A 30-Month Prospective Follow-up Study of Psychological Symptoms, Psychiatric Diagnoses, and Their Effects on Quality of Life in Children Witnessing a Single Incident of Death at School

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ABSTRACT

Objective: We explored the course of trauma-related psychological symptoms and psychiatric diagnoses in 167 children who, as fourth graders, witnessed death at school and assessed the long-term effects of their symptoms on quality of life and their parents' rearing stress.

Method: 167 children were evaluated using diverse self-rating symptom scales at 2 days (T1: May 19, 2007), 2 months (T2: July 16, 2007), 6 months (T3: November 12 – 17, 2007), and 30 months (T4: November 16 – 21, 2009) after the accident. All children were interviewed with the Diagnostic Interview Schedule for Children-Version IV (DISC-IV) at T1. High-risk children were assessed with the DISC-IV at T3 and T4. Children's quality of life and parental stress were assessed in all children and parents using the Parenting Stress Index and the Child Health and Illness Profile at T4.

Results: The mean scores and prevalence of severe posttraumatic stress disorder (PTSD) and anxiety symptoms decreased significantly over time ($P < .001$), but depressive symptoms did not. Although the prevalence of DISC-IV–based diverse anxiety disorders decreased significantly over time, 45% of high-risk subjects evaluated with the DISC-IV met criteria for an anxiety or depressive disorder at T4. Linear and logistic regression analyses showed that depressive symptoms at 6 months predicted more severe parental stress ($\beta = 0.51$; odds ratio [OR] = 2.88), less satisfaction ($\beta = -0.25$; OR = 2.66), and lower achievement ($\beta = -0.41$; OR = 1.50) at 30 months. PTSD symptoms were not associated with parental stress or quality of life at T4.

Conclusions: This study provides new evidence regarding the long-term course of trauma-related symptoms and diagnostic changes in children exposed to a single trauma. Children's depressive symptoms predicted lower children's quality of life and higher parental rearing stress after 2 years. Careful assessment and management of depressive symptoms can potentially reduce parental stress and improve quality of life of children.

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On May 17, 2007, 2 mothers of primary school children fell to their deaths from a height of more than 20 m. They were participating in a fire escape drill conducted with approximately 240 students at an elementary school in Seoul, Korea. The tragedy occurred during a rescue demonstration when a wire connecting a basket attached to the fire engine ladder disconnected. Fourth-grade students witnessed the accident; they reacted with fear and crying and were so shocked that they could not attend school for the next few days.

Exposure to various types of traumatic events is associated with an increase in posttraumatic anxiety and depressive symptoms in children.[1] Witnessing death is significantly associated with posttraumatic stress disorder (PTSD) in children,[2] and a single trauma can increase the prevalence of anxiety and depressive disorders.[3] However, there is a paucity of literature on the long-term course of PTSD and anxiety and depressive disorders among children after witnessing death as a single trauma. While some reports have indicated that trauma-related psychological symptoms decline significantly with time,[4,5] others have shown that traumatized children or adolescents continue to experience a moderate degree of posttraumatic stress symptoms for an extended period.[6]

Previous studies on the quality of life of children who have experienced trauma have focused on children or adolescents with physical injuries, not psychological trauma.[7] While Alisic and colleagues[8] reported that posttraumatic stress reactions and quality of life were strongly related, the significance of their report was tempered by a cross-sectional design and the fact that the findings relied only on retrospective self-reporting. To our best knowledge, there are very few prospective follow-up studies dealing with the relationship between trauma-related symptoms and quality of life of children.

The present study was designed to follow up on the cohort of children assessed at 2 days (time point 1 [T1]: May 19, 2007), 2 months (time point 2 [T2]: July 16, 2007), 6 months (time point 3 [T3]: November 12–17, 2007), and 30 months (time point 4 [T4]: November 16–21, 2009) after they witnessed death at school and to evaluate the changes in posttraumatic stress symptoms and their postaccident quality of life prospectively. We regarded 30 months after the accident as a critical time, because the children were about to graduate from elementary school and enter secondary school and adolescence.

