Post Traumatic Stress Disorder and Death Anxiety Symptoms During the Coronavirus Epidemic in 2019: A Cross-Sectional Study Based on the Affected Population

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Abstract

Background Mental health is an important aspect of the management public health emergencies. While extensive research is being conducted on various aspects of the COVID-19 epidemic, one of the factors overlooked is death anxiety.

Methods A cross-sectional study based on the results of an online survey. The survey was conducted one month after the outbreak (February 18–29, 2020) and repeated at the time of resuming activity (April 8–14, 2020). The 15-item Death Anxiety Scale (T-DAS) was used to assess the degree of death anxiety, and the revised 23-item Stanford Acute Stress Response Questionnaire (SASRQ) assessed PTSD symptom clusters. Through convenient sampling, a total of 7678 cases were collected.

Results: Between the first and second surveys, the number of individuals with high death anxiety rose from 48.1–53.2%, while the incidence of PTSD increased from 7–10.4%. PTSD was found to be significantly associated with living community contact history, poor health status of participants, history of life-threatening experiences, high death anxiety level, and non-medical occupation. Compared with other occupations, medical staff suffer more lasting death anxiety during the COVID-19 epidemic.

Conclusions: During the COVID-19 epidemic, adverse psychological symptoms were prevalent among the general population in China. High death anxiety also was an important factor affecting PTSD. Therefore, means to address death anxiety must be included in the plan for the management of psychological effects of public health emergency and high-risk groups such as medical personnel should receive targeted intervention.

1. Background

Corona virus disease 2019 (COVID-19) was first discovered in Wuhan, China, and is now referred to as COVID-19¹. Since its discovery at the end of December, the virus outbreak has spread worldwide, making it a global pandemic. The increase in the number of suspected cases, close contacts, and confirmed patients is paralleled by an increase in the number of people requiring isolation. The National Health Council of China reports that as of September 4, a total of 90,475 cases of COVID-19 were diagnosed in mainland China, with 4735 deaths². Nearly 26 million cases have been diagnosed abroad, with a total death toll of 868,805³. Research indicates that post-traumatic stress disorder (PTSD) is the most common long-term mental disorder caused by public health emergencies^{4,5}. This highlights the need for the establishment of a suitable emergency strategy for the management of psychological disorders associated with major public health emergencies, so that they can be promptly put into place before the outbreak and allow for effective identification and intervention once an outbreak occurs.

1.1. Risk factors related to PTSD

As studies about PTSD go deeper, researchers have noticed a relatively obvious difference between PTSD and anxiety disorder. Unlike the standards in DSM-V, PTSD is not incorporated into the anxiety disorder,

but regarded as a kind of disorder related to trauma and stress in DSM-V⁶. Although PTSD also tend to show a relatively strong symptoms of fear and anxiety, which are the core symptoms of the anxiety disorder, they are by no means the core signs of PTSD.

Various categories of risk factors of PTSD have been identified by investigators. The first category includes individual variables such as gender, age, education level, family income, and family emotional support^{5,7,8}. The second category comprises pre-traumatic factors, including the number and type of previously experienced traumatic events, psychological status of the participants before the trauma, and history of traumatic disorders during childhood^{5,7,8}. The third category encompasses variables associated with the impact of trauma event on the individual, including the type of trauma, participant's degree of exposure, participant's perception of life threats, and damage the event caused to the participant^{5,7,8}. Our research takes a step further from this premise. When discussing the factors influencing PTSD during the COVID-19 outbreak, death anxiety may be assumed to be an important related factor of PTSD.

1.2 The current study

Previous research has pointed out that post-traumatic stress disorder usually coexists with other mental illnesses, among which the most common comorbidities are depression, drug abuse and other anxiety disorders^{9–12}. Death anxiety is the fear of death, as if it were inevitable, which causes anxiety moves a person away from happiness and satisfaction¹³. The theory of terror management believes that due to the occurrence of PTSD, the anxiety buffer system is destroyed, which leads to the loss of normal defense, and the awareness of death appears^{14–16}. And this anxiety buffer destruction theory has been confirmed in the civil war in Côte d'Ivoire and women subjected to domestic violence^{17,18}. But we believe that the fear of death is the most basic cause of anxiety and fear, and it will increase the incidence of PTSD. Other researchers have pointed out that PTSD will increase the risk of suicide of the reporter¹⁹. In this study, we conducted the first large-scale screening of public for PTSD and death anxiety in the context of a large-scale public health disaster. Additionally, we also sought to explore the impact of death anxiety on PTSD. This study sought to survey the level of public death anxiety in large-scale public health incidents and sought to justify the administration of life and death education for the masses in mainland China.

