Previous studies of IED took no account of the viewpoints of cross-cultural factors, in spite of the fact that behavioral problems related to impulsivity-control are likely to be strongly affected by cultural circumstances. In general, Japanese tend to more readily suppress their emotions, (especially overt anger) than Westerners or other Asian populations. This cultural proclivity may, to some extent, affect plain behavioral problems such as IED among Japanese.

The purpose of the present study is to evaluate both a lifetime and 12-month prevalence of IED as well as the comorbidity of mood, anxiety, and substance-related disorders with IED together with associations with behavioral problems caused by commonly used drugs, and suicidal ideation in a Japanese community sample based on data specific to Japan that were collected between 2002 and 2006 as part of the World Mental Health Surveys (WMH-J 2002-06 Survey) (WHO World Mental Health Survey Consortium, 2004).

2. Methods

2.1. Subjects

Eleven community populations in Japan were selected as study sites in 2002-2006. The sites included three urban cities and eight rural municipalities. At each survey site, random sample was selected from residents aged 20 years or older based on a voter registration list or a resident registry. Residents who could not speak Japanese, had moved, died, or were hospitalized at the time of the survey were excluded. After a letter of invitation was sent or a welfare commissioner sounded out a resident's opinion, trained interviewers contacted the subjects and interviewed those who agreed to participate in the survey using a standardized instrument. A total of 4,134 concerned community residents participated during the study period. The final response rate was estimated to be 55.1%, except in Nagasaki City where a different survey method had been used (response rate 26%). The response rate at 10 sites ranged from 41 to 82%.

In the present survey, an internal sampling strategy was used to reduce a respondent's burden by dividing the interview into two parts (Kawakami et al., 2005). Part I included a diagnostic assessment, which all respondents were required to complete. Part II covered information about the correlates of a disorder. A subsample of part I respondents who met the criteria for any mental disorder, and a probability subsample of approximately 10% of other respondents were given part II (n = 1,725). As mentioned below, when we use information from part II data, the subjects should be restricted to part II only to compensate for the difference in weighted values between parts I and II. Thus, the present analyses principally included part I data, except for analyses of the association between substance-related problems and IED.

To compensate for differences between the sample and population characteristics due to frame under-coverage, non-response and sampling variability, all samples were weighted to adjust for differential probabilities of selection and were post-stratified to match the population distributions on the cross-classification for sex and age, for which the non-response weight in a given group for sex and age was the inverse of the response rate in this category (Kawakami et al., 2005).

2.2. Assessments of mental disorders

2.2.1. Intermittent explosive disorder

Three or more lifetime anger attacks were required to apply the DSM-IV criterion A for IED requirement of "several attacks." With special reference to the report by Kessler et al. (2006) who used almost the same methods as ours, we also created a narrow definition of lifetime IED that requires three attacks in the same year as described in that paper. Furthermore, we created a "broad only" category which was defined as three or more lifetime attacks without ever having as many as three attacks in a single year. Similarly, a narrow definition of 12-month IED required three attacks in the past 12 months, whereas a broad definition required three lifetime attacks and at least one attack in the past 12 months. Although Kessler et al. (2006) created "intermediate only" and "broad only" categories, we did not use such categories because the numbers of "intermediate only" and "broad only" in our sample were three and one, respectively, which was extremely few compared with those reported by Kessler et al. (2006).

DSM-IV criterion B for IED requires the aggressive "grossly out of proportion to any precipitating psychosocial stressor," and criterion C excludes the possibility that the anger attack is caused by other mental or organic disorders as well as by the direct effect of a substance. These criteria were ascertained according to the prescribed interview procedures of World Mental Health Survey Initiative Version of the World Health Organization Composite International Diagnostic Interview (WMH-CIDI) described below.

Impairment due to lifetime IED was assessed by property damage as well as the number of times the respondent or someone sought medical attention due to an injury caused by the respondent's anger attacks. On the other hand, 12-month questions ask respondents to rate the extent to which their IED interfered with their life and activities during the past 12 months using the Sheehan Disability Scale (Leon et al., 1997), which are visual analogue scale with 0-10 points that ask how much a disorder interfered with

home management, work, social life, and personal relationships. A score of seven or more was defined as a severe or very severe condition.

2.2.2. Mood and anxiety disorders

The Mini-International Neuropsychiatric Interview (M.I.N.I), which is widely used as a convenient structured diagnostic interview, deals with 10 mental disorders which can be categorized into mood and anxiety disorders, based on the standard of a 12-month prevalence of 0.5% or more (Sheehan et al., 1998). Among these 10 categories, we used bipolar I and II disorders instead of mania. Obsessive-compulsive disorder was not assessed in the present survey, while post traumatic stress disorder was examined in part II data. Therefore, we chose the following nine disorders for evaluating the comorbidity of mood and anxiety disorders with IED: Anxiety disorders (panic disorder [PD], agoraphobia with/without panic disorder [AGO], specific phobia [SP], social phobia [SO], and generalized anxiety disorder [GAD]): Mood disorders (major depressive disorder [MDD], dysthymia [DYS], and bipolar I and II disorders).

Details regarding factors such as training of interviewers, field procedures, and survey instruments were given elsewhere (Kawakami et al., 2005). WMH-J diagnoses are based on WMH-CIDI (Kessler and Üstün, 2008), a fully structured lay-administered diagnostic interview that generates data on both the International Classification of Diseases, 10th Revision (ICD-10) (World Health Organization, 1993) and DSM-IV (American Psychiatric Association, 1994). In the present study, DSM-IV criteria were used for diagnoses of the above mental disorders.

The diagnostic hierarchy rules of DSM-IV (National Comorbidity Survey, 2005) were used for IED, GAD, MDD, and DYS. Since there were very few subjects in the 12-month prevalence category, we used the lifetime prevalence of these disorders for the analyses regarding the comorbidity with IED. In addition, the association between the lifetime prevalence of serious suicidal ideation and IED was also evaluated.

