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Original Article

Prevalence and associated factors of post-traumatic stress symptoms in hospitalised children with cancer and their parents in South China: A multicentred cross-sectional study

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ABSTRACT

Objective: This study aimed to examine the prevalence and risk factors of Post-Traumatic Stress Symptoms (PTSS) in hospitalised children with cancer and their parents and explore the PTSS correlation between parents and children.

Methods: Data were collected using the University of California at Los Angeles (UCLA) Posttraumatic Stress Disorder-Reaction Index for DSM-IV and the Chinese version of the Impact of Event Scale-Revised Questionnaire.

Results: Out of 203 families with hospitalised children with cancer, 77.3% of parents and 7.9% of children experienced PTSS. Time since diagnosis of less than 3 months ($\beta = -0.063$, $P < 0.001$), actively seeking financial help ($\beta = -0.190$, $P = 0.031$), children living in rural areas ($\beta = 0.166$, $P = 0.023$) and having a daughter with cancer ($\beta = 0.135$, $P = 0.040$) were risk factors for parental PTSS. At the early stages of diagnosis ($\beta = 0.118$, $P = 0.017$), recurrence ($\beta = 0.140$, $P = 0.042$) and low monthly household income ($\beta = -0.283$, $P = 0.003$) were risk factors for children's PTSS. No significant correlation between parental PTSS and children's PTSS ($r = -0.06$, $P > 0.05$).

Conclusions: The hospitalised children with cancer had a low prevalence of PTSS, but their parents' PTSS prevalence was high. No significant correlation was observed between parental and children's PTSS. Attention should be given to the mental health of families with hospitalised children with cancer. Early psychosocial support should be provided, especially to families with poor economic situations and a newly diagnosed or relapsed child.

Introduction

Over 200,000 cases of childhood cancer are diagnosed annually worldwide, and the incidence of this disease continues to increase.[1] According to the statistical data of the World Health Organization, 202,124 children under 14 years old were diagnosed with cancer and 77,176 of the patients died from this disease worldwide in 2022. In China, 23,121 children under 14 years old were diagnosed with cancer and 7498 of the patients died from cancer (Globocan 2022 [version 1.1]).[2] Most families typically describe their cancer experience as one of the most stressful events. The disruption of the child's physical integrity during diagnosis and treatment and the decrease in life expectancy may contribute to the development of Post-Traumatic Stress Symptoms (PTSS). PTSS include trauma-related intrusions (e.g., distressing memories of the trauma and nightmares), avoidance of trauma reminders, negative alterations in cognition and mood (e.g., negative affect and negative changes in beliefs about the world/other people) and marked alterations in arousal and reactivity (e.g., irritability and hypervigilance).[3] The presence of PTSS in children and their parents may reduce confidence and treatment adherence.

Most studies on the incidence of PTSS in children with cancer and their parents have focused on children in survivorship, and insufficient attention has been devoted to hospitalised children. Various studies have shown that 6.2% to 44% of children with cancer and 22% to 54% of

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parents experienced cancer-related PTSS,[4–9] and 99% of families with childhood cancer have at least one family member experiencing PTSS such as repetitive experiences.[10] The occurrence of PTSS in children with cancer may lead to cognitive deficits, reduced activity and decreased adherence to health behavior.[8] And for their parents, it not only affects their quality of life, but also prevents them from making the right treatment decisions and providing adequate care and emotional support to their children.[7] However, compared with families with surviving children, families whose children are close to the time of diagnosis or treatment may have higher levels of PTSS.[11] To the best of the authors' knowledge, only seven studies have investigated PTSS in children receiving cancer treatment and their parents. All of these studies reported a low incidence of PTSS in children[12,13] and revealed that 22% to 68% of parents exhibit PTSS.[14–16] However, a study found no difference in PTSS incidence between parents with sick children and those with healthy ones.[17] In addition, Guido's study during the period of coronavirus disease 2019 (COVID-19) showed that 87.5% of parents experience PTSS.[18] These results suggest that the incidence of parental PTSS may vary in different populations and times. In addition, the aforementioned studies were conducted primarily in western countries; however, specialised care facilities for childhood cancer in China are concentrated in tertiary hospitals in large urban areas. The three hospitals we collected data followed treatment protocols developed by the National Children's Center of China. Receiving treatment at tertiary hospitals ensures children with cancer receive high-quality care, but those in rural areas have to travel long distances to receive treatment. Long distances not only increase the likelihood of experiencing treatment side effects, such as pain, nausea and fatigue, but also lead to prolonged separation from family and additional travel costs.[19] They may reduce family resources for children and families' adaptive capacity when faced with cancer-related events, thus increasing the likelihood of experiencing PTSS.

