

Post-Traumatic Stress Disorder among Children Involved in Traffic Accidents and Their Parents in Japan

Mio Yoshino¹, Takahiro Ueda¹, Haruki Takada²,
Aya Kanno³, Miho Maeda^{1,4}, Hisashi Matsumoto⁵,
Yutaka Matsui⁶, Takeshi Asano³ and Yasuhiko Itoh¹

¹Department of Pediatrics, Nippon Medical School Hospital, Tokyo, Japan

²Department of Clinical Psychology, Faculty of Psychology, Iryo Sosei University, Fukushima, Japan

³Department of Pediatrics, Nippon Medical School Chiba Hokusoh Hospital, Chiba, Japan

⁴Department of Pediatric Dentistry, School of Life Dentistry at Tokyo, Nippon Dental University, Tokyo, Japan

⁵Shock and Trauma Center, Nippon Medical School Chiba Hokusoh Hospital, Chiba, Japan

⁶Graduate School of Comprehensive Human Science, Tsukuba University, Tokyo, Japan

Background: Children who survive traffic accidents, and their parents, may develop post-traumatic stress disorder (PTSD) or related symptoms (depression or anxiety), which can hinder the children's development and the parents' ability to provide effective care. In Japan, the PTSD incidence rate after traffic accidents and its related factors remain unclarified.

Methods: The participants were 79 children and 104 parents. The children were aged 3-18 years when injured. From August through December 2015, participants completed a self-reported questionnaire survey that comprised the 15-item Post-traumatic Stress Symptoms for Children and the Japanese version of the Impact of Event Scale-Revised. The children's Injury Severity Score (ISS) was also obtained from their medical records. Correlation analysis, analysis of variance, and multiple regression analysis were conducted.

Results: Among the children and parents, 10.1% and 22.1%, respectively, were deemed to be at high risk of PTSD. Their stress scores were significantly positively correlated with each other and negatively correlated with the children's age at the time of the accident. Parents who witnessed their children's accidents and those whose children were hospitalized were more stressed. Neither the children's nor the parents' risk for PTSD was associated with ISS or the amount of time since the accident.

Conclusions: A system that simultaneously works with children and parents to support both parties' psychological recovery is required. To ensure psychological care post-injury, it is necessary to evaluate PTSD risk, regardless of injury severity. Implementing preventive and early interventions can prove more valuable than awaiting natural recovery. (J Nippon Med Sch 2022; 89: 47-55)

Key words: children, parent-child relationship, post-traumatic stress disorder, traffic accident

Introduction

Traffic accidents pose major threats to children's lives globally. Attempting to solve this problem is a universal endeavor. In Japan, more than 430,000 traffic accidents occur annually, and the number of casualties exceeds 520,000 (National Police Agency, 2018)¹. Among these, the

number of injured people younger than 14 years exceeds 30,000¹.

Children who survive traffic accidents may be greatly affected psychologically, and the incidence of post-traumatic stress disorder (PTSD) among children involved in traffic accidents ranges from 13% to 25%, 4-12

Correspondence to Takahiro Ueda, MD, PhD, Department of Pediatrics, Nippon Medical School Hospital, 1-1-5 Sendagi, Bunkyo-ku, Tokyo 113-8603, Japan

E-mail: yuri878t@nms.ac.jp

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months post-accident². Further, one in 6 children and parents have PTSD or some psychological problem even after they recover physically³. PTSD and PTSD-related issues, such as depression and anxiety, can hinder children's development⁴.

Failing to treat children with PTSD-related symptoms is a societal problem². In Japan, however, studies of the psychological effects of involvement in traffic accidents on children have mainly focused on PTSD treatments^{5,6}; the incidence of PTSD following traffic accidents and its related factors have not been clarified.

