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## PUBLIC HEALTH | RESEARCH ARTICLE

# Mental health services and related factors in health care of traumatic brain injury survivors

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**Abstract:** *Background:* Family members can be confounded by cognitive and other changes that occur in traumatic brain injury (TBI) survivors, and feel burdened in providing their nursing care. Factors affecting mental health promotion in caregivers of patients with TBI-induced cognitive dysfunction have not been addressed fully. *Objective:* To maintain and improve mental health status of caregivers by clarifying the characteristics of TBI survivors and caregivers, and mental health status of caregivers. *Methods:* On a questionnaire survey, TBI survivors answered questions about their characteristics, activity of daily living, and symptoms of cognitive dysfunction, and caregivers answered questions about their characteristics and mental health status. We analyzed the impact of the individual levels of the items for TBI survivors and caregivers on the caregivers' mental health status. *Results:* The mean General Health Questionnaire 30-item score was  $14.8 \pm 7.6$  points, and mental illness was confirmed in 47 (75.8%) caregivers. The mental health status of the caregivers was more undermined when the nursing care period and sleep time of caregivers were short, when care was required for cosmetic preparation and dressing, and when the patient had symptoms of impaired executive dysfunction and social behavior.

**Subjects:** Mental Health Research; Cognitive Neuroscience; Mental Health/Clinical Social Work

**Keywords:** caregiver; cognitive dysfunction; mental health status; traumatic brain injury

### 1. Introduction

Cognitive dysfunction caused by traumatic brain injury (TBI) affects a patient's information processing capability, memory, attention, and ability to react to stimulation (Lezak, 2004). In addition, some TBI survivors may have difficulty in daily life and social activities because of neurobehavioral



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### ABOUT THE AUTHOR

Yusuke Suzuki is an associate Professor in Occupational therapy at the Shonan University of Medical Sciences. He has more than 15 years of experience in clinical occupational therapy working as clinician. His research interest is mental health status of caregivers of persons with traumatic brain injury (TBI).

This article is the first step of his research for understanding the status of mental health of caregivers of persons with TBI. The subsequent step will be the development of interventional programs to reduce the psychological distress of family caregivers of persons with TBI.

### PUBLIC INTEREST STATEMENT

Evidence has been accumulated from recent decades of research that most family caregivers have psychological distress such as depression and anxiety caused by the neurobehavioral change of patients with traumatic brain injury (TBI). Despite this evidence, few studies have been conducted to investigate status of mental health of caregivers of persons with TBI in Japan.

We then conducted a questionnaire survey with the aim of discussing the ideal support to maintain and facilitate the mental health promotion of caregivers by clarifying the characteristics of TBI survivors and their caregivers and the mental health states of caregivers.

changes such as increased aggression and egocentrism. Furthermore, such aggression and other behavioral symptoms may be aggravated with time, whereas other disability indexes improve with time (Brooks, Campsie, Symington, Beattie, & McKinlay, 1987). Family members of TBI survivors may be confounded by such changes, and feel burdened in providing nursing care.

Evidence that TBI has a large impact on the family has been presented in a prior critical review (Perlesz, Kinsella, & Crowe, 1999). Many of these studies report that family caregivers of persons with TBI worry about the psychological burden, such as significant levels of anxiety and depression (Livingston, Brooks, & Bond, 1985a; Marsh, Kersel, Havill, & Sleigh, 1998a, 1998b). Also, it is reported that family functioning became impaired due to TBI (Douglas & Spellacy, 1996; Groom, Shaw, O'Connor, Howard, & Pickens, 1998). Investigations have been conducted focused entirely on the psychological burden on caregivers and family functioning (Anderson, Parmenter, & Mok, 2002; Curtiss, Klemz, & Vanderploeg, 2000; Kreutzer, Gervasio, & Camplair, 1994a). Especially, Kreutzer research (Kreutzer, Gervasio, & Camplair, 1994b) using The Family Assessment Device (FAD) (Epstein, Baldwin, & Bishop, 1983) point out communication problems between primary caregivers and patients by referring to primary caregivers who could not frankly express clear thoughts and feelings, and expressed anger and aggressiveness in some instances toward patients. Hall et al. (1994) suggested that a fierce temper, egocentrism, aggression, and forgetfulness would be factors in TBI survivors that would cause family caregivers to feel burdened. In addition, Kreutzer, Marwitz, and Kepler (1992), Kreutzer et al. (1994a, 1994b) reported that behavioral, emotional, and personality disorders in the survivors are factors that cause caregivers to feel burdened, whereas Brooks and McKinlay (1983) suggested personality change as a factor. Furthermore, for more than the past 10 years, investigators have accumulated evidence to support the fact that neurobehavioral changes in TBI survivors would cause depression, anxiety, and other psychological pain in many family caregivers (Perlesz et al., 1999).