METHOD

Sample and Procedure

In 2009, we reported 6-month follow-up results,[9] which included child PTSD and anxiety and depressive symptoms and diagnoses in both the indirect and direct trauma exposure groups. We defined the direct group as the group of children who witnessed the death of the mothers and the indirect group as children in the same school who heard about the accident. At 30 months, we evaluated only the children with direct exposure to the trauma, because symptoms in the indirect-exposure group subsided rapidly at 6 months. Among children presumed to be in the direct group, only fourth-grade children at T1 (sixth-grade at T4) were recruited into this study, because they had been confirmed to be in the same schoolyard where the accident happened and witnessed the deaths. The adults who died in the accident were mothers of fourth-grade students. The 2 children who experienced their mothers' deaths were excluded as study subjects, and 6 children were also excluded due to additional traumatic experiences during the follow-up period (2 were involved in motor vehicle accidents, 1 witnessed violence in the family, and 3 were hospitalized for surgery). Another 65 children and their parents could not be reached because they had already moved to other schools during that period. However, no difference was found in the mean age, sex ratio, or scores on the Child Posttraumatic Stress Disorder-Reaction Index (CPTSD-RI), Children's Depression Inventory (CDI), or the State Anxiety Scale of the State-Trait Anxiety Inventory for Children (STAIC) at T1, T2, and T3 between the participants and those lost to follow-up.

Finally, we analyzed the data of 167 children who had participated in self-administered questionnaires at all time points (T1–T4). The mean age of the children was 11.76 years (SD = 0.48 years) at T4, and 57.5% were boys. All of the children lived with 1 or both of their biological parents and denied experiencing additional shocking or fearful events during the follow-up period. See Supplementary eFigure 1 for a summary of short-term interventional processes.

The protocol for this study was approved by the Institutional Review Board for Human Subjects at Seoul National University College of Medicine and Seoul National University Hospital in Korea. The parents of the subjects provided written informed consent for the study. The children or adolescents provided verbal assent to participate in the study.

Children's Self-Rating Scales

Child Posttraumatic Stress Disorder-Reaction Index. The 20-item self-reported CPTSD-RI was used for evaluating PTSD.[10] Items are rated on a 0–4 frequency scale. The total CPTSD-RI scores range from 0 to 80, and we regarded a total score of 40 as the cutoff point for severe symptoms. The Korean version of the CPTSD-RI has been standardized. The data showed a Cronbach α of 0.91 and a test-retest reliability of 0.85.

Clinical Points

- The posttraumatic stress symptom severity declined with time, whereas depressive symptom severity increased mildly with time.
- At 30 months after exposure to trauma, the children's quality of life and parents' rearing stress were associated with the severity of children's depressive symptoms.
- Careful assessment and management of depressive symptoms is warranted for children exposed to a single trauma.

Children's Depression Inventory. We used the 27-item self-report CDI to evaluate depressive disorders. The total CDI score ranges from 0 to 54.[11] The Korean version of the CDI has been standardized, and its validity and reliability have been established and reported.[12]

State Anxiety Scale of the State-Trait Anxiety Inventory for Children. The STAIC consists of 20 self-rated questions that measure the level of state anxiety.[13] The Korean version of the STAIC has been standardized, and its validity and reliability have been reported.[14]

Parents' Rating Scales

At T4, both the Parenting Stress Index-Short Form (PSI-SF) and the Child Health and Illness Profile-Child Edition Parent Report Form (CHIP-CE/PRF) were rated by the children's biological parents.

Parenting Stress Index-Short Form. Parents' rearing stress was measured by an instrument that Shin[15] standardized and modified for Koreans based on Abidin's PSI-SF.[16] It comprises 3 subscales: child characteristic–related stress, parent-child interaction–related stress, and achievement expectation–related stress. The higher the score, the higher the parent's perceived stress.

Child Health and Illness Profile-Child Edition Parent Report Form. We used the CHIP-CE/PRF, which is designed to measure the health and quality of life of children from the caregiver's perspective. It consists of 76 items, producing 5 domain scores: Satisfaction, Comfort, Resilience, Risk Avoidance, and Achievement.[17] Current data show that internal consistency ranges from 0.80 to 0.92, with test-retest reliabilities for total and domain scores ranging from 0.68 to 0.85.