Parents are an important party for accurate assessment and treatment of PTSD in children involved in traffic accidents⁷. However, after a child is involved in a traffic accident, parents' risk for PTSD also increases^{8,9}. Parents' PTSD symptoms affect their assessment of children's psychological states¹⁰, making it difficult for them to provide children with quality care when they have PTSD symptoms. It is essential to accurately understand the risk of developing PTSD among parents of children involved in traffic accidents and to provide them with appropriate treatment.

It is vital to investigate the incidence rate of PTSD in children involved in traffic accidents, and in their parents, to aid in developing necessary preventive interventions. Therefore, we conducted a questionnaire survey to examine these issues in Japan.

Materials and Methods

Participants

The participants were children involved in traffic accidents and their parents. The children were in traffic accidents between January 2010 and October 2015 and were transported by ambulance or helicopter to Nippon Medical School Chiba Hokusoh Hospital, where they recovered from their injuries. The children's place of residence was distributed in Chiba, Ibaraki, Saitama Prefectures, and Tokyo. Children with severe physical illness and those who could not complete the questionnaire, and their families, were excluded from this study. Nippon Medical School Chiba Hokusoh Hospital is a leading critical care center in Japan. As of 2018, the hospital treats approximately 640 traffic injury cases (including adults) per year.

Procedure

Between August and December 2015, the questionnaire survey was mailed to potential participants. Written instructions were enclosed and individuals who wished to participate provided written informed consent; signed in-

formed consent forms along with participants' questionnaires were received by the researchers. This study was approved by an in-house ethics committee (approval no. 426).

Measures

The 15-item Post-traumatic Stress Symptoms for Children (PTSSC-15)

To screen children who experienced psychological trauma, we used the self-reported PTSSC-15, which was created by adding the following 5 items to the PTSS10¹¹: flashbacks, appetite loss, somatic reactions such as headache and abdominal pain, attention deficit, and anxiety¹²⁻¹⁵. A factor analysis showed that the scale comprised a depression factor (7 items) and a PTSD factor (8 items). Responses were provided using a six-point Likert scale (completely disagree, mostly disagree, partially disagree, partially agree, mostly agree, and completely agree; scored 0, 0, 0, 1, 2, and 3 points, respectively; that is, 0-45 points). A total score of ≥ 23 meant that the children required individual consideration, and a total score of 15-22 meant that the children required special attention^{12,14}. Children requiring individual consideration were those who needed trauma care such as psychotherapy, whereas those requiring special attention needed to be monitored¹².

For the PTSD factor, a score of ≥ 15 was considered "high risk"; for the depression factor, a score of ≥ 9 was considered "high risk."

We used the PTSSC-15 to evaluate the children's psychological states because it was easy for children to understand; the events that caused trauma were not repeatedly referred to; and the measure comprised only 15 items, which made it easy to use as a primary screening tool. Children aged ≥ 8 years were able to complete this measure without assistance. Children aged 7 years or younger were not required to complete the questionnaire.

Japanese version of the Impact of Event Scale-Revised (IES-R-J)

The 22-item IES-R is used to assess psychological traumatic stress symptoms caused by natural disasters, crimes, or accidents¹⁶. It measures 3 symptoms: intrusion, avoidance, and hyperarousal. Asukai and colleagues translated the scale into Japanese, which has been found to be reliable¹⁷.

The IES-R-J easily measures PTSD-related symptoms and is widely used in cross-sectional surveys, symptom follow-ups, and for screening purposes. Total scores range from 0 to 88, and higher scores indicate more or more severe PTSD symptoms. The IES-R-J recommends a

cutoff score of 25 to screen those at a high risk of developing PTSD. In this study, we used the IES-R-J to measure parents' psychological state.

Demographics and questions about the accident

In addition to basic information such as children's age and gender, parents were asked whether their children were hospitalized and, if so, for how long; whether they were outpatients and, if so, for how long; and about the duration of their post-injury period.