In Japan as well, social problems have occurred: the symptoms of patients with TBI-induced cognitive dysfunction are difficult to confirm during their hospitalization and, on later discovering the aftereffects of a TBI through social activities, the patients have no information about training and social services, and thus no chance to have consultation. As a result, such patients are in the blindspot of medicine and welfare. Therefore, for 5 years (2001–2005), the Ministry of Health, Labour and Welfare (Tokyo, Japan) conducted a model project for supporting people with higher brain dysfunctions to provide appropriate medical/welfare services smoothly to patients with cognitive dysfunction caused by underlying diseases such as cerebral stroke and TBI, which were sorted from the viewpoint of the welfare administration. Based on the data accumulated in this project, several criteria and guidelines required for public administration were prepared and included diagnostic criteria, evaluation methods, training programs, support programs, and ideal support services for patients with cognitive dysfunction (Nakajima, 2006). The importance of the support for caregivers was suggested as an ideal support service in the model project; however, no sufficient attention has been placed on the actual situations of caregivers. In particular, the factors affecting mental health status in caregivers of patients with TBI-induced cognitive dysfunction have not been discussed, to the best of the authors' knowledge. We then conducted a questionnaire survey with the aim of discussing the ideal support to maintain and facilitate the mental health status of caregivers by clarifying the characteristics of TBI survivors and their caregivers and the mental health status of caregivers.

## 2. Materials and methods

### 2.1. Study participants

The study participants were 155 primary caregivers who belonged to the Family Association of Patients with Acquired Brain Injuries, primarily in the Kinki area. Effective answers were obtained from 79 caregivers, and the response rate was 51.0%. We analyzed the data of 62 caregivers, but excluded patients with underlying diseases other than TBI.

## **2.2. Ethical consideration for the study participants**

The questionnaire survey was administered to the study participants, who gave us their informed consent after receiving written explanation about the study objectives and the protection of privacy.

## **2.3. Investigation period and data collection method**

The questionnaire survey was performed from 13 January 2008 to 29 February 2008. The data were collected by distributing and collecting the self-recording questionnaire sheets by mail. The questions in the sheets included (1) characteristics of the patients (e.g. sex, age, age at the time of injury, underlying disease, conditions of disorder, Activity of daily living, and presence of physical disability certificate/mental health welfare booklet), symptoms of cognitive dysfunction and (2) characteristics of the caregivers (e.g. age, relationship to the patient, nursing care period, occupation and working arrangements, daily sleep time, the number of people who live with the patient and primary caregiver, and the presence of helper for the caregiver among family members who live together), and mental health status.

To determine a patient's disorder level, we used the health index and output measure (Walker & Rosser, 1993), which includes an eight-level evaluation scale: (1) unconscious; (2) bedridden; (3) chair or wheelchair use and no in-house transfer without a caregiver's support; (4) no paid employment, difficulty in continuously receiving education, an elderly person who stays at home—except for field trips and walking with a caregiver, or a housewife who can only do some simple household duties; (5) limited selection of occupation and limited capability, or a housewife or elderly person who can do light household duties such as shopping; (6) severe impairment in social involvement and/or mild executive dysfunction, capability to perform all household duties—other than hard work; (7) mild impairment in social involvement; (8) no impairment in ability.

We used the Barthel Index (BI) to evaluate the patient's capability for activity of daily living (Mahoney & Barthel, 1965). The evaluation was performed for 10 items such as diet, transfer, cosmetic preparation, toileting, bathing, walking on a flat surface, use of stairs, dressing, bowel management, and urination management, which were evaluated by several levels of independence such as "independent" and "partial support." The criteria of independence are concretely set for individual items; therefore, the evaluation method is easy to understand and use, and has been widely used as the evaluation method for activity of daily living in patients at clinical sites. The level of independence is represented by the number of points, and 100 points are assigned to patients who are completely independent. The Cronbach's alpha coefficient for the study participants' scores was 0.95.