Structured Interview for Children

Diagnostic Interview Schedule for Children-Version IV. Psychiatric disorders were diagnosed according to the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (*DSM-IV*)[18] by the DISC-IV Depressive and Anxiety Disorders module. The reliability and validity of the Korean version of the DISC-IV have been determined previously.[19] Subthreshold diagnoses were made by including symptoms causing functional impairment, but not to the *DSM-IV* threshold level. At T1, all children were evaluated using the DISC-IV PTSD module only.

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Table 1. Prevalence of Severe PTSD, Anxiety, and Depressive Symptoms and Mean CPTSD-RI, CDI, and STAIC Scores Across Time Points After Trauma

	Time 1 (N = 167)		Time 2 (N = 167)		Time 3 (N = 167)		Time 4 (N = 167)	
Measure	N	%	N	%	N	%	N	%
CPTSD-RI score > 40[a,b]	42	25.2	18	10.8	35	21.0	15	9.0
CDI score > 29	10	6.0	NA	NA	7	4.2	4	2.4
STAIC score > 49[b]	24	14.4	NA	NA	7	4.2	6	3.6
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CPTSD-RI score[c,d]	29.52	18.19	18.47	15.77	24.46	15.14	20.86	11.94
CDI score	12.46	8.64	NA	NA	12.31	8.85	13.33	15.14
STAIC score[d]	35.71	10.40	NA	NA	31.11	8.86	32.40	11.94

[a]Significant differences in within-group comparisons of scores between all time points ($P < .05$).
[b]Significant differences in within-group comparisons of scores between time points 1 and 4 ($P < .05$).
[c]Significant differences in within-group comparisons of scores between all time points ($P < .001$).
[d]Significant differences in within-group comparisons of scores between time points 1 and 4 ($P < .001$).
Abbreviations: CDI = Children's Depression Inventory, CPTSD-RI = Child Posttraumatic Stress Disorder-Reaction Index, NA = not assessed, STAIC = State-Trait Anxiety Inventory for Children, Time 1 = 2 days after direct exposure to the accident, Time 2 = 2 months after direct exposure to the accident, Time 3 = 6 months after direct exposure to the accident, Time 4 = 30 months after direct exposure to the accident.

Among direct-exposure children, 58 (at T3) and 53 (at T4) high-risk children who reported severe PTSD or anxiety symptoms on the CPTSD-RI or STAIC were evaluated using the DISC-IV Depression/Anxiety module.

Analyses

Changes in scores on the CPTSD-RI, CDI, and STAIC were analyzed by repeated-measures analysis of variance with time as a within-subject factor. Chi-square tests were used to evaluate the differences in categorical variables. Pearson correlation coefficient analyses were performed to assess the relationship between children's symptoms and quality of life. Multiple logistic and linear regression tests were performed to detect predictors. For linear regression analysis, we categorized the high CDI and STAIC scores. All statistical analyses were conducted using SPSS software version 17.0 for Windows (IBM Inc, Armonk, New York). A P value < .05 was considered to indicate statistical significance.

RESULTS

Changes in the Psychiatric Diagnosis and Symptoms Over Time

PTSD and depressive and anxiety symptoms based on the questionnaire measures. The prevalence of severe PTSD and anxiety decreased over time (Table 1). The decline in PTSD symptoms measured on the CPTSD-RI at T1, T2, T3, and T4 was 25.2%, 10.8%, 21.0%, and 9.0%, respectively. Similarly, the decline in anxiety symptoms as measured on the STAIC was 14.4%, 4.2%, and 3.6% at T1, T3, and T4, respectively. For the frequency of severe depressive symptoms on the CDI, there was a tendency to decrease (6.0%, 4.2%, and 2.4% at T1, T3, and T4, respectively), although this reduction over time was not statistically significant. Although the mean total CPTSD-RI and STAIC scores decreased significantly over time (CPTSD-RI, $F = 32.9$; STAIC, $F_1 = 18.7$, $P < .001$), the mean CDI scores did not ($F_1 = 1.5$, $P = .223$; Table 1).