Information related to Injury Severity Score (ISS) was also obtained from the children's medical records. The ISS is a severity assessment method for patients with multiple injuries, which was devised by Baker and colleagues in 1974, and is calculated based on the Abbreviated Injury Scale¹⁸. Further, it is an anatomical severity score for assessing multiple lesions and correlates well with mortality¹⁸. The maximum score is 75. A score of > 15 is considered to indicate severe injury, and a score between 25 and 34 points is associated with a mortality rate of about 30%¹⁹. In addition to the mortality rate, the ISS is also correlated with hospitalization days and is regarded as an index for a wide range of social applications. A previous study indicated that a score of >25 should be categorized as severe for children²⁰.

Statistical Analysis

To determine the association between children's PTSD and sample characteristics, psychological status, and accident situation, Pearson correlation coefficients were calculated, and analysis of variance (ANOVA) and multiple regression analysis were conducted. To examine associations between parents' PTSD and sample characteristics, psychological status, and accident situation, Pearson correlations were calculated, and *t*-tests, ANOVA, and multiple regression analysis were conducted.

Data were analyzed using R version 3.6.1 of psych package (1.8.12; Rev William Revelle, 2018), MASS package (7.3; Brian Ripley, Bill Venables, Douglas M. Bates, Kurt Hornik, Albrecht Gebhardt, David Firth, 2019), and Pequod package (version 0.0-5; @Alberto Mirisola & Luciano Seta, 2016). Significance was set at $p < .05$.

Results

The questionnaire was mailed to 408 children and their parents. We obtained responses from 79 children and 104 parents (valid response rates, 19.4% and 25.5%, respectively). As the samples in this study were valuable data, responses with some data missing were analyzed. Therefore, the number of samples differed in some items.

Table 1 shows the participants' descriptive characteris-

tics, accident characteristics, and injury severity. The children were aged 3-18 years at the time of injury. The mean length of the children's hospital stay was 19.8 days ($SD = 45.4$, median = 4). Twenty-six (38.8%) children did outpatient visit for less than 1 month; 7 (10.4%) children for 1-3 months; 11 (16.4%) children for 3-6 months; 8 (11.9%) children for 6 months to 1 year; 9 (13.4%) children for 1-2 years; 4 (6.0%) children for 2 or more years, and 2 (3.0%) children for an unknown interval. This classification yields the sum of children who went to the hospital and those who are still going to the hospital ($n = 67$).

Descriptive statistics were calculated for children's age at the time of injury, at the time of their responses, and for the post-injury period. According to the parents' responses, children's mean age at the time of injury was 128.71 months (10 years and 8 months, $SD = 57.39$ months), and their mean age at the time of their responses was 163.12 months (13 years and 7 months, $SD = 63.09$ months). The mean post-injury period was 33 months (2 years and 9 months, $SD = 17.40$ months; range = 3-71months). As indicated by the children's responses, their mean age at the time of their injuries was 146.18 months (12 years and 2 months, $SD = 49.00$ months), and their mean age at the time of their responses was 182.32 months (15 years and 2 months, $SD = 53.26$ months). The average post-injury period was 35 months (2 years and 11 months, $SD = 17.12$ months; range = 3-71months).

Psychological States of Children and Parents

Descriptive statistics of the PTSSC-15 and the IES-R-J were calculated to examine children's and parents' psychological states after the traffic accident (**Table 2**). Concerning the PTSSC-15 total score, 4 children required individual consideration, and 4 required special attention^{12,14} (i.e., 10.1% were at risk for PTSD). For the PTSD and depression factors, 5 (6.3%) and 3 children (3.8%), respectively, were considered at high-risk¹². Concerning the IES-R-J total score, with the cutoff set at 25 points 23 parents (22.1%) were considered at high risk. The highest score in the high-risk group was 59, indicating that some had particularly severe symptoms.