In this study, five symptoms each for memory impairment, attentional disorder, executive dysfunction, and social behavioral impairment, which were selected from the model project, were added to conventional symptoms of cognitive dysfunction such as aphasia, apraxia, and agnosia. For each symptom, the study participants were requested to select one answer, which contained four levels ranging from "none" to "frequently." Our calculation of Cronbach's alpha coefficient for the study participants' responses showed a favorable internal consistency at 0.918.

For the evaluation of mental health status, we used the General Health Questionnaire 30-item (GHQ-30) version, which is the most used measurement scale of mental health status in Japan. The Japanese version of the measurement scale is widely used in clinical sites and in local and occupational investigations, and the split-half method and test-retest method show it has a high reliability, in addition to its high internal consistency (Nakagawa & Daibo, 1991). The Cronbach's alpha coefficient for the study participants' scores was 0.953. In addition, Kitamura, Sugawara, Aoki and Shima (1989) suggested that  $\geq 8$  points be appropriate to determine mental illness in the GHQ-30 respondents. We also judged that individuals with eight points or higher on the GHQ-30 had mental illness.

## 2.4. Statistical analysis

We analyzed the impact of individual levels of the investigation items of the TBI patients and caregivers on the mental health status of the caregivers. We used the *t* test, Fisher's exact test, and Kruskal–Wallis test for statistical analysis. We also performed a significance test for correlative analysis by calculating the Pearson and Spearman correlation coefficients. With regard to the risk of statistical processing, less than 5% was determined to be significant. In the results of cross tabulation, missing values were included, and the answers, including the missing values, were excluded from the analysis. As statistical software, we used SPSS for windows, version J12 (IBM Japan Inc., Tokyo, Japan).

## 3. Results

### 3.1. Characteristics of TBI patients and caregivers

Table 1 shows the characteristics of TBI patients and the caregivers. Men accounted for nearly 80% of the participants, the mean age of the patients was  $37.3 \pm 11.9$  years, and the mean age at the time of injury was  $26.4 \pm 12.7$  years; thus, young individuals constituted the majority. With regard to the level of disorder, paid employment was impossible for more than 50% of the patients, followed by patients who had difficulty in continuously receiving education. The mean BI score was  $73.2 \pm 32.5$  points.

Table 2 shows the characteristics of the caregivers. 90% of the caregivers were female with mean age of  $58.6 \pm 9.2$  years, and mothers accounted for the majority.

### 3.2. Symptoms of cognitive dysfunction

Table 3 presents the individual symptoms of cognitive dysfunction. More than 80% of the participants answered “present” or “frequently present” for the following questions: for memory impairment: “cannot fulfill a promise or forget a promise” (87.7%), “forget where a valuable item was placed” (84.5%), “repeatedly ask the same question” (81.9%), and “cannot remember a new thing” (93.1%); for attentional disorder: “cannot continue a task for a long period of time” (83.7%); and for executive dysfunction: “cannot finish a task as promised” (86.1%). There were no questions for which more than 80% answered with regard to social behavioral impairment.

### 3.3. Mental health status of caregivers

The mean GHQ-30 score was  $14.8 \pm 7.6$  points, and 47 (75.8%) caregivers had eight points or higher, which suggested mental illness. In a study by Sugasaki (1994) on mental health status of caregivers for elderly dementia patients, the mean GHQ-30 score of 67 caregivers was  $12.3 \pm 8.0$  points, and the ratio of caregivers with  $\geq 8$  points on the GHQ-30, which indicated mental illness, was 67.1%.