Hospitalised children with cancer rely on their parents as primary caregivers. Therefore, the psychological states of the child and parents influence each other. A previous study[20] proposed a bidirectional model of Post-Traumatic Stress Disorder (PTSD) between parents and children and called the model 'relational PTSD'. The study showed that parents' reactions to a traumatic event may lead to child distress, and children's reactions can affect their parents. However, existing research findings on the link between the two are inconsistent.[21–23] A meta-analysis study found an association between parental PTSS and children's PTSS ($r = 0.31$, $P < 0.01$).[24] However, Landolt et al. found no correlation between parental PTSS and children's PTSS from diagnosis to one year after hospitalisation.[23] In addition, the informant source (parent proxy report or child self-report) is a factor to consider when assessing the parent-child PTSS relationship.[24] Parents are inclined to report their children's symptoms when they present with PTSS.[25] Although some studies have found high concordance between parent proxy-reported and child self-reported data, children should be asked to self-report their PTSS.[25]

Thus far, China has limited data on the prevalence of PTSS and the factors that contribute to PTSS in hospitalised children with cancer and their parents. The current study aims to (1) investigate the prevalence of PTSS in hospitalised children with cancer and their parents, (2) explore the association between children's PTSS and parental PTSS and (3) examine the associated factors of PTSS amongst hospitalised children with cancer and their parents.

Methods

Participants

This cross-sectional study was conducted amongst families of children who were hospitalised and receiving ongoing treatment for pediatric cancer, including children with cancer and their parents. The participants were recruited from the pediatric departments of three tertiary hospitals in Central South China, which are all affiliated hospitals of a comprehensive university in Hunan.

The inclusion criteria for the children were as follows: (1) age of 7–14 years, (2) an established cancer diagnosis at least 1 month prior to the study (including newly diagnosed cases or cases with relapse) and (3) receiving active treatment in an in-hospital setting. Children with substantial cognitive, sensory and psychiatric disabilities and their parents were excluded. For each child recruited, one of the parents (mother or father) was invited to participate in the study.

Subject recruitment

The study subjects were recruited from three hospitals in Hunan, China. The families of children with cancer were sought through online recruitment advertisements and nurse referrals. The researchers strictly followed the inclusion and exclusion criteria during the screening of the families. Convenience sampling was employed to invite the families who met the criteria.

Sample size

The study used the sampling formula for rates in cross-sectional studies to determine the sample size.

$$n = \frac{u_{\alpha/2}{}^2 p(1-p)}{\delta^2}$$

In the study, $\alpha = 0.05$, $\delta = 0.07$ and p was the prevalence of PTSS amongst parents of hospitalised children with cancer in China (32.97% in parents).[14] Thus, the sample size was calculated to be 173. In consideration of the possibility of having missing samples and invalid questionnaires, the sample size was enlarged by 10%. As a result, 190 families of hospitalised children with cancer were included in the sample.

Data collection

Data were collected from September 2021 to January 2022 in three tertiary hospitals in Hunan Province. The questionnaires were completed by the children with cancer and their parents in a quiet room at the hospital at a time that was convenient for them to avoid affecting the children's treatment. The children and parents were asked to complete the questionnaires separately. Before the collection of the questionnaires, all the participants were asked to recheck for omissions. The data collected from the participants were kept confidential to protect the participants' privacy.

Outcome measurements

Sociodemographic and medical data

The questionnaire on sociodemographic and medical data was developed through a literature review and focus group discussions.[26–28]

The sociodemographic data included parents' age, gender, education level, occupation status, family type, monthly household income and medical expense burden and children's gender, age and academic status. The medical data included cancer type, clinical stage, time of diagnosis and treatment stage of the child with cancer.

