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Influencing factors of posttraumatic stress disorder in Shidu parents who have lost their only child: a cross-sectional survey

Zhuo Peng¹, Yifeng Luo², Rongfeng Qi³, Zhihong Cao², Jiyuan Ge², Luoan Wu⁴, Jin Liu¹ and Li Zhang^{1*} 

Abstract

Background In China, parents who have lost their only child are referred to as Shidu parents (SDPs). This study aimed to investigate the prevalence and risk factors of post-traumatic stress disorder (PTSD) and investigate the influence of depressive and anxiety symptoms on the development of PTSD.

Method Four hundred and thirty-six SDPs completed assessments of PTSD (Structured Clinical Interview for DSM-IV Disorders, SCID-IV; The Clinician-Administered PTSD Scale-IV, CAPS-IV), depression (Hamilton depression scale), and anxiety (Hamilton Anxiety Scale) via in-person interviews. Logistic regression and hierarchical multiple linear regression analyses were used to explore the association of demographic characteristics, depression, and anxiety symptoms with PTSD.

Results The prevalence of PTSD in SDPs was 14.45%. The comorbidity of depression and anxiety symptoms was 87.30% in the SDPs with PTSD. The logistic regression model, which included factors of gender, age, education, depression, and anxiety, which contributed to the development of PTSD, was significant [$\chi^2(11) = 122.47, p < 0.001$]. The hierarchical multiple linear regression analysis indicated that female gender and the severity of comorbidities (depression and anxiety) were positively associated with the severity of PTSD.

Conclusion This study found that the severity of depression and anxiety was closely related to the severity of PTSD, supporting that SDPs are highly prone to the co-occurrence of PTSD, depression, and anxiety after bereavement. Our findings may provide more insights into the development of individualized interventions for parents who have experienced the loss of their only child.

Keywords Mental health, Post-traumatic stress disorder, Depression, Anxiety

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Introduction

China is a country with an aging population. Researchers have predicted that by 2030, older Chinese adults will make up 24.6% of all adults aged 60 or older across the world [1]. The term “Loss-of-only-child family” refers to a situation in which the only child in the family has passed away or been rendered disabled as a result of an accident and the mother has passed her reproductive age [2]. In Chinese society, these parents are known as Shidu parents. It is estimated that 82,500 families will lose their only child and 165,000 older Shidu parents will emerge every year [3].

Shidu parents (SDPs) experience more severe health issues than parents who have a living child [4]. Although this problem is not common in Chinese society, the impact can be serious for those who have lost their only child. Shidu parents may suffer from mental illnesses, such as post-traumatic stress disorder (PTSD), depression, and anxiety, and it can be hard for them to accept the truth for a prolonged period of time [5]. PTSD after the loss of a child can inflict agony for weeks, months, or even years after the traumatic event. Individual accidents tend to be more traumatic than accidents involving a group of people or natural disasters. Symptoms of PTSD include distressing and intrusive memories and nightmares, hyperarousal, emotional withdrawal, and poor concentration [6]. Some Shidu parents with PTSD may avoid talking about their lost child and are unwilling to meet with friends, relatives, or strangers who might inadvertently remind them of the painful memories associated with their loss [5, 7]. The imagery of the child's burial may resurface like scenes from a movie, and these agonizing memories are difficult to avoid, persistently and involuntarily intruding upon the minds of SDPs [8]. Moreover, SDPs may develop enduring cognitive distortions regarding the cause and consequences of the loss of their only child. These distortions often manifest as persistent self-blame or the attribution of faults to others for the child's death [7, 8]. In an attempt to come to terms with the loss of a child, the parents may cry more, have appetite changes and difficulty sleeping, long for their child, and be concerned about how they live without their beloved child [9]. PTSD in Shidu parents may have long-lasting consequences; for instance, some parents may use drugs or alcohol to mitigate their sorrow, which can lead to substance or alcohol misuse [10].

Post-traumatic stress disorder (PTSD) is a psychiatric disorder that may occur in people who have experienced or witnessed a traumatic event, a series of events, or a set of circumstance [11]. Trauma includes events that pose a significant threat to the victim's safety or loved ones and are overwhelming and shocking, including the death of a loved one [7, 12]. Losing the only child is one of the most traumatic experiences for elderly parents who have

passed the child-bearing age. Studies have found that those who have experienced the loss of a loved one from a violent or unexpected cause, such as a homicide, suicide, or accident, are more likely to experience PTSD and depressive symptoms [13]. After losing the only child in the distinct social and cultural context of China, Shidu parents may also have to cope with stress from social isolation, cultural stigmatization, and financial hardship [14]. Perceived external (e.g., social gatherings or unfamiliar places) and internal risks (e.g., strange physical sensations) may also contribute to the development of anxiety [15].

Overall, not only PTSD but also depression and anxiety are possible mental health problems among SDPs [16]. A cross-sectional survey conducted in China revealed that the rates of depression, anxiety, and PTSD detection were 94.7%, 82.6%, and 47.9%, respectively [17]. It was also found that these three affective disorders co-occurred in 45.5% of cases, indicating a high rate of comorbidity [17]. PTSD is highly comorbid with anxiety and depression [18–21]. The comorbidity of PTSD, depression, and anxiety may exacerbate the psychological distress of the SDPs, resulting in adverse intervention outcomes [18]. However, current studies frequently investigate PTSD, depression, and anxiety as independent variables rather than the cause of the coexistence of these psychiatric issues. Such a strategy may not adequately capture the complexity of psychological issues that affect SDPs. Prior studies have found a correlation between increased severity of PTSD and the comorbidity of PTSD and depression [13, 17, 22, 23]. People with both major depressive disorder and PTSD showed higher levels of negative affect, decreased positive affect, and heightened dysphoria when compared to those with PTSD only [24]. However, many current studies overlooked the presence of anxiety symptoms in SDPs, and there are few studies examining the association between anxiety symptoms and PTSD. It has been found that avoidance strategies related to anxiety symptoms can increase psychological distress, making anxious individuals more susceptible to suicidal ideation or attempts [25]. Lebeaut et al. hypothesized that the severity of PTSD might be significantly correlated with anxiety sensitivity, in both physical and cognitive forms [26]. It is evident that depression and/or anxiety co-occur with PTSD symptoms and that this co-occurrence is linked to more severe symptoms and disease outcomes. Thus, a thorough investigation of the status and influencing factors of PTSD is warranted to improve our understanding of PTSD and facilitate the development of intervention strategies.