Associations between Children's and Parents' Psychological States, Children's Age, and the Post-Injury Period

To examine the associations between the children's and parents' psychological states, the children's age, and the post-accident period, we analyzed correlations between PTSSC-15 total score, IES-R-J total score, children's age at the time of injury, children's age at the time of their re-

Table 1 Descriptive sample characteristics

		<i>n</i>	%
Gender of children	Boy	71	68.3%
	Girl	33	31.7%
Gender of parents	Man	31	29.8%
	Woman	65	62.5%
	Unknown	8	7.7%
Hospitalization	Hospitalized	84	80.8%
	Still in hospital	1	1.0%
	Not hospitalized	19	18.3%
Outpatient visits	Went to hospital	59	56.7%
	Currently going to hospital	8	7.7%
	Did not go to hospital	29	27.9%
	Unknown	8	7.7%
Situation at the time of the accident	Was walking	19	18.3%
	Was standing	2	1.9%
	Was riding a bicycle	41	39.4%
	Was a passenger on a bicycle	2	1.9%
	Was driving a motorcycle	6	5.8%
	Was a passenger on a motorcycle	0	0.0%
	Was driving a car	3	2.9%
	Was a passenger in a car	25	24.0%
	Other	6	5.8%
Witnessing of the accident by the parent	Witnessed	27	26.0%
	Not witnessed	77	74.0%
In ambulance or helicopter with parent	With parent	38	36.5%
	Without parent	65	62.5%
	Unknown	1	1.0%
Injury Severity Score	<9 points	57	54.8%
	9 to 25 points	27	26.0%
	>25 points	8	7.7%
	Unknown	12	11.5%

Table 2 Descriptive statistics of PTSSC-15 and IES-R-J scores

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Minimum</i>	<i>Maximum</i>
PTSSC-15 (children)					
Total score	79	5.03	6.53	0	26
PTSD	79	3.29	4.90	0	23
Depression	79	1.20	1.92	0	10
IES-R-J (parents)					
Total score	100	14.73	15.05	0	59
Intrusion	102	5.07	5.36	0	25
Avoidance	101	5.86	6.26	0	23
Hyperarousal	103	3.87	4.56	0	17

PTSSC-15: 15-item Post-traumatic Stress Symptoms for Children; IES-R-J: Japanese Version of the Impact of Event Scale-Revised; SD: standard deviation; PTSD: post-traumatic stress disorder.

sponses, and the post-injury period (Table 3). There was a significant positive correlation between PTSSC-15 and IES-R-J total scores. However, the PTSSC-15 and IES-R-J total scores were negatively correlated with children's age at the time of injury and at the time of their re-

sponses. There were no significant correlations in relation to the post-injury period.

Associations of Children's and Parents' Psychological States with Their Attributes

ANOVA was performed to examine the associations of

Table 3 Pearson product-moment correlation coefficients between parents' and children's psychological states, ages, and post-injury period

	IES-R-J total score (parents)		Age at time of injury (months)		Age at time of response (months)		Post-injury period (months)
① PTSSC-15 total score (children)	.371	**	-.262	*	-.284	*	-.177
② IES-R-J total score (parents)			-.271	**	-.264	**	-.101
③ Age at time of injury (months)					.961	***	.183

*** $p < .001$, ** $p < .01$, * $p < .05$. PTSSC-15: 15-item Post-traumatic Stress Symptoms for Children; IES-R-J: Japanese Version of the Impact of Event Scale-Revised.

Table 4 Analysis of variance of parents' and children's psychological state by attribute and accident situation