2. Methods

2.1. Study Design

This investigation was designed as a cross-sectional study of the results of an online survey, which was first conducted one month after the outbreak (February 18–29, 2020) and repeated again when normal work was resumed (April 8–14, 2020). The questionnaire collected data on several demographic variables of the participants: gender, age, occupation, marital status, health status, living community contact with COVID-19 patients, etc. Moreover, it also includes questions pertaining to past experiences,

such as life-threatening incidents or bereavement. Informed consent for participation in the study was obtained from all participants and participants had the right to refuse participation in the study or use of personal data for scientific research. Data collection was anonymized in order to ensure privacy, and participants had the right to refuse to participate or use personal data for scientific research.

2.2. Instruments

The questionnaire collected data on various parameters, including demographic characteristics, past experience, and community contact with COVID-19 patients.

The revised version of Stanford Acute Stress Reaction Questionnaire (SASRQ) has been shown to have good reliability and validity in the screening of PTSD symptom clusters induced by exposure to emergencies^{20–22}. In all, this questionnaire includes 22 entries, each of which relates to specific symptoms or behaviors related to stress and reports the duration of this emotional state (within two days, within a week, within a month, and over a month). The diagnosis of PTSD is established on the basis of DSM-IV criteria for PTSD: ≥ 1 re-experience symptoms, ≥ 3 avoidance symptoms, and ≥ 2 arousal/anxiety symptoms²³. Individuals meeting these criteria were classified as having a high number of PTSD symptoms. In this study, we screened patients according to whether they had the main symptom groups of PTSD and did not conduct a comprehensive clinical evaluation; therefore, the diagnosis of PTSD cannot be conclusively established in our study participants. The Cronbach α coefficient for the scale in this study was 0.971.

The Templer–Death Anxiety Scale was used to investigate the degree of death anxiety of participants. This scale was originally developed by Templer and has been in use for the measurement of death anxiety in individuals and has been shown to have good reliability and validity^{24,25}. In this scale, a total of 15 points are assigned to various domains: emotion, which mainly pertains to subjective experiences and feelings in the emotional process and emotions related to death; stress and pain, which represent the stress and pain of death caused by disease; and time awareness (awareness regarding the transient and finite nature of life), cognition (emotional memory of death). A total score of 7 and above was indicative of high death anxiety, with higher scores indicating more severe death anxiety. In this study, Cronbach α coefficient for this scale was 0.724.

2.3. Statistical Analysis

The results of the online surveys were collected and SPSS software version 25.0 was used for statistical analysis. Parameters for which the data conformed to normal distribution were expressed as mean $\pm$ standard deviation ($\bar{x} \pm s$), while countable data were expressed as frequency. The chi-square test was used to evaluate the difference between the first and second surveys in terms of the incidence of death anxiety and PTSD. Univariate analysis and multivariate binary logistic regression were performed to identify the risk factors of PTSD. First, a univariate analysis was performed to identify independent variables, which were then subjected to multivariate binary logistic regression. Among the variables identified in univariate analysis, those with a significance level of $P < 0.10$ were included in the

multivariate analysis. Secondly, multivariate binary logistic regression was performed after the exclusion of confounding factors of each variable; the odds ratio (OR) was then corrected and the statistical significance level of the final analysis was set at $P < 0.05$.

3. Results

3.1. Descriptive Results

A total of 7771 participants completed the questionnaire. Among them, 84 participants refused to participate in the study and questionnaires of 9 participants were inconsistent and therefore excluded. Thus, the final effective participation rate was 98.80% (7678). Among the individuals who completed the questionnaires, 6792 were women (88.46%) and 886 were men (11.54), with an average age of was 34.88 years (SD = 10.468). Among them, 5769 (75.14%) of the participants were medical staff, whereas the remaining 1974 (25.71%) were non-medical staff such as students, educators, and civil servants (Table 1).

3.2. Incidence of death anxiety and PTSD at the two time points

Between the first and second surveys, the percentage of people with high death anxiety in our two surveys rose from 48.1–53.2% ($P < 0.001$), whereas the incidence of PTSD increased from 7–10.4% ($P < 0.001$). Bivariate analysis revealed that both non-medical staff and medical staff had similarly high levels of death anxiety at the time of the outbreak ($P = 0.851$). At the second survey, once work was resumed, a significant difference was noted between the medical staff and non-medical staff in terms of the incidence of high death anxiety ($P < 0.001$; Tables 2 and 3).

3.3. Influencing factors of PTSD

Next, we performed regression analysis while accounting for confounding factors in order to identify the predictors of PTSD (Table 4). Multivariate analysis revealed the following as risk factors associated with PTSD: history of community contact (vs. no contact history: OR, 1.376; 95% CI 1.127 ~ 1.680; $P = 0.002$), poor health status of the participants (vs. good health: OR, 1.923; 95% CI, 1.407 ~ 2.628; $P < 0.001$), the history of past life-threatening events (vs. no such history: OR, 1.410; 95% CI, 1.177 ~ 1.691; $P < 0.001$), high death anxiety (vs. low death anxiety: OR, 3.555; 95% CI, 2.949 ~ 4.286; $P < 0.001$). In addition, the non-medical occupation was also found to be a significant factor associated with higher incidence of PTSD (vs. medical staff: OR, 0.803; 95% CI, 0.662 ~ 0.974; $P = 0.026$).

4. Discussion

To the best of our knowledge, this is the first study to investigate the incidence of PTSD and death anxiety and their relationship during the COVID-19 epidemic. After its first detection in Wuhan, China, the COVID-19 epidemic broke out within a short time, making our sample a strong representative of epidemic-affected populations. On screening at the time of resumption of duties, the incidence of PTSD had

increased from 7–10.4%, which was much higher than that at the baseline (0.2–3.8%)²⁶. The results of our study are similar to those obtained in studies on the prevalence of PTSD among medical staff, which were conducted one to three years after the onset of SARS^{27,28}. This high incidence of PTSD among the staff may be attributed to the fact that compared to previous epidemics of coronavirus diseases in China, COVID-19 has been the most contagious, most rapidly spreading, and most difficult to prevent and control, with the widest range of infection. This places a great psychological burden on the general public^{28,29}.

The incidence of high death anxiety increased from 48.1% at the time of the outbreak to 53.2% at the time of resumption of activities ($P < 0.001$). One possible explanation for the persistence of increased death anxiety even during the relaxation phase may be that at this stage, the anxiety may be difficult to prevent and control²⁹. Another possible explanation is that medical personnel have been constantly exposed to COVID-19 patients. Medical personnel are constantly exposed to known and unknown sources of viruses while they are involved in the process of prevention and control of the disease^{27,28}. This prolonged exposure to COVID-19 patients and the resultant psychological pressure result in a high incidence of death anxiety among medical personnel.

Sex and occupation have been previously identified as important factors associated with PTSD^{11,30,31}. Women have been shown to be more likely to encounter traumatic events (such as sexual assault and abuse) than men, and therefore, the incidence of PTSD is higher among women than in men. From a physiological point of view, under the influence of physiological hormonal and regulatory axes, women often tend to repeatedly process negative information, have more obvious symptoms of trauma separation, and experience the sense of trauma and emotional turmoil more strongly as compared to men^{32–34}. These factors make women a high-risk group for PTSD^{30,31,35}. However, sex was not found to be a significant factor related to PTSD in this study; this may be attributed to the lower participation of men in this study.

Occupation and contact history were found to be important factors associated with PTSD. Studies have shown that among rescuers exposed to natural or man-made disasters, the incidence of PTSD varies from 3–32%, depending on the nature of the rescue^{11,36}. During this epidemic, medical personnel who are the main warriors involved in the fight against the epidemic are constantly under the risk of infection. In addition, witnessing the death of patients may also trigger their anxiety and fear among the medical staff³⁷. As the most vulnerable group, medical personnel need special care to prevent the development of PTSD and should be provided follow-up care for mental health.

Individuals with trauma have been reported to exhibit a higher prevalence of PTSD as compared to individuals who have not experienced highly traumatic events (Wald $\chi^2 = 10.96$, $df = 1$, $P = 0.0009$)^{26,38}. The risk of PTSD is influenced by the number and type(s) of traumatic events experienced (e.g., violence, loss of loved ones, and unrequited affection)³⁸. In the present study, we selected three past experiences, namely, participant's own health status, history of bereavement, and history of life-threatening events.

Among them, the participant's own poor health and history of life-threatening events were found to be significantly associated with the development of PTSD. However, previous studies have shown less significant impact of these experiences as compared to experiences of violence (OR: 10.22; 95% CI: 5.53 ~ 18.89) and electric shock (OR: 2.54; 95% CI: 1.34 ~ 4.80)³⁸. In this study, we did not find any significant correlation between bereavement history and PTSD; this may be related to the differences between populations with respect to the impact of bereavement history. PTSD is associated with multiple traumatic experiences and its management requires personalized, targeted therapeutic strategies developed on the basis of a careful understanding of the patient's psychological status before the occurrence of the event^{39, 40}.

Our findings indicated that compared to individuals without high levels of anxiety, those with high levels of death anxiety were three times more likely to develop PTSD. This implies that it is necessary to recognize high death anxiety as an important factor related to PTSD; we should consider the concurrent existence of other types of anxiety in patients with PTSD. The terror management theory points out that the anxiety-buffer system is a physiological phenomenon intended for self protection function¹⁴. Thoughts about death are a source of anxiety, and generally, death anxiety does not persist for long in individuals¹⁵. However, once an individual faces the impact of a traumatic event, the anxiety-buffer function is destroyed, which reduces the body's buffer of thoughts pertaining to death^{15, 41}. As per the theory of terror management, victims of traumatic events have a heightened awareness of death, especially individuals with damaged or fragile psychological buffering mechanism; this leads to anxiety or reduce happiness¹⁴. Our study results indicate that death anxiety is an important factor related to the occurrence of PTSD, which means that death anxiety has a two-way effect on PTSD. When faced with the threat of death, individuals consciously and unconsciously develop negative emotions associated with death anxiety⁴². However, the initial post-traumatic stress compromises the anxiety-buffer system, thereby resulting in the development of PTSD. Thus, persistent death anxiety may play an important role in the development of PTSD.

5. Limitations

Our study has several limitations. First, the population surveyed in this study was not uniform, which did not account for the baseline level of mental health of the participants before the survey. Second, when the content of the study was explained, some candidates refused participation because of the Chinese culture of avoiding the topic of death. It is unclear whether this rejection is in itself an indicator of higher levels of death anxiety. Finally, the participation rate of non-medical personnel was significantly lower than that of medical personnel, and again, we are unsure whether this lack of participation represents non-medical worker's resistance to the problem.

6. Conclusion

To summarize, our study results suggest that death anxiety is an important factor influencing the occurrence of PTSD, with medical personnel facing longer periods of death anxiety than non-medical personnel. History of life-threatening events, occupation, degree of exposure to the epidemic, and high death anxiety status were all significant factors influencing PTSD. When formulating a plan for the management of psychological effects of public health emergencies, the main target is effective prevention of the psychological status of the victims after the event. Death anxiety is not only an influencing factor of PTSD, but since PTSD compromises the individual's anxiety-buffer system, death anxiety may become more severe. These new findings may be taken into consideration when formulating a plan for the management of the psychological effects of public health emergencies and thereby provide effective interventions for key populations.

Declarations

Ethics approval and consent to participate

Affected by the epidemic, we were unable to contact the Ethics Committee during the investigation phase. Informed consent for participation in the study was obtained from all participants and participants had the right to refuse participation in the study or use of personal data for scientific research.

Consent for publication Not applicable

Availability of data and materials

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

Competing interests

The authors declare that they have no competing interests.

Funding Not applicable

Authors' contributions

Q Z: Formal analysis; Writing-Original Draft;

RJ Z: Resources; Supervision;

QQ M: Investigation; Resources;

Y F: Investigation; Data Curation;

JY L: Methodology; Writing- Review& Editing; Funding acquisition;

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43. **Additional files.**

Tables

Table1. Respondents' demographic characteristics				
Variable	Outbreak phase N(%)	Work resumption phase N(%)	Total N(%)	N
Total	3762	3916	7678	
Sex				
Female	3261(86.7)	3531(90.2)	6792(88.46)	
Male	501(13.3)	385(9.8)	886(11.54)	
Age				
<25	512(13.6)	919(23.5)	1431(18.64)	
25~50	2553(67.9)	2751(70.3)	5304(69.08)	
>50	697(18.5)	246(6.3)	943(12.28)	
Age Mean(SD)	37.91(11.113)	31.98(8.886)	34.88(10.468)	
Education				
Junior college or below	1634(43.4)	1216(31.1)	2850(37.12)	
Undergraduate	1899(50.5)	2493(63.7)	4392(57.2)	
Postgraduate and above	229(6.1)	207(5.3)	436(5.68)	
Occupation				
Non-medical staff	1432(38.1)	477(12.2)	1909(24.86)	
Medical staff	2330(61.9)	3439(87.8)	5769(75.14)	
Marital status				
Unmarried	707(18.8)	1267(32.4)	1974(25.71)	
Married	2875(76.4)	2524(64.5)	5399(70.32)	
Divorce	146(3.9)	114(2.9)	260(3.39)	
Widowed	34(0.9)	11(0.3)	45(0.59)	
Residence				
villages and towns	242(6.4)	158(4)	400(5.21)	
County-level city	1040(27.6)	713(18.2)	1753(22.83)	
Prefecture-level city	855(22.7)	2062(52.7)	2917(37.99)	
Provincial capital	1625(43.2)	983(25.1)	2608(33.97)	

city			
Living community contact			
Yes	566(15)	3269(83.5)	3835 49.95
No	3196(85)	647(16.5)	3843 50.05
Religious belief			
Yes	332(8.8)	3649(93.2)	3981 51.85
No	3430(91.2)	267(6.8)	3697 48.15
physical condition			
Good	3489(92.7)	3780(96.5)	7269 94.67
Worse	273(7.3)	136(3.5)	409 5.33
Life threatening event			
Yes	1001(26.6)	3125(79.8)	4126 53.74
No	2761(73.4)	791(20.2)	3552 46.26
Bereavement			
Yes	1716(45.6)	2317(59.2)	4033 52.53
No	2046(54.4)	1599(40.8)	3645 47.47

Table.2 Difference between high mortality anxiety and PTSD in two time periods				
Variable	Pearson Chi-Square	Outbreak phase (%)	Work resumption phase (%)	P
High death anxiety incidence	20.22	48.10	53.20	<0.001
PTSD incidence	27.324	7.00	10.40	<0.001

Abbreviated PTSD post-traumatic stress disorder

Table.3 Differences in death anxiety of different occupations in two periods				
Variable	Non-medical staff	Medical staff	Pearson Chi-Square	P
Outbreak phase HDA (%)	48.3	47.9	0.035	0.851
Work-resumption phase HDA (%)	45.3	54.3	13.646	<0.001
Abbreviated: HDA,high death anxiety				

Table 4.Multivariate binary logistic regression analysis to determine risk factors of PTSD

Variable	OR(95% CI)	P value
Sex		
Female	1[Reference]	NA
Male	1.243(0.946~1.632)	0.118
Age		
<25 y	1[Reference]	NA
25~50 y	1.126(0.845~1.500)	0.417
>50 y	0.934(0.622~1.404)	0.744
Education		
Junior college or below	1[Reference]	NA
Undergraduate	1.076(0.894~1.296)	0.439
Postgraduate and above	0.972(0.663~1.487)	0.972
Occupation		
Non-medical staff	0.803[0.662~0.974]	0.026
Medical staff	1[Reference]	NA
Marital status		
Unmarried	1[Reference]	NA
Married	0.921(0.718~1.180)	0.513
Divorce	1.441(0.923~2.250)	0.108
Widowed	1.066(0.313~3.626)	0.919
Residence		
Villages and towns	1[Reference]	NA
County-level city	0.823(0.548~1.235)	0.346
Prefecture-level city	0.928[0.625~1.378]	0.710
Provincial capital city	0.747[0.503~1.110]	0.149
Living community contact		
Yes	1.376[1.127~1.680]	0.002
No	1[Reference]	NA

Physical condition		
Good	1[Reference]	NA
Worse	1.923[1.407~2.628]	>0.001
Life-threatening event		
Yes	1.410[1.177~1.691]	>0.001
No	1[Reference]	NA
Bereavement		
Yes	1.148[0.969~1.361]	0.111
No	1[Reference]	NA
Death anxiety		
High	3.555(2.949~4.286)	>0.001
Low	1[Reference]	NA

Abbreviated PTSD post-traumatic stress disorder

Questionnaire

The revised version of Stanford Acute Stress Reaction Questionnaire (SASRQ) has been shown to have good reliability and validity in the screening of PTSD symptom clusters induced by exposure to emergencies²⁰⁻²².

The Templer–Death Anxiety Scale was used to investigate the degree of death anxiety of participants. This scale was originally developed by Templer and has been in use for the measurement of death anxiety in individuals and has been shown to have good reliability and validity^{24, 25}.

Supplementary Files

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

- [STROBEchecklistcrosssectional.docx](#)