PTSS

Parental PTSS was evaluated using the Chinese version of the Impact of Event Scale–Revised Questionnaire (IES-R), and children's PTSS was evaluated with the University of California at Los Angeles (UCLA) Post-traumatic Stress Disorder-Reaction Index (PTSD-RI) for DSM-IV (Revision 1, Children's Version).

Chinese version of IES-R.[29,30]

IES-R is a 22-item, 5-point Likert questionnaire of a self-report screening tool for PTSS that assesses symptoms of intrusion, avoidance and hyperarousal. The IES-R score ranges from 0 to 88, and a score ≥ 35

indicates PTSS. The tool has been translated into Chinese and validated with high levels of sensitivity and specificity; the Cronbach's α for the total scale is 0.87–0.92.[31]

UCLA PTSD-RI for DSM-IV (Revision 1, Children's Version).[32]

UCLA PTSD-RI is a 20-item, 5-point Likert questionnaire of a self-report screening tool for PTSS that assesses symptoms of intrusion, avoidance and hyperarousal. All items have positive scores, and a high score indicates severe PTSD symptoms. The UCLA PTSD-RI score ranges from 0 to 80, and children who meet the criteria for only two symptom subcategories are defined as having significant PTSD symptoms. The Cronbach's α for the total scale is 0.90; for the subscales, the α value is 0.80 for intrusion, 0.74 for avoidance and 0.76 for hyperarousal, demonstrating the internal consistency of the scale. The tool has been translated into Chinese and validated with high levels of sensitivity and specificity; the Cronbach's α for the total scale is 0.90.[33]

Data analysis

Data were analysed using SPSS for Windows (Ver. 26.0 IBM, New York, the USA). All the tests were two-tailed, and a P value less than 0.05 indicated a significant difference. The sociodemographic and medical data of the hospitalised children with cancer and their parents were presented as means with standard deviations (SDs), frequency or percentages as needed. An independent-sample t test or one-way ANOVA was used to compare the continuous variables. Normality of the data was determined by the Shapiro–Wilk test. Pearson's chi-square (χ^2) test was used to compare the categorical variables, and when the data did not conform to the normal distribution, we used the nonparametric Mann–Whitney U test or the nonparametric Kruskal–Wallis H test to compare them. Spearman correlations were calculated to measure the correlations amongst the categorical variables. In addition, multiple linear regression analysis was performed to identify the independent variables for predicting PTSS. The variables with a P value < 0.05 in the univariate analysis were included as independent variables in the multivariate model. The IES-R and UCLA PTSD-RI scores were used as the outcome variables.

Ethical considerations

This study's data collection was approved by the Nursing and Behavioural Medicine Research Ethics Review Committee, Xiangya School of Nursing, Central South University (IRB No. 2020125). All the participants signed written informed consent forms (the children's informed consent forms were completed by their parents), were fully informed of the purpose and protocol of the study and participated in the study on a voluntary and anonymous basis. The participants could withdraw at any time during the study. All researchers were trained to fully understand the purpose and methods of the study.

Results

Out of the 229 children who met the inclusion criteria, 203 children and their parents (88.6%) agreed to participate and complete the survey. The main reasons for nonparticipation included limited time or no interest in the research.

Sample characteristics

Out of the 203 parents, 160 were mothers (78.8%) and 43 were fathers (21.2%), with a mean age of 39.47 ± 5.57 years. Amongst the children, 129 were boys (63.5%) and 74 were girls (36.5%), and the average age was 11.09 ± 2.33 years. More than half (72.4%) of the children had leukemia, 16.3% had lymphoma, 11.3% had solid cancer and only 3.9% were in disease relapse. The distributions of the parents' and children's data on the basis of the other sociodemographic and medical factors are presented in Tables 1–3.

Table 1
Sociodemographic data of the parents ($N = 203$).

Sociodemographic variables	*n* (%)	Sociodemographic variables	*n* (%)
Parents		Monthly household income (RMB yuan)	
Father	43 (21.2)	< 5000	159 (78.3)
Mother	160 (78.8)	5000~7500	24 (11.8)
Parents age (year)		> 7500	20 (9.9)
< 35	42 (20.7)	Medical expenses (RMB thousand yuan)	
35~44	126 (62.1)	< 30	82 (40.4)
≥ 45	35 (17.2)	30~60	94 (46.3)
Parents educational level		> 60	27 (13.3)
Primary school or lower	28 (13.8)	Medical expenses burden	
Junior high school	89 (43.8)	Barely afford	70 (34.5)
Senior high school	62 (30.5)	Unable afford	133 (65.5)
Junior college or higher	24 (11.8)	Actively seek financial help	
Family type		Yes	154 (75.9)
Nuclear family	86 (42.4)	No	27 (13.3)
Stem family	117 (57.6)	Data missing[a]	22 (10.8)

[a] Participants avoided content related to seeking financial help.

