

# Physical and Mental Health of Disaster Victims: A Comparative Study on Typhoon and Oil Spill Disasters

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**Objectives:** The purpose of this study was to compare the physical and mental health status of disaster victims according to disaster types, such as a typhoon disaster and an oil spill disaster, and to suggest adequate health care services for them.

**Methods:** A total of 484 people who suffered disasters were selected for this study, and data were collected from July to August, 2008. The data-set for this study included 286 victims of typhoon disasters in Jeju and Jeollanamdo district in South Korea, and 198 victims of the oil spill disaster in Taean. Physical health status was measured using revised Patient Health Questionnaire and mental health status was measured using the Korean version of 'Post-traumatic Diagnostic Scale'.

**Results:** According to the comparative analyses of typhoon disaster victims and oil spill disaster victims, poorer physical health outcomes were shown among the oil spill disaster victims when compared to the typhoon disaster victims. Also, the oil spill disaster victims showed symptoms of depression, anxiety, and post-traumatic stress disorder, at rates higher than those found among the typhoon disaster victims.

**Conclusions:** These findings suggest that there is a need to provide adequate physical and mental health-related care services for oil spill disaster victims. The seriousness of oil spill disaster should be realized and reconsidered in developing recovery strategies and disaster preparedness for physical and mental health services.

**Key words:** Disaster victims, Typhoon disaster, Oil spill disaster, Physical health, Mental health, Comparative study  
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## INTRODUCTION

Korea has experienced many forms of disasters recently, and the severity of damages from disasters has been getting worse. Such disasters ranged from unexpected natural disasters caused by anomalies in weather to man-made disasters, such as fire and environmental pollution. According to a survey on trends of disasters and damages for the past ten years (1999-2008) announced by the National Emergency Management Agency, the scales of damages caused by disasters have been continuously increasing [1], and as a result, concerns on damages caused by disasters and preparation of countermeasures are being raised as important issues. It has been reported that disasters in particular have significant physical and mental health impacts on victims as well as economic and social impacts such as a loss of life and/or property [2-5]. Disaster victims were found to have experienced more serious depression, anxiety, and post-traumatic stress disorder (PTSD), compared to individuals residing in non-disaster-influenced areas [6], and disaster victims recognized that their physical health was worsened due to disasters [7]. Also, disaster victims have experienced symptoms such as

headache, anorexia or insomnia due to disasters [8,9], and complained experiencing mental difficulties such as serious stress, depression or anger [10-12]. Also, it was shown that many disaster victims showed symptoms of PTSDs [13-15].

Although research on disaster victims' health has been actively carried out, the current domestic literature is limited in that few research has focused on examining disaster victims' health by different types of disasters and possible differences in the severity of the impact on health [16-18]. There is fewer domestic studies dealing with problems of health of disaster victims compared to overseas research, and these small number of domestic studies dealing with physical and mental health have examined the impact of a disaster on victims' health with only one type of disaster [19-21].

To fill the gap in the domestic literature, this research attempts to analyze disaster victims' physical and mental health difficulties by types of disasters, and aims to suggest a preliminary blueprint for public health intervention plans. For these purposes, the authors proceed this research by selecting two recent disasters, the Typhoon Nari (September 2007) and crude oil spills

by the Hebei Spirit in the sea area of Taean in Chungcheongnam-do, Korea that occurred at a similar time in 2007. Both significantly damaged nearby areas and had large impacts on the affected communities.

## METHODS

### I. Sample and Data Collection

The subjects of this research are victims who experienced the damages of typhoon and crude oil spills. With disaster victims being the subjects of this research and due to the types of experiences of damages, probabilistic sampling was difficult. Hence, victims of the damaged areas by the aforementioned disasters were conveniently sampled with the intentional non-probabilistic sampling method. Data collection for both types of disasters was conducted for approximately seven weeks from July 4 to August 21, 2008, and oral consents from the subjects were obtained after explaining the objective of the research prior to collecting data.