	The 15-item Post-traumatic Stress Symptoms for Children (for children)						The Japanese Version of the Impact of Event Scale-Revised (for parents)					
	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>F</i>	<i>p</i>	η^2	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>F</i>	<i>p</i>	η^2
Gender												
Male	51	4.65	6.20	0.48	.491	.006	30	10.87	10.68	2.09	.152	.022
Female	28	5.71	7.15				63	15.44	15.69			
Hospitalization												
Hospitalized	69	5.17	6.80	0.28	.598	.004	83	14.92	15.14	0.07	.787	.001
Not hospitalized	10	4.00	4.37				17	13.82	15.02			
Outpatient visits												
Went to the hospital	50	4.44	6.47	0.04	.963	.001	57	14.89	14.91	0.26	.770	.006
Currently going to the hospital	8	6.00	5.10				8	12.63	8.99			
Have not been going to the hospital	14	6.21	7.28				27	12.63	14.98			
Period of outpatient visits												
Under 1 month	20	6.40	8.38	0.05	.770	.049	26	16.77	18.14	0.332	.892	.028
Under 3 months	6	2.67	3.78				5	14.80	15.83			
Under 6 months	9	4.78	5.83				11	14.55	10.64			
Under 1 year	7	5.14	6.47				8	11.13	9.01			
Under 2 years	9	3.22	3.60				9	12.11	6.95			
Over 2 years	4	3.50	4.73				4	19.50	18.72			
Parent's witnessing of the accident												
Witnessed	14	5.29	6.13	0.03	.871	.000	26	22.50	17.84	10.25	.002*	.095
Not witnessed	65	4.97	6.65				74	12.00	13.00			
In ambulance or helicopter with parent												
With parent	24	6.08	7.00	0.83	.364	.011	37	16.19	14.39	0.45	.506	.005
Without parent	54	4.61	6.37				62	14.10	15.49			

SD: standard deviation. * $p < .05$. $\eta^2 > .01$ (small effect size), $\eta^2 > .06$ (medium effect size), $\eta^2 > .14$ (large effect size)³⁶.

children's and parents' psychological states with their respective descriptive characteristics (Table 4), which are shown in Table 1. The independent variables were the children's and parents' gender, whether the children were hospitalized, whether they were outpatients, the duration for which they were outpatients, whether the accidents were witnessed by the parents, and whether parents accompanied children in the ambulance/helicopter. The dependent variables were the children's PTSSC-15 total score or parents' IES-R-J total score. The results (Table 4) showed that all attribute variables were non-significantly associated with PTSSC-15 total score. In contrast, parents

who witnessed the accident had higher total IES-R-J scores than those who did not witness the accident ($p < .01$).

Association between Children's and Parents' Psychological States and ISS

Children's ISSs were divided into 3 groups: those with <9 points, 9-25 points, and >25 points. To examine associations of children's and parents' psychological states with ISS, ANOVA was performed using children's ISS scores as independent variables; PTSSC-15 total score or IES-R-J total score were the dependent variables. The results (Table 5) showed no significant associations.

Table 5 Differences between PTSSC-15 and IES-R by ISS classification

		Low ISS group (<9 points) n = 39		Middle ISS group (9–25 points) n = 26		High ISS group (>25 points) n = 8		F	p	η^2
		Mean	SD	Mean	SD	Mean	SD			
PTSSC-15 (children)	Total score	5.15	6.38	5.27	6.78	2.63	3.54	0.60	.553	.017
	PTSD	3.05	4.65	3.73	5.05	1.50	2.51	0.72	.491	.020
	Depression	1.59	2.33	0.92	1.47	0.63	1.06	1.36	.263	.038
		Low ISS group (<9 points) n = 57		Middle ISS group (9–25 points) n = 27		High ISS group (>25 points) n = 8		F	p	η^2
		Mean	SD	Mean	SD	Mean	SD			
IES-R-J (parents)	Total score	15.21	16.27	10.74	10.03	16.63	12.55	1.02	.365	.022
	Intrusion	5.28	5.68	3.85	3.51	5.50	4.07	0.81	.448	.018
	Avoidance	5.82	6.56	4.52	4.96	7.00	6.70	0.66	.520	.015
	Hyperarousal	4.11	5.02	2.37	2.57	4.13	3.68	1.52	.223	.033

PTSSC-15: 15-item Post-traumatic Stress Symptoms for Children; IES-R-J: Japanese Version of the Impact of Event Scale–Revised; SD: standard deviation; PTSD: post-traumatic stress disorder; ISS: Injury Severity Score. $\eta^2 > .01$ (small effect size), $\eta^2 > .06$ (medium effect size), $\eta^2 > .14$ (large effect size)³⁶.