Table 2
Sociodemographic data of children ($N = 203$).

Sociodemographic variables	*n* (%)	Sociodemographic variables	*n* (%)
Child gender		Child permanent residence	
Boys	129 (63.5)	City	33 (16.3)
Girls	74 (36.5)	County	55 (27.1)
Child age (year)		Town	20 (9.9)
7~12	129 (63.5)	Rural	95 (46.8)
13~14	74 (36.5)	Child keep course learning	
Only child		Yes	25 (12.3)
Yes	31 (15.3)	No	178 (87.7)
No	172 (84.7)		

Table 3
Medical characteristics of children ($N = 203$).

Clinical variables	*n* (%)	Clinical variables	*n* (%)
Diagnosis		Treatment stage	
Leukemia	147 (72.4)	Early stage of diagnosis	32 (15.8)
Lymphomas	33 (16.3)	Hospitalization period	163 (80.3)
Solid cancer	23 (11.3)	Hospitalized after relapse	8 (3.9)
Time since diagnosis (month)			
< 3	84 (41.4)		
≥ 3	119 (58.6)		

Prevalence of PTSS in parents and children

The mean IES-R score of the parents was 44.29 ± 14.94. We identified a total of 157 (77.3%) parents who met the diagnostic criteria for PTSS (IES-R score ≥ 35), including 35 (81.4%) fathers and 122 (76.3%) mothers.

The median PTSD-RI score of the children was 18.00 (9.00–27.00). We identified a total of 16 (7.9%) children who met the diagnostic criteria for PTSS (meeting two or more symptom subcategory criteria), including 11 (8.5%) boys and 5 (6.8%) girls.

Associated factors of parental and children's PTSS

The results of the univariate analysis showed that monthly household income, actively seeking financial help, time since diagnosis, child gender and child treatment stage were significantly associated with the IES-R scores ($P < 0.05$). The parents' and children's other sociodemographic factors and medical characteristics were not significantly correlated with PTSS.

For the children, the results showed that parents' educational level, monthly household income, actively seeking financial help, time since diagnosis, metastasis and treatment stage were significantly associated with the PTSD-RI scores ($P < 0.05$). The parents' and children's other sociodemographic factors and medical characteristics were not significantly correlated with PTSS (Table 4).

Multiple linear regression analysis of the risk factors of PTSS in parents and children

The results showed that time since diagnosis, child gender, actively seeking financial help and treatment stage were significant risk factors for parents' PTSS. Altogether, these variables accounted for 18.1% of the

Table 4
Effects of sociodemographic and medical factors on PTSS in the Parents' group and Children's group ($N = 203$).

