Assessment For Mental Disease Risk And Associated Factors, Predictive Value For Onset Of Major Depressive Disorder Among Disaster Rescue Workers Using Predictive Scale For Mental Disease

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Abstract:

Background: *Natural disasters not only cause direct economic losses and physical harm, but also pose significant mental health risks to victims and rescue workers of natural calamity. This study aimed to assess the risk and associated factors of mental disease using Predictive Scale for Mental Disease (PSMD) and the predictive value of PSMD for the onset of major depressive disorder (MDD) among disaster rescue workers.*

Material and methods: *A total of 1,177 workers for disaster rescue including earthquakes, infectious diseases, ebris flow, typhoons, were enrolled by random cluster sampling. The PSMD was used to assess the risk of mental disease and analyze predictive value of PSMD for MDD using Chi-square test among disaster rescue workers.*

Results: *The dimension scores and total PSMD score except choleric temperament in disaster rescue workers were higher than Chinese norm (P<0.05 or 0.01). dimension scores of psychosis, social support deficiency, introversion and total PSMD score in only-child group were lower than those of non-only child group (P<0.05 or 0.01). Scores of melancholic temperament among urban origin group was higher and of introversion was lower than those of rural origin group (P<0.05). Among the 1,177 disaster rescue workers, 123 were hospitalized within two years and eventually diagnosed as MDD with a prevalence rate of 10.45%. The total PSMD scores were firstly ranked from high to low with the top 25% being low-score group and the bottom 25% being high-score group. The results showed that the MDD diagnosis rate in high-score group was significantly higher than that in low-score group (P=0.001).*

Conclusion: *The risk of mental disease associated with only-child or not, native place(urban or rural area) was higher than that of the general population among disaster rescue workers. The mental health of urban origin and non-only child group in disaster rescue workers needed more concern. It was also indicated that PSMD assessment was a necessity in the selection and professional training of disaster rescue workers for establishing a more impeccable health care system.*

Keywords: *Disaster; Stress; Mental disease risk; Major depressive disorder; Rescue workers*

I. Introduction

Human beings, as the products of nature, have achieved survival and development through interaction with nature. Unfortunately, unexpected natural disasters still cause considerable harm to humanity on the condition of today's highly developed civilization. According to "The situation of national natural disaster" released by Office of National Committee for Disaster Prevention, Mitigation and Relief/Ministry of Emergency Management, 9,978,000 people in China were stricken by heavy rain, drought, strong wind with 55 people dying or missing in May 2025. A report from the Swiss Re Institute showed that global insurance losses from natural disaster reached 108 billion US dollars, exceeding 100 billion US dollars as a new normal for the fourth consecutive year in 2023 [1, 2]. Natural disasters not only cause direct economic losses and physical harm, but also pose significant mental health risks to victims and rescue workers of natural calamity.

At present, more concern was underlined for mental health of the victims who have experienced natural calamity, there was a lack of in-depth exploration on mental health and related factors in disaster rescue workers. It is reported that the PTSD prevalences in rescue workers was 10% to 20% and among police officers, firefighters and emergency service workers ranged from 6% to 32%, an overall prevalence rate was 4% for general population [3]. Among 95 members of rescue team for coal mines, 27 (28.42%) members at abnormal emotional states with dispositions of anxiety and depression, including 5 (5.26%) with simple anxiety, 17 (17.89%) with simple depression, and 5 (5.26%) with coexisting anxiety and depression. The BMI and systolic blood pressure in abnormal emotion group were significantly higher than those of normal controls [4]. Stress response, a series of psychological, physical, behavioral reactions when facing extreme environment of disaster rescue scenes, may lead to problems in decision-making and teamwork in firefighters, thereby affecting rescue efficacy and even personal safety. At the same time, stress response may induce psychosomatic diseases, such as musculoskeletal disorders characterized with physical disability and chronic pain, which could lead to serious life quality reduction [5, 6]. In addition, some studies have found that public safety workers (PSWS) exposed to traumatic events, job hazards, injuries, death, overwork, irregular shift arrangements, and lack of administrative support were at high risk of psychological trauma and burnout, which may eventually develop into substance abuse, sleep disorders, depressive disorder, etc. [7-10]. A meta-analysis comprehensively investigated the prevalence of depression, anxiety and insomnia among healthcare workers during outbreak of COVID-19 pandemic, the results showed the overall prevalences of anxiety was 23.2%, of depression was 22.8% and the estimated prevalence of insomnia was 38.9%. A subgroup analysis revealed gender and occupational differences with female HCPs and nurses exhibiting higher rates of affective symptoms compared to male and medical staff respectively [11].