2.2.3. Substance use

In the same way as the comorbidity analyses of mood and anxiety disorders, the associations between IED and final diagnosis of substance-related disorders by DSM-IV criteria, such as alcohol abuse and dependence, drug abuse and dependence were also evaluated according to the interview procedure of WMH-CIDI, in which each DSM-IV item was transformed into corresponding question. The current interview list included three categories of the relevant substances or drugs, i.e., every kind of beverage containing alcohol (e.g., beer, wine, whisky, vodka), medical drugs (e.g., analgesics, benzodiazepines, methylphenidates), and some illegal substances in Japan (e.g., cannabis, cocaine, marijuana, heroin). These substances or drugs are listed in the diagnostic criteria of substance-related disorders in DSM-IV.

Among these drugs, the commonly used medications that were readily available, such as analgesics, tranquilizers (e.g., benzodiazepines), and methylphenidates were possible agents affecting IED symptoms at the level of daily life. Hence, we evaluated the relation between IED and the use of such drugs (except for medical purposes) by relevant questions included in WMH-CIDI. Those drugs should be used for medical purposes only according to a physician's instructions, because they can often cause substance-related disorders such as dependence or abuse. The experiences of such drug use were ascertained by showing the respondents a list of relevant drugs for supporting their recall.

In addition, the association between a history of alcohol-related issues as well as the possibility of their occurrence and IED was also evaluated. Such experiences included troubles in coping with social or familial obstacles, interpersonal difficulties caused by drinking, driving drunk, or having been arrested for that offence. Questions regarding the above problems were also extracted from WMH-CIDI questions for the diagnosis of alcohol abuse. In addition, these alcohol abuse and dependence symptoms such as alcohol tolerance, withdrawal symptoms, or failure of temperance among subjects with lifetime IED within the recent 12 months were confirmed. Harmful effects due to drinking within the past 12 months were also assessed by questions regarding five domains in physical or social impairments (i.e., harm to physical health, damage to family, impulsive action with regret, breach of trust, and feeling of unhappiness). Further, the comorbid status was evaluated between lifetime IED, and diagnoses of alcohol abuse and dependence within one month.

The use of obviously illicit drugs such as cannabis, cocaine, or marijuana was not taken into account because the characteristics of the drug users were considered not to be representative of the general population (i.e., extremely anti-social), and the number of subjects available for analysis was very few.

2.3. Statistical analysis

Comparisons of courses or severities between narrow and 'broad only' groups in lifetime IED were conducted by analysis of variance. In these comparisons and the following descriptive analysis of 12-month IED, subjects who reported their number of lifetime attacks to be more than (number of years with attacks x highest number of annual attacks) or those with missing values of such variables were excluded because their recollection of the cause of the anger attacks was considered to be inaccurate (n = 25 for lifetime IED, and n = 10 for 12-month IED).

Logistic regression analysis was used in the following three steps. First, bivariate or multivariate logistic regression models were computed to determine the association of lifetime and 12-month IED with demographic and personal characteristics. In these regression models, analyses for IED and narrow IED were conducted separately, because narrow IED is considered to be clinically more

significant than IED or 'broad only' IED. In addition, analysis for 'broad only' lifetime IED was conducted. Second, age-adjusted models of logistic regression were computed to determine the association of a lifetime prevalence of IED with a corresponding prevalence of mental disorders and suicidal ideation. Analyses for narrow IED and IED were conducted separately also in these models. However, the number of lifetime 'broad only' IED ($n = 24$) was too few to calculate the comorbidity between 'broad only' IED and those mental disorders. In those analyses, age was categorized into the two strata of <50 or 50+. Third, multiple logistic regression analysis was used to evaluate the association between drug use (except for medical purpose) or alcohol-related problems and IED. This analysis was conducted in part II samples since the relevant items used were restricted to that sub-sample. The outcome variables were IED (or narrow IED) assessed by 12-month and lifetime prevalence in the first and third analysis, with IED (or narrow IED) assessed by a lifetime prevalence only being used in the second analysis. In the analyses regarding narrow and 'broad only' IED, subjects with lifetime or 12-month IED but whose number of attacks was unknown were deleted ($n = 12$ for lifetime narrow and 'broad only', one for 12-month narrow). The odds ratios (ORs) and their 95% confidence intervals (CIs) were obtained from the corresponding logistic regression coefficients and their design-adjusted standard errors.

Finally, we compared age of onset among subjects having IED and comorbid mental disorders by a paired t-test separately for lifetime IED and lifetime narrow IED.

P-values (two-sided) less than 0.05 were considered statistically significant. All computations were performed using the SAS software package, version 9.1.3 (SAS Institute, Inc., Cary, NC, USA).

2.4. Ethical considerations

Written informed consent was obtained from each respondent at each site. The protocol of the present survey was approved by the Research Ethics Committee of Okayama University (for the Okayama site), the Japan National Institute of Mental Health (for the Kagoshima site), Nagasaki University (for the Nagasaki site), Yamagata University (for the Yamagata site), and Juntendo University (for Yokohama City).

3. Results

The subjects diagnosed with lifetime total IED numbered 52 for men and 28 for women. Mean ages (95% CIs) at the onset of the disease for men and women were 16.5 years (13.8-19.1), and 26.3 years (21.0-31.6), respectively. Only 4.2% of the subjects with IED had ever consulted a doctor or a psychological counselor about their anger attacks. On the other hand, 15 men and 12 women were diagnosed with 12-month IED.

Table 1 shows the course and property damage of lifetime IED, according to narrow IED as well as DSM-IV IED. Although the narrow group showed high number of attacks, the property damage and medical attention were rather less. In comparison with 'broad only' IED, narrow IED showed significantly higher number of lifetime attacks, more years with attacks, and greater highest number of annual attacks than 'broad only' IED (data not shown). Course and role impairment of 12-month IED are shown in Table 2. 76.5% of 12-month IED was classified as narrow group, showing a high number of 12-month attacks.

Table 1
Course and property damage of lifetime DSM-IV IED and narrow IED.