The traumatic experience of losing a beloved child also coexists with the economic and social predicaments faced by SDPs. Due to a variety of factors such as the absence of emotional support from their children, marginalization

by society, and inequality in the social security system, SDPs are more susceptible to mental health issues [27]. However, not all SDPs experience symptoms of PTSD, depression, or anxiety. Individuals react differently to the loss of a loved one [28]. Thus, identifying risk and preventive factors for PTSD is also important for SDPs [13].

Previous research has identified several factors that probably impact the development of PTSD of SDPs, including gender, age, education, income, sex and age of the lost child, cause of death, loss of time, and whether they have a grandchild [5, 29]. Among these factors, being female, older age, and low education level were recognized as prime risk factors [3, 5, 30–32]. According to prior studies, women are more prone to have more severe PTSD symptoms and prolonged grief disorder (PGD) [24–26]. While some studies have indicated that losing a child at a younger age may be a significant risk factor for depressive symptoms and severe PGD symptoms [26], others have found that losing the only child at an older age is associated with PGD [25] and a greater level of PTSD. With regard to education, a lower educational level was found to be a significant risk factor for depression symptoms of parents who have lost their children. However, the exact influence of these factors on PTSD and its co-morbidity with depression and anxiety remains unclear [31, 33–36].

In summary, our insights into the mental health status of SDPs are based on the abovementioned studies. The present study aimed to examine the prevalence of PTSD and its comorbidities of depression and anxiety among Shidu parents, identify the impact of gender, age, and education level on PTSD, and investigate the influence of depressive and anxiety symptoms on the development of PTSD.

Methods

Participants and procedures

A total of 436 SDPs were recruited in Jiangsu Province, China from April 2021 to July 2021. All SDPs have experienced the loss of their only child and had not received any psychiatric treatment, and none of them had given birth to other children at the time of the interview. All participants had normal cognitive function and were able to express themselves in Chinese fluently. Participants with any history of loss of consciousness, brain injury with coma, severe neurological illness, or mental retardation were excluded.

The Structured Clinical Interview for DSM-IV (SCID) was used to identify participants with PTSD, and the Clinician-Administered PTSD Scale (CAPS) was used to assess the severity of PTSD symptoms. The Hamilton Anxiety Scale (HAMA) was used to measure anxiety, and the Hamilton Depression Scale (HAMD) was used to evaluate depression. All participants provided

written informed consent after receiving adequate information about this study. This study was approved by the Medical Ethics Committee of the Affiliated Yixing Hospital and was conducted in accordance with the Helsinki Declaration.

Measures

The demographic information of subjects was collected through ad hoc interviews. The SCID Axis I Disorders [37] was used to identify participants who met the DSM-IV-TR criteria for PTSD as well as those who met the criteria for other major psychiatric illnesses (e.g., bipolar disorder, schizophrenia, substance or alcohol dependence). The SCID scales have demonstrated substantial internal consistency and good reliability and validity.

Based on the established symptom clusters described in the DSM-IV [38], CAPS-IV was used to evaluate the severity of PTSD symptoms, with higher scores indicating more severe PTSD symptoms. To determine the total score of CAPS-IV, a 5-point scale was used to rate the frequency of symptoms experienced in the past month, ranging from 0 (never) to 4 (daily or almost every day) [39]. The severity of symptoms was also assessed using a 5-point scale, with the score ranging from 0 (none) to 4 (extreme) [39]. The internal consistency analysis yielded a Cronbach's alpha coefficient of 0.97 for all CAPS items, demonstrating high reliability [40].

The Hamilton Depression Rating Scale-17 (HAMD-17) [41] was used to measure the severity of depressive symptoms over the past week. This scale involved the rating of the level of agitation observed by clinicians during the interview and how the mood was affecting one's work or leisure pursuits [42]. The total score ranges from 0 to 52, with cutoff scores of 7, 17, and 24 to indicate mild, moderate, and severe depressive symptoms, respectively [43]. The reliability coefficient (R) of the overall assessment is 0.88 to 0.99, with an experience-based authenticity coefficient of 0.92 to reflect the severity of clinical symptoms [44]. This scale has demonstrated good reliability [34].

The 14-item Hamilton Anxiety Scale (HAMA) was used to assess the severity of the participant's anxiety [45]; all the items were rated on a 5-point Likert scale from 0 (not present) to 4 (severe). The total score ranges from 0 to 56, with cutoff scores of 7, 14, 21, and 29 to indicate mild, moderate, severe, and extremely severe anxiety symptoms, respectively [45]. As one of the reliable and valid interviewer-administered instruments to assess the severity of anxiety, it has become the standard in the field [46–50].