Prevalence of PTSD, depression, and anxiety disorders by DISC-IV. Of the 58 subjects who reported severe PTSD or anxiety symptoms on the CPTSD-RI or STAIC, 38 (65.5%) had 1 or more anxiety or depressive disorder diagnoses, including subthreshold diagnoses at T3 (Figure 1A). Separation anxiety disorder was the most common (n = 24, 41.4%), followed by agoraphobia (n = 20, 34.5%), PTSD (n = 12, 20.7%), social phobia (n = 12, 20.7%), and generalized anxiety disorder (n = 10, 17.2%). Only 4 children (6.9%) had subthreshold depressive disorders.

Of the 53 subjects evaluated with the DISC-IV, 24 (45.3%) met criteria for an anxiety or depressive disorder at T4 (Figure 1B). Agoraphobia was the most common (17.0%), followed by social phobia (13.2%), generalized anxiety disorder (5.7%), PTSD (3.8%), separation anxiety disorder (3.8%), and depressive disorder (1.9%). No child met the full diagnostic criteria for PTSD, agoraphobia, or social phobia.

A χ^2 analysis showed that the diagnostic rate for separation anxiety disorder ($\chi^2_1 = 21.8$, $P < .001$), PTSD ($\chi^2_1 = 7.1$, $P < .007$), and agoraphobia ($\chi^2_1 = 4.4$, $P < .03$) decreased significantly at T4 compared with that at T3.

Self-rated psychological symptoms in children with and without early PTSD. The children with early PTSD (PTSD without the duration criterion) on the DISC-IV PTSD module at T1 (n = 85) had significantly higher mean scores on the CPTSD-RI and STAIC at T2, T3, and T4 compared with subjects without early PTSD at T1 (n = 82). However, the difference in the mean CDI score ceased to be significant at T3 (Table 2).

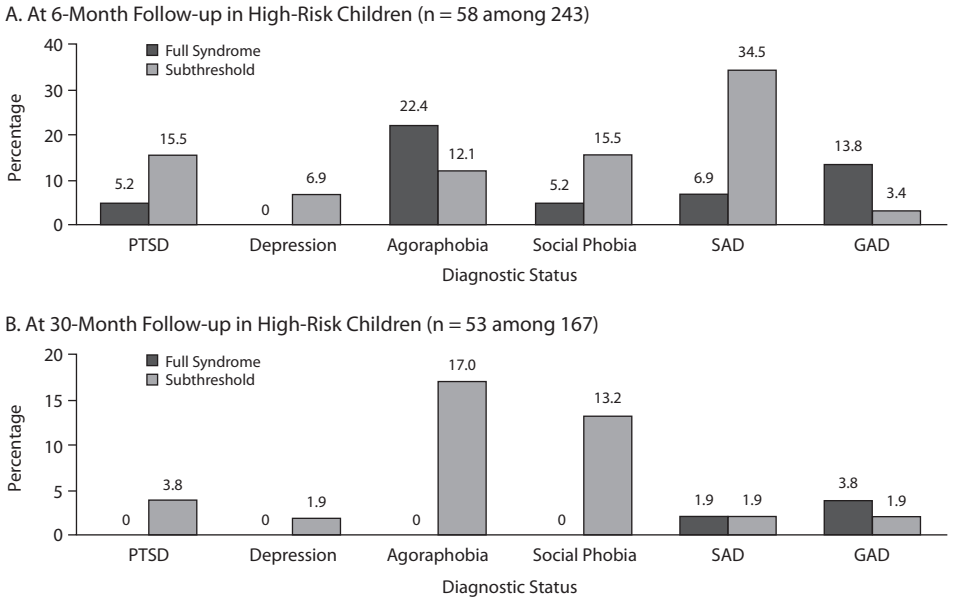
A χ^2 analysis showed that subjects with early PTSD had a higher proportion of severe symptoms, as measured by the CPTSD-RI and STAIC at T3 and by the CPTSD-RI at T4. No difference was found in the frequency of severe depressive symptoms at T3 or T4.