### 3.4. Relationship with mental health status

As a result of examining the relationship between the characteristics of the patients and caregivers and mental health status, no relationship was confirmed with all items of patient characteristics and

**Table 1. Characteristics of the patients with traumatic brain injury**

Number of study participants	62
Sex	Male: 49 (79.0%); female: 13 (21.0%)
Age	12–73 years (mean age, 37.3 mean 11.9 years)
Age at the time of injury	8–67 years old (mean age at the time of injury, $26.4 \pm 12.7$ years)
Measure of disability	Level 1, 0 patients; level 2, 1 patient; level 3, 13 patients; level 4, 20 patients; level 5, 12 patients; level 6, 9 patients; level 7, 3 patients; level 8, 0 patients; and unknown level, 4 patients
Activity of daily living	5–100 point (mean point, $73.2 \pm 32.5$ )
Presence of physical disability certificate	Present, 43 (69.4%) patients; not present, 19 (30.6%) patients
Presence of mental health welfare booklet	Present, 35 (56.5%) patients; not present, 27 (43.5%) patients

**Table 2. Characteristics of caregivers**

Number of patients	62
Sex	Male, 3 (4.8%) caregivers; female, 59 (95.2%) caregivers
Age	39–88 years old (mean age, 58.6 ± 9.2 years)
Relationship to the patient	Mother, 43 (69.4%) caregivers; wife, 10 (16.1%) caregivers; father, 3 caregivers (4.8%)
	Younger sister, 2 (3.2%) caregivers; older sister, 1 (1.6%) caregiver; and unknown, 3 (4.8%) caregivers
Nursing care period	2–33 years (mean period, 10.9 ± 6.4 years)
Occupation	Inoccupation, 37 caregivers; full-time worker, 8 caregivers; part-time worker, 9 caregivers; others, 5 caregivers; and unknown, 3 caregivers
Daily sleep time	3–8.0 hours (mean sleep time, 6.0 ± 1.2 h)
Number of persons living together with the patient and caregiver	0 people, 19 caregivers; 1 person, 20 caregivers; 2 people, 11 caregivers; 3 people, 4 caregivers; 5 people, 2 caregivers; and unknown, 6 caregivers
Presence of a helper living with a caregiver	Present, 24 caregivers; not present, 31 caregivers; and unknown, 7 caregivers

**Table 3. Symptoms of cognitive dysfunction**

		None	Almost none	Present	Frequently present (%)
Memory impairment	Cannot fulfill a promise, or forget a promise	0.0	12.3	49.1	38.6
	Forget where a valuable item was placed	3.4	12.1	39.7	44.8
	Make up a story	21.4	30.4	23.2	25.0
	Repeatedly asks the same question	1.8	16.4	36.4	45.5
	Cannot remember a new thing	0.0	6.9	50.0	43.1
Attentional disorder	Get interested in others, and always follow a person around	46.4	35.7	7.1	10.7
	Bother the work of a neighbor	37.7	32.1	20.8	9.4
	Tend to perform an action with little regard to surrounding situations	5.5	20.0	34.5	40.0
	Cannot continue a task for a long period of time	1.8	14.5	45.5	38.2
	React to talk about someone else in the misguided belief that it was about the patient	11.8	50.0	19.1	19.1
Executive dysfunction	Being late for appointments	13.5	19.2	25.0	42.3
	Cannot finish a task as promised	2.3	11.6	34.9	51.2
	Cannot complete any work	2.3	23.3	48.8	25.6
	Cannot appropriately organize records in a notebook for supplementing memory impairment	17.8	46.7	20.0	15.6
	Cannot achieve a task, which is different from a previous task	4.3	21.3	44.7	29.8
Social behavior impairment	Get excited, speak loudly, and conduct violence	17.5	26.3	29.8	26.3
	Speak loudly always when things do not go as the patient wants	16.1	32.1	28.6	23.2
	Take on mischievous behavior by following someone around	52.7	36.4	5.5	5.5
	Conduct nasty and sloppy things	38.2	29.1	23.6	9.1
	Not satisfied if the focus is not on the patient	30.9	36.4	18.2	14.5

caregiver characteristics such as age, relationship to the patient, occupation, number of people living with the patient and main caregiver, and presence of a helper living with the caregiver. On the other hand, a negative correlation was confirmed between mental health status and nursing care period/sleep time, which suggested that the mental health status of caregivers is undermined when the nursing care period and sleep time were short (Tables 4–6). In addition, we divided the participants with  $\leq 7$  points and  $\geq 8$  points on the GHQ-30 into the normal group and the mental illness group, respectively, to examine the relationship between presence of cognitive dysfunction symptoms and mental health status. No significant difference was confirmed for the presence of symptoms of memory impairment and attentional disorder, but a significant difference was confirmed for the presence of symptoms of executive dysfunction such as “cannot appropriately organize records in a notebook for the supplement of memory impairment” and “cannot achieve a task that is different from a previous task” ( $p < 0.05$ ), and for symptoms of social behavioral impairment such as “gets excited, speaks loudly, and acts violent,” and “always speaks loudly when things do not go as the patient wants” ( $p < 0.05$ ) (Table 7). When we examined the relationship between the GHQ-30 and BI,