Depressive symptoms are common among disaster rescue workers which may be strongly related to suicide, early retirement, heart disease and hypertension [12-14]. Strengthening the selection of disaster rescue workers and early assessment and intervention of risk factors for depressive disorder is of great implication in disease prevention. Zhang developed Predictive Scale for Mental Disease(PSMD), which included 11 assessment dimensions, such as maladapted defense mechanism, psychosis, melancholic temperament, personality disturbance, choleric temperament, social support deficiency, introversion, family history, stressors, neurosis, adverse childhood, based on comprehensively analysis for the etiology, risk & protective factors, and prodromes of mental disease. PSMD with confirmed reliability and validity property had been widely used in the assessment of mental disease risk among different populations [15, 16]. PSMD played an active role in the early detection, diagnosis, prevention and rehabilitation of mental disorders.

Therefore, this study aimed to assess the risk and associated factors of mental disease using PSMD and the predictive value of PSMD for the onset of major depressive disorder (MDD) among disaster rescue workers, and thereby providing a scientific reference for health maintenance and disease prevention in disaster rescue

workers.

II. Materials And Methods

This cross-sectional study was carried out among disaster rescue workers in Psychiatric Center, No. 904th Hospital of Join Logistic Support Force, Changzhou 213003, China from January to June in 2025. A total of 1,177 workers for disaster rescue including earthquakes, infectious diseases, ebris flow, typhoons, were enrolled by random cluster sampling.

Study Design: Cross-sectional study

Study Location: In Psychiatric Center, No. 904th Hospital of Join Logistic Support Force, Changzhou 213003, China.

Study Duration: January to June in 2025

Sample Size: A total of 1,177 disaster rescue workers

Subjects & selection method: A total of 1177 males, aged 18 to 37 (22.34±3.61) years old were enrolled using random cluster sampling.

Inclusion criteria:
1. On good health conditions with no history of craniocerebral injury affecting nervous system function, endocrine disorders, or severe mental disorders (schizophrenia, major depressive disorder, bipolar disorder, anxiety disorder, etc.)
2. Without drug abuse history and life events experience recently.

Exclusion criteria:
1. With severe social withdrawal.
2. With a history of childhood abuse.
3. The WAIS<90 whom as diagnosed as intellectual disability.

Mental evaluation tools

The Mental disease risk among disaster rescue workers was evaluated by Predictive Scale for Mental Disease (PSMD), which has consisted of 96 items belonging to 11 dimensions, including maladapted defense mechanism, psychosis, melancholic temperament, personality disturbance, choleric temperament, social support deficiency, introversion, family history, stressors, neurosis, adverse childhood. The items of PSMD was scored at two-level scale with "Yes" response being scored as 1 and "No" response being scored as 0. The higher the score, the greater the risk of mental disease. Previous research showed that PSMD has good reliability and validity property [17]. In this study, the Cronbach's α coefficient of PSMD was 0.867.

Research Methods

All participants were evaluated for mental disease risk using PSMD according to Chinese norm). Individuals who were admitted to the hospital within 2 years and diagnosed as MDD based on Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-V) were recorded [18].

Statistical Analysis

Data were managed using SPSS21.0, and descriptive statistical analysis, one-sample t-test, independent sample t-test, chi-square test were conducted for the data analysis. A P value <0.05 was considered statistically significant.

III. Results

Comparison of PSMD scores between disaster rescue workers and Chinese norm

The one sample t-test revealed that the dimension scores and total PSMD score except choleric temperament in disaster rescue workers were higher than Chinese norm [19] (P<0.05 or 0.01).