Table 6 Results of multiple regression analysis

	PTSSC-15 (children)		IES-R-J (parents)		
	β	p	β	p	
ISS (0 = low ISS group, 1 = middle ISS group, 2 = high ISS group)	-.128	.326	-.050	.645	
Gender (male = 1, female = 2)	.060	.632	-.082	.440	
Whether accidents were witnessed (yes = 1, no = 0)	-.025	.841	.255	.020 *	
Whether a parent accompanied children in ambulance/helicopter (with = 1, without = 0)	.103	.404	.090	.393	
Whether they were hospitalized (not hospitalized = 0, hospitalized = 1)	-.092	.471	.248	.026 *	
Outpatient visits (no = 0, yes = 1)	.172	.186	.063	.584	
	R^2	.049	.750	.164	.016 *

* $p < .05$. PTSSC-15: 15-item Post-traumatic Stress Symptoms for Children; IES-R-J: Japanese Version of the Impact of Event Scale–Revised; ISS: Injury Severity Score.

Then, multiple regression analysis was performed to examine items that affected the psychological state of children and parents. The objective variables used were PTSSC-15 and IES-R-J total scores. The explanatory variables used were the ISS, gender, whether the accidents were witnessed, whether parents accompanied children in the ambulance/helicopter, whether the children were hospitalized, and whether they were outpatients. The results (Table 6) revealed no significant standardized partial regression coefficient for the PTSSC-15 total score. In contrast, for the IES-R-J total score, whether parents witnessed the accident and whether children were hospitalized were significant items; that is, IES-R-J total scores were significantly higher if the accident was witnessed (vs. not) and if the children were hospitalized (vs. not).

Discussion

Children's Risk for PTSD

About 1 in 10 children in the present study were deemed at high risk for developing PTSD. The extent of PTSD development after a traffic accident is related to the country where the survey was conducted²¹; for example, a rate of 5% was found in a French survey conducted 5 weeks after an accident, while a rate of 41% was noted in a survey conducted 1 month after an accident, in Greece. A meta-analysis found significant differences among the 11 examined regions (mean = 19.5%)²¹. The incidence rate was lower in the current study than the mean score of the meta-analysis.

PTSSC-15 total scores were negatively correlated with children's age-both at the time of their injuries and their

responses. This suggests that surviving a car accident at a younger age is associated with a higher risk of developing PTSD. Some previous studies found no association between PTSD and age²²⁻²⁶. One study found associations between children's age and children's PTSD risk: older children had a higher risk of developing PTSD than did younger children²⁷, which contradicts our results. In the study by De Vries and colleagues²⁷, the children's age ranged from 3 to 18 years, and parents evaluated their children's risk of developing PTSD. De Vries and colleagues maintained that, when children were young, they were probably unable to express their psychological distress in a way that parents could notice; thus, the parents might have underestimated the children's risk of developing PTSD. In contrast, the present study surveyed the children directly.

Another hypothesis is that there are differences in symptoms and trauma responses, owing to cultural differences. A report on children's PTSD after the Great Han-Shin Awaji earthquake noted that many children in Japan complained of physical symptoms or regressive behavior as a reaction to the trauma. In that study, Nagao reported that children regress and attain a sense of security, without feeling guilty, because regressive behavior and separation anxiety are accepted in Japanese culture²⁸. Van der Kolk indicated that there are many unknown aspects of PTSD, one of which is how culture influences the expression of human reactions to traumatic events and subsequent processes²⁹. Future studies should carefully examine differences between the present findings and those obtained in other countries and cultural contexts.