**Table 4. The correlation between patient/caregiver characteristics and the GHQ-30 score**

		n	GHQ-30 (n = 57)	
			r	p
Patient characteristics	Age	57	-0.059	0.662
	Age at the time of injury	62	0.066	0.627
	Measure of disability	58	-0.225	0.105
Caregiver characteristics	Age	58	-0.011	0.936
	Nursing care period	62	-0.271	0.045 *
	Daily sleep time	57	-0.439	0.001 **
	Number of persons living together	56	0.049	0.729

Notes: The number in the parentheses is the number of patients, excluding the nonresponders.

GHQ-30, General Health Questionnaire 30-item.

\*Indicates significance at  $p < 0.05$ , based on Pearson and Spearman coefficients.

\*\*Indicates significance at  $p < 0.01$ .

**Table 5. Difference in the mean GHQ-30 score between the patient and caregiver characteristics**

			n	GHQ-30			
				Mean	Standard deviation	t	p
Patient characteristics	Sex	Male	46	14.0	7.5	-1.494	0.141
		Female	11	17.8	7.5		
	Presence of physical disability certificate	Present	41	14.6	9.1	0.193	0.848
		Not present	16	15.1	9.1		
	Presence of mental health welfare booklet	Present	33	14.8	8.3	0.017	0.986
		Not present	27	14.8	6.8		
Caregiver characteristics	Presence of occupation	Present	20	13.9	6.7	0.403	0.688
		Not present	35	14.7	7.9		
	Presence of a helper for the caregiver	Present	23	14.3	7.2	-0.217	0.828
		Not present	29	14.8	7.7		

Notes: The number in the parenthesis is the number of patients, excluding the nonresponders; n.s., based on the t test. GHQ-30, General Health Questionnaire 30-item.

**Table 6. Difference in the median GHQ-30 score in caregiver characteristics**

		n	Mean	GHQ-30		
				Standard deviation	p	
Caregiver characteristics	Relationship with patient	Mother	40	43.4	15.6	0.175
		Wife	10	40.7	16.8	
		Father	3	61.7	27.5	
		Younger sister	1	70		
		Older sister	1	44		

Notes: The number in the parentheses is the number of patients, excluding the nonresponders; n.s., based on the Kruskal Wallis test.  
 GHQ-30, General Health Questionnaire 30-item.

**Table 7. Relationship between the presence of cognitive dysfunction symptoms and mental health status**

		Unit: n(%)			
		GHQ-30			
		8 points or higher	7 points or lower		
Memory impairment	Cannot fulfill a promise or forget a promise	No	6 (85.7)	1 (14.3)	
		Yes	36 (80.0)	9 (20.0)	
	Forget where a valuable item was placed	No	7 (77.8)	2 (22.2)	
		Yes	36 (81.8)	8 (18.2)	
	Make up a story	No	20 (74.1)	7 (25.9)	
		Yes	21 (87.5)	3 (12.5)	
	Repeatedly ask the same question	No	6 (66.7)	3 (33.3)	
		Yes	34 (82.9)	7 (17.1)	
	Cannot remember a new thing	No	3 (75.0)	1 (25.0)	
		Yes	40 (81.6)	9 (18.4)	
Attentional disorder	Get interested in others, and always follow a person around	No	33 (76.7)	10 (23.3)	
		Yes	9 (100)	0 (0.0)	
	Bother the work of a neighbor	No	25 (73.5)	9 (26.5)	
		Yes	14 (93.3)	1 (6.7)	
	Tend to make an action with little regard to surrounding situations	No	10 (76.9)	3 (23.1)	
		Yes	31 (83.8)	6 (16.2)	
	Cannot continue a task for a long period of time	No	6 (66.7)	3 (33.3)	
		Yes	36 (85.7)	6 (14.3)	
	React to talk about someone else in the misguided belief that it was about the patient	No	22 (75.9)	7 (24.1)	
		Yes	19 (90.5)	2 (9.5)	