Table 1 Comparison for testing scores of PSMD in disaster rescue workers and Chinese norm ($\overline{X}$ ±SD)				
Dimensions	Disaster rescue workers (n=1177)	Chinese norm(n=11017)	t	P
Maladapted defense mechanism	1.41±1.84	1.07±1.61	6.44	0.000
Psychosis	0.81±1.59	0.59±1.29	4.85	0.000
Melancholic temperament	2.48±2.44	1.56±2.14	13.00	0.000
Personality disturbance	2.35±1.96	1.64±1.77	12.37	0.000
Choleric temperament	1.72±1.75	2.02±1.85	−5.88	0.000
Social support deficiency	0.54±1.05	0.36±0.85	5.76	0.000
Introversion	3.12±2.21	2.54±1.96	8.99	0.000
Family history	0.18±0.51	0.11±0.43	4.70	0.000
Stressors	1.54±1.77	1.20±1.59	6.60	0.000
Neurosis	1.81±2.23	1.38±1.95	6.61	0.000
Adverse childhood	1.18±0.86	1.12±0.79	2.22	0.027
PSMD	17.14±12.72	13.57±11.54	9.60	0.000

Comparison of mental illness risk between only-child group and non-only child group

The results suggested that dimension scores of psychosis, social support deficiency, introversion and total PSMD score in only-child group were lower than those of non-only child group (P<0.05 or 0.01).

Table 2 Comparison for mental disease risk of only-child and non-only child groups in disaster rescue workers ($\overline{X}$ ±SD)				
Dimensions	Only-child group (n=468)	Non-only child group(n=709)	t	P
Maladapted defense mechanism	1.32±1.86	1.48±1.82	−1.46	0.144
Psychosis	0.69±1.49	0.90±1.65	−2.23	0.026
Melancholic temperament	2.35±2.37	2.57±2.48	−1.53	0.126
Personality disturbance	2.28±1.96	2.39±1.96	−0.94	0.348
Choleric temperament	1.65±1.69	1.76±1.78	−1.06	0.288
Social support deficiency	0.46±0.97	0.59±1.09	−2.05	0.041
Introversion	2.88±2.15	3.28±2.24	−2.99	0.003
Family history	0.21±0.54	0.16±0.48	1.90	0.058
Stressors	1.46±1.67	1.60±1.83	−1.34	0.180
Neurosis	1.66±2.23	1.91±2.22	−1.82	0.070
Adverse childhood	1.21±0.95	1.16±0.81	1.01	0.312
PSMD	16.14±12.57	17.81±12.78	−2.20	0.028

Comparison of mental disease risk between urban origin group and rural origin group in rescue workers

The results of independent sample t-test showed that scores of melancholic temperament among urban origin group was higher and of introversion was lower than those of rural origin group (P<0.05).

Table3 Comparison for mental disease risk between urban origin and rural origin groups in rescue workers ($\overline{X}$ ±SD)

Dimensions	Urban origin group (n=361)	Rural origin group(n=816)	t	P
Maladapted defense mechanism	1.46±1.81	1.40±1.85	0.561	0.575
Psychosis	0.84±1.58	0.80±1.60	0.398	0.691
Melancholic temperament	2.72±2.44	2.38±2.43	2.201	0.028
Personality disturbance	2.45±1.99	2.30±1.95	1.201	0.230
Choleric temperament	1.87±1.76	1.66±1.74	1.897	0.058
Social support deficiency	0.46±0.92	0.57±1.10	−1.742	0.082
Introversion	2.93±2.18	3.21±2.22	−1.998	0.046
Family history	0.24±0.59	0.15±0.47	2.574	0.010
Stressors	1.53±1.71	1.55±1.80	−0.212	0.832
Neurosis	1.89±2.34	1.78±2.18	0.806	0.420
Adverse childhood	1.22±0.93	1.16±0.83	1.227	0.220
PSMD	17.58±12.67	16.75±12.75	0.734	0.463

Comparison of MDD diagnosis rate between the high- and low-PSMD testing score groups in disaster rescue workers

Among the 1,177 disaster rescue workers, 123 were hospitalized within two years and eventually diagnosed as MDD with a prevalence rate of 10.45%.

The total PSMD scores were firstly ranked from high to low with the top 25% being low-score group and the bottom 25% being high-score group. The results showed that the MDD diagnosis rate in high-score group was significantly higher than that in low-score group (P=0.001).