A logistic regression revealed that the presence of an early PTSD diagnosis at T1 was related to the high frequency of severe PTSD on the CPTSD-RI (odds ratio [OR], 2.8; 95% CI, 1.2–5.0; $P = .01$) and severe anxiety on the STAIC (OR = 4.2; 95% CI, 1.7–10.4; $P = .002$), but not severe depressive symptoms on the CDI at T4.

Correlation of Psychological Symptoms With Children's Quality of Life and Parents' Rearing Stress

The depressive symptoms on the CDI at T1, T3, and T4 were significantly correlated with total score on the PSI ($r = 0.16$–0.24, $P < .05$), but PTSD symptoms were not correlated with total score on the PSI. When we examined the correlation with subscale scores on the PSI, the depressive symptoms on

Figure 1. Prevalence of Full Syndrome and Subthreshold Diagnoses Among High-Risk Children Assessed by the Diagnostic Interview Schedule for Children-Version IV, Anxiety and Depressive Disorders Modules



Abbreviations: GAD = generalized anxiety disorder, PTSD = posttraumatic stress disorder, SAD = separation anxiety disorder.

Table 2. Comparison Between Children With and Without "Early PTSD" on DISC-IV PTSD Module Across Time Points After Trauma

	No PTSD (n = 82)[a]		PTSD (n = 85)[b]		
Measure/Time	Mean	SD	Mean	SD	*P* Value
CPTSD-RI score					
Time 1**	21.49	14.56	37.27	18.05	.000
Time 2**	14.63	12.77	22.16	17.49	.002
Time 3**	19.78	12.05	28.96	16.47	.000
Time 4*	18.59	9.96	23.06	13.27	.015
CDI score					
Time 1*	10.76	7.63	14.09	9.28	.012
Time 3	11.60	8.38	13.96	9.02	.094
Time 4	12.40	7.30	14.22	7.59	.116
STAIC score					
Time 1**	33.05	9.35	38.28	10.76	.001
Time 3**	29.12	7.64	33.02	9.55	.004
Time 4*	30.76	7.76	33.98	8.16	.010

[a]No PTSD: no PTSD on DISC-IV at Time 1.
[b]PTSD: PTSD or PTSD NOS on DISC-IV at Time 1.
*$P < .05$, independent samples *t* test.
**$P < .01$, independent samples *t* test.
Abbreviations: CDI = Children's Depression Inventory, CPTSD-RI = Child Posttraumatic Stress Disorder-Reaction Index, DISC-IV = Diagnostic Interview Schedule for Children-Version IV, NOS = not otherwise specified, PTSD = posttraumatic stress disorder, STAIC = State-Trait Anxiety Inventory for Children, Time 1 = 2 days after direct exposure to the accident, Time 2 = 2 months after direct exposure to the accident, Time 3 = 6 months after direct exposure to the accident, Time 4 = 30 months after direct exposure to the accident.

the CDI at T3 and T4 were significantly correlated with child characteristics–related stress and achievement expectation–related stress ($r = 0.18–0.27$, $P < .05$), and the depressive symptoms on the CDI at T1 and the anxiety symptoms on the STAIC at T3 were significantly correlated with achievement expectation–related stress ($r = 0.19$, $P < .05$) (Table 3).

While the children's PTSD symptoms were not correlated to any domain of the CHIP-CE, their current and past depressive symptoms were significantly and negatively correlated with satisfaction, comfort, and achievement ($r = –0.16$ to $–0.29$ at T1, T3, and T4), as well as resilience and risk avoidance ($r = –0.16$ at T1 and T3). Their state anxiety symptoms on the STAIC were significantly and negatively correlated with the satisfaction ($r = –0.19$) and achievement ($r = –0.27$) domain scores on the CHIP-CE only at T3.