	IED	Narrow IED[a]
	Mean (SE)	Mean (SE)
No. of cases	55	34
Course		
No. of lifetime attacks	14.3 (3.2)	19.8 (4.7)
No. of years with attacks	8.1 (1.0)	9.9 (1.3)
Highest no. of annual attacks	9.5 (2.9)	14.7 (4.5)
Severity		
Property damage, $[b]	1182.4 (544.7)	1024.2 (574.9)
Medical attention, per 100 cases[c]	70.7 (27.9)	59.6 (27.5)

[a] Narrow IED, three or more annual attacks in at least one year of life.
Subjects with missing values of the relevant items were excluded.
[b] Estimated cost of all the things ever damaged or broken in an anger attack (converted into US dollars with yen/dollar exchange rate of November 20, 2009), $n = 17$ for narrow IED, 30 for IED.
[c] Number of times during an anger attack someone was hurt badly enough to need medical attention per 100 cases of intermittent explosive disorder, $n = 29$ for narrow IED, 44 for IED.

Table 2
Course and impairment of 12-month DSM-IV IED and narrow IED.

	IED	Narrow IED[a]
No. of cases	17	13
12-month persistence, mean (SE)		
No. of 12-month attacks[b]	17.1 (8.7)	19.9 (10.1)
No. of weeks with attacks[c]	5.1 (0.7)	5.8 (0.8)
Severe or very severe role impairment[d], % (SE)		
Home[e]	0.0	0.0
Work[f]	0.0	0.0
Interpersonal[g]	14.1 (4.8)	17.5 (6.0)
Social[h]	7.4 (7.4)	9.2 (9.2)
Any of the above	20.5 (11.8)	25.1 (14.4)

[a] Narrow IED, three or more past 12-month attacks. Subjects with missing values of the relevant items were excluded.
[b] $n = 13$ for narrow IED, 16 for IED.
[c] $n = 12$ for narrow IED, 15 for IED.
[d] Sheehan Disability Scale.
[e,g,h] $n = 12$ for narrow IED, 16 for IED.
[f] $n = 10$ for narrow IED, 14 for IED.

There were, however, no subjects with severe or very severe role impairment in home or work due to their anger attacks.

The lifetime and 12-month prevalence of IED according to personal and demographic factors are shown in Table 3. In both lifetime and 12-month prevalence, men showed higher rates of IED than women. As for other demographic factors, old age and low educational backgrounds were regarded as IED preventive factors as shown by ORs, while marital and employment status showed no material associations with IED. These tendencies became more obvious when narrow IED was used as a dependent variable (Table 4). Results of lifetime 'broad only' IED showed similar tendencies with those of IED (data not shown). Lifetime and 12-month prevalence of IED were 2.1% and 0.7%, respectively, whereas those of narrow IED were 1.2% and 0.6%, respectively. Lifetime prevalence of 'broad only' IED was 0.6%.

Comorbidity rates and associations of mental disorders and suicidal ideation with IED as evaluated by ORs according to gender are shown in Table 5. In both genders, the comorbidity of MDD was relatively high (approximately 15%). Comorbidity rates of anxiety

Table 3
Relations of demographic factors to lifetime and 12-month prevalence of DSM-IV IED ($n = 4,134$).

	Lifetime IED ($n = 80$)		12-month IED ($n = 27$)	
Factor	% (SE)	OR (95% CI)	% (SE)	OR (95% CI)
Sex				
Male	2.9 (0.4)	2.3 (1.5-3.8)	0.9 (0.2)	1.4 (0.7-3.2)
Female	1.3 (0.2)	1.0	0.6 (0.2)	1.0
Age (yr)				
20-34	2.8 (0.7)	3.0 (1.4-6.5)	1.1 (0.4)	2.7 (0.8-8.9)
35-49	2.5 (0.5)	2.6 (1.3-5.5)	0.7 (0.3)	1.7 (0.5-5.8)
50-64	2.2 (0.4)	2.3 (1.1-4.7)	0.7 (0.3)	1.8 (0.6-5.6)
≥65	1.0 (0.3)	1.0	0.4 (0.2)	1.0
Education (yr)[a]				
≤12	1.5 (0.2)	0.5 (0.3-0.8)	0.6 (0.2)	0.5 (0.2-1.4)
13-15	2.3 (0.7)	0.7 (0.3-1.5)	0.6 (0.3)	0.6 (0.2-2.2)
≥16	3.2 (0.8)	1.0	1.1 (0.4)	1.0
Marital Status[b]				
Never married	2.2 (0.7)	1.0 (0.5-2.0)	0.9 (0.5)	1.2 (0.4-3.5)
Previously married	1.0 (0.4)	0.5 (0.2-1.1)	0.3 (0.2)	0.4 (0.1-1.7)
Married	2.2 (0.3)	1.0	0.8 (0.2)	1.0
Occupational Status[c]				
Unemployed[d]	1.5 (0.3)	0.7 (0.4-1.2)	0.6 (0.2)	0.8 (0.3-2.1)
Employed	2.2 (0.3)	1.0	0.7 (0.2)	1.0
Total	2.1 (0.2)		0.7 (0.1)	

[a] $n = 3,902$.
[b] $n = 4,133$.
[c] $n = 3,922$.
[d] Including looking for work, temporary layoff, retired, homemaker, student, maternity leave, illness/sick leave, and disabled.

Table 4

Relations of demographic factors to lifetime and 12-month prevalence of narrow IED (n=4,122 for lifetime diagnosis, 4,133 for 12-month diagnosis).

Factor	Lifetime narrow IED (n=44)		12-month narrow IED (n=22)	
	% (SE)	OR (95% CI)	% (SE)	OR (95% CI)
Sex				
Male	1.5 (0.3)	2.0 (1.0–3.7)[c]	0.9 (0.2)	2.2 (0.9–5.6)
Female	0.8 (0.2)	1.0	0.4 (0.1)	1.0
Age (yr)				
20–34	1.7 (0.5)	4.8 (1.6–15.0)	1.1 (0.4)	3.3 (0.9–11.9)
35–49	1.3 (0.4)	3.7 (1.2–11.1)	0.6 (0.3)	1.8 (0.5–6.9)
50–64	1.3 (0.3)	3.6 (1.2–10.4)	0.5 (0.2)	1.5 (0.4–5.6)
≥65	0.4 (0.2)	1.0	0.3 (0.2)	1.0
Education (yr)[a]				
≤12	0.9 (0.2)	0.5 (0.2–1.2)	0.4 (0.1)	0.4 (0.1–1.0)[f]
13–15	1.4 (0.5)	0.9 (0.3–2.3)	0.6 (0.3)	0.6 (0.2–2.2)
≥16	1.7 (0.6)	1.0	1.1 (0.4)	1.0
Marital Status[b]				
Never married	1.5 (0.6)	1.3 (0.6–3.0)	0.9 (0.5)	1.4 (0.5–4.3)
Previously married	0.4 (0.3)	0.3 (0.1–1.2)	0.2 (0.2)	0.2 (0.03–1.8)
Married	1.2 (0.2)	1.0	0.6 (0.2)	1.0
Occupational Status[c]				
Unemployed[d]	0.9 (0.3)	0.8 (0.4–1.6)	0.5 (0.2)	0.9 (0.3–2.5)
Employed	1.2 (0.2)	1.0	0.6 (0.2)	1.0
Total	1.2 (0.2)		0.6 (0.1)	

Note. Subjects whose number of attacks was unknown were deleted (n = 12 for lifetime narrow, 1 for 12-month narrow).