Variables	Parents' group				Children's group		
	Mean	SD	t/F	Significant	Rank mean	Z[a]/H[b]	Significant
Parents			2.336	0.128		−0.203[a]	0.839
Father	47.37	14.89			103.62		
Mother	43.46	14.89			101.57		
Parents age (year)			1.819	0.165		3.669[b]	0.160
< 35	42.02	14.76			111.29		
35~44	45.84	14.88			95.85		
≥ 45	41.43	15.02			113.01		
Parents educational level			2.410	0.068		10.609[b]	0.014*
Primary school or lower	43.89	13.99			100.29		
Junior high school	47.27	17.29			92.57		
Senior high school	41.74	11.78			121.66		
Junior college or higher	40.29	12.28			88.17		
Family type			0.068	0.795		−0.798[a]	0.425
Nuclear family	43.93	14.93			97.71		
Stem family	44.50	15			104.52		
Monthly household income (RMB yuan)			3.776	0.025*		10.428[b]	0.005*
< 5000	45.70	15.50			104.25		
5000~7500	41.00	10.95			118.56		
> 7500	37.00	11.97			64.22		
Medical expenses(RMB thousand yuan)			1.678	0.189		1.815[b]	0.404
< 30	42.59	14.67			95.29		
30~60	44.54	15.33			106.20		
> 60	48.59	13.97			107.78		
Medical expenses burden			2.929	0.089		−0.904[a]	0.366
Barely afford	41.83	14.07			107.14		
Unable afford	45.59	15.27			99.30		
Actively seek financial help			12.030	0.001*		8.273[b]	0.016*
Yes	45.95	14.03			95.44		
No	36.11	10.65			107.70		
Data missing**	40.29	12.28			70.14		
Time since diagnosis (month)			21.030	0.000*		−2.162[a]	0.031*
< 3	49.75	13.91			112.60		
≥ 3	40.44	14.49			94.52		
Child gender			4.290	0.040*		−0.450[a]	0.653
Boys	42.66	13.37			103.40		
Girls	47.14	17.07			99.55		
Child age (year)			0.179	0.672		−1.465[a]	0.143
7~12	43.95	15.12			97.43		
13~14	44.88	14.70			109.97		
Only child			0.360	0.549		−0.288[a]	0.774
Yes	44.56	14.80			101.50		
No	42.81	15.87			104.79		
Child permanent residence			5.080	0.002*		1.430[b]	0.698
City	46.24	13.83		1 > 3	93.14		
County	40.91	14.53			100.09		
Town	35.55	12.35			99.85		
Rural	47.41	15.11		4 > 3	106.64		
Child keep course learning			0.338	0.562		−0.693[a]	0.488
Yes	44.06	14.69			103.07		
No	45.92	16.89			94.38		
Diagnosis			0.611	0.544		3.611[b]	0.164
Leukemia	44.14	15.57			104.37		
Lymphomas	46.48	13.28			106.61		
Solid tumors	42.09	13.07			80.22		
Treatment stage			3.136	0.046*		12.205[b]	0.002*
Early stage of diagnosis	50.28	16.06			131.31		
Hospitalization period	43.12	14.60			94.87		
Hospitalized after relapse	44.13	13.11			130.00		

*$P < .05$, **Participants avoided content related to seeking financial help.
SD: Standard deviation.
[a] Nonparametric Mann–Whitney *U* test.
[b] Nonparametric Kruskal–Wallis *H* test.

Table 5
Multiple linear regression analysis of the risk factors of parents' PTSS ($N = 203$).

Variables	Reference value	B	β	*t*	*P*
(Constant)		48.062		22.853	0.000
Time since diagnosis (month)					
≥ 3	< 3	−7.972	−0.263	−3.508	0.001*
Child gender					
Girls	Boys	4.176	0.135	2.068	0.040*
Actively seek financial help					
No	Yes	−8.338	−0.190	−2.168	0.031*
Data missing**		−1.941	−0.040	−0.613	0.541
Treatment stage					
Early stage of diagnosis	Hospitalization period	2.924	0.071	0.962	0.337
Hospitalized after relapse		3.992	0.052	0.772	0.441
Child permanent residence					
Rural	City	6.721	0.166	2.295	0.023*
Monthly household income (RMB yuan)					
5000~7500	< 5000	−5.805	−0.126	−1.870	0.063
> 7500		−3.300	−0.066	−0.716	0.475

*$P < 0.05$, **Participants avoided content related to seeking financial help.

Table 6
Multiple linear regression analysis of the risk factors of Children's PTSS ($N = 203$).

Variables	Reference value	B	β	*t*	*P*
(Constant)		19.033		7.994	0.000
Time since diagnosis (month)					
≥ 3	< 3	−0.372	−0.016	−0.214	0.831
Actively seek financial help					
No	Yes	3.976	0.081	1.285	0.200
Data missing**		−7.987	−0.214	−3.275	0.001*
Treatment stage					
Early stage of diagnosis	Hospitalization period	5.620	0.118	2.413	0.017*
Hospitalized after relapse		8.209	0.140	2.047	0.042*
Monthly household income (RMB yuan)					
5000~7500	< 5000	0.431	0.012	0.180	0.857
> 7500		−10.873	−0.283	−3.046	0.003*
Parents educational level					
Junior high school	Primary school or lower	−2.879	−0.125	−1.244	0.215
Senior high school		4.177	0.168	1.714	0.088
Junior college or higher		−0.627	−0.018	−0.168	0.867