Statistical analysis

Statistical analyses were performed using SPSS 26.0. Independent t-test or one-way ANOVA was used to analyze the relationship between demographic

characteristics and PTSD symptoms, as appropriate. Pearson’s correlation coefficient was calculated to explore the correlations among PTSD, demographic characteristics, depression, and anxiety. Hierarchical linear regression determines the contribution of variables in each step to the dependent variable, thus, it was used to explore the influence of demographic characteristics and comorbidities on PTSD at each step, with age, education, gender, the score of HAMD, and the score of HAMA included at

each step. Dummy variables were set for education as it is a categorical variable.

Results

Demographic and clinical data of SDPs are shown in Table 1. A total of 436 Shidu parents participated in our survey, including 188 males (43.12%) and 248 females (56.88%). The age of males ranged from 44 to 72 years ($M=58.93$, $SD=5.48$), and the age of females ranged

Table 1 Demographic characteristics associated with PTSD symptoms in Shidu parents

		Total N (%) M ± SD	Participants with PTSD n = 63 N (%) M ± SD	Participants without PTSD n = 373 N (%) M ± SD
Gender	Female	248 (56.88)	46 (73.02)	202 (54.16)
	Male	188 (43.12)	17 (26.98)	171 (45.84)
Age (years)	44–59	260 (59.63) 55.00 ± 0.202	38 (60.32) 54.84 ± 3.680	222 (59.52) 55.03 ± 3.188
	60–72	176 (40.37) 63.64 ± 0.186	25 (39.68) 63.88 ± 2.403	151 (44.48) 63.60 ± 2.479
Educational level	Illiteracy	41 (9.40)	9 (14.29)	32 (8.58)
	Primary school	92 (21.10)	14 (22.22)	78 (20.91)
	Junior high school	233 (53.44)	28 (44.44)	205 (54.96)
	Senior high school or above	70 (16.06)	12 (19.05)	58 (15.55)
Cause of the child’s death	Somatic Diseases	164 (37.61)	20 (31.75)	144 (38.61)
	Tumor	90 (20.64)	13 (20.63)	77 (20.64)
	Cardiovascular disease	17 (3.90)	0 (0.00)	17 (4.56)
	Brain diseases	10 (2.29)	1 (1.59)	9 (2.41)
	Other diseases	47 (10.78)	6 (9.52)	41 (10.99)
	Accidental causes	190 (43.58)	29 (46.03)	161 (43.16)
	Traffic accident	112 (25.69)	17 (26.98)	95 (25.47)
	Drown	35 (8.03)	5 (7.94)	30 (8.04)
	Industrial accident	12 (2.75)	0 (0.00)	12 (3.22)
	Toxicity	6 (1.38)	2 (3.17)	4 (1.07)
	Other accidents	25 (5.73)	5 (7.94)	20 (5.36)
	Suicide	41 (9.40)	6 (9.52)	35 (9.38)
	Homicide	15 (3.44)	5 (7.94)	10 (2.68)
Sudden death	26 (5.96)	3 (4.76)	23 (6.17)	
Depression (HAMD score)	None (<7)	253 (58.03) 3.42 ± 0.115	3 (4.76) 6.00 ± 0.000	250 (67.02) 3.39 ± 1.818
	Mild (7–17)	168 (38.53) 10.01 ± 0.210	50 (79.37) 11.70 ± 2.840	118 (31.64) 9.27 ± 2.301
	Moderate (18–24)	11 (2.52) 21.00 ± 0.632	7 (11.11) 21.43 ± 1.813	4 (1.07) 20.25 ± 2.630
	Severe (≥ 25)	4 (0.92) 31.00 ± 2.483	3 (4.76) 29.33 ± 4.509	1 (0.27) 36.00 ± 0.000
Anxiety (HAMA score)	None (<7)	240 (55.05) 3.35 ± 0.118	7 (11.11) 4.86 ± 1.069	233 (62.47) 3.31 ± 1.826
	Mild (7–13)	159 (36.47) 9.10 ± 0.144	32 (50.79) 10.00 ± 1.901	127 (34.05) 8.87 ± 1.732
	Moderate (14–20)	28 (6.42) 16.00 ± 0.262	18 (28.57) 16.17 ± 1.339	10 (2.68) 15.7 ± 1.494
	Severe (21–28)	5 (1.15) 24.40 ± 0.927	3 (4.76) 24.33 ± 2.887	2 (0.54) 24.5 ± 0.707
	Extremely severe (≥ 29)	4 (0.92) 30.75 ± 0.854	3 (4.76) 30.00 ± 1.000	1 (0.27) 33.00 ± 0.000

from 46 to 68 years ($M=58.16$, $SD=4.92$). Two hundred and sixty people aged 44–59 years accounted for around 59.63%, and 176 people aged 60–72 years accounted for approximately 40.37%. In terms of educational level, 41 (9.40%) were illiterate, 92 (21.10%) completed primary school education, 233 (53.44%) completed junior high school education, 66 (15.14%) graduated from senior high school, and 4 (0.92%) obtained a university degree. Regarding PTSD, 63 participants (14.45%) were diagnosed with PTSD using the SCID scale, and 373 (85.55%) were not experiencing such a problem. Among the participants diagnosed with PTSD, 46 were females, accounting for approximately 73.02%, and 17 were males, accounting for approximately 26.98%. Thirty-eight participants aged 44–59 years had PTSD, accounting for approximately 60.32%. Fifty-one people with PTSD had lower levels of education (junior high school or below), accounting for approximately 80.95% of all people with PTSD. For Shidu parents, the primary causes of their child’s death include somatic diseases (37.61%), accidents (43.58%), suicide (9.40%), sudden death (5.96%), and homicide (3.44%). For SDPs with PTSD, the most common cause of their child’s death is accidents (46.03%), specifically traffic accidents (26.98%); this is followed by tumors (20.63%), which is in the somatic diseases category (31.75%). Participants with PTSD scored 33–85 ($M=50.06$, $SD=1.29$) on CAPS, significantly higher than that of those without PTSD ($M=18.48$, $SD=0.49$). Of all the SDPs, 46.56% showed mild to moderate PTSD symptoms and 2.98% had severe or extremely severe symptoms. There were 153 participants with PTSD symptoms, accounting for approximately 41.02% of the undiagnosed population. Among those diagnosed with PTSD ($M=12.83$, $SD=0.78$), 32 (50.79%) were likely to have anxiety; of them, 22 showed pronounced symptoms, accounting for approximately 34.92% of the total diagnosed population, and three (4.76%) had severe symptoms. Of the participants with undiagnosed PTSD ($M=5.73$, $SD=0.21$), 127 (34.05%) were likely to have anxiety symptoms, and 12 (3.22%) showed severe anxiety. Of the patients diagnosed with PTSD ($M=13.40$, $SD=0.71$), 50 (79.37%) had mild depression, and 10 (15.87%) had moderate to severe depression; among participants with undiagnosed PTSD ($M=5.52$, $SD=0.21$), 118 (31.64%) had mild depression, and 5 (1.34%) had moderate to severe depression.