[a] n=3,890 for lifetime narrow, 3,901 for 12-month narrow.

[b] n=4,121 for lifetime narrow, 4,132 for 12-month narrow.

[c] n=3,910 for lifetime narrow, 3,921 for 12-month narrow.

[d] Including looking for work, temporary layoff, retired, homemaker, student, maternity leave, illness/sick leave, and disabled.

[e] P=0.037.

[f] P=0.059.

disorders such as GAD, SO, and SP were higher in women than in men. The comorbidity of bipolar disorder and IED was observed only in women suffering from bipolar II disorder, while there was no comorbidity of PD or AGO. Comorbidity rates of all mood disorders and IED in men and women were 15.2% and 26.6%, respectively, while 10.2% of men and 30.3% of women with IED were diagnosed with anxiety disorders. Any mood or anxiety disorders as well as a lifetime prevalence of suicidal ideation were statistically significantly or

Table 5

Comorbidity between mental disorders, suicidal ideation, and lifetime DSM-IV IED according to gender.

	Men with IED (n=52)		Women with IED (n=28)	
	% (SE)	OR (95% CI)[a]	% (SE)	OR (95% CI)[a]
Anxiety disorders				
Any anxiety disorder	10.2 (4.3)	1.9 (0.7–5.0)	30.3 (8.7)	5.6 (2.4–12.9)
Panic disorder	0.0		0.0	
Agoraphobia	0.0		0.0	
Specific phobia	6.3 (3.6)	2.3 (0.7–8.0)	12.5 (5.6)	3.4 (1.1–10.2)
Social phobia	2.3 (2.3)	1.2 (0.2–9.0)	11.9 (7.1)	12.5 (3.2–48.3)
GAD[b]	5.9 (3.2)	4.9 (1.4–17.1)	12.7 (6.4)	7.2 (2.4–21.9)
Mood disorders				
Any mood disorder	15.2 (5.2)	4.4 (2.0–10.0)	26.6 (10.2)	3.6 (1.5–9.0)
MDD[c]	15.2 (5.2)	4.8 (2.1–10.7)	13.7 (7.2)	1.6 (0.5–5.0)
Dysthymia	1.6 (3.8)	19.3 (3.9–95.7)	6.8 (4.9)	7.3 (1.6–34.2)
Bipolar I disorder	0.0		0.0	
Bipolar II disorder	0.0		6.1 (5.9)	81.9 (9.6–698)
Substance-related disorders				
Alcohol abuse	22.0 (7.2)	1.9 (0.8–4.5)	8.4 (8.1)	1.8 (0.2–14.5)
Alcohol dependence	2.9 (2.9)	1.6 (0.2–12.0)	0.0	
Drug abuse	0.0		0.0	
Drug dependence	0.0		0.0	
Suicidal ideation	18.9 (6.3)	2.4 (1.1–5.3)	23.0 (9.0)	2.4 (0.9–6.2)

[a] Age-adjusted odds ratio. Lifetime prevalence of IED was used as a dependent variable. References are those without relevant mental disorders or suicidal ideation.

[b] General anxiety disorder.

[c] Major depressive disorder.

possibly significantly associated with IED in both genders. Similar tendencies were observed when narrow lifetime IED was used as a dependent variable (Table 6). As for the comorbidity of substance-related disorders with IED and narrow IED, no subjects had both such disorders and IED, except for nine (seven for narrow) men and one woman with alcohol abuse, and one man with alcohol dependence (Table 5, Table 6).

The use of at least one of the following three categories of drugs (except those used for medical treatment), tranquilizers or similar drugs, methylphenidates or similar drugs (psychostimulants), and analgesics was statistically significantly associated with an approximately four-fold increased risk of a lifetime prevalence of IED (OR 3.7 95% CI 1.7–8.2). The association between the use of those substances and a 12-month prevalence of IED showed a tendency similar to that of lifetime prevalence, while it did not reach statistical significance, partly due to the small sample size with a 12-month prevalence of IED. The actual experiences of alcohol-related problems or their possibility were significantly associated with a lifetime prevalence of IED (OR 4.5 95% CI 1.1–17.9); however, again, the association of those with a 12-month prevalence of IED did not reach statistical significance. Among those with lifetime IED, 57.8% drank three or more times per week in the most frequent drinking year in their lives, and 83.3% drank three shots of liquor or more per drinking day in such a year. Only one subject with lifetime IED had any alcohol abuse or dependence symptoms within the most recent six months. Similarly, only one subject with lifetime IED experienced any harmful effects due to drinking within recent 12 months. No comorbidity was observed between lifetime IED and one-month prevalence of alcohol abuse or dependence diagnosis.

Comparisons of the age of onset between lifetime IED (DSM-IV and narrow) and comorbid mental disorders are shown in Table 7. Average age of onset was significantly younger (earlier) for SP than for IED and narrow IED. Average age of onset was marginally significantly older (later) for MDD than for IED, and for alcohol abuse than for narrow IED (P<0.10).

Table 6

Comorbidity between mental disorders, suicidal ideation, and lifetime narrow IED according to gender.