Predictors for Current Quality of Life and Parental Rearing Stress

After adjusting for age, sex, and symptoms (including the PTSD symptoms from the CPTSD-RL and anxiety symptoms from the STAIC), the CDI score at T3 significantly predicted the achievement ($\beta = –0.32$, $P = .024$), satisfaction ($\beta = –0.25$, $P = .027$), comfort ($\beta = –0.41$, $P = .01$), and risk avoidance ($\beta = –0.28$, $P = .044$) domains of children's quality of life on the CHIP-CE. The CDI score at T3 also significantly predicted total ($\beta = 0.51$, $P = .01$), child characteristic–related stress ($\beta = 0.38$, $P = .013$), and achievement expectation–related stress ($\beta = –0.41$, $P = .01$) scores on the PSI at T4, but it did not predict parent-child interaction–related stress score ($\beta = –0.20$, $P = .125$). Female sex predicted risk avoidance ($\beta = 0.21$, $P = .017$) and comfort ($\beta = –0.25$, $P = .04$) domains on the CHIP-CE (Table 4).

A logistic regression analysis also revealed that a high CDI score at T3 significantly predicted higher parental stress on the PSI (OR = 2.88; $P = .016$) as well as lower children's achievement (OR = 1.50; $P = .045$) and satisfaction (OR = 2.66; $P = .024$) on the CHIP-CE.

Table 3. Correlation of Children's Psychiatric Symptoms With Parents' Rearing Stress and Children's Quality of Life[a,b]

	CPTSD-RI				CDI			STAIC		
	Time 1	Time 2	Time 3	Time 4	Time 1	Time 3	Time 4	Time 1	Time 3	Time 4
PSI score (n = 155)										
Child characteristics	0.090	0.049	0.080	0.076	0.090	**0.271****	0.184*	0.042	0.149	0.116
Parent-child interaction	−0.034	0.056	0.061	−0.103	−0.034	−0.053	−0.008	−0.048	0.068	0.016
Achievement expectation	0.079	0.057	0.082	−0.065	0.188*	**0.269****	0.180*	−0.016	**0.187***	0.180
CHIP-CE/PRF score (n = 152)										
Satisfaction	−0.012	−0.025	0.032	−0.086	−0.161*	**−0.248****	**−0.226****	0.018	−0.185*	−0.085
Comfort	−0.046	−0.147	−0.072	−0.122	−0.170*	−0.186*	**−0.219****	−0.110	−0.089	−0.124
Resilience	−0.022	0.035	−0.010	−0.009	−0.120	−0.162*	−0.125	−0.010	−0.116	−0.023
Risk avoidance	−0.044	0.038	0.056	0.062	−0.162*	−0.136	−0.060	−0.078	−0.029	−0.027
Achievement	−0.098	−0.156	−0.062	−0.005	−0.187*	**−0.298*****	**−0.229****	−0.035	**−0.267****	−0.077

[a]All data presented as Pearson correlation coefficients (*r*).
[b]Boldface text indicates most significant correlation coefficients at PSI and each domain of CHIP-CE.
*$P < .05$.
**$P < .01$.
***$P < .001$.
Abbreviations: CDI = Children's Depression Inventory, CHIP-CE/PRF = Child Health and Illness Profile-Child Edition Parent Report Form, CPTSD-RI = Child Posttraumatic Stress Disorder-Reaction Index, PSI = Parenting Stress Index, Time 1 = 2 days after direct exposure to the accident, Time 2 = 2 months after direct exposure to the accident, Time 3 = 6 months after direct exposure to the accident, Time 4 = 30 months after direct exposure to the accident.

Table 4. Multiple Regression Analysis of the Relationship of 6-Month Psychological Symptoms With Current Parental Stress and Children's Quality of Life (n = 152)

	PSI		CHIP-CE/PRF: Achievement		CHIP-CE/PRF: Satisfaction		CHIP-CE/PRF: Comfort		CHIP-CE/PRF: Risk Avoidance		CHIP-CE/PRF: Resilience	
	Adjusted β	*P* Value	Adjusted β	*P* Value	Adjusted β	*P* Value	Adjusted β	*P* Value	Adjusted β	*P* Value	Adjusted β	*P* Value
Model 1[a]												
Age	−0.021	.8	0.042	.5	0.086	.28	−0.06	.4	−0.007	.927	0.078	.340
Sex	−0.035	.6	0.025	.7	−0.120	.15*	−0.243*	.04*	0.238*	.006*	−0.052	.540
CDI[b]	0.347*	.003*	−0.124*	.001*	−0.241*	.003*	−0.21*	.027*	−0.125	.130	−0.164*	.046*
Model 2[c]												
Age	−0.021	.8	0.054	.5	0.061	.44	−0.052	.5	−0.040	.616	0.058	.480
Sex	−0.035	.6	0.054	.5	−0.015	.08	−0.248*	.04*	0.205*	.017*	−0.073	.410
STAIC[b]	−0.135	.2	−0.021	.8	−0.115	.4	0.135	.33	0.167	.230	−0.013	.926
CPTSD-RI[b]	0.064	.5	0.066	.5	0.104	.3	0.114	.26	0.051	.620	0.124	.646
CDI[b]	0.51*	.01*	−0.324*	.024*	−0.254*	.027*	−0.412*	.01*	−0.280*	.044*	−0.223	.117