Table 2 The comorbidity of PTSD among Shidu parents

	Participants with PTSD (n = 63)	Participants without PTSD (n = 373)	χ^2	p-value
HAMD score ≥ 7	60 (95.24)	123 (32.98)	85.79	<0.001
HAMA score ≥ 7	56 (88.88)	140 (37.53)	57.44	<0.001

Note HAMD: Hamilton Depression Scale; HAMA: Hamilton Anxiety Scale

Notes: M: mean; SD: standard deviation; HAMD: Hamilton Depression Rating Scale; HAMA: Hamilton Anxiety Scale.

The comorbidities of PTSD in Shidu parents are presented in Table 2. The results showed that 41.97% (183/436) of all participants had depression symptoms, and 44.95% (196/436) had anxiety symptoms. Furthermore, 13.76% (60/436) had both PTSD and depression symptoms, and 12.8% (56/436) had both PTSD and anxiety symptoms. The participants with PTSD had a significantly higher comorbidity rate of depression and anxiety than those without PTSD (for depression, 95.24% vs. 32.98%; for anxiety, 88.88% vs. 37.53%, both $p<0.001$). Three participants without depression symptoms and seven participants without anxiety symptoms met the diagnostic criteria for PTSD.

Logistic regression analyses were performed for all the outcome variables selected from the demographic variables, depression, and anxiety. The results showed that mild (odds ratio [OR]: 20.19, 95% confidence interval [CI]: 5.25–77.71, $P<0.001$), moderate (OR: 17.54, 95%CI: 2.04–150.47, $P<0.01$), and severe depression symptoms (OR: 31.76, 95%CI: 1.78–565.66, $P<0.05$) as well as moderate (OR: 9.35, 95%CI: 2.50–34.98, $P<0.01$) and severe anxiety symptoms (OR: 9.67, 95%CI: 1.14–82.34, $P<0.05$) were risk factors for PTSD (Table 3).

The hierarchical multiple linear regression showed that 62.3% of the variance in PTSD severity could be explained by the regression model (Table 4). The R^2 changes showed that the additional variances explained by each block of variables were 5.0%, 55.8% and 1.9% for demographic characteristics (i.e., age, education, and gender), severity of depression and severity of anxiety, respectively. The stratified multi-linear regression analysis showed that older age and a higher level of education could reduce the risk of PTSD, while the female gender might increase the risk of PTSD. Moreover, a higher risk of developing PTSD and more severe symptoms were found associated with greater severity of depression and anxiety symptoms.

Discussion

This study examined the prevalence of PTSD and its associated factors among SDPs in urban China. In this study, we found that the prevalence of PTSD among SDPs was 14.45%, which was lower than that in previous studies. For instance, a meta-analysis involving 2,722 SDPs found that the pool prevalence of PTSD was 46.8% [5], and Wang et al. found that the prevalence of PTSD symptoms was 24.46% in Shenyang Province, China [51]. Based on our findings, the lower prevalence of PTSD might be due to the use of SCID, which is a more stringent and accurate assessment tool. Prior studies found that more than two-thirds of SDPs do not suffer from

Table 3 Logistic regression analysis for the prediction of PTSD

Factor	B	SE	Wald	Odds ratio	95% CI	
					Lower limit	Upper limit
Age						
Middle aged				1.00		
Older adults	-0.36	0.36	0.99	0.70	0.34	1.42
Education						
Illiteracy				1.00		
Primary school	0.19	0.60	0.10	1.21	0.37	3.91
Junior high school	-0.18	0.54	0.12	0.83	0.29	2.41
Senior high school or above	0.66	0.63	1.10	1.93	0.57	6.62
Gender						
Male				1.00		
Female	0.09	0.38	0.05	1.09	0.52	2.28
HAMD (score)						
None (< 7)				1.00		
Mild (7–17)	3.01***	0.69	19.10	20.19	5.25	77.71
Moderate (18–24)	2.86**	1.10	6.82	17.54	2.04	150.47
Severe (≥ 25)	3.46*	1.47	5.54	31.76	1.78	565.66
HAMA (score)						
None (< 7)				1.00		
Mild (7–13)	0.62	0.52	1.41	1.85	0.67	5.10
Moderate (14–20)	2.24**	0.67	11.02	9.35	2.50	34.98
Severe or above (≥ 21)	2.27*	1.09	4.31	9.67	1.14	82.34

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed)

Table 4 Hierarchical multiple linear regression analysis of PTSD symptoms among Shidu parents in urban China