First of all, for sampling of the September 2007 Typhoon Nari victims, two areas, Jeju-do, which showed the highest human death toll (76.1 percent of the total death toll), and Goheung-gun in Jeollanam-do, which showed the highest property damage (73.5 percent of the total property damage) [22] were selected. For the next step, areas that suffered more serious damages within Jeju-do and Goheung-gun were selected based on data from the Disaster and Safety Management Offices of Jeju-do and Goheung-gun. In Jeju-do, Yongdam 1-dong, Yongdam 2-dong, Samdo 1-dong, Ara-dong and Jocheon-eup were chosen, and in Goheung-gun, Goheung-eup, Doyang-eup and Geumsam-myeon were selected. The total number of listed victims was 440 with 218 individuals from Jeju-do and 222 individuals from Goheung-gun. After the final list of subjects for research among victims introduced by the offices of eups, myeons and dongs, graduate and undergraduate students majoring in social welfare with a prior training in conducting a survey distributed questionnaires to the subjects. The questionnaires were filled out by self-entering method as student research assistants visited shops or houses of the victims. While most respondents self-entered answers for the questionnaires, if respondents could not read or understand the questions, the student research assistants recorded answers after reading the questions and getting answers from the respondents. A total of 400 copies of questionnaires were distributed and 325 copies were

collected (response rate: 81.2 percent). Of these 325 returned questionnaires, 219 copies (105 copies from Jeju-do and 114 copies from Goheung in Jeollanam-do) were entered as data for our analysis after excluding 105 copies due to insincere responses.

Secondly, to select a sample of the crude oil spill victims in Taean-gun, the area where the crude oil spill accident caused by the Hebei Spirit occurred in December 2007, we used the damage-related data from the Government Office of Taean-gun, Chungcheongnam-do. We selected two most damaged areas, and they were Mohang 3-ri and Pado-ri of Sowon-myeon in Taean-gun. The total number of victims from these two areas was 1129 with 312 individuals in Mohang 3-ri and 817 individuals in Pado-ri. As the final step, study subjects were selected after the victims were introduced based on a list provided by the Government Office of Sowon-myeon that listed persons affected by the oil spill. After the final selection, the victimized local residents were summoned to the village centers, libraries and churches through cooperation from the Government Office of Myeon, and questionnaires were distributed and answered by the self-entering method. Also, in the case of subjects who could not read, the students research assistants recorded respondent's answers on the questionnaires after reading the questions and hearing the answers. Time spent for responding the questionnaires was on average 20 minutes per person in the case of self-entering, and about 40 minutes per person on average in the case of students assistants' reading the questions and recording respondent's answers.

For data collection in the typhoon-damaged areas, a total of 400 copies of questionnaires were distributed and 325 copies were collected (response rate: 81.2 percent). Of these 325 returned questionnaires, 219 copies (105 copies from Jeju-do and 114 copies from Goheung in Jeollanam-do) were entered as data for our analysis after excluding 105 copies due to insincere responses. In the case of the areas damaged by the crude oil spill, a total of 300 copies of questionnaires were distributed and 223 copies were collected (response rate: 74.4 percent). Of these 223 returned questionnaires, 156 copies were used as valid data for our analysis after excluding 67 copies which showed insincere responses. Time spent for responding the questionnaires was on average 20 minutes per person in the case of self-entering, and about 40 minutes per person on average in the case of surveyors' reading the questions and recording respondent's answers.

## II. Measurements

### A) Physical health

Physical health was measured by physical symptoms and subjective health. First, for physical symptoms, questions from the Patient Health Questionnaire (PHQ) used in the researches of Colarossi et al. were taken after translation (into Korean), revision and supplementation [23]. While the original scale of PHQ were developed by Spitzer et al. [24], Colarossi and colleagues selected and used items appropriate for persons who experienced disasters from Spitzer's original set of questions. Our study uses the questions Colarossi and colleagues has used in their studies as they showed a high degree of confidence and validity. Colarossi and colleagues' scale is composed of 28 questions from three sub-scales on physical symptoms, symptoms of depression, and anxiety. In this research, eight out of ten questions about physical symptoms were asked. Included in our survey are questions about stomach pain, back pain, chest pain, headache, dizziness, heart pounding or racing, shortness of breath, constipation or diarrhea after excluding the question for 'any problem when having sex', and combining the questions for indigestion and stomach pain into a question for stomach pain. For each symptom, whether or not the symptom had occurred after experiencing the disaster was measured by 1 point or 0 point, and the Chronbach's  $\alpha$  of the measurement tool in the case of physical symptoms in the research by Colarossi was 0.80 and it was 0.70 in this research.

