ASSOCIATION BETWEEN PTSD SYMPTOMS AND STRESS-RELATED FACTORS AMONG NUCLEAR EMERGENCY WORKERS OVER A LONG PERIOD

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Introduction

The Fukushima Daiichi Nuclear Power Plant (NPP) suffered serious damage from the Great East Japan Earthquake and Tsunami of 2011.

The Ministry of Health, Labour and Welfare of Japan (MHLW) temporarily raised the emergency cumulative radiation exposure dose limit in Fukushima NPP from 100 millisievert (mSv) to 250 mSv during the period from March 14 to December 16, 2011.

About 20,000 workers were involved in the emergency work for coping with accidents during this period.

Objectives:

This study examined the association between PTSD symptoms and stress-related factors among nuclear emergency workers 6-8 years after the disaster.

Subjects and Methods:

All of the workers engaged at Fukushima NPP from March 14 to December 16, 2011 were registered as emergency workers by MHLW. All the emergency workers (N=19,808) were recruited through individual letters from the authors since January 2015. The survey, using a self-administered questionnaire, was conducted on those who agreed to participate in an epidemiological study on the emergency workers for the TEPCO Fukushima Daiichi Nuclear Power Plant accident (Nuclear Emergency Workers Study) and underwent medical examination by December 2018 (N=4,979). The participants completed and sent the questionnaire to the authors.

All participants were assured that their participation was voluntary.

PTSD symptoms were measured using IES-R (Impact of Events Scale – Revised). The stress-related factors we evaluated included life events, stress coping (BSCP), sense of coherence (SOC-UTHS), self-esteem (by Rosenberg), generalized self-efficacy (by Sherer), resilience (CD-RISC2), social support (current/emergency), satisfaction (life/job), and stigma-associated stress owing to post-disaster management criticism (slandorous defamation). Multiple regression analysis was performed with the IES-R score as the dependent variable and stress-related factors as the independent variables.

Demographic and occupational characteristics of the subjects			
	N (%)		N (%)
Age	3784	Timing of engaging in emergency work	
≤29	61 (1.6)	March–May	2226 (60.6)
30–39	371 (9.8)	June–July	652 (17.8)
40–49	1059 (28.0)	August–September	333 (9.1)
50–59	1269 (33.5)	October–December	285 (7.8)
≥60	1024 (27.1)	January–	176 (4.8)
Marital status		Working period	
Never married	374 (9.9)	≤5 days	1170 (31.3)
Currently married	3177 (84.2)	≤10 days	409 (11.0)
Divorced	172 (4.6)	≤30 days	614 (16.4)
Widowed	46 (1.2)	≤100 days	576 (15.4)
Others	2 (0.1)	≥101 days	966 (25.9)
Education		Main operation during emergency work	
Middle school or less	265 (7.0)	Engineering and construct	782 (65.1)
High school	1654 (43.7)	Reactor control	792 (68.6)
Vocational school	190 (5.0)	Dose control	286 (65.1)
Some college	211 (5.6)	Material management	112 (24.0)
College	1000 (26.4)	Others	1802 (75.6)
Graduate school	434 (11.5)		
Others	30 (0.8)		

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Results and Conclusions:

In total, 3,784 nuclear emergency workers completed a self-administered questionnaire, of which 3,776 were male.

The IES-R score was significantly higher in the workers who had worked on-site for a long period of time. It was also associated with scores of life events, stress coping, sense of coherence, self-esteem, self-efficacy, social support, and slanderous defamation. Life events and slanderous defamation scores had particularly strong associations with the IES-R score.

Long-term follow-up is necessary for nuclear emergency workers who worked for a longer period of time, and mitigating slanderous defamation responses is one of the most important measures to support the mental health of these workers.

Association between IES-R score and stress-related factors in the subjects (Results of multiple regression analysis)						
		b	95% CI	p	β	VIF
Slandorous defamation		.896	.854 – .938	.000	.589	1.17
Support(Current)	Supervisor	-.365	-.567 – -.163	.000	-.096	4.37
	Coworker	.136	-.083 – .356	.223	.034	4.50
	Private	-.191	-.348 – -.034	.017	-.045	2.09
Support(Emergency)	Supervisor	.030	-.173 – .233	.771	.009	5.19
	Coworker	-.241	-.461 – -.021	.032	-.065	5.32
	Private	.135	.010 – .261	.035	.039	2.00
Life event		.955	.702 – 1.207	.000	.105	1.19
BSCP	Active solution	.081	-.054 – .215	.239	.020	1.77
	Seeking help for solution	-.140	-.257 – -.022	.020	-.041	1.80
	Changing a point of view	.168	.069 – .266	.001	.048	1.23
	Emotional expression involving others	.330	.138 – .522	.001	.049	1.23
	Avoidance and suppression	-.101	-.247 – .045	.176	-.022	1.59
	Changing mood	.085	-.034 – .205	.162	.021	1.37
SOC3-UTHS		-.122	-.220 – -.024	.015	-.042	1.74
Self-esteem		-.077	-.125 – -.030	.001	-.060	2.06
Self-efficacy		.050	.022 – .079	.000	.073	2.53
CD-RISC2		-.120	-.309 – .069	.212	-.022	1.81
Satisfaction(life, job)		-.022	-.238 – .195	.843	-.003	1.64
Adjusted R ²		.480				

The Nuclear Emergency Workers Study Group includes Toshiteru Okubo (Radiation Effects Research Foundation; RERF) as the principal investigator, Makoto Akashi (National Institutes for Quantum and Radiological Science and Technology; NIQRST), Hisanori Hiro (University of Occupational and Environmental Health; UOEH), Hokuto Hoshi (Hoshi General Hospital), Fumiyoshi Kasagi (Radiation Effects Association), Kazuaki Kawai (UOEH), Hiroko Kitamura (RERF), Kazunori Kodama (RERF), Osamu Kurihara (NIQRST), Megumi Miyagawa (Toranomon Hospital), Takuma Momose (Japan Atomic Energy Agency), Waka Ohishi (RERF), Ryuji Okazaki (UOEH), Kotaro Ozasa (RERF), Hiroshi Sasaki (Kanazawa Medical University), Jun Shigemura (National Defense Medical College), Tomotaka Sobue (Osaka University), Yumiko Suto (NIQRST), Nobuyuki Taniguchi (Jichi Medical University), and Shinji Yoshinaga (NIQRST) as the investigators.