Variable	PTSD symptoms							Adjusted R ²	ΔR ²
	B	95% CI	t	p-values	β				
Demographic characteristics							0.044	0.050	
Age	-0.11	-0.39	0.16	-0.80	0.428	-0.04			
Education (under middle school vs. high school or above)	-2.48	-5.56	0.60	-0.08	0.115	-0.08			
Gender (male vs. female)	5.98	3.24	8.72	4.30	<0.001	0.20			
Comorbidity									
HAMD	1.60	1.30	1.90	10.32	<0.001	0.56	0.605	0.558	
HAMA	0.73	0.42	1.04	4.65	<0.001	0.26	0.623	0.019	

Note B = unstandardized beta; β = standardized regression weight

PTSD, depression, or anxiety disorders, which might be related to their adaptability. Our findings are in line with earlier studies, which showed that a large number of people who had experienced trauma or bereavement could still manage their sense of loss [13, 52–54].

To our knowledge, there have been few studies on the correlation of depression and anxiety with PTSD among SDPs. The present study found that the comorbidity rate of PTSD, depression, and anxiety was as high as 12.61%, which was lower than 45.5% as revealed in a prior study [17]. Nevertheless, the comorbidity rate of depression and anxiety symptoms was 87.30% in the SDPs with PTSD. This result may provide further evidence that bereaved people with PTSD are more likely to have depression and anxiety than people without PTSD.

The logistic and hierarchical multiple linear regression analyses in this study indicated that depression and

anxiety symptoms were associated with the diagnosis and severity of PTSD. Moreover, the hierarchical multiple linear regression analysis also indicated that the female gender was positively associated with the severity of PTSD symptoms. In line with prior studies, we found that female SDPs experienced higher levels of PTSD, depression, and anxiety symptoms than males. A study found that the risk of developing PTSD in women was twice as high as that in men [55]. A large number of studies yielded similar results [3, 5, 31, 32, 36], but some studies had different findings [13]. One reason for the disparity might be that mothers in China usually invest more time in raising their children and are more intimately connected to their children. Thus, mothers tend to develop more severe mental and physical problems due to the loss of a child [36, 56, 57]. Furthermore, our findings also suggested that post-bereavement depression and/or anxiety

symptoms were more likely to co-occur with PTSD. A study found that negative emotional experiences could contribute to the higher comorbidity rate associated with PTSD [58].

The severity of depression and anxiety symptoms may also be associated with the severity of PTSD, and gender may be another contributor. In a biopsychosocial view, PTSD can be exacerbated by increased severity of depression and anxiety, which may further limit the social functioning of the affected people [59]. Meanwhile, PTSD can solely predict the subsequent anxiety and depression and the triple comorbidities over time [19]. The potential common neural pathways of anxiety, depression, and PTSD, such as dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis and abnormalities in brain regions such as the amygdala and prefrontal cortex, may lead to mutually amplifying symptoms of comorbidities [60–63]. However, it should not be ignored that the overlapping comorbid symptoms may also lead to a perception of increased severity [64, 65]. In Chinese culture, children are of great significance to their parents as they are viewed as their parents' primary source of hope and the reason for living [13, 66]. As the social care provision system for aged people is still developing in China, social and financial assistance to older people is almost solely provided by their children. Thus, the loss of an only child can increase the financial burden of SDPs as they have lost their caregiver [13, 51, 57], which may also contribute to their intensified symptoms of depression and anxiety. Financial difficulties have been widely recognized as a significant stressor that can exacerbate mental health issues, including PTSD, anxiety, and depression [67–70]. However, the present study did not directly investigate financial status as a potential risk factor for SDPs. Future research is needed to explore the specific mechanism through which financial stress impacts SDPs.

In accordance with previous studies, the present study did not find a significant association of the severity of PTSD with education or age [71–73]. However, some studies have shown that a higher educational level is a risk factor for the development of PTSD among SDPs [5, 31], and some other studies indicated that a lower educational level is a risk factor [74, 75]. Shidu is an extremely traumatic event that may disrupt traditional cultural and age-related patterns of influence on psychological well-being [76]. On the one hand, the psychological impact of losing a child on Shidu parents may exceed the protective effect that a high education level could offer [76]. On the other hand, age may indirectly impact the severity of PTSD through other variables (e.g., physical health and life experiences) rather than directly affecting this disorder [77]. Older Shidu parents may have more experience and resources in coping with life adversities, which may alleviate their PTSD symptoms to some extent. The

mechanism for the association between the education level of SDPs and PTSD is still unclear and needs to be further explored. With regard to age, although a study by Yin et al. suggested that the loss of an only child at an older age is associated with a higher severity of PTSD [3], it is still inconclusive whether aging is predictive of an increased risk of PTSD [73, 78]. Overall, the relatively small sample size, non-inclusion of other potential influencing factors (e.g., financial status and the cause of the child's death), individual differences in psychological resilience, and limitations related to measurement tools can potentially result in an insignificant association of the severity of PTSD with education or age [5].

Overall, this study further investigated PTSD in Shidu parents. Firstly, our findings suggest that clinicians need to pay special attention to emotional well-being of SDPs. Although the prevalence of PTSD is not high, it is still important to consider the comorbidity of depression and anxiety when assessing PTSD symptoms. Early identification and intervention for anxiety and depression can help to prevent the further development of PTSD. Secondly, interventions for SDPs should include comprehensive mental health assessment and management strategies that address anxiety, depression, and PTSD. Thus, psychologists and psychiatrists should consider the interplay of multiple mental health issues when making treatment plans. Lastly, this research underscores the importance of gender in mental health. The present study also found that women were more likely to experience PTSD, suggesting that mothers who lost their only child are more vulnerable and need more care. Clinicians and mental health service providers need to be aware of the role of gender in mental health issues and provide more personalized and targeted support. Hopefully, our findings may provide a basis for the development of intervention strategies to manage mental health problems and improve the quality of life of SDPs.