Secondly, the self-rated health status was measured by one of the questions frequently used in prior researches [25,26], which was how the victims subjectively recognize their physical health. It was measured by the following a five-point Likert scale going from low and high points: 'much worse than before', 'a bit worse than before', 'almost same as before', 'a bit better than before', and 'much better than before.'

### B) Mental health

Symptoms of depression and anxiety

For symptoms of depression and anxiety, the questionnaire used in the research by Colarossi et al. was used after translation, revision and supplementation [23]. Questionnaires for depression was composed of eight questions such as 'feeling bad about myself', 'numb or distance from my emotions', 'poor appetite or overeating', 'use of alcohol or other drugs', 'blaming myself for things', 'little interest or pleasure in doing things', 'down, blue, hopeless', and 'thinking of death or dying'. For symptoms of anxiety, six questions were

taken and used after deleting 'muscular tension' and combining 'difficulty in concentration' and 'deterioration in concentration' into 'trouble concentrating' from the eight questions. For each symptom, whether or not the symptom had occurred after experiencing the disaster was measured by 1 point or 0 point. The Chronbach's  $\alpha$  of the measurement tool in the research by Colarossi was 0.85 for depression symptoms and 0.87 for symptoms of anxiety, and it was 0.74 for symptoms of depression and 0.72 for symptoms of anxiety in this research.

Post-traumatic stress disorder (PTSD)

For PTSD, post-traumatic diagnostic scale (PDS) developed by Foa [27] and translated and used by Ahn was used [28]. While PDS was originally composed of a total of 49 questions, the research by Ahn used 17 questions asking symptoms of PTSD based on the DSM-IV diagnostic criteria. This tool, translated and used by Ahn, was used in this research as it was shown that the degrees of confidence and validity were secured. Each question asked the level of symptoms experienced during the last two weeks in the four-point Likert scale where, 0 point was assigned to 'not at all or had such symptom for only once', 1 point for 'once a week or occasionally', 2 points for 'two to four times a week', and 3 points for 'at least five times a week or had such symptom almost every day'. The standard for evaluating PTSD is to calculate the total points for 17 questions on symptoms, and following the guideline that the symptom is deemed mild if the total points are not more than 10 points, the symptom is deemed moderate if it is between 11-20, and the symptom is deemed severe if it is more than 20 points. In this research, however, the diagnostic criteria of classifying a total point of 15 points or higher as a clinical PTSD was applied. This diagnostic criteria was developed by Foa through the analysis of discriminant function. In our study, the Chronbach's  $\alpha$  was shown as 0.95.

Self-rated stress status

Self-rated stress status of the respondents was measured by one of the questions frequently used in the previous researches [25,26], i.e. subjectively recognized degree of victim's stress. It was measured by a five points scale from 'not severe at all' to 'very severe', and a higher point is assigned to higher stress.

C) Demographic characteristics and characteristics of disaster damage experienced by the victims

Questions for socio-demographic information

included gender, age, marital status, occupation, educational background, and subjective evaluation of the respondent's economic status. The subjective evaluation of the economic status was measured by the level at which the respondent subjectively recognized his/her economic status, and the question had four levels to choose from, such as 'poor', 'relatively poor', 'relatively good' and 'good'. Questions for disaster damages included types of disaster damage, the ratio of property damages, and the ratio of recovery. The types of disaster damage were measured by damages to life and to property based on the classification method adopted by the National Emergency Management Agency. The ratios of property damages and of recovery were measured by the portion for total property damaged and for total recovery of damages based on the recognition of the victims.

### III. Data Analysis

The SPSS version 18.0 (SPSS Inc., Chicago, IL, USA) was used for data analyses. For data on socio-demographic information, frequency and percentage were calculated. To examine significant differences in disaster victims' physical and mental health difficulties by the type of disasters (by the typhoon and by the crude oil spill), t-test and chi-square test were used.