(Continued)

**Table 7. (Continued)**

		Unit: n(%)			
		GHQ-30			
		8 points or higher	7 points or lower		
Executive dysfunction	Being late for an appointment	No	12 (75.0)	4 (25.0)	
		Yes	27 (84.4)	5 (15.6)	
	Cannot finish a task as promised	No	5 (83.3)	1 (16.7)	
		Yes	28 (80.0)	7 (20.0)	
	Cannot complete any task	No	8 (80.0)	2 (20.0)	
		Yes	25 (80.6)	6 (19.4)	
	Cannot appropriately organize records in a notebook for the supplement of memory impairment	No	18 (69.2)	8 (30.8)	*
		Yes	15 (93.8)	1 (6.3)	
Cannot achieve a task that is different from a previous task	No	4 (40.0)	6 (60.0)	*	
	Yes	31 (91.2)	3 (8.8)		
Social behavioral impairment	Get excited, speak loudly, and act violently	No	15 (68.2)	7 (31.8)	*
		Yes	29 (93.5)	2 (6.5)	
	Always speak loudly when things do not go as the patient wants	No	16 (69.6)	7 (30.4)	*
		Yes	27 (93.1)	2 (6.9)	
	Takes on mischievous behavior by following someone around	No	37 (80.4)	9 (19.6)	
		Yes	5 (100)	0 (0.0)	
	Conduct nasty and sloppy things	No	27 (77.1)	8 (22.9)	
		Yes	15 (93.8)	1 (6.3)	
Not satisfied if the focus is not on the patient	No	27 (79.4)	7 (20.6)		
	Yes	15 (88.2)	2 (11.8)		

Notes: The data are presented as n(%). GHQ-30, General Health Questionnaire 30-item.

\*Indicates significance at  $p < 0.05$ , based on Fisher's exact test.

a negative correlation was confirmed (Pearson  $r = -0.232$ ,  $p = 0.049$ ), which suggested that mental health status is more undermined when more nursing care was required in the activity of daily living. In addition, we examined the relationship between the BI and mental health status in individuals with  $\leq 7$  points on the GHQ-30 in the normal group and individuals with  $\geq 8$  points in the mental illness group, and used the 10 items of the BI to divide individuals into the independence group and the care required group. We confirmed a significant difference with regard to cosmetic preparation and dressing ( $p < 0.05$ ) (Table 8).

#### 4. Discussions

There have been no quantitative investigations on mental health status in caregivers for TBI survivors, and thus the results of this study will be useful material for future support for caregivers.

In the current study, a correlation was confirmed for the nursing care period and sleep time in the patient and caregiver characteristics. In a previous study (Livingston, Brooks, & Bond, 1985b), it was interesting that feeling of burden for nursing care increased with time, and 90% of relatives experienced a moderate to severe burden of nursing care, even when 5 years had passed since the time of injury. This finding suggested that family members would show a clinically meaningful level of anxiety and depression for several years after a patient's brain injury. This study revealed that mental health status of caregivers is undermined when the nursing care period is short, and this period may



**Table 8. Relationship between the activities of daily living and mental health status**

		GHQ-30		
		8 points or higher	7 points or lower	
Diet	Independent	28 (75.5)	9 (24.3)	
	Care required	17 (94.4)	1 (5.6)	
Transfer	Independent	33 (78.6)	9 (21.4)	
	Care required	12 (92.3)	1 (7.7)	
Cosmetic preparation	Independent	22 (71.0)	9 (29.0)	*
	Care required	23 (95.8)	1 (4.2)	
Use of toilet	Independent	30 (76.9)	9 (23.1)	
	Care required	15 (93.8)	1 (6.3)	
Bath	Independent	22 (73.3)	8 (26.7)	
	Care required	23 (92.0)	2 (8.0)	
Walking on a flat surface	Independent	30 (78.9)	8 (21.1)	
	Care required	15 (88.2)	2 (11.8)	
Use of stairs	Independent	22 (73.3)	8 (26.7)	
	Care required	23 (92.0)	2 (8.0)	
Dressing	Independent	21 (70.0)	9 (30.0)	*
	Care required	23 (95.8)	1 (4.2)	
Bowel management	Independent	23 (74.2)	8 (25.8)	
	Care required	22 (91.7)	2 (8.3)	
Urination management	Independent	24 (77.4)	7 (22.6)	
	Care required	21 (87.5)	3 (12.5)	

Note: The data are presented as n(%).