Limitations

There are several limitations to be noted. First, the cross-sectional design of the study precluded the establishment of causal links between the factors, which may be addressed by additional follow-up studies employing a longitudinal design. In addition to exploring the correlation between demographic characteristics and mental illnesses in SDPs, future studies are warranted to explore other variables such as the economic conditions, age of the child, cause of death, or having a grandchild, in order to gain more insights into the development of mental illnesses and facilitate the formation of the best intervention strategies for this vulnerable population. While the death of an only child can be traumatic for parents, not all individuals who have experienced such a loss develop PTSD.

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Author contributions

Z.P. drafted the manuscript. Y.L. and R.Q. conceived the study. L.W. collected data for the analyses. L.Z. conceived the study and revised the manuscript. J.L., Z.C., and J.G. revised the manuscript. All authors endorsed the final manuscript for submission and publishing.

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Data availability

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

Declarations

Ethics approval and consent to participate

This study was approved by the Medical Ethics Committee of the Affiliated Yixing Hospital and was conducted in accordance with the Helsinki Declaration. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

- Du YS, Zhang W, Wang Y, Jia X, Cheng Z, Xia Z, et al. Exploration on the Trend of temporal and spatial distribution of Population aging in China. *Chin J Health Stat.* 2018;35(4):522–26.
- Chen E. The Number of the Only-child-died-Families in China. *Population and Development.* 2013.
- Yin Q, Zhang H, Shang Z, Wu L, Sun Z, Zhang F, et al. Risk factors for PTSD of Shidu parents who lost the only child in a rapid aging process: a cross-sectional study. *BMC Psychiatry.* 2020;20:37.
- Yin Q, Shang Z, Zhou N, Wu L, Liu G, Yu X, et al. An investigation of physical and mental health consequences among Chinese parents who lost their only child. *BMC Psychiatry.* 2018;18:45.
- Wang Q, Zhang S, Wang Y, Jing Z, Zhou Y, Qi K, et al. Prevalence and risk factors of posttraumatic stress disorder among Chinese shidu parents: a systemic review and meta-analysis. *J Affect Disord.* 2021;282:1180–6.
- Yehuda R, Hoge CW, McFarlane AC, Vermetten E, Lanius RA, Nievergelt CM, et al. Post-traumatic stress disorder. *Nat Reviews Disease Primers.* 2015;1(1):15057.
- Yangfan P. Traumatie Memory and its construction of the Group who have lost their only child. PhD diss. College of Sociology, Central China Normal University; 2019.
- Xu X, Liu B. Post-traumatic stress disorder in Shidu parents and its psychological assistance. *WUHAN Univ J (Arts Humanity).* 2017;70(02):122–8.
- Lee C. PTSD and the Loss of a Child 2021 <https://heretoserve.org/blog/ptsd-and-the-loss-of-a-child/>
- Christiansen SG, Reneflot A, Stene-Larsen K, Hauge LJ. Alcohol-related mortality following the loss of a child: a register-based follow-up study from Norway. *BMJ Open.* 2020;10(6):e038826.
- Diagnostic and Statistical manual of mental disorders: DSM-5™. 5th ed. Washington: American psychiatric association; 2013.
- Clinical Practice Guideline for the Treatment of Posttraumatic Stress Disorder (PTSD) in Adults. (2017): American Psychological Association; 2017.
- Eli B, Zhou Y, Liang Y, Fu L, Zheng H, Liu Z. A profile analysis of post-traumatic stress disorder and depressive symptoms among Chinese Shidu parents. *Eur J Psychotraumatol.* 2020;11(1):1766770.
- Zheng Y, Lawson TR. Identity reconstruction as shiduers: narratives from Chinese older adults who lost their only child. *Int J Soc Welf.* 2015;24(4):399–406.
- Craske MG, Stein MB, Anxiety. *Lancet (London England).* 2016;388(10063):3048–59.