Table 4 Analysis for coincidence rate of MDD diagnosis between the high- and low-PSMD score groups in disaster rescue workers (Case/%)

PSMD assessment	Diagnosis for MDD		χ^2	P
	MDD	Healthy controls		
High-score group	98(33.33)	196(66.67)	54.79	0.001
Low- score group	25(8.50)	269(91.50)		

IV. Discussion

The interaction between human being and nature has run through human history, so far, a basic system of rescue, relief, reconstruction, scientific research, international cooperation for natural disaster has been established, and main countries around the world have also set up their own professional rescue teams [20-22]. The potential impact of natural disasters, accidents, major public health events, etc. on the health of rescue workers is a matter that requires more concern. This study preliminary explored the mental disease risk and associated factors using PSMD among disaster rescue workers and predictive value of PSMD for the onset of MDD.

Firstly, this study found that dimension scores and total PSMD score except choleric temperament in

disaster rescue workers were higher than Chinese norm which indicated the personnel participating in disaster rescue have a relatively higher risk of mental disease. The sudden occurred disasters required rescue workers quickly assemble within a short period of time and rush to the disaster area as soon as possible for carrying out rescue work. Usually, A large number of missing people needed to be searched and injured or sick people in need of treatment on the conditions of limited rescue forces and scarce medical resources. In addition, the living environment, including public facilities and social service networks, were severely damaged in the disaster-stricken area. The rescue workers faced harsh working and living conditions for the critical shortages of electricity, clean water, food and of environment hazards with a high risk of accidental injury [23-26]. The stress reaction induced by complex disaster-stricken environment may impair executive function, cognitive flexibility, attention, memory, problem-solving which associated with depressive rumination, negative cognitive bias, chronic fatigue in disaster rescue workers, thereby, the pathological process of mental disease was accelerated and prodromal symptoms would gradually emerge.

Some demographic characteristics were also related to the mental disease risk, it was confirmed in this study that scores of psychosis, social support deficiency, introversion and total PSMD score in only-child group were lower than those of non-only child group, scores of melancholic temperament among urban origin group was higher and of introversion was lower than those of rural origin group. These results indicated that non-only child group was at a higher risk of mental disease and urban origin group was more extroverted while their depressive disorder risk was stronger among disaster rescue workers. It was argued parental rearing styles, living environment, and childhood experiences was greatly related to personality development, subjective well-being, adjustment, and mental health, families of non-only child group had a heavier caring burden and limited development resources, which could easily shape their introverted personality traits featured with social withdrawal and insufficient social support, therefore, non-only child group was prone to psychological distress under these conditions. The individuals, grown in urban with open and inclusive atmosphere in entertainment, social interaction, education, culture, could acquire an extroverted personality. However, their lack of training in willpower and endurance would shape fragile diathesis in physical activities and adaptive processes. In uncontrollable and unpredictable environments, it was easy to develop depressive moods [27,28]. Therefore, the mental health of urban origin and non-only child group in disaster rescue workers needed more concern and early intervention.

Secondly, this study found that 123 individuals among 1,177 disaster rescue workers were admitted to the hospital within two years and diagnosed as MDD with a prevalence rate of 10.45%. The MDD diagnosis rate in high-score group was significantly higher than that of low-score group of PSMD. The forementioned results indicated that the test scores of PSMD revealed a good predictive property on MDD among disaster rescue workers. The primary design of PSMD was based on comprehensive analysis and assessment of risk & protective factors, prodromal symptoms in mental disease, as a result, PSMD had a good predictive value for mental disease [15-17]. Meanwhile, all the disaster rescue workers in this study had experienced stressful disasters and accidents, The previous research showed that human stress mechanism was latent and persistent which may lead to a decrease of response threshold to stress stimuli [29,30]. Hence, the MDD diagnosis rate in the high-score group of PSMD was higher.

V. Conclusion

This present study showed that the risk of mental disease associated with only-child or not, native place(urban or rural area) was higher than that of the general population among disaster rescue workers. The mental health of urban origin and non-only child group in disaster rescue workers needed more concern and early intervention. It was also suggested that PSMD assessment was necessary to be introduced into the

selection and professional training of disaster rescue workers for establishing a more impeccable health care system.

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