	Men with narrow IED (n=27)		Women with narrow IED (n=17)	
	% (SE)	OR (95% CI)[a]	% (SE)	OR (95% CI)[a]
Anxiety disorders				
Any anxiety disorder	11.2 (5.7)	2.1 (0.6–7.2)	39.3 (12.1)	8.2 (3.0–22.6)
Panic disorder	0.0		0.0	
Agoraphobia	0.0		0.0	
Specific phobia	7.6 (5.3)	2.8 (0.6–12.8)	20.2 (7.8)	5.9 (1.8–19.1)
Social phobia	0.0		19.2 (11.7)	21.0 (5.0–88.7)
GAD[b]	7.6 (4.4)	6.4 (1.4–27.9)	11.2 (7.8)	6.2 (1.4–28.0)
Mood disorders				
Any mood disorder	15.9 (7.6)	4.6 (1.6–13.5)	36.4 (13.7)	5.6 (2.0–15.9)
MDD[c]	15.9 (7.6)	4.9 (1.7–14.5)	22.1 (10.9)	2.9 (0.9–9.4)
Dysthymia	0.0		4.5 (0.2)	4.6 (0.6–35.7)
Bipolar I disorder	0.0		0.0	
Bipolar II disorder	0.0		9.8 (9.4)	142.0 (NC[e])
Substance-related disorders				
Alcohol abuse	29.3 (10.0)	2.8 (1.0–8.0)[d]	11.5 (11.0)	2.3 (0.3–20.0)
Alcohol dependence	5.3 (5.4)	3.1 (0.4–24.8)	0.0	
Drug abuse	0.0		0.0	
Drug dependence	0.0		0.0	
Suicidal ideation	21.6 (8.8)	2.8 (1.1–7.5)	24.1 (11.1)	2.5 (0.7–8.3)

Note. Subjects whose number of attacks was unknown were deleted (n = 12).

[a] Age-adjusted odds ratio. Lifetime prevalence of narrow IED was used as a dependent variable. References are those without relevant mental disorders or suicidal ideation.

[b] General anxiety disorder.

[c] Major depressive disorder.

[d] P=0.051.

[e] Not calculated due to small sample size.

Table 7

Comparisons of age of onset between mental disorders and IED in subjects having both mental disorders and IED.

N^a	IED		Comorbid disorder		p^b	N^a	Narrow IED	Comorbid disorder		p^b
	Age of onset, year (SE)		Type of comorbid disorder	Age of onset, year (SE)			Age of onset, year (SE)	Type of comorbid disorder	Age of onset, year (SE)	
7	16.9 (4.2)		Specific phobia	4.9 (0.5)	0.026	6	19.3 (4.5)	Specific phobia	5.1 (0.6)	0.027
4	18.1 (6.4)		Social phobia	14.0 (2.3)	0.63	3	23.0 (7.4)	Social phobia	14.5 (3.5)	0.49
8	21.5 (6.6)		GAD^c	37.5 (2.6)	0.17	5	26.8 (8.5)	GAD^c	34.6 (7.2)	0.39
13	21.7 (3.9)		MDD^d	30.6 (4.1)	0.07	9	24.6 (3.0)	MDD^d	32.0 (5.3)	0.18
4	20.5 (9.6)		Dysthymia	31.3 (7.1)	0.23	1	15.0 (—)^e	Dysthymia	23.0 (—)^e	—^{e}
10	23.1 (4.1)		Alcohol abuse	25.8 (2.4)	0.16	8	22.0 (3.6)	Alcohol abuse	24.7 (1.6)	0.08

[a] Number of comorbid cases.
[b] Paired t-test for average age differences of onset between IED and each comorbid disorder.
[c] General anxiety disorder.
[d] Major depressive disorder.
[e] Not calculated.

4. Discussion

Due to insufficient antecedent evidence regarding the population-based prevalence of IED, the present results regarding such prevalence are difficult to compare with the previous data. However, both the lifetime and 12-month prevalence of IED observed in the present survey were obviously lower than those in the United States (Coccaro et al., 2004; Kessler et al., 2006; Ortega et al., 2008) or in South Africa (Fincham et al., 2009). As mentioned above, Japanese are less likely to openly express their emotions compared with Westerners. In addition, Japanese are generally more likely than Westerners to share a stigmatization toward mental disorders (Griffiths et al., 2006), and to suppress their emotions accordingly. This cultural reluctance to express emotion may also have affected responses to the structured interviews conducted in the present survey. Ortega et al. (2008) also suggested that the different prevalence of IED among sub-ethnic Latino groups might reflect differences in response styles rather than any disabling psychopathology. However, we could not include a measure that would reflect the suppression of anger because the present study was conducted as a part of a widespread prevalence survey of various mental disorders including IED. Thus, the possibility of a Japanese tendency to suppress their emotions still remains speculative.

Nevertheless, it should be noted that the total amount of property damages of subjects with narrow lifetime IED and the number of cases in which they sought medical attention were rather fewer despite the fact that they had more anger attacks than those in the 'broad only' category. This suggested that each anger attack of subjects within the narrow criteria was relatively trivial, and that those people in such criteria might exaggeratedly regard their trivial emotional reactions as "anger attacks." No role impairment in home and work of those with 12-month IED supports this supposition.

As for demographic factors, both a lifetime and 12-month prevalence of IED tended to be higher in men than in women. This is not surprising given that men are generally more impulsive than women. The strong association between younger age and a lifetime prevalence of IED may be somewhat affected by recall bias, since young people are more readily able to recall their behavioral problems. On the other hand, employment and a good educational background were associated with a somewhat increased risk of IED, which suggested that job-related stress among the educated classes might be one of the environmental triggers of impulsivity. These findings are consistent with those in South Africa (Fincham et al., 2009).

Regarding the comorbidity of mood and anxiety disorders with IED, such disorders were shown to be associated with an increased risk of a lifetime prevalence of IED, which was consistent with the previous studies (Kessler et al., 2006; Amara et al., 2007; Ortega et al.,

2008; Fincham et al., 2009). Specific phobia, which had younger age of onset than that for IED, might be a possible risk factor for the later onset of IED. On the other hand, IED seems a precursor of MDD and alcohol abuse.