- Cao X, Yang C, Wang D. The Impact on Mental Health of Losing an only child and the influence of Social Support and Resilience. *Omega (Westport).* 2020;80(4):666–84.
- ZHANG, Y.-d. JIA X-m. Mental Health Status of the shiduers: based on latent Profile Analysis. *Chin J Clin Psychol.* 2019;27(2):362–6.
- Dikmen-Yildiz P, Ayers S, Phillips L. Depression, anxiety, PTSD and comorbidity in perinatal women in Turkey: a longitudinal population-based study. *Midwifery.* 2017;55:29–37.
- Ginzburg K, Ein-Dor T, Solomon Z. Comorbidity of posttraumatic stress disorder, anxiety and depression: a 20-year longitudinal study of war veterans. *J Affect Disord.* 2010;123(1):249–57.
- Byllesby BM, Durham TA, Forbes D, Armour C, Elhai JD. An investigation of PTSD's core dimensions and relations with anxiety and depression. *Psychol Trauma.* 2016;8(2):214–7.
- Hashemian F, Khoshnood K, Desai MM, Falahati F, Kasl S, Southwick S. Anxiety, depression, and posttraumatic stress in Iranian survivors of chemical warfare. *JAMA.* 2006;296(5):560–6.
- Eli B, Liu Z. Posttraumatic Stress Disorder and Depression Symptoms in Parents who Lost Their Only Child in China: Latent Class Analysis and Social Support. 2018. p. 3.
- Jing Z, Zhengkui L, Zhujiang M, BUZOHRE-Eli, Yichong Z, Yang L. Symptoms of post-traumatic stress disorder and its related factors among parents who lost their single child. *Chin Mental Health J.* 2019;33(01):21–6.
- Post LM, Zoellner LA, Youngstrom E, Feeny NC. Understanding the relationship between co-occurring PTSD and MDD: symptom severity and affect. *J Anxiety Disord.* 2011;25(8):1123–30.
- Kanwar A, Malik S, Prokop LJ, Sim LA, Feldstein D, Wang Z, et al. The Association between Anxiety Disorders and suicidal behaviors: a systematic review and Meta-analysis. *Depress Anxiety.* 2013;30(10):917–29.
- Lebeaut A, Leonard SJ, Healy N, Raines AM, Buser SJ, Vujanovic AA. Associations between Lower-Order anxiety sensitivity facets and PTSD symptomatology among trauma-exposed firefighters. *Behav Modif.* 2022;46(2):294–320.
- Feng Z. Childlessness and vulnerability of older people in China. *Age Ageing.* 2018;47(2):275–81.
- Bonanno GA. Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events? *Am Psychol.* 2004;59(1):20–8.
- Cohen-Mansfield J, Shmotkin D, Malkinson R, Bartur L, Hazan H. Parental bereavement increases mortality in older persons. *Psychol Trauma: Theory Res Pract Policy.* 2013;5(1):84–92.
- Ji Z. Analysis of Mental Health Status of the Elderly who lost their only child. *J GUIZHOU Med Univ.* 2017;42(12):1393–6.
- Cao X, Jiang X, Li X, Lo M-CJH, Li R, Dou X. Perceived family functioning and depression in bereaved parents in China after the 2008 Sichuan earthquake. *Arch Psychiatr Nurs.* 2013;27(4):204–9.
- Xu J, Song X. Posttraumatic stress disorder among survivors of the Wenchuan earthquake 1 year after: prevalence and risk factors. *Compr Psychiatry.* 2011;52(4):431–7.
- Wang P. Depression of the Aging Parents who lost their only child in China. *Am J Appl Psychol.* 2015;4:83.
- Yudi Z, Xiaoming J. The relationship between Loss Characteristics and Mental Health of Shiduers (parents who have lost the only child). *Chin Gen Pract.* 2019;22(22):2749–54.
- Zhao S, Long M, Diao Y, Ma H, Liu M, Feng Z, et al. Culture-related grief beliefs and social support influence depressive symptoms of Shidu parents in rural China. *Eur J Psychotraumatol.* 2021;12(1):1945748.
- Gu J, Cai X, Yan W, Zhan J, Sun L, Xing C, et al. PTSD among Shidu parents in China: the roles of personality types and social support. *Yale J Biol Med.* 2022;95(1):33–44.
- First MB, Gibbon M. The structured clinical interview for DSM-IV Axis I disorders (SCID-I) and the structured clinical interview for DSM-IV Axis II disorders (SCID-II). *Comprehensive handbook of psychological assessment. Personality assessment. Volume 2.* Hoboken, NJ, US: John Wiley & Sons, Inc.; 2004. pp. 134–43.