\*Indicates significance at  $p < 0.05$ , based on Fisher's exact test.

be affected by the differences in the services of public institutions between countries. Thus, further investigation will be required on the relationship between mental health status and nursing care period in the future. These findings suggested that an intervention that includes support for the physical control of caregivers should be provided in the early period of nursing care life when a patient begins to show symptoms of cognitive dysfunction.

Memory impairment was most prevalent in patients with cognitive dysfunction. However, memory impairment was not closely correlated with mental health status, and a correlation was confirmed for executive dysfunction and social behavioral impairment.

The results of this study suggested that executive dysfunction and social behavioral impairment would aggravate the mental health status of caregivers. These findings were similar to the results of some previous studies with interviews (Panting & Merry, 1972; Thomsen, 1973, 1984) to show that family members seemed to feel psychological pain when the feelings and actions of a patient with brain injury changed rather than when such a patient had physical and language disorders. Tanemura and Tsubahara (2005) suggested that the prefrontal area, front limbic system, and the axons connecting these areas would be most subject to injury, which may cause a disturbance in autogenous control (i.e. self-motivation, inhibition, and orientation). As a result, executive dysfunction, decreased control function related to cognitive functions (e.g. attentional disorder and memory impairment), and psychosocial disturbance would occur, and these impairments may produce problems in communication and thereby induce social maladjustment. In the model project, social behavioral impairment were changes in personality and behavioral disorder with symptoms such as analysis/regression, decreased control for desire, decreased emotional control, poor interpersonal skills, perseveration, decreased desire/drive, and depression. These are associated with emotional

disturbance as prominent symptoms, including direct verbal abuse and violence to caregivers, which may be related to mental health status of caregivers. The findings suggested that the relationship between TBI survivors and caregivers should be reconstructed based on the characteristics of the communication between them so that no stress would be caused in either of them.

Furthermore, we also discussed the relationship with physical disorder by examining the relationship with the activity of daily living. As a result, it was demonstrated that mental health status is undermined when more nursing care was required for the activities of daily living. In addition, mental health status was related to cosmetic preparation and dressing. This suggested that mental health status may be affected by factors other than the amount of physical care such as physical support. The substantial amount of talking and observation required for a comparatively large number of processes in cosmetic preparation and dressing may affect mental health status. It was also suggested that mental health status in caregivers may be undermined because nursing care was required for activities related to communication with others such as cosmetic preparation and dressing appropriate for individual situations. In this study, we used independence in actions as the criterion, but more detailed evaluation and the examinations on the relationship with mental health status such as the amount of talking and observation required for individual actions and the completion level, will be required in the future.

### 5. Limitations of the study

This study was performed for caregivers who belonged to one family association of brain injury patients, primarily in the Kinki area. Therefore, the data of this study cannot be generalized as the mental health status of caregivers for TBI survivors. Because the caregivers who are members of the family association of patients are supposed to be comparatively well adapted for the role of caregiver, there may be a difference in the mental health status of caregivers who do not belong to such an association. In addition, the impact of the difference in the operation of other family associations and local differences cannot be denied. Further discussions through nationwide investigations, regardless of the participation in a family association, will be required in the future.

### 6. Conclusion

Based on the results and discussions in this study, we believe the following three points are important for the support for home caregivers of TBI survivors: (1) reconstruction of the relationship between TBI survivors and their caregivers with no stress on either of them, based on the characteristics of the communication between them, (2) guidance for nursing care methods in the activities of daily living, which may affect communication with others such as cosmetic preparation and dressing appropriate for individual situations, and (3) support for physical control to continue nursing care life. In addition, such support should be provided in the early phase of nursing care life when patients began to show symptoms of cognitive dysfunction. Based on these findings, we should formulate a concrete intervention program to maintain or increase mental health status in caregivers, and to examine the effects of the program in the future. We then hope to contribute to the support of as many caregivers as possible so that they can smoothly live with patients at home and in society.

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#### Competing Interests

The author declares no competing interests.

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