[a]Adjusted for children's sex and age.
[b]At Time 3 (6 months after the accident).
[c]Adjusted for children's sex, age, and scores on CPTSD-RI and STAIC at Time 3 (6 months after the accident).
*$P < .05$.
Abbreviations: CDI = Children's Depression Inventory, CHIP-CE/PRF = Child Health and Illness Profile-Child Edition Parent Report Form, CPTSD-RI = Child Posttraumatic Stress Disorder-Reaction Index, PSI = Parenting Stress Index, STAIC = State-Trait Anxiety Inventory for Children.

DISCUSSION

According to the present study of the 3-year course of PTSD, anxiety, and depressive symptoms and diagnoses among children who witnessed the accidental deaths of 2 parents at school, the prevalence of severe PTSD and anxiety decreased over time. However, a substantial portion (45%) of the high-risk children suffered persistently from PTSD and diverse anxiety disorders, such as social phobia and agoraphobia, even after 3 years. The variety of anxiety disorders found in our subjects is similar to that found in a previous study[20] reporting that children experiencing trauma could display diverse classes of symptoms, social phobia, agoraphobia, and separation anxiety, as well as PTSD.

Our study subjects' trauma-related symptoms and diagnoses may result from witnessing the death of their friends' mothers in a school playground. Previous studies have considered the potential harmful effects of witnessing death or violence.[21] One study reported that 52% of children who had witnessed a public hanging were diagnosed with PTSD after 3 months.[22] However, few systemic long-term follow-up studies are available on the courses of children witnessing death as a single traumatic incident. Thus, the present study is one of only a handful of studies adding important scientific knowledge concerning the long-term effects of witnessing death on children's mental health.

From our results, the mean scores of self-reported PTSD on the CPTSD-RI and anxiety symptoms on the STAIC decreased significantly over time, whereas the mean score on the CDI did not change significantly, suggesting that depressive symptoms may be more persistent than PTSD or anxiety symptoms in chronically traumatized children or adolescents. Prior studies have indicated that depressive symptoms can be related to the persistence of posttraumatic stress symptoms[6,23] and interfere with the resolution of PTSD. In such cases, continuing depressive symptoms may be related to unresolved grief or anger reactions.[6,23]

The structured DISC-IV interview with the high-risk children revealed the prevalence of diverse anxiety and depressive disorders, which decreased significantly at T4 compared with T3. At T4, the diagnoses of full PTSD, agoraphobia, and social phobia disappeared and subthreshold diagnoses of those disorders notably decreased. These results were consistent with our results from the self-rated CPTSD-RI and STAIC. Longitudinal studies have reported a substantial decrease in diverse psychological symptoms and psychiatric diagnoses over time after natural disasters, accidents, or refugee experiences.[5,24,25] However, even after 3 years, 45% of the high-risk children still had 1 or more psychiatric diagnoses at T4, although they were mainly subthreshold. Consistent and continuing support must be provided for high-risk children exposed to a single incident of such trauma.

Children who underwent the DISC-IV based on an early PTSD diagnosis at T1 had persistently higher CPTSD-RI and STAIC scores at T2, T3, and T4. A logistic regression analysis revealed that an early PTSD diagnosis at T1 resulted in a 2.8-fold increase in the number of cases with severe PTSD symptoms (CPTSD-RI score > 40) and a 4.2-fold increase in the number of cases with severe anxiety symptoms (STAIC scores > 49) at T4. These results are comparable with previous studies reporting that early peritraumatic distress can be a robust predictor of acute PTSD and anxiety symptoms in the short and long term after accidents in school-aged children or adults.[26,27] In our study, early PTSD (PTSD without the duration criterion) was used instead of acute stress disorder, because the DISC-IV PTSD module was used for diagnostic assessment at T1. Our findings suggest that careful clinical attention must be provided to children with early PTSD to prevent emerging anxiety-related symptoms and allow for early intervention.

