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Letter to the Editor

From Hiroshima to Fukushima: PTSD symptoms and radiation stigma across regions in Japan

To the editor

Stigma is known to be associated with poorer mental health (Raguram et al., 1996). Perceived radiation stigma is the belief that people who were exposed to radiation are contaminated and are discriminated against (Tone and Stone, 2014). Japan is the only country that experienced two major nuclear disasters: the first the A-bomb attacks on Hiroshima and Nagasaki during WWII, the second the Fukushima Daiichi nuclear disaster in 2011 (Ben-Ezra et al., 2012). In Japanese radiation exposure is "Hibaku"; this term, along with "Hibakusha" (an exposed individual), has been used to stigmatize A-bomb survivors and now it is used with respect to the Fukushima Daiichi nuclear disaster in 2011. Little is known about the association of radiation stigma and PTSD symptoms across regions with different radiation-related histories in Japan. This should be viewed in light trauma transmission found among grandchildren of the A-bomb survivors in the aftermath of Japan's earthquake, tsunami and nuclear disaster in 2011 (Ben-Ezra et al., 2012).

1. Method

We conducted an online survey between 10 and 21 April, 2014 using Geolocation mapping Internet Protocol (IP) address mapping to determine participant's location. 750 Participants from Hiroshima and Nagasaki ($N = 253$), Tokyo ($N = 251$) and Fukushima ($N = 246$) responded (response rate = 75%), mean age 41.4 (SD = 12.2), 49.5% women, 55.7% married. There were no significant differences in demographics between the different regions. Radiation stigma was measured by the question: "Are you being perceived by others as Hibakusha?" rated on a five point Likert scale ranging from (1- not at all to 5- all the time) along with endorsement of PTSD symptoms criteria taken from DSM-5 referring to Japan's earthquake, tsunami and Nuclear disaster in 2011 (Kilpatrick et al., 2013). This national disaster affected all of Japan, but primarily the Fukushima Prefecture where the nuclear meltdown occurred. ANOVA and post-hoc Scheffé tests examined group differences; a subsequent ANCOVA tested the interaction between region, radiation stigma and number of PTSD symptoms.

Table 1
PTSD symptoms, radiation stigma, recollections of national trauma and disaster related fear among three regions in Japan ($n = 750$).

Variable	Hiroshima/Nagasaki ($n = 253$)	Tokyo ($n = 251$)	Fukushima ($n = 246$)	Statistics			Post hoc Scheffé[b]
	Mean (SD)	Mean (SD)	Mean (SD)	*F*	df	*p*	
Age (Years)	41.93 (12.79) Range 18–60	41.10 (13.01) Range 18–60	41.26 (12.08) Range 18–60	0.30	2747	0.738	
Perceived as being stigmatized by others (Hibakusha)	1.17 (0.58)	1.22 (0.61)	2.00 (1.13)	76.82	2688[a]	<0.001	3 ≠ 1, 3 ≠ 2
Recollections of Fukushima Daiichi nuclear disaster	2.75 (0.85)	2.76 (0.95)	3.53 (1.03)	55.83	2747	<0.001	3 ≠ 1, 3 ≠ 2
Fear of Radiation	2.84 (1.15)	2.90 (1.17)	3.34 (1.22)	13.48	2747	<0.001	3 ≠ 1, 3 ≠ 2
	n (%)	*n* (%)	*n* (%)	χ^2		*p*	Jonckheere-Terpstra[c]
Female	127 (50.2)	125 (49.8)	119 (48.4)	0.18		0.685	0.170
Currently married	141 (55.7)	138 (55.0)	139 (56.5)	0.12		0.865	−0.405
Having grandparents that were exposed to the A-Bomb	132 (52.2)	18 (7.2)	11 (4.5)	213.80		<0.001	−13.048
DSM-5 Post Traumatic Stress disorder symptoms							
None	172 (68.0)	157 (62.5)	95 (38.6)				
Partial PTSD symptoms	75 (29.6)	88 (35.1)	125 (50.8)				
Endorsed PTSD symptoms criteria	6 (2.4)	6 (2.4)	26 (10.6)	55.49		<0.001	6.944

DSM-5 = Diagnostic and statistical manual for mental disorders fifth edition.
[a] Missing values.
[b] Coding for Post hoc Scheffé: 1 = Hiroshima/Nagasaki; 2 = Tokyo; 3 = Fukushima.
[c] Jonckheere-Terpstra scores transformed to *z*-values.

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Jonckheere-Terpstra scores transformed to z-values were used for PTSD symptoms criteria based on the DSM-5.

2. Results

The prevalence of endorsed PTSD symptoms criteria was 10.6% in Fukushima compared to 2.4% in Hiroshima/Nagasaki and Tokyo. The mean number of PTSD symptoms was 1.7 (SD = 3.6) in Hiroshima/Nagasaki, 2.0 (SD = 3.6) in Tokyo and 4.3 (SD = 5.5) in Fukushima ($F = 25.33$; $p < 0.001$). The mean perception of radiation stigma (Hibaku) was 1.2 (SD = 0.6) in Hiroshima/Nagasaki, 1.2 (SD = 0.6) in Tokyo and 2.0 (SD = 1.1) in Fukushima ($F = 76.82$; $p < 0.001$).

A subsequent ANCOVA revealed an interaction between region and radiation stigma with respect to number of PTSD symptoms ($F = 5.28$; $p < 0.001$). In addition, we found main effects of region ($F = 6.26$; $p = 0.002$) and radiation stigma ($F = 12.40$; $p < 0.001$). These results suggest that the perception of Hibaku in Fukushima is associated with higher level of PTSD symptoms compared to other regions in Japan. Radiation related stress in Fukushima was higher even amongst those who perceived themselves as Hibaku in Hiroshima and Nagsaki (Table 1).

3. Discussion

To the best of our knowledge, this is the first study to explore the association of PTSD symptoms with radiation stigma. It seems that radiation stigma is associated with detrimental effects on mental health according to location. Mental health professionals may use this knowledge as brief screening for poor mental health among high risk populations. Radiation stigma can be viewed as another marker for poorer mental health when dealing with people who were exposed to nuclear disaster, such as nuclear power plant workers (Shigemura et al., 2012) and the general population.

Limitations of this study include the use of a cross-sectional design and self-reported evaluation of PTSD symptoms criteria. In addition, one may be cautious since some PTSD symptoms are also symptoms of general psychological distress and may lead to some bias in PTSD estimation and the self-report measure of PTSD used a dichotomized method instead of a scale.

Conflict of interest

The authors declare to financial conflict or otherwise.

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