*$P < 0.05$, **Participants avoided content related to seeking financial help.

variance in the prediction of PTSS ($R^2 = 0.148$, $F = 5.266$, $P < 0.001$). Tolerance (range: 0.496–0.992) and the variance inflation factor (VIF; range: 1.034–2.015) indicated that the regression model had acceptable multicollinearity. Time since diagnosis ≥ 3 months ($\beta = -0.063$, $P < 0.001$), not actively seeking financial help ($\beta = -0.190$, $P = 0.031$) and children normally living in rural areas ($\beta = 0.166$, $P = 0.023$) were protective factors of parental PTSS. Child's gender was associated with parental PTSS, and having a daughter with cancer equated to high susceptibility to PTSS ($\beta = 0.135$, $P = 0.040$; Table 5).

The results also showed that monthly household income and treatment stage were significant risk factors for PTSS. These variables together accounted for 15.9% of the variance in the prediction of PTSS ($R^2 = 0.159$, $F = 4.906$, $P < 0.001$). Tolerance (range: 0.413–0.947) and VIF (range 1.096–2.663) indicated acceptable multicollinearity in the regression model. High monthly household income ($\beta = -0.283$, $P = 0.003$) reduced PTSS expression, and children at the early stages of diagnosis ($\beta = 0.118$, $P = 0.017$) or tumour recurrence ($\beta = 0.140$, $P = 0.042$) were more susceptible to PTSS than those in the other hospitalisation periods. With regard to seeking financial help, children in the missing-data group were less likely to develop PTSS ($\beta = -0.217$, $P = 0.001$; Table 6).

PTSS correlations between parents and children

The results of the Spearman's correlation coefficient analysis showed that no significant correlation existed between parental PTSS and children's PTSS ($r = -0.06$, $P > 0.05$).

Discussion

This cross-sectional study found a high prevalence of PTSS amongst the parents of children with cancer during treatment (77.3% in all the parents, 76.3% in mothers and 81.4% in fathers). Compared with studies that used the same measurement tool, the current study's rate is lower. Specifically, it is lower than the 87.5% PTSS incidence in parents of children with cancer reported by Guido et al. who surveyed 45 parents with hospitalised children with cancer in Italy.[18] However, our incidence rate is higher than the incidence rates in two studies conducted in the United States (41% to 68% in mothers and 30% to 57% in fathers).[34,35] These differences may be due to variations in sample characteristics and cultural backgrounds. Chinese parents tend to be reluctant to actively talk to others about the fact that their child has cancer; they choose to suppress their own emotional grief and helplessness and suffer from the stress caused by a family member's misfortune alone.[12] Another possible reason may be that during the COVID-19 pandemic, children being infected may cause symptom exacerbation of and pose additional health threats, which will increase parental fears and concerns.[18] Overall, our results further verify that PTSS is common in the mothers and fathers of hospitalised children with cancer.

Different from the results on the prevalence of parental PTSS, the results on the prevalence of PTSS amongst the hospitalised children with cancer were lower (7.9% in all the children, 8.5% in boys and 6.8% in girls). This finding is consistent with the results of two other studies on hospitalised children with cancer, which found no difference in the prevalence of PTSS between children with cancer and healthy

controls.[12,13] The study suggested that the childhood cancer treatment experience does not substantially increase the level of PTSS. One possible reason is that cancer experience leads to increased parental sensitivity and attention to children's internal states[25] and the prioritisation of children's needs, all of which improve children's resilience and relieve their psychological stress.[9] Another reason is that whether or not a child experiences posttraumatic stress depends on the subjective interpretation of the event.[36] Hospitalised children with cancer may not be adequately informed about the severity of their disease,[37] so they have a low incidence of PTSS.