Factors related to children's risk for PTSD included parents' risk for PTSD. Previous studies found that parents' risk for PTSD is strongly associated with children's risk for PTSD^{22,27,30}. In addition, parents are an important coping model for children-specifically, the familial relationship plays a protective role in traumatic situations^{30,31}. When considering support for children involved in a traffic accident, it is necessary to have a system that simultaneously works with children, as well as with parents, to support both parties' psychological recovery.

In this study, no association was found in relation to gender, whether children were outpatients, the duration for which they were outpatients, their ISS score, and the children's PTSD risk. In contrast, some studies noted gender differences in children's PTSD^{25,26,32}; therefore, a Japanese study with a larger sample size is necessary. Regarding ISS, while most studies found no association

with PTSD^{9,23,27,32}, some did^{10,33}. Some studies stated that the intensity of fear at the time of injury, and not objective indexes such as ISS, had an effect on children's PTSD risk^{25,34}. Considering psychological care post-injury, it is necessary to evaluate children's PTSD risk regardless of injury severity, and to assess children's psychological states.

Parents' Risk for PTSD

About 1 in 5 parents in this study were deemed to be at high risk for developing PTSD. In Japan, no survey of parents has been conducted; In other countries, the parents' risk for PTSD was reported to be 13% to 16%^{10,23,27}. A survey in Japan revealed that 8% of adults in traffic accidents were at high risk for developing PTSD³⁵. Our study demonstrated that the probability of developing PTSD was higher for parents than for their children, and higher still for adults involved in a car accident.

Parents' IES-R-J scores were associated with children's risk for PTSD, and children's age at the time of their response and accident. The younger the children's age at the time of the response and accident, the higher the parents' risk for PTSD. This result was consistent with those of a previous study²⁷ that examined how having small children increased parents' risk for PTSD because parents were more emotionally engaged with younger children and tended to attribute the cause to themselves.

Parents who witnessed accidents had significantly higher IES-R-J scores, perhaps because parents who witnessed their children's accidents blamed themselves for being unable to prevent it.

Factors Common to Children's Risk for PTSD and Parents' Risk for PTSD: the Post-Injury Period

An important finding of this study was that neither children's nor parents' risk for PTSD was associated with the amount of time that had passed since the accidents. In previous studies, the post-injury period was often 3 months to 1 year^{7,10,22,23,25,27,33}, with the longest being 2 years^{2,8}. At 3 months to 71 months, the post-injury period of this study differed from those in previous reports. This study focused on children and their families for whom a long period had elapsed since the injury. The finding that there was no correlation between PTSD and the post-injury period among the children and parents over a long period of time suggested that some participants might have developed chronic PTSD. Pfefferbaum reported that PTSD and PTSD symptoms tend to lessen over time; however, in some instances, they increase or even become chronic³¹. Our findings indicate that, after experiencing a traffic accident, some PTSD patients devel-

oped chronic PTSD. Hence, there is a need to implement systematic interventions and follow-ups for children and parents shortly after an accident, rather than waiting for a natural recovery, to reduce PTSD risk. Trauma-focused cognitive behavioral therapy (TF-CBT) and eye movement desensitization and reprocessing (EMDR) are effective treatments for PTSD³⁰. By assessing the psychological state and identifying the high-risk group at an early stage after injury, treatment would be hastened and worsening and chronicity potentially prevented.

Limitations

In the present study, basic parental attributes such as educational background, occupation, and socioeconomic status were not included in the survey items. In addition, subjective fear of injury, which is said to be related to PTSD^{26,30,34}, was not included in the survey items. Moreover, the sample size was relatively small. Therefore, further study with a larger sample size or a prospective study needs to confirm the results.

Conclusions

In light of the importance of post-injury psychological care, it is necessary to evaluate PTSD risk among children and parents, regardless of injury severity. There is a need for a system that simultaneously works with children and parents, to support their mutual psychological recovery. Neither children's nor parents' risk for PTSD was associated with the amount of time that had passed since the accident. This suggests that, rather than waiting for natural recovery, early intervention is needed for prevention of chronic PTSD.

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