38. Blake DD, Weathers FW, Nagy LM, Kaloupek DG, Gusman FD, Charney DS, et al. The development of a clinician-administered PTSD scale. *J Trauma Stress*. 1995;8(1):75–90.
39. Jackson CE, Currao A, Fonda JR, Kenna A, Milberg WP, McGlinchey RE, et al. Research utility of a CAPS-IV and CAPS-5 hybrid interview: posttraumatic stress symptom and diagnostic concordance in recent-era U.S. veterans. *J Trauma Stress*. 2022;35(2):570–80.
40. Pupo MC, Jorge MR, Schoedel AF, Bressan RA, Andreoli SB, Mello MF, et al. The accuracy of the clinician-administered PTSD scale (CAPS) to identify PTSD cases in victims of urban violence. *Psychiatry Res*. 2011;185(1–2):157–60.
41. Hamilton M. A rating scale for depression. *J Neurol Neurosurg Psychiatry*. 1960;23(1):56–62.
42. Sharp R. The Hamilton Rating Scale for Depression. *Occup Med*. 2015;65(4):340.
43. Zimmerman M, Martinez JH, Young D, Chelminski I, Dalrymple K. Severity classification on the Hamilton Depression Rating Scale. *J Affect Disord*. 2013;150(2):384–8.
44. Zhang M, He Y. Manual of Psychiatric Rating scales. Changsha, Hunan, China: HUNAN SCIENCE & TECHNOLOGY; 2015.
45. Maier W, Buller R, Philipp M, Heuser I. The Hamilton anxiety scale: reliability, validity and sensitivity to change in anxiety and depressive disorders. *J Affect Disord*. 1988;14(1):61–8.
46. Juang KD, Wang SJ, Lin CH, Fu JL. Use of the hospital anxiety and depression scale as a screening tool for patients with headache. *Zhonghua Yi Xue Za Zhi (Taipei)*. 1999;62(11):749–55.
47. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The validity of the hospital anxiety and Depression Scale. An updated literature review. *J Psychosom Res*. 2002;52(2):69–77.
48. Yong N, Hu H, Fan X, Li X, Ran L, Qu Y, et al. Prevalence and risk factors for depression and anxiety among outpatient migraineurs in mainland China. *J Headache Pain*. 2012;13(4):303–10.
49. Hamilton M. The assessment of anxiety states by rating. *Br J Med Psychol*. 1959;32:50–5.
50. Zimmerman M, Martin J, Clark H, McGonigal P, Harris L, Holst CG. Measuring anxiety in depressed patients: a comparison of the Hamilton anxiety rating scale and the DSM-5 anxious distress specifier interview. *J Psychiatr Res*. 2017;93:59–63.
51. Wang Q, Ren L, Wang W, Xu W, Wang Y. The relationship between post-traumatic stress disorder and suicidal ideation among shidu parents: the role of stigma and social support. *BMC Psychiatry*. 2019;19:352.
52. Alam R, Barrera M, D'Agostino N, Nicholas DB, Schneiderman G. Bereavement experiences of mothers and fathers over time after the death of a child due to cancer. *Death Stud*. 2012;36(1):1–22.
53. Djelantik AAAMJ, Smid GE, Kleber RJ, Boelen PA. Symptoms of prolonged grief, post-traumatic stress, and depression after loss in a Dutch community sample: a latent class analysis. *Psychiatry Res*. 2017;247:276–81.
54. Zhou N, Yu W, Huang H, Shi G, Luo H, Song C, et al. Latent profiles of physical and psychological outcomes of bereaved parents in China who lost their only child. *Eur J Psychotraumatol*. 2018;9(1):1544026.
55. Christiansen DM, Berke ET. Gender- and sex-based contributors to sex differences in PTSD. *Curr Psychiatry Rep*. 2020;22(4):19.
56. Murphy SA, Johnson LC, Chung I-J, Beaton RD. The prevalence of PTSD following the violent death of a child and predictors of change 5 years later. *J Trauma Stress*. 2003;16(1):17–25.
57. Xiao SY, Yang DS. The impact of social support on physical and mental health. *Chin J Mental Health*. 1987;1(4):183–7.
58. Zoellner LA, Pruitt LD, Farach FJ, Jun JJ. UNDERSTANDING HETEROGENEITY IN PTSD: FEAR, DYSPHORIA, AND DISTRESS. *Depress Anxiety*. 2014;31(2):97–106.
59. Roth M, King L, Richardson D. Depression and anxiety as mediators of PTSD Symptom clusters and Pain in treatment-seeking Canadian forces members and veterans. *Mil Med*. 2023;188(5–6):e11150–5.
60. Bremner JD. Traumatic stress: effects on the brain. *Dialogues Clin Neurosci*. 2006;8(4):445–61.
61. Shin LM, Liberzon I. The neurocircuitry of fear, stress, and anxiety disorders. *Neuropsychopharmacology*. 2010;35(1):169–91.
62. Davidson RJ, McEwen BS. Social influences on neuroplasticity: stress and interventions to promote well-being. *Nat Neurosci*. 2012;15(5):689–95.
63. Etkin A, Wager TD. Functional neuroimaging of anxiety: a meta-analysis of emotional processing in PTSD, social anxiety disorder, and specific phobia. *Am J Psychiatry*. 2007;164(10):1476–88.
64. Southwick SM, Yehuda R, Giller EL. Characterization of depression in war-related posttraumatic stress disorder. *Am J Psychiatry*. 1991;148(2):179–83.
65. Franklin CL, Zimmerman M. Posttraumatic stress disorder and major depressive disorder: investigating the role of overlapping symptoms in diagnostic comorbidity. *J Nerv Ment Dis*. 2001;189(8).
66. Zimmer Z, Kwong J. Family size and support of older adults in urban and rural China: current effects and future implications. *Demography*. 2003;40(1):23–44.
67. Meltzer H, Bebbington P, Brugha T, Farrell M, Jenkins R. The relationship between personal debt and specific common mental disorders. *Eur J Public Health*. 2013;23(1):108–13.
68. Pickett KE, Wilkinson RG. Income inequality and health: a causal review. *Soc Sci Med*. 2015;128:316–26.
69. Guan N, Guariglia A, Moore P, Xu F, Al-Janabi H. Financial stress and depression in adults: a systematic review. *PLoS ONE*. 2022;17(2):e0264041.
70. El Zouki CJ, Chahine A, Mhanna M, Obeid S, Hallit S. Rate and correlates of post-traumatic stress disorder (PTSD) following the Beirut blast and the economic crisis among Lebanese University students: a cross-sectional study. *BMC Psychiatry*. 2022;22(1):532.
71. Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for post-traumatic stress disorder in trauma-exposed adults. *J Consult Clin Psychol*. 2000;68(5):748–66.
72. Ullman SE, Filipas HH, Townsend SM, Starzynski LL. Psychosocial correlates of PTSD symptom severity in sexual assault survivors. *J Trauma Stress*. 2007;20(5):821–31.
73. van Zelst WH, de Beurs E, Beekman AT, Deeg DJ, van Dyck R. Prevalence and risk factors of posttraumatic stress disorder in older adults. *Psychother Psychosom*. 2003;72(6):333–42.
74. Xue C, Ge Y, Tang B, Liu Y, Kang P, Wang M, et al. A meta-analysis of risk factors for combat-related PTSD among military personnel and veterans. *PLoS ONE*. 2015;10(3):e0120270.
75. Cadichon JM, Lignier B, Cénat J-M, Derivois D. Symptoms of PTSD among adolescents and Young Adult survivors Six years after the 2010 Haiti Earthquake. *J Loss Trauma*. 2017;22(8):646–59.
76. Li J, Precht DH, Mortensen PB, Olsen J. Mortality in parents after death of a child in Denmark: a nationwide follow-up study. *Lancet*. 2003;361(9355):363–7.
77. Ozer EJ, Best SR, Lipsey TL, Weiss DS. Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. *Psychol Bull*. 2003;129(1):52–73.
78. Mittal D, Torres R, Abashidze A, Jimerson N. Worsening of post-traumatic stress disorder symptoms with cognitive decline: case series. *J Geriatr Psychiatry Neurol*. 2001;14(1):17–20.

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