Depressive symptoms on the CDI at T3 were consistently associated with parent-rated children's quality of life and parental rearing stress at T4. Considering the temporal relationship, it seems possible that children's depressive symptoms may in the first instance be related causatively to subsequent low quality of life and high parental stress. However, it seems likely that subsequent low quality of life and high parental stress would then play maintaining roles in children's depressive symptoms, with the relationship between these variables perpetuated over time. Interestingly and unexpectedly, the PTSD symptoms on the PTSD-RI were not associated with any domain of the children's quality of life or the parents' rearing stress. Taken together, the children's depression should be regarded as an independent primary psychological problem predicting parental rearing stress and quality of life in children over the long term. Depressive symptoms can be persistent and disturbing in children exposed to a single trauma.[6] Because previous quality of life studies on trauma in exposed children usually considered physical health–related issues, such as various types of physical injuries,[7,28] few studies have considered the quality of life or parenting stress among children exposed to a psychological trauma. One refugee study considered children's well being, social adjustment, and self-worth, but the authors did not investigate the relationship with children's psychological symptoms.[29] Thus, our result of a strong association between depressive symptoms and quality of life in traumatized children must be investigated further by additional longitudinal studies of children witnessing death or injury.

This study had several strengths. Because it was conducted prospectively, it obviated potential confounders related to memory failure inherent in retrospective studies. Second, we used multiple information sources, including not only the children's self-reports but also a structured interview and parents' reports. Third, this is one of a few epidemiologic studies considering the relationship between psychological symptoms and children's quality of life after a psychological trauma. Fourth, as the subjects were exposed to a single trauma and did not report additional trauma during the follow-up period, the effect of a single trauma was assessed more precisely.

Several limitations of this study must be considered. First, various psychosocial factors were not examined. Second, we could not assess any preexisting psychopathology prior to trauma in children or in parents before and after this traumatic event. Third, because the screening of high-risk children was done based on only CPTSD-RI and STAIC scores, the prevalence of depressive disorder on the DISC could be underestimated. Fourth, the high attrition due to the mobility of students following the accident may have affected the result, although it is important to reemphasize that no differences were found in the mean age, sex ratio, or scores on CPTSD-RI, CDI, and STAIC at T1, T2, and T3 between the participants and those lost to follow-up. Finally, children's quality of life and parenting stress were not able to be assessed prior to the traumatic event.

CONCLUSIONS

The results of this longitudinal study provide substantial evidence regarding the long-term course of children after direct exposure to a single traumatic event (witness to death) at school in terms of diverse psychological symptoms and psychiatric diagnoses over time. The prevalence of psychopathology and emotional disorder diagnoses generally decreased over time. However, symptom-domain specificities were present; the posttraumatic stress symptom severity declined with time, whereas depressive symptom severity increased mildly with time. The children's quality of life and parents' rearing stress were correlated with and predicted by the severity of children's depressive symptoms but not by posttraumatic stress symptom severity. Careful assessment and management of depressive symptoms are warranted for reducing parental stress and improving the quality of life of children exposed to a single trauma. Considering the reciprocal nature of the relationships between the variables of children's depression, quality of life, and parental rearing stress, a parenting intervention or family therapy approach is also recommended to parents of children exhibiting high levels of symptomatology following a single incident of trauma.

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Supplementary material: See accompanying page.

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Supplementary material follows this article.

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Supplementary Material

Article Title: A 30-Month Prospective Follow-Up Study of Psychological Symptoms, Psychiatric Diagnoses, and Their Effects on Quality of Life in Children Witnessing a Single Incident of Death at School

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List of Supplementary Material for the article

1. eFigure 1 Short-Term Interventions in Children Witnessing a Single Death at School

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