The habitual use of tranquilizers, psychostimulants, and analgesics (except for medical treatment), has been statistically significantly associated with an increased risk of lifetime prevalence of IED. Those drugs are relatively common and easy to obtain. In general, patients with IED, after calming down, often regret their sudden explosive outbursts. Indeed, 52% of our subjects usually or invariably regretted their behavior after such outbursts, which might lead them to a depressive or anxious state. Therefore, they are apt to use such drugs as a natural element in the course of such stressful events. Because the habitual use of these drugs increases the risk of drug dependence, they may sometimes use the drugs for other than the primary medical purpose. On the other hand, no comorbid conditions were observed between drug abuse or dependence, and IED in our sample.

However, substance-related disorders have actually been reported as significantly associated with an increased prevalence of IED (Kessler et al., 2006; Ortega et al., 2008; Fincham et al., 2009). The above-mentioned commonly used drugs that are relatively easy to obtain are likely to be the causes of bad habits from recreational use to harmful dependence, even if the use of those drugs did not reach the diagnostic threshold for substance-related disorders.

The comorbidity of any mood or anxiety disorder may mediate these interactions between substance-use and IED. The present results have demonstrated that those disorders, especially extreme anxiety, were more frequently observed or more strongly associated with IED in women than in men. It has also been reported that the association between suicide and substance-related disorders is stronger in women (Yoshimasu et al., 2008). As mentioned above, these findings suggest that women with both IED and mood or anxiety disorders should be regarded as a particularly high-risk group for suicide. Consequently, special vigilance must be used to forestall suicide or suicidal attempts, especially because women tend to frequently use harmful substances as the means of taking their lives (Bostwick and Rundell, 1999).

Furthermore, the experience of alcohol-related problems as well as their possibility has been significantly associated with a lifetime prevalence of IED. Though subjects with lifetime IED in our sample did not present the symptoms of alcohol abuse or dependence at the time when an interview was conducted, these results indicate that patients with IED may actually be prone to cause serious accidents when drinking. Alcohol-related disorders have also been associated with depression or suicidal risks (Kõlves et al., 2006; Sher, 2008; Watts, 2008). Thus, the vicious interaction between drinking or substance abuse and impulsivity leading people to suicidal acts should itself be regarded as a serious suicidal risk. This hypothesis deserves close

attention, especially because subjects in the present study with lifetime IED have in fact showed an especially high prevalence of suicidal ideation. In this sense, IED patients with harmful drinking habits or substance abuse might well comprise a high-risk group for suicide. Indeed, another US epidemiological study suggested that patients having both IED and MDD or drug dependence should receive rigorous assessment for their self-aggression (McCloskey et al., 2008).

In summary, the present study showed that the prevalence of IED was relatively low in Japanese compared with Western populations, and that IED was associated with mood and anxiety disorders as well as suicidal ideation. In addition, common substance use and drinking-related problems were associated with an increase in the prevalence of IED. Considering the impulsivity caused by IED and its relation to suicidal ideation, those having IED as well as such mental and behavioral problems should be regarded as one of the highest suicide-risk groups, and must be given the benefit of an appropriate interventional approach specifically designed for suicide prevention.

Acknowledgements

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Mental health conditions in Korean atomic bomb survivors: a survey in Seoul

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More than 60 years have elapsed since the atomic bombings to Hiroshima and Nagasaki, and since all of the atomic bomb survivors have become old, the importance of caring their mental health has become increasing in Japan. Although approximately 70% of overseas atomic bomb are living in Korea, there have been quite few studies on their mental health. The objectives of the present study were to elucidate whether the mental health conditions of atomic bomb survivor in Korea are similar to those in Japan. The subjects were 181 Korean atomic bomb survivors living in Korea (cases) and 209 outpatients of a hospital in Seoul who were not exposed to atomic bombs (controls). Interviewers administered them at the hospital a questionnaire with Impact of Event Scale-Revised, General Health Questionnaire 12 (GHQ-12), Korean version of short form Geriatric Depression Scale and the K scale of the Minnesota Multiphasic Personality Inventory. Excluding subjects with incomplete responses we analyzed 162 cases and 189 controls. The proportion of subjects with high score of GHQ-12 (≥ 4) was significantly higher in cases (78/162 or 48.1%) than in controls (42/189 or 22.2%) ($p < 0.0001$, Fisher's exact test). The present results, though preliminary, indicate that atomic bomb survivors in Korea have also mental health problems similar to those observed in Japanese atomic bomb survivors, indicating the necessity of a larger study.
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Introduction

Two atomic bombs (A-bombs) were dropped on Hiroshima on 6 and on Nagasaki on 9 August 1945, respectively. The bombs instantaneously destroyed almost all areas of the respective cities, resulting in a total of 194,000 deaths by the end of 1945 and about 158,000 injured people. As of the end of March 2007, there were approximately 240,000 atomic bomb survivors in Japan. Hereafter, the atomic bomb survivor (A-bomb survivor) designates an individual who has officially been issued a so called A-bomb survivor's handbook. The A-bomb survivors are classified into 4 groups: Category 1-individuals exposed to the A-bombs in designated areas in Hiroshima or Nagasaki, who are called directly exposed; Category 2-individuals who had not been exposed to A-bombs but entered into the designated areas in either city

within 2 weeks after the bombing; Category 3-individuals who were engaged in rescue and burial; and Category 4-individuals who were in uteri of those in Categories 1-3.

In addition to these survivors, there are many so-called 'overseas atomic bomb survivors' who had been exposed to the A-bombs and immigrated to foreign countries or returned to their home country. As of the end of March 2007, there were approximately 4,300 overseas atomic bomb survivors. Of those survivors, about 2,930 were in the Republic of Korea (called hereafter Korean A-bomb survivors), 970 were in the United States, and 160 were in Brazil, so that 90% of overseas survivors were in these 3 countries.

As Japan is the unique country that has experienced atomic bombing, health effects of exposure to the A-bomb have been investigated extensively. The results of these studies have demonstrated that many survivors are still experiencing physical problems due to the effects of A-bomb radiation, 65 years after exposure. Known physical effects include an increased risk of leukemia and various other types of cancer, and many researches have been carried out to elucidate the role of radiation in developing these diseases.[1-3]

Studies on overseas A-bomb survivors include a mail survey of the health status of 1,256 Korean A-bomb survivors,[4] an investigation of the health status of 4,079 children of 1,115 Korean A-bomb survivors,[5] and studies comparing Korean A-bomb survivors and controls with respect to the physical conditions using blood tests and other data.[6-7] The study of Korean survivors' children[5] demonstrated a relatively high frequency of mental retardation (0.18%) and congenital bone disorders (0.18%) among them. Jhun et al[7] reported that blood pressure, white blood cell count, serum total cholesterol, and aspartate aminotransferase level were higher in Korean A-bomb survivors than in controls, while hemoglobin concentration, hematocrit, and red blood cell count were lower in the former than in the latter. Although the reports on physical illness in Korean A-bomb survivors are increasing, their number is still small compared to those on Japanese A-bomb survivors.