## RESULTS

### I. Demographic Characteristics of Disaster Victims

The demographic characteristics of disaster victims are shown in Table 1. The distribution of gender was similar for both groups-36.4 percent male and 63.6 percent female in the case of typhoon damages, and 27.7 percent male and 72.3 percent female in the case of crude oil spill damages. For age, the most frequently observed age group for the typhoon victims were between ages of 40-49 (22.8 percent of the typhoon victims), and that for the crude oil victims were between ages of 50-59 (31.4 percent of the crude oil spill victims). For educational backgrounds, it was shown that high school graduates occupied the biggest portion in both groups. For marital status, the percentage of married persons was 80.8 percent for the typhoon victims and that for the crude oil spill victims was 83.2 percent. The average duration of residence in the

**Table 1.** Demographic characteristics of study subjects

Classification	Typhoon disaster	Oil spill disaster
	N=219 n (%)	N=156 n (%)
Gender		
Male	79 (36.4)	43 (27.7)
Female	138 (63.6)	112 (72.3)
Age (y)		
< 40	27 (12.3)	22 (14.1)
40 - 49	50 (22.8)	22 (14.1)
50 - 59	44 (20.1)	49 (31.4)
60 - 64	17 (7.8)	14 (9.0)
65 - 74	47 (21.5)	40 (25.6)
> 75	34 (15.5)	9 (5.8)
Mean±SD	56.8±15.3	55.7±13.0
Education		
None	40 (18.7)	24 (15.8)
Elementary school	46 (21.5)	41 (27.0)
Middle school	31 (14.5)	34 (16.4)
High school	60 (28.0)	62 (32.9)
College and advanced	37 (17.3)	18 (7.9)
Marital status		
Single	40 (19.2)	26 (16.8)
Married	168 (80.8)	129 (83.2)
Length of residence (y)		
0 - 9	56 (25.8)	30 (19.2)
10 - 19	42 (19.4)	27 (17.3)
20 - 29	36 (16.6)	24 (15.4)
30 - 39	26 (12.0)	32 (20.5)
> 40	57 (26.2)	43 (27.6)
Mean±SD	26.8±21.4	27.8±18.4
Occupation (Before disaster)		
Not employed	30 (13.8)	8 (5.2)
Farming and fishing business	30 (13.8)	56 (36.3)
Self employed	110 (50.7)	34 (22.1)
Housewife	21 (9.7)	32 (20.8)
Other	26 (12.0)	24 (15.6)
Occupation (After disaster)		
Not employed	33 (15.2)	17 (13.4)
Farming and fishing business	30 (13.8)	35 (16.4)
Self employed	108 (49.8)	27 (36.4)
Housewife	22 (10.1)	40 (16.6)
Other	24 (11.1)	37 (16.2)
Income (Monthly average income/KRW)		
< 500000	52 (24.2)	38 (25.5)
500000 - 999999	68 (31.8)	37 (24.9)
1000000 - 1499999	38 (17.8)	28 (18.8)
≥ 1500000	56 (26.2)	46 (30.8)
Self-rated economic status		
Bad	48 (22.2)	49 (31.8)
Bad relatively	95 (44.0)	69 (44.8)
Good relatively	61 (28.2)	30 (19.5)
Good	12 (5.6)	6 (3.9)

KRW: Korea won, SD: standard deviation.

affected areas for the typhoon victims was 26.8 years and that for the crude oil victims was 27.8 years, showing that the period of residence in the area of crude oil spill was a little bit longer. Regarding employment (occupation), the post-disaster ratio of unemployed respondents increased from the pre-disaster ratio among

**Table 2.** Characteristics of disaster damages

Variable	Classification	Typhoon disaster	Oil spill disaster	t/ $\chi^2$	p-value
		N=219 n (%)	N=156 n (%)		
Types of damages	Property damages	189 (93.1)	105 (91.3)	1.366	0.51
	Damages of life	3 (1.5)	4 (3.5)		
	Property damages and damages of life	11 (5.4)	6 (5.2)		
Rate of property damages (%)	Mean $\pm$ SD	42.1 $\pm$ 28.5	59.8 $\pm$ 28.1	-5.186	<0.001
Rate of recovery (%)	Mean $\pm$ SD	76.0 $\pm$ 32.8	25.6 $\pm$ 25.7	13.250	<0.001

Independent samples t-test or Chi-square test, SD: standard deviation.