The results also showed that low monthly household income was one of the risk factors for PTSS in hospitalised children, and actively seeking financial help, living in a rural area and having a daughter with cancer were associated with parental PTSS. Consistent with the results of previous studies,[8] our result indicated that children with low monthly family incomes and parents who actively sought financial help had high PTSS scores. In China, children's insurance generally consists of basic medical insurance, critical illness insurance and supplementary medical insurance.[38] Despite the existence of these insurances, travelling to a tertiary care hospital in large cities would result in at least one parent taking time off work to care for the patient, and require families to pay for additional travel expenses and living costs, which exacerbate the family's cancer-related financial toxicity.[39] Facing great pressure form health care costs, families with low monthly incomes may not be able to adequately meet their child's psychological needs because they prioritise disease treatment; thus, their children are likely to develop PTSS. For parents, the state of needing help resulting from the inability to pay for their child's treatment is the primary cause of PTSS,[40] so parents who actively sought financial had high PTSS scores. These findings suggest that childhood cancer can be financially traumatic for families. In addition, some parents may not be willing to tell others about their financial stress,[40] and this missing data may mask the true extent of the effect of financial stress on PTSS.

Moreover, parents whose children lived in rural areas had higher PTSS scores than those whose children lived in urban areas. This result may be due to the limited medical services and related resources in rural areas of China. Families need to travel long distances to urban tertiary hospitals for cancer treatment. Compared with families living close to tertiary hospitals, families in rural areas travel longer distances, and frequent hospital admissions may result in high travel expenditures and prolonged separation from other family members, which increase families' financial burden and reduce the family resources available to parents.[19] In contrast to previous studies on adult populations,[41–43] which showed that mothers have a higher incidence of PTSS than fathers, our study found no difference in PTSS incidence between mothers and fathers. However, the parents of girls tended to exhibit higher PTSS than the parents of boys. In Asian cultures, boys are taught to be strong in the face of anything from an early age, so when faced with a cancer diagnosis and the side effects of treatments, such as hair and weight loss, girls are more likely to exhibit PTSS than boys;[44,45] this in turn increases the risk of PTSS in the parents of girls. However, given the lack of evidence from previous studies, this conclusion still needs to be further validated in subsequent studies.

Consistent with previous research results, our results showed that children at the early diagnosis and relapse stage[46–48] and parents whose children were diagnosed less than three months ago[6] had high PTSS. At the early stage of diagnosis, hospitalised children with cancer may frequently experience medical events, such as invasive procedures, complex treatment and painful treatment side effects,[36] which increase the risk of children's PTSS. In addition, PTSS increases with multiple traumas,[17] so the occurrence of recurrence, a new cancer-related traumatic event, may increase the risk of PTSS in children. Even if children are not currently experiencing PTSS, they may become sensitised by cancer events and are likely develop PTSS when a new traumatic event occurs. Therefore, regularly screening children for PTSS is essential. For parents, they have limited knowledge of the illness' treatment and ways of caring for children during the first three months after diagnosis, especially when treatment options have not been finalized.[35] Facing the illness and pain of their children, they may experience strong psychological stress and social maladjustment.

We found no significant correlation between parental PTSS and children's PTSS. But different criteria for PTSS in children show different results, when a PTSD-RI cutoff score of 38 or greater was used as the criterion for defining PTSS in children, we found a positive correlation ($r = 0.158$, $P = 0.024$) between parental and children's PTSS. The correlation difference between parental and children's PTSS in the results may be due to the difference in the emphasis of the two criteria for determining PTSS in children. The meeting of two or more symptom subcategories focuses on the appearance of a single positive symptom, and a cut-off score of 38 focuses on the overall burden of symptoms. Relevant research also showed that a cutoff score of 38 or higher for a single incident traumatic event has high sensitivity and specificity for detecting PTSD.[32] The positive correlation between parental and children's PTSS corroborates the parent–child dichotomy in PTSS and Scheering and Zeanah's (2001) model of relational PTSD.[20] Therefore, attention should be given to the psychological state of families with children with cancer during hospitalisation. However, the correlation coefficient in this study is lower than that in Bakula's meta-analysis, which reviewed 14 articles published from 1989 to 2018 and found a correlation ($r = 0.31$) between parental and child distress.[24] A possible reason is that the families of hospitalised children may not have a fully consistent model of how to cope with cancer,[49] so the correlation between parent and child PTSS is low. Another reason may be that parents with high PTSS tend to report many symptoms in their children as well,[25] so studies that relied on children's self-reported PTSS obtained lower correlation coefficients than those that relied on parent proxy-reported children's PTSS.[24] Furthermore, the prevalence of PTSS in parents is higher than that in children, suggesting that raising a hospitalised child may be more traumatic than the cancer itself.[50] Therefore, targeted interventions for parents must be developed to improve their ability to care for their children and cope with the cancer.

Implications for nursing practice and research

The results of this study indicate that parents of hospitalised children with cancer have high PTSS, whereas children have low PTSS. Given the potential correlation between the two, hospitalised children and their parents must be screened for PTSS in clinical practice. PTSS is likely to occur in families with poor financial situations. Thus, the Government should formulate a differentiated health insurance policy to provide special support for low-income families and rural people with serious illnesses. Health care professionals could actively communicate with family of children with cancer about treatment protocol and costs.[51] Assessing family's financial toxicity in real time, and helping those in poor financial situations to seek social support can also reduce their financial burden.[52] In addition, children at the stage of diagnosis or recurrence is another risk factor for families' PTSS, so the mental health support provided to these children's families must be strengthened at the early stages of treatment to reduce the incidence of PTSS amongst family members. Cognitive behavioural therapy is one of the most effective treatments for PTSS,[53] and its effectiveness has been demonstrated in survivor families.[16] However, further research is needed to validate its effectiveness in families undergoing treatment, which may be a future direction for this area of research.

Limitations

The current study has several limitations. Firstly, considering that completing the questionnaire required a child to have a certain level of comprehension, we chose school-age children who were older than 7 years old. Secondly, because the Pediatric Department of the local hospital admits children under 14 years old and allows only one caregiver for long-term care, the participants in this study were children under the age

of 14, and the caregivers were predominantly mothers. Future studies could include families of children with cancer in other age groups and increase the participation of fathers. Thirdly, some children were unaware of whether their families sought financial help or not, which may be due in part to the fact that parents are uncomfortable mentioning finances to their children. These missing data may have affected the results. Fourthly, the families that participated in this study and those that refused may have differences. The families that refused to participate may be experiencing higher tress than the families that participated. Finally, data was collected from three hospitals, with the sample size at each hospital being limited. Although these hospitals followed the same treatment protocols, variations in the stress levels experienced by families of children with cancer may exist. Therefore it is necessary to further expand the sample size for the study.

Conclusions

The parents of the hospitalised children with cancer had a high prevalence of PTSS. No significant correlation was observed between parental and children's PTSS. The diagnosis and treatment of the disease resulted in substantial changes in family life. Economic pressure and cancer treatment stage were important factors that affected the occurrence of PTSS in children and their parents. In addition, permanent residence and child's gender affected parental psychological outcomes. Therefore, attention should be paid to the posttraumatic stress response of the family as a whole, especially for families with poor economic situations and children with newly diagnosed or relapsed cancer. In the future, family-oriented intervention programs should be developed and implemented to improve posttraumatic stress responses, quality of life and treatment effects.

CRediT authorship contribution statement

Yunyun Peng: Software, Writing – Original draft preparation, Writing-Reviewing. **Lin Xu**: Data collection, Writing – Original draft preparation, Investigation, Software. **Can Gu**: Access to fund support, Conceptualization, Writing – Reviewing, Supervision and Editing. **Guiyuan Ma**: Validation, Writing – Reviewing. **Zitong Zhang**: Data collection. **Yilin Zhang**: Data collection. **Li Liu**: Writing – Reviewing. **Jianhui Xie**: Writing – Reviewing. **Sulan Lin**: Writing – Reviewing. **Stanley Kam Ki Lam**: Writing – Reviewing. All authors had full access to all the data in the study, and the corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. All authors had full access to all the data in the study, and the corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Ethics statement

The study was approved by the Nursing and Behavioural Medicine Research Ethics Review Committee, Xiangya School of Nursing, Central South University (IRB No. 2020125). All the participants provided written informed consent (the children's informed consent forms were completed by their parents).

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Data availability statement

The data that support the findings of this study are available from the corresponding author, Prof. Can Gu, upon reasonable request.

Declaration of generative AI and AI-assisted technologies in the writing process

No AI tools/services were used during the preparation of this work.

Declaration of competing interest

The authors declare no conflict of interest. Prof. Can Gu, the corresponding author, serves on the editorial board of the *Asia-Pacific Journal of Oncology Nursing*. The article underwent standard review procedures of the journal, with peer review conducted independently of Prof. Gu and their research groups.

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