Though less compared to the study on physical conditions in Japanese A-bomb survivors, several researches have been carried out about their mental health conditions. The study by Okumura et al[8] is the first one regarding the psychological impact on A-bomb survivors: they randomly selected 3 months after the Nagasaki atomic bombing 50 patients among 192 A-bomb survivors having been hospitalized at Omura Naval Hospital, examined them, reviewed their medical history, and diagnosed 3 patients psychogentic disorder. Nishikawa et al[9] reported that they observed 533 neurosis cases among 7297 A-bomb survivors in Nagasaki who

underwent an extensive health examination and that the proportion of neurosis cases was higher by twofold or more in those with acute symptoms due to radiation exposure (9.7%) than in those without such symptoms (3.9%). Ohta et al[10] reported that psychological distress measured half a century after exposure to the A-bomb on the basis of the GHQ-30, 30-item version of the original General Health Questionnaire (GHQ) consisting of 60 items,[11] was greater in the A-bomb survivors than in the controls. A study by Honda et al[12] on the mental health of Nagasaki A-bomb survivors revealed that 8.4% of them scored 4 points or higher in GHQ-12 (12-item version of the original GHQ),[11] suggesting that A-bomb survivors had mental health problems. The analysis[13] of 35,035 responses to the mail survey which Nagasaki city administered to 49,867 A-bomb survivors in 2003 showed that 4,503 (28.2%) scored 25 points or higher on the Impact of Event Scale-Revised (IES-R).[14] Furthermore, Yamada et al[15] demonstrated that the proportion of A-bomb survivors showing anxiety disorder or somatoform disorder was significantly higher in those who had acute symptoms than in those who did not.

Since little is known about the mental health of overseas atomic bomb survivors, and since most of them living in areas other than Korean Peninsula are Japanese, we carried out the present study to elucidate the mental health conditions in Korean A-bomb survivors. The study was approved by the Nagasaki University School of Medicine Ethics Committee (08061978-2).

Subjects and Methods

Study subjects were Korean A-bomb survivors living in Seoul and outpatients of a hospital in Seoul not exposed to the A-bomb, who were included as controls.

Information on subjects was collected using anonymous self-administered questionnaire written in Korean with the help, if necessary, by Korean interviewers who were not healthcare professionals; however, they received, prior to commencement of the survey, one-day training enough to understand the content of the questionnaire. The questionnaire administered to controls included basic demographic items, e.g. gender and age, the GHQ-12,[14] the Korean version of short-form Geriatric Depression Scale (K-SGDS),[16] and the Minnesota Multiphasic Personality Inventory (MMPI),[17,18] while the questionnaire administered to Korean A-bomb survivors included furthermore the I-ESR,[18] the questions about circumstances due to the atomic bombing, e.g. injuries and deaths of family members, questions about the

experience of blast, heat and light from the bomb, and questions about official category as an A-bomb survivor.

The IES-R was used to assess the presence of posttraumatic stress disorder (PTSD) in A-bomb survivors. All items in the IES-R are scored on a 5-point scale (0, 1, 2, 3, 4) and the degree of PTSD is measured as the sum of all scores. The IES-R was assessed on the basis of the score distribution.

The GHQ-12 was used to assess the current mental health status. There are two methods for calculating the GHQ scores: the one method called the Likert scale method scores respective responses to each item by 4-point scale of (0, 1, 2, 3) and sums up all the scores to make up the total score, while the other method scores respective responses to each item by 4-point scale (0, 0, 1, 1) and sums up all the scores to make up the total score. The latter method was used in this study to calculate the GHQ score; the GHQ-12 score of 4 or higher was designated as a high GHQ-12 score, and those with a high GHQ-12 score are said to be more likely to have a non-psychotic mental illness.[11]

The K-SGDS, the respective items being scored on a 2-point scale, was used to measure depression status. The total of the scores of all items was used for assessment, and subjects with total score of 8 or more were classified into a group of high scorers showing a tendency towards depression.

The MMPI K-scale (MMPIK), the respective items being scored on a 2-point scale, was used to assess respondent's demeanor during interviews related to attitudes towards personal problems. The total of the scores of all items was used for assessment, and subjects with total score of 20 or more were classified into a group of high scorers.

The frequency of subjects with high score was compared between A-bomb survivors and controls for GHQ-12, K-SGDS and MMPIK on the basis of Fisher's exact test. Similar comparison was also made in A-bomb survivors between those exposed within 2.5 km from the hypocenter and those exposed at further place. The effects of radiation exposure, gender, age and MMPIK score on the frequency of high GHQ-12 score was assessed by logistic regression analysis. The necessary calculations were performed using PROC FREQ and PROC LOGISTIC of the SAS system® version 9.1. The results were called (statistically) significant if the p-value was less than 0.05.

Results

The questionnaire was administered to 181 individuals

(66%) among 274 people who received health consultations for Korean A-bomb survivors in Seoul between June 23 and July 5, 2008; they provided written consent to participate in the present study. Of 181 participants, 19 people were excluded because they cancelled participation in the course of interview or because their responses were incomplete. A total of 162 A-bomb survivors (86 men and 76 women) remained for the analysis. A slightly different questionnaire was administered to 225 controls who provided written consent to participate in the present study. After excluding 36 participants who cancelled participation in the course of interview, whose responses were incomplete or who required hospitalization in the course of interview189 controls (89 men and 100 women) remained. Thus a total of 351 people (175 men and 176 women) remained for the analysis.