**Table 3.** Physical health of the typhoon and oil spill disaster victims

Variable		Typhoon disaster	Oil spill disaster	Total	t/ $\chi^2$	p-value
		N=219 n (%)	N=156 n (%)	N=375 n (%)		
Symptom types						
Stomach pain	Yes	67 (30.6)	67 (42.9)	134 (35.7)	6.056	0.01
	No	152 (69.4)	89 (57.1)	241 (64.3)		
Back pain	Yes	38 (17.4)	26 (16.7)	64 (17.1)	0.030	0.49
	No	181 (82.6)	130 (83.3)	311 (82.9)		
Chest pain	Yes	30 (13.7)	28 (18.1)	58 (15.5)	1.320	0.31
	No	189 (86.3)	127 (81.9)	316 (84.5)		
Headaches	Yes	54 (24.7)	77 (49.4)	131 (34.9)	24.756	<0.001
	No	165 (75.3)	79 (50.6)	244 (65.1)		
Dizziness	Yes	53 (24.2)	63 (40.4)	117 (30.9)	11.169	<0.001
	No	166 (75.8)	93 (59.6)	259 (69.1)		
Heart pounding or racing	Yes	59 (26.9)	54 (34.8)	113 (30.1)	2.685	0.06
	No	160 (73.1)	101 (65.2)	261 (69.9)		
Shortness of breath	Yes	23 (10.5)	35 (22.4)	58 (15.5)	9.923	0.002
	No	196 (89.5)	121 (77.6)	318 (84.5)		
Constipation or diarrhea	Yes	35 (16.0)	28 (17.9)	63 (16.8)	0.252	0.68
	No	184 (84.0)	128 (82.1)	313 (83.2)		
Mean number of symptoms	Mean $\pm$ SD	1.64 $\pm$ 1.64	2.40 $\pm$ 2.22	1.95 $\pm$ 1.89	-3.908	<0.001
Self-rated health status	Mean $\pm$ SD	2.47 $\pm$ 0.79	1.91 $\pm$ 0.79	2.24 $\pm$ 0.84	6.773	<0.001

Independent samples t-test or Chi-square test, SD: standard deviation.

the crude oil spill victims. The average monthly household income of most typhoon victims were distributed between 500 thousand won to one million won while the greatest proportion of crude oil spill victims earned at least one and a half million won a month on average. For the subjective evaluation of economic status, it was shown that 66.2 percent of the typhoon victims and 76.6 percent of the crude oil spill victims considered their economic status negatively, and the crude oil spill victims showed a little bit higher percentage of negative consideration of their economic status than the other group.

## II. Characteristics of Disaster Damages

The types of disaster damage experienced by the victims are shown in Table 2. Property damages occupied the biggest proportion of both the typhoon damages and crude oil spill damages with 93.1 and 91.3 percent of total damages, respectively. For the average

property damage ratio, the ratio from the crude oil spill (59.8 percent) was statistically significantly higher ( $p < 0.001$ ) than the ratio from the typhoon (42.1 percent). For the ratio of recovery of damages, the ratio of recovery from typhoon damages (76.0 percent) was statistically significantly higher ( $p < 0.001$ ) than that from crude oil spill damages (25.6 percent).

## III. Physical Health of Disaster Victims

The physical health status of the disaster victims is displayed in Table 3. It was shown that typhoon victims experienced symptoms in the frequency order of stomach pain (30.6%), heart pounding or racing (26.9%), headaches (24.7%), and crude oil spill victims experienced symptoms in the frequency order of headache (49.4%), stomach pain (42.9%), and dizziness (40.4%). In the case of headache symptoms, it was shown that crude oil spill victims experienced such symptoms significantly more than typhoon victims.

**Table 4.** Mental health of the typhoon and oil spill disaster victims

Variable		Typhoon disaster N=219 n (%)	Oil spill disaster N=156 n (%)	Total N=375 n (%)	t/ $\chi^2$	p-value
<b>Depressive symptoms</b>						
Feeling bad about yourself	Yes	31 (14.2)	35 (22.4)	66 (17.6)	4.308	0.04
	No	188 (85.8)	121 (77.6)	310 (82.4)		
Numb or distant from your emotions	Yes	27 (12.3)	31 (19.9)	58 (15.5)	3.965	0.06
	No	192 (87.7)	125 (80.1)	318 (84.5)		
Poor appetite or overeating	Yes	29 (13.2)	42 (26.9)	71 (18.9)	11.110	<0.001
	No	190 (86.8)	114 (73.1)	305 (81.1)		
Use of alcohol or other drugs	Yes	17 (7.8)	14 (9.0)	31 (8.3)	0.176	0.71
	No	202 (92.2)	142 (91.0)	345 (91.7)		
Blaming yourself for things	Yes	26 (11.9)	31 (19.9)	57 (15.2)	4.523	0.04
	No	193 (88.1)	125 (80.1)	319 (84.8)		
Little interest or pleasure in doing things	Yes	25 (11.5)	48 (30.8)	73 (19.5)	21.564	<0.001
	No	193 (88.5)	108 (69.2)	302 (80.5)		
Down, blue, hopeless	Yes	43 (19.6)	46 (29.5)	89 (23.7)	4.886	0.04
	No	176 (80.4)	110 (70.5)	287 (76.3)		
Thinking of death or dying	Yes	21 (9.6)	21 (13.5)	42 (11.2)	1.374	0.25
	No	198 (90.4)	135 (86.5)	334 (88.8)		
Mean number of symptoms	M $\pm$ SD	1.00 $\pm$ 1.53	1.72 $\pm$ 2.03	1.29 $\pm$ 1.79	-3.898	<0.001
<b>Anxiety symptoms</b>						
Trouble concentrating	Yes	44 (20.1)	52 (33.3)	96 (25.6)	8.537	0.003
	No	175 (79.9)	104 (67.7)	280 (74.4)		
Nervous, anxious, on edge, or worrying a lot	Yes	54 (24.7)	56 (35.9)	110 (29.3)	5.552	0.02
	No	165 (75.3)	100 (64.1)	266 (70.7)		
Easily annoyed, irritable	Yes	55 (25.1)	71 (45.5)	126 (35.3)	16.992	<0.001
	No	164 (74.9)	85 (54.5)	250 (66.5)		
Trouble falling or staying asleep	Yes	32 (14.6)	52 (33.3)	84 (22.4)	18.370	<0.001
	No	187 (85.4)	104 (66.7)	292 (77.6)		
Feeling as if your future will be cut short	Yes	38 (17.4)	54 (34.6)	92 (24.5)	14.666	<0.001
	No	181 (82.6)	102 (65.4)	284 (75.5)		
Job stress	Yes	53 (24.2)	67 (42.9)	120 (31.9)	14.716	<0.001
	No	166 (75.8)	89 (57.1)	256 (68.1)		
Mean number of symptoms $\pm$ SD		1.26 $\pm$ 1.40	2.26 $\pm$ 2.02	1.67 $\pm$ 1.75	-5.314	<0.001
PTSD	< 15 points	163 (74.4)	65 (41.7)	228 (60.8)	-7.704	<0.001
	$\geq$ 15 points	56 (25.6)	91 (58.3)	147 (39.2)		
Self-rated stress status	M $\pm$ SD	3.63 $\pm$ 1.04	3.82 $\pm$ 0.96	3.71 $\pm$ 1.01	-1.814	0.07

Independent samples t-test or Chi-square test, SD: standard deviation, PTSD: post-traumatic stress disorder, M: mean.

Overall, a higher percentage of the crude oil spill victims experienced physical symptoms than typhoon victims. For the average number of items for which the victims had symptoms among the eight total items of physical symptoms, the typhoon victims had an average of 1.64 symptoms while the crude oil spill victims had an average of 2.40 symptoms. This difference between the two victim groups was statistically significantly different ( $p < 0.001$ ). Furthermore, self-rated health status of respondent also showed that the crude oil spill victims reported statistically significantly ( $p < 0.001$ ) worse health (1.91 points out of a 5-point scale) than the typhoon victims (2.47 points).

#### IV. Mental Health of Disaster Victims

The mental health status of the disaster victims is found in Table 4. First, in the case of symptoms of

depression, the most frequently reported symptom among the typhoon victims was 'down, blue, and hopelessness' (19.6%), and among the crude oil spill victims was 'little interest or pleasure in doing things' (30.8%). The average number of depressive symptoms were statistically different ( $p < 0.001$ ) between the two victim groups. The typhoon victims had on average 1.00 depressive symptom while the crude oil spill victims had an average of 1.72 symptoms. Secondly, in the case of symptoms of anxiety, the typhoon victims and the crude oil spill victims both showed 'easily annoyed, irritable' the most with 25.1 percent and 45.5 percent, respectively. The average number of anxiety symptoms for two victim groups were statistically significant different ( $p < 0.001$ ). The typhoon victims had 1.26 anxiety symptoms on average, while the crude oil spill victims had 2.26 symptoms on average. Lastly, regarding the PTSD measurement, 25.6 percent of the

typhoon victims scored at least 15 points (i.e., classified as clinical PTSD), and 58.3 percent of the crude oil spill victims scored at least 15 points. Hence it was shown that 39.2 percent of the respondents were in need of a PTSD diagnosis. In particular, as shown with the statistically significantly ( $p < 0.001$ ) higher rate of PTSD among the crude oil victims, the seriousness of mental difficulties among the crude oil spill victims was found. Self-rated stress status of the respondents, however, displayed no statistically significant difference ( $p = 0.071$ ) between the two victim groups the typhoon victims reported 3.63 points out of a 5-point scale while the crude oil spill victims reported 3.82 points.

## DISCUSSION

This research was conducted with the purpose of comparing differences in physical and mental health of victims of different types of disasters, and to suggest preliminary data for intervention plans. The research results show that crude oil spill victims are experiencing more difficulties in health compared to typhoon victims. Based on such research results, we suggest the following practical and theoretical implications in relation to disaster victims:

First, it is necessary to recognize that there are differences in difficulties in health experienced by disaster victims depending on the type of disasters, and to prepare health care alternatives according to the type of disasters. The research results showed that the typhoon victims and the crude oil spill victims experienced problems in health differently, and the crude oil spill victims were experiencing physical and mental problems much more seriously. While many prior researches on disasters [2-5] pointed out disaster victim's health difficulties, their research was limited to only one kind of disaster with no consideration of the type of the involved disaster. The results from this research showed that difficulties in victim's health were recognized differently depending on the type of disasters. Such research results are consistent with previous research results reporting that health issues of victims change depending on the type of a disaster, (i.e. whether it is a natural disaster or a man-made disaster) [16-18]. Baum et al. reported that victims who suffered technical or man-made disasters experience more stress and depression, and more alienated in personal relations than those who suffered natural disasters such as floods or earthquakes. In particular, Baum et al. reported that victims experience more hardships as man-made disasters make the situation difficult for victims to

forecast due to a strong irregularity compared to natural disasters, and this makes it difficult to properly prepare countermeasures. In summary, even though all the disasters share some similarities in difficulties experienced by victims, they exhibit differences depending on the type of a disaster. Therefore, it is necessary to explore intervention plans which take the type of disasters into account.

Secondly, it is necessary to prepare physical health care alternatives for the victims by recognizing that there are differences in physical health difficulties suffered by the victims depending on the type of disasters. This research results showed that crude oil spill victims were suffering physical health problems more seriously than typhoon victims. This finding may be attributable to the facts that, (1) in the case of man-made disasters such as crude oil spills, victims are forced to be exposed to a harmful environment with the spread of chemical substances such as crude oil or wastes; and (2) the restoration efforts to recover the damage proceeded slowly. This finding implies that physical health-related services such as medical support for crude oil spill victims should be provided more intensively compared to typhoon victims. Thus, it seems necessary to adjust the intensity of medical services at the time of intervention and confrontation for the disaster victims by differentiating man-made disasters from natural disasters. It also seems necessary to conduct research regarding which specific areas in physical health the victims are suffering from relatively more serious difficulties. In particular, an epidemiologic investigation is being performed after it was reported that cancer patients have rapidly increased in Pado-ri of Taean-gun after the crude oil spill, the area where the study sample for this research was selected. Since it may take a while to find out and resolve such health issues, it is necessary to continuously intervene after disasters occur and to conduct additional in-depth researches and surveys to monitor the long-term impact on health.

Thirdly, it is necessary to prepare mental health care alternatives for the victims by recognizing that there are differences in mental health difficulties depending on the types of disasters. The results from this research showed that crude oil spill victims were experiencing mental difficulties more seriously than typhoon victims. This finding may be attributable to the possible predictability of the typhoon damages as typhoons can be forecasted in advance whereas disasters such as crude oil spills occur abruptly with no advance notification. Also, more mental stress among the victims of the crude oil spills may be due to a longer restoration process. Our results

are consistent with the research results of Baum et al. which compared the differences between typhoon victims and toxic waste victims [16,18]. In their research, investigating the psychological impact on the victims, it was reported that the figures of epinephrine and norepinephrine for the toxic waste victims were higher than those for typhoon victims, and that toxic waste victims suffered mental health problems such as anger, depression or feelings of alienation more seriously than typhoon victims. Therefore, it is necessary to consider the type or restoration duration of a disaster at the time of intervention for mental health problems of victims.

As shown already, crude oil spill victims especially suffer from depression, anxiety and PTSD more seriously compared to typhoon victims. Hence it is necessary to provide assistance from specialists who have expertise in mental health assistance. Since it is easy to overlook the seriousness of mental health problems compared to visibly exposed physical problems, countermeasures for mental health assistance to the areas affected by the crude oil spill should be prepared at the time of confronting the disaster and intervention for victims. In particular, as it has been shown, the necessity of diagnosis of PTSD among the crude oil spill victims was very high compared to the typhoon victims. Thus, continuous management as well as an initial response are needed, and intervention by mental health specialists, social workers and psychotherapists must be actively sought, considering that in the mental health effects are likely to last for a long period of time.

Lastly, this research has some limitations in the following aspects: First, this research is based on a one-time survey at a specific time on difficulties victims suffered by selecting two disasters which occurred at similar times, and not based on a longitudinal data on experiences of the victims. Therefore, in the future research, it would be beneficial to conduct a time-series research taking into account the passage of time in exploring how the physical and mental difficulties suffered by the victims of different types of disasters change over time.

Secondly, while this research attempted a comparative analysis by selecting the recent typhoon damages and crude oil spill damages which were of a large scale and occurred at about the similar time, there was limitation with samples in that samples differed with respect to gender and distribution of age of the victims, and difference in passage of time, etc. due to the characteristics of unpredictable to the time of occurrence and

scale of disaster damages. Therefore, for a more precise comparative analysis with respect to problems suffered by victims according to the type of disasters, it would be necessary to consider a sampling method which would yield a more representative sample by each type of disasters.

Thirdly, although it is expected that various factors affect the difficulties suffered by disaster victims, analysis of long-term effects, continuity and severity of damage experience was not performed in this study. In the case of crude oil in particular, there was limitation in identifying long-term effects on health caused by toxic substances. Therefore, in a future research, it would be necessary to conduct a study which identifies the long term, continuity and severity of physical and mental health difficulties suffered by disaster victims.

Despite these limitations, this research is meaningful in that it presented empirical data regarding the kinds of difficulties disaster victims suffer physically and mentally and made a contribution to the literature with a dearth of research on disaster victims. In particular, this research is meaningful as it conducted comparative analyses of difficulties suffered by victims by the type of disasters, and highlighted the necessity of differentiated interventions by the type of disasters and the importance of preparation of countermeasures which, take into account the differences in experiences of critical situations suffered by victims.

## CONFLICT OF INTEREST

The authors have no conflict of interest to declare on this study.

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