 participants. A self-made questionnaire was used to evaluate their coping ability and mental health status (Both total score 110). Chi-square analysis and multivariate logistic regression analysis was used to identify influencing factors on them.

Results The majority of the participants (96.8%) had coping ability scores (Median, 81; IQR, 75~87) above the passing line, most (65.0%) were in normal mental health (median, 58; IQR, 44~68). Analyses showed that older age, higher education level, and distrust in unofficial information were facilitating factors for better coping ability among medical workers. For mental health status, medical workers had 3 promoting factors: older age, distrust of unofficial information, and non-participation in epidemic prevention and control. On the other hand, poor physical health was a risk factor. ($P < 0.05$)

Conclusions In early stage of the epidemic, medical staff in Henan performed well in coping ability and mental health, but the government still needs to pay more attention to the coping capacity and mental health of medical workers who are younger, less educated, blind to unofficial information and in poor physical condition who may have worse coping ability and mental health status. And other studies are needed to determine the follow-up status.

1. Introduction

Since the outbreak of COVID-19 in Wuhan, China in December 2019, the epidemic has grown rapidly and spread worldwide. Studies showed that this new type of coronavirus was mainly transmitted through air transmission or contact, and it will cause fever, cough, muscular soreness, dyspnea and other atypical symptoms[1, 2]. Due to the convenience of its transmission route, it spreads quickly among the population, triggered a pandemic, and the epidemic continues to worsen[3]. The World Health Organization (WHO) had declared the COVID-19 epidemic a public health emergency of international concern on 30 January[4]. As of June 30, China had a total of more than 4,000 deaths and more than 80,000 confirmed cases; globally, there had been more than 500,000 deaths and more than 10,000,000 confirmed cases[5, 6].

Front-line hospitals and medical personnel are the main force in response to the epidemic. However, some studies have pointed out that the emergency public health response capacity of primary hospital workers was not satisfactory[7-10]. In the face of COVID-19, knowledge of prevention, control and treatment is an integral part of coping ability, medical workers need to correctly grasp and strictly implement it[8, 10]. Improved coping ability of medical staff could enable early detection of infected individuals, effective

control of secondary transmission, and ultimately improve the healthcare system's response capacity. However, studies focusing on coping capacity of medical workers were scarce.

In the face of the high risk of infection, an increasing number of cases, long-hours and intensive work and sacrifice of colleagues, tremendous psychological pressure was posed on medical workers[5, 6, 11, 12]. Especially in the early stage of the epidemic when not all information about the virus was clear and most people were still in a state of shock and fear, medical personnel were particularly vulnerable, they may get mental disorders and even psychological diseases based on previous research on public health emergencies[13-15]. Investigation of medical workers' mental health is needed, and appropriate adjustments and interventions are essential[11].

Due to the necessity of understanding the coping ability and mental health status of medical staff, especially in the early stages of the outbreak when information about the epidemic was still unclear, we carried out this research in Henan. Henan Province, bordering Hubei Province, like most provinces in China, has not seen a large-scale epidemic spread and was representative of most of China's provinces. In this study, we conducted a quick assessment of the coping ability and mental health status of medical workers in Henan during the initial outbreak of COVID-19, found potential influencing factors among them, and identified the main influencing factors in further logistic regression. Through the study, it will be possible to take targeted measures to improve medical workers' coping ability and protect them, thereby enhancing the response capacity of the health system and preventing the further spread of the epidemic.

2. Method

2.1 Study Design

The study was approved by the Zhengzhou University Life Science Ethics Committee and was in accordance with the guidelines of the Helsinki Declaration. The survey was conducted in the form of an anonymous online questionnaire, and participants could terminate the survey at any time. Verbal informed consent was obtained from all participants prior to enrollment in the survey, and the ethics committee approved this procedure.

This cross-sectional study was conducted through an online questionnaire via www.wjx.cn on the WeChat platform from January 29th to February 4th. The investigation period was the first two weeks of the lockdown, at the beginning of the outbreak when information about the epidemic was still unclear. (Figure 1) A total of 1794 participants responded to the questionnaire, of whom 1739 were medical staff of the designated hospital in Henan Province. After excluding missing or invalid responses, there were 1735 validated participants included in the final analysis with an effective questionnaire rate of 99.77%. (Figure 2)

2.2 Questionnaire

Based on the Technical guide for COVID-19 virus infection prevention and control in Medical institutions (first edition) (Published on 22 January 2020) and COVID-19 diagnosis and treatment plan (trial version 4) (Published on 27 January 2020), we designed a questionnaire to get basic information and assess the coping ability and mental health status about diagnosis and management towards the COVID-19 (See the English version in supplementary material)[16, 17]. The coping ability part of the questionnaire was reviewed and approved by experts from The Second Affiliated Hospital of Zhengzhou University and the College of Public Health at Zhengzhou University, and the mental health part had good reliability and validity (Cronbach's Coefficient Alpha, 0.898; Kaiser-Meyer-Okin measure of sampling adequacy, 0.943; Bartlett's Test of Sphericity, $P < 0.001$; cumulative accounting of variance, 59.72%).

Basic information contains demographic information included age, gender, marital status, educational level and occupation, access and attitude to the information, concerns about the epidemic, mask-wearing situation, surrounding infected people and the view of the situation.

We used 22 questions including 16 single choice questions and 6 multiple choice questions about occupational protection, epidemiological characteristics and clinical features to assess the coping ability status. 5 points for each knowledge question, with the total score being 110 points: for single choice questions, 5 points for a correct answer and 0 points for a wrong answer; for multiple-choice questions, no score for a wrong choice, and 1 point will be deducted for each missing choice. The median score of all the respondents was set as the threshold. Those who are higher than the median was classified as high score group, and others were classified as low score group.

The mental health status of medical personnel was evaluated through 11 questions about nervousness, anxiety, worry, anger, pessimism, fatigue, and other psychological symptoms. Participants were asked to report the frequency of conditions during the epidemic, on a scale of five degrees including hardly, seldom, sometimes, regularly and frequently. The scores were set to 2, 4, 6, 8 and 10 based on the five levels of psychological question answers (from 2 "hardly" to 10 "frequently"), with a total score of 110 points for all the 11 mental health status questions. Those whose scores were higher than the median was considered as the poor group, whereas those who were below the median score were considered as the better group.

2.3 Statistics Analysis

The Chi-square analysis was performed to test for differences in proportions of categorical variables between two or more groups. Multivariate logistic regression analysis was used to evaluate the effects of various factors on coping ability and mental health status. Logistic regression analysis was performed using coping ability (0=low score, 1=high score) and mental health status (0=poor group, 1=better group) as the dependent variable. Variables that were statistically significant in the Chi-square analysis were included in the logistic regression analysis. All statistical analyses were performed using R (version 3.6.2; R Project for Statistical Computing, Vienna, Austria) with a significance level of 0.05.

3. Results

3.1 Characteristics of Study Participants

Table 1 shows the basic demographic characteristics of the participants. Among all 1735 participants, most of them (84.96%) were females and 70.20% were between 30 and 50. More than 80% (81.15%) of them had a bachelor's degree and 68.41% were nurses. Almost all participants (99.54%) were very concerned about the progress of the epidemic, and only a few of them (1.04%) had infected people around them. Many participants (97.43%) believed that the emergency plan could control the development of the incident promptly, and the vast majority (87.20%) believed that the epidemic would be brought under control within a short period of time. More than 70% (78.39%) participated in the handling of this public health emergency. (Table 1)

Participants' knowledge of COVID-19 was mainly derived from official sources such as government and professional organizations (93.85%), media (66.74%) and professional knowledge (66.74%) (Figure 3), and they don't very trust the unofficial channels (72.16%) (Table 1).

3.2 Coping Ability and Mental Health Status

The 1735 respondents had a coping ability score of 81 (Median; IQR, 75~87) ranging from 47 to 108 points. The average correct rate reached about 80%, and performance in all three categories of questions (occupational protection, epidemiological characteristics, and clinical features) were all well (65.3%, 69.4%, 76.3%, respectively). The majority of the participants (96.8%) had scores above the passing line. Only some (3 of 22) of the more interfering multiple-choice questions were poorly answered (Below 25%). Results showed that age ($c^2=26.03$, $P<0.001$), education level ($c^2=39.18$, $P<0.001$), occupation ($c^2=24.72$, $P<0.001$), degree of trust in unofficial information ($c^2=12.14$, $P<0.05$) and participation in epidemic prevention and control ($c^2=5.15$, $P<0.05$) were factors affecting coping capacity. (Table 1)

The mental health score of participants was 58 (Median; IQR, 44~68). Most of them (65.0%) didn't have a severely unhealthy mental status. Results showed that age ($c^2=16.31$, $P<0.001$), gender ($c^2=11.14$, $P<0.001$), education level ($c^2=19.1$, $P<0.001$), occupation ($c^2=34.81$, $P<0.001$), degree of trust in unofficial information ($c^2=12.14$, $P<0.05$), participation in the event ($c^2=5.15$, $P<0.05$) and physical condition ($c^2=168.87$, $P<0.001$) were factors influencing mental health. (Table 1)

3.3 Influencing Factors for Coping Ability and Mental Health Status

The multivariate logistic regression analyses showed that older age(Age(30~50): OR, 1.63; 95%CI, 1.29~2.06; Age(50~70): OR, 1.71; 95%CI, 1.05~2.79), higher education level(Undergraduate: OR, 1.81;

95%CI, 1.07~3.15; Postgraduate and above: OR, 3.56; 95%CI, 1.88~6.90), and distrust in unofficial information (Very distrust: OR, 1.60; 95%CI, 1.04~2.48) were facilitating factors for better coping ability among medical workers. (Table 2)

For mental health status, medical workers had 3 promoting factors: older age (Age(50~70): OR, 2.48; 95%CI, 1.44~4.38), distrust of unofficial information (Very distrust: OR, 1.96; 95%CI, 1.24~3.12), and not involved in the event (OR, 1.82; 95%CI, 1.40~2.36). On the other hand, poor physical health (General: OR, 0.17; 95%CI, 0.12~0.24; ill: OR, 0.14; 95%CI, 0.03~0.49) was a risk factor. (Table 3)

4. Discussions

Hospitals are the key places to provide diagnosis and medical treatment and medical staff are the main force to deal with public health emergencies. The coping ability of medical staff has a direct impact on the regional or national response to public health emergencies and the mental health of them is also crucial in the long run. Our study was the first study focusing on the coping ability and mental health of medical staff during the early stage of the outbreak of COVID-19. In this study of 1735 medical staff in Henan Province, participants performed well in coping ability and mental health. More than 90% of the participants scored above the passing line in the assessment of coping ability, and most of them (65.0%) didn't have a severely unhealthy mental status. The analysis showed that older age, higher education, and distrust of unofficial information were contributing factors to medical workers' coping ability. Mental health status had three contributing factors: older age, distrust of unofficial information, and non-involvement in outbreak prevention and control; moreover, poor physical health was a risk factor. This provides a direction for improving the coping skills of medical staff and protecting their mental health, which could help improve the medical system's ability to respond and control the spread of the epidemic.

All participants were medical workers with medical backgrounds or engaged in medical-related work, so most of them were very concerned about the epidemic and they held a positive attitude towards the situation. Their knowledge about COVID-19 was mainly obtained from official sources and professional knowledge, which ensured the correctness of their knowledge. At the same time, we can discover the importance of government and professional media and other mainstream media. When an epidemic breaks out, even professional personnel such as medical staff also need to acquire knowledge and skills through these channels[18]. The uneven information in the external media could affect medical workers, but also seriously affect the knowledge and psychological state of the general population, even causing panic and damages[19-24]. In this way, the re-education about COVID-19 should be strengthened under the situation that the information from the outside public is mixed and incorrect information needs to be controlled in a timely manner[25, 26].

Medical workers are mainly responsible for timely detection, diagnosis and treatment of patients, playing an important role in epidemic response and control. A high level of COVID-19 knowledge among medical staff is necessary to prevent secondary infection and secondary transmission[27]. In this study, the answer status of the questionnaire showed that the participants had a good grasp of most of the

epidemic prevention and control knowledge and had corresponding coping ability towards the epidemic, inconsistent with some previous studies that showed opposing results[7-10]. This may be due to the fact that since the outbreak of SARS in 2003, Chinese medical personnel has paid more attention to their ability to respond to public health emergencies and the similarities between COVID-19 and SARS. Consistent with previous studies, age, education and whether trust in unofficial information were the main influencing factors on medical workers' coping ability[10, 25]. Older age represents a higher title and more experienced, and some of them have even participated in SARS-epidemic control in 2003[25]. A higher degree also means more medical knowledge, experience and skills[10, 25]. Extensive clinical experience, knowledge and skills would become a strong guarantee in the face of the epidemic. Distrust of unofficial information indicates a vigilant and cautious attitude, free from external inaccurate messages so that medical staff could adhere to correct information and knowledge and make unmistakable diagnoses and treatments.

Medical workers on the front line dealing with public health emergencies and fighting against epidemic were under tremendous psychological pressure, especially in the early stages of the outbreak[28]. Previous studies showed that exposure to a public health emergency can cause mental health problems, depression and even PTSD[13, 29, 30]. However, results of the present study showed that the psychological status of the participants was not bad and most mental health scores were in the upper-middle range, which is also inconsistent with some recent studies[12, 31, 32]. The reason for the difference may be that the study was conducted in different periods and regions. This study was conducted in the early stage of the epidemic in Henan Province, and Henan Province did not experience a large-scale spread of the epidemic and took timely countermeasures. In line with previous studies, age, participation in the event, health condition and trust in unofficial information were the main influencing factors to mental health[12, 31, 33-35]. Contrary to a recent study, age worked as a facilitating factor to mental health. This may be because although the older participants were not as physically fit or vigorous as the younger ones, they had more experience and skills, which allowed them to have a calmer attitude, especially in the early stages of the epidemic[12]. Participation in epidemic control means close contact with infected patients, increasing the risk of infection, which inevitably leads to an altered mental state of medical workers[31]. And we also found that the mental status of nurses was worse compared to other occupations, which may be due to their more time and frequency of contact with patients[29]. Poor health was originally an important factor in mental health, and this effect was also present among health workers during the epidemic[31]. In addition, distrust of unofficial information and belief in official information demonstrate their confidence in and approval of the state and society, indicating a positive attitude towards the situation. The Chinese government has provided mental health services medical workers[32, 36], but more attention should be paid to medical workers who may face more serious mental problems in the long run[14, 15].

This study was conducted at the beginning of the outbreak (first two weeks of the lockdown), and through a direct investigation of primary medical workers, the coping ability and mental health status of them in the early stage of epidemic can be truly reflected. There are also some limitations. At the beginning of the outbreak, neither the prevalence nor the mortality rate has yet reached its peak. With

subsequent enrichment of information, the release and update of official response guidelines, the improvement of training and the supplement of medical supplies, the coping ability and mental status of medical workers would change accordingly. Facing the changing situation, this study can only show the results of the investigation at the time it was conducted and can't reflect the changes over time, and other follow-up studies are needed to investigate long-term status. Online survey was used for this study, although it is convenient and quick, some factors may influence the results, resulting in a bias. And other undiscovered influencing factors may also have an impact on the results of the study.

5. Conclusions

In conclusion, our study showed that medical staff in Henan perform well in coping ability and mental health in the early stage of COVID-19. But the young, the under-educated and those who blindly trust unofficial information tended to have a worse coping ability; mental health is poorer among the younger, those who ignorantly believe unofficial information and those in poor health. This study can provide direction for the protection and intervention of medical staff in the early stages of an epidemic, help improve response capabilities, and provide a reference for other public health emergencies. However, follow-up studies are needed to determine long-term status.

Abbreviations

COVID-19

Corona Virus Disease 2019

IQR

Interquartile Range

WHO

World Health Organization

CI

Confidence interval

OR

Odds Ratio

SARS

severe acute respiratory syndrome

Declarations

Ethics approval and consent to participate

The study was approved by the Zhengzhou University Life Science Ethics Committee and was in accordance with the guidelines of the Helsinki Declaration. The survey was conducted in the form of an anonymous online questionnaire and did not involve any private and sensitive issues, and participants

could terminate the survey at any time. Verbal informed consent was obtained from all participants prior to enrollment in the survey, and the ethics committee approved this procedure.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are 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

SC, MF, XY, LZ and LL designed the research; LY, YS, SC and LL conducted research; SC and YS analyzed data; SC wrote the manuscript. All authors read and approved the final manuscript.

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Tables

Table 1 Basic Characteristics and Comparison of Coping Ability and Mental Health among Subgroups

Personal characteristics	N	%	Coping ability score		c ²	P	Mental health score		c ²	P
			Low score group	High score group			Poor group	Better group		
Age					26.03	<0.001			16.31	<0.001
<30	424	24.44	258	166			211	213		
30~50	1218	70.20	566	652			652	566		
>=50	93	5.36	46	47			30	63		
Gender					0.124	0.723			11.14	<0.001
Male	261	15.04	134	127			109	152		
Female	1474	84.96	736	738			784	690		
Marriage status					2.18	0.336			2.68	0.262
Single	298	17.18	161	137			141	157		
Married	1408	81.15	695	713			738	670		
Divorced and others	29	1.67	14	15			14	15		
Education level					39.18	<0.001			19.1	<0.001
Senior High School and below	70	4.03	48	22			32	38		
Undergraduate	1422	81.96	741	681			766	656		
Postgraduate and above	243	14.01	81	162			91	175		
Occupation					24.72	<0.001			34.81	<0.001
Management and logistics staff	50	2.88	31	19			20	30		
Clinicians	412	23.75	166	246			169	243		
Nurse	1187	68.41	621	566			668	519		
Medical technician	86	4.96	52	34			36	50		
Degree of trust in unofficial information					12.14	0.012			55.71	<0.001
Very trust	104	5.81	60	44			60	44		
Trust	39	2.18	25	14			22	17		
General trust	301	16.83	168	133			207	94		
Distrust	713	39.85	341	372			356	367		
Very distrust	578	32.31	276	302			248	330		
Participation in the event					5.15	0.023			14.40	<0.001
Y	1360	78.39	662	698			733	627		
N	375	21.61	208	167			160	215		
Physical condition									168.87	<0.001
Healthy	749	43.17	365	384	2.65	0.448	260	489		
Fine	716	41.27	362	354			428	288		
General	257	14.81	138	119			196	61		
Ill	13	0.73	5	8			9	4		

Table 2 Analysis of Factors Influencing Coping Ability

	β	S.E.	Statics	<i>P</i>	OR(95% CI)
(Intercept)	-1.76	0.45	-3.89	<0.01	0.17(0.07~0.41)
Age					
Age (30~50)	0.49	0.12	4.08	<0.01	1.63(1.29~2.06)
Age (50~70)	0.53	0.25	2.14	0.03	1.71(1.05~2.79)
Education level					
Undergraduate	0.59	0.27	2.17	0.03	1.81(1.07~3.15)
Postgraduate and above	1.27	0.33	3.84	<0.01	3.56(1.88~6.90)
Occupation					
Clinicians	0.48	0.33	1.47	0.14	1.62(0.85~3.11)
Nurse	0.43	0.31	1.36	0.17	1.53(0.84~2.87)
Medical technician	0.13	0.38	0.39	0.72	1.14(0.55~2.42)
Degree of trust in unofficial information					
Trust	-0.23	0.40	-0.59	0.56	0.79(0.36~1.71)
General trust	0.10	0.24	0.44	0.66	1.11(0.70~1.77)
Distrust	0.41	0.22	1.91	0.06	1.51(0.99~2.33)
Very distrust	0.47	0.22	2.13	0.03	1.60(1.04~2.48)
Participation in the event (Not)	-0.23	0.12	-1.88	0.06	0.79(0.62~1.01)
Mental health	0.04	0.10	0.43	0.67	1.04(0.86~1.28)

Table 3 Influencing Factors Analysis for Mental Health Status

	β	S.E.	Statics	<i>P</i>	OR(95% CI)
(Intercept)	0.68	0.47	1.45	0.15	1.97(0.79~4.96)
Age					
Age (30~50)	-0.18	0.13	-1.46	0.14	0.83(0.65~1.07)
Age (50~70)	0.91	0.28	3.21	<0.01	2.48(1.44~4.38)
Education					
Undergraduate	-0.12	0.28	-0.45	0.66	0.88(0.51~1.53)
Postgraduate and above	0.32	0.34	0.93	0.35	1.38(0.70~2.70)
Gender	-0.17	0.17	-0.99	0.32	0.85(0.60~1.18)
Occupation					
Clinicians	-0.02	0.34	-0.07	0.94	0.98(0.49~1.90)
Nurse	-0.32	0.33	-0.99	0.32	0.72(0.38~1.36)
Medical technician	0.11	0.39	0.27	0.79	1.11(0.51~2.40)
Degree of trust in unofficial information					
Trust	-0.04	0.41	-0.10	0.92	0.96(0.43~2.14)
General trust	-0.46	0.25	-1.79	0.07	0.63(0.38~1.05)
Distrust	0.32	0.23	1.39	0.16	1.38(0.88~2.18)
Very distrust	0.67	0.23	2.86	<0.01	1.96(1.24~3.12)
Participation in the event (Not)	0.60	0.13	4.49	<0.01	1.82(1.40~2.36)
Physical condition					
Fine	-0.95	0.11	-8.42	<0.01	0.39(0.31~0.48)
General	-1.75	0.17	-10.11	<0.01	0.17(0.12~0.24)
Ill	-1.96	0.66	-2.95	<0.01	0.14(0.03~0.49)
Coping ability	0.03	0.11	0.25	0.81	1.03(0.83~1.27)

Figures

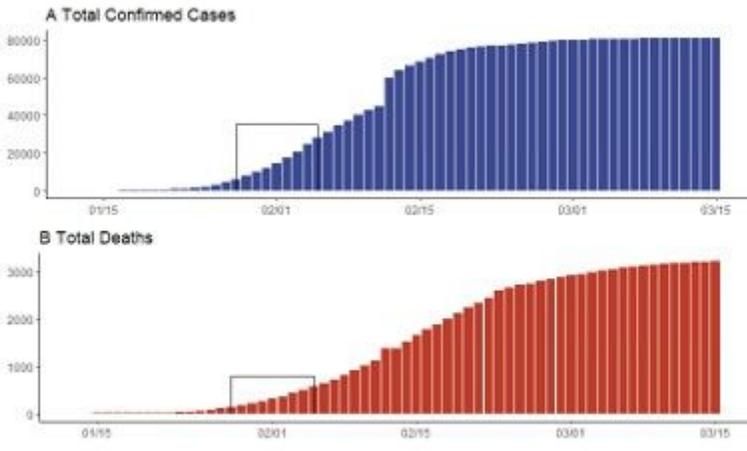


Figure 1

Epidemic Situation (From 13 January to 15 March; The square area represents the timespan of this study.)

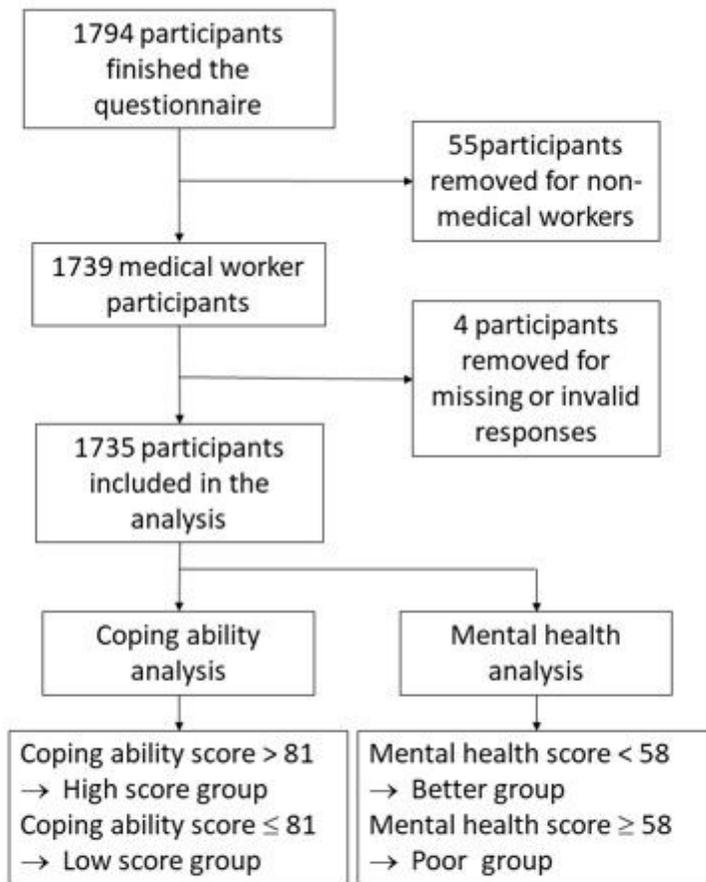


Figure 2

Flowchart of the methodology

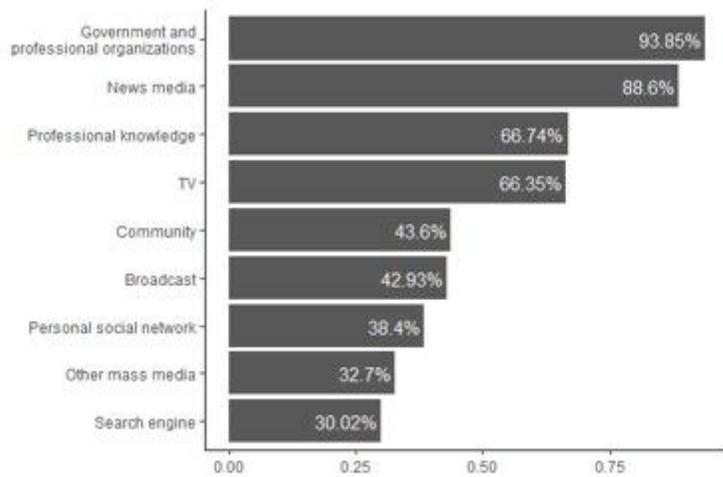


Figure 3

Knowledge Sources of Participants

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [supplementarymaterial.docx](#)