The male-female ratio was 1.13 in A-bomb survivors and 0.89 in controls, and no statistically significant difference was observed in the male-female ratio between A-bomb survivors and controls ($p = 0.29$, Fisher's exact test). The ages of A-bomb survivors ranged from 62 to 88 years with quartiles of 65, 68, and 73 years, while those of controls ranged from 59 to 89 years with quartiles of 66, 71, and 76 years. Though a statistically significant difference was observed in the median of age distribution between the two groups ($p = 0.0039$, Wilcoxon rank-sum test), the difference was rather small.

Among 162 A-bomb survivors, 148 (91.4%) were of Category 1, 3 (1.8%) were of Category 2, 7 (4.3%) were of Category 4, and categories in 4 (2.5%) were unknown. Regarding the A-bomb survivors' health conditions before the bombing, 118 (72.8%) responded good, 17 (10.5%) responded fair, 2 (1.2%) responded not good, and 25 (15.4%) responded nothing. Twenty-five A-bomb survivors (15.4%) had been treated after the bombing, while 129 (79.6%) did not, and 8 (4.9%) responded nothing. Approximately half of the A-bomb survivors (80 or 49.4%) lost their family members or relatives. Among 160 A-bomb survivors who responded to the questions about flash, blast and heat, 8 (5.0%) responded that they had not feel any of them, 42 (26.3%) responded that they had felt all, 63 (39.4%) responded that they remember any of them, 21 (13.1%) and 24 (15.0%) responded that they felt one and two, respectively, 2 (1.2%) responded that although they felt flash, they didn't remember other two.

The mean (standard deviation, SD) of IES-R score in A-bomb survivor was 19.9 (14.3), and the proportion of those with score of 25 or higher was 30.25%.

The proportion of subjects with high GHQ-12 score was

larger in A-bomb survivors (48.1% or 78/162) than in controls (22.2% or 42/189); the difference was statistically significant ($p < 0.0001$, Fisher's exact test) (Table 1). The mean (SD) of GHQ-12 score calculated by Likert scale method was 14.4 (6.4) in A-bomb survivors and 10.7 (4.3) in controls, respectively.

Table 1. Comparison of the A-bomb survivors and controls regarding the frequency of subjects with high scorers in the GHQ-12, K-SGDS, and MMPIK scales

| Scale | Score | Group | | P-value |
		A-bomb survivors (n = 162)	Controls (n = 189)	
GHQ-12	≥ 4	78 (48.1%)	42 (22.2%)	< 0.0001
K-SGDS	≥ 8	56 (34.6%)	56 (29.6%)	0.3586
MMPIK	≥ 20	39 (24.1%)	24 (12.7%)	0.0077

GHQ-12: General Health Questionnaire (GHQ) is a self-administered screening instrument developed by Goldberg[11] to detect psychiatric disorders in community settings and non-psychiatric clinical settings such as primary care or general practice. The full version consists of 60 items. In the present study, we used a quick, reliable and short form consisting of 12 items named GHQ-12.
K-SGDS: The Korean version of SGDS, which is a short form of self-evaluating scale GDS (Geriatric Depression Scale) designed specifically to identify depression in the elderly. Although the full version of GDS consists of 30 items, the number of items in SGDS is decreased to 15 for not fatiguing elderly testee.
MMPIK: Abbreviation of The Minnesota Multiphasic Personality Inventory (MMPI) K scale. MMPI was developed in the late 1930's by psychologist S.R. Hathaway and psychiatrist J.C. McKinley at the University of Minnesota. The K scale of the MMPI was an attempt to assess more subtle distortion of response, particularly clinically defensive response.

The proportion of subjects with high K-SGDS score was larger in A-bomb survivors (34.6% or 56/162) than in controls (29.6% or 56/189); the difference, however, was not statistically significant ($p = 0.3586$, Fisher's exact test) (Table 1). The mean (SD) of K-SGDS score was 5.8 (4.5) in A-bomb survivors and 5.0 (4.2) in controls, respectively.

The proportion of subjects with high MMPIK score was larger in A-bomb survivors (24.1% or 39/162) than in controls (12.7% or 24/189); the difference was statistically significant ($p < 0.0077$, Fisher's exact test) (Table 1).

Table 2 presents the results of the logistic regression analysis regarding the frequency of subjects with high GHQ-12 score; we see from this Table, for example, that the odds of the frequency of subjects with high GHQ-12 score in A-bomb survivors will be about 3.3 times higher than those in controls after adjustment for gender, age and MMPI K scale score.

Table 3 summarizes the comparison of 69 A-bomb survivors

Table 2. The results of the logistic regression analysis regarding the frequency of subjects with high GHQ-12 score

Factor	Comparison	Estimated odds ratio (95% CI)
Exposure to A-bombing	Yes vs No	3.3 (2.09-5.50)
Gender	Female vs Male	1.8 (1.14-2.97)
Age	≥ 70 years vs < 70 years	1.2 (0.78-2.03)
MMPI K scale score	≥ 20 vs < 20	1.8 (1.04-3.35)

Table 3. Comparison of the A-bomb survivors exposed within 2.5 km from the hypocenter and those exposed at 2.5 km or further from the hypocenter regarding the frequency of subjects with high scorers in the IES-R, GHQ-12, K-SGDS, and MMPIK scales

| Scale | Score | Distance of the exposed place from the hypocenter | | P-value |
		< 2.5 km (n = 69)	≥ 2.5 km (n = 58)	
IES-R	≥ 24	24 (34.8%)	25 (43.1%)	0.8523
GHQ-12	≥ 4	34 (49.3%)	25 (43.1%)	0.5924
K-SGDS	≥ 8	21 (30.4%)	21 (36.2%)	0.5711
MMPIK	≥ 20	14 (20.3%)	16 (27.6%)	0.4032

IES-R: Abbreviation of The Impact of Event Scale-Revised developed by Weiss and his colleagues, which is a self-administered 22-item questionnaire based on three clusters of symptoms identified in the Diagnostic and Statistical Mannual of Mental Disorders, third edition (DSM-III), as indicators of posttraumatic stress disorder (PTSD).
See the footnote of Table 1 for other scales.

directly exposed within 2.5 km from the hypocenter and 58 those directly exposed at 2.5 km or further from the hypocenter with respect to the frequency of subjects with high IES-R, GHQ-12, K-SGDS, and MMPIK scorers. No statistically significant difference was indicated between the two groups of A-bomb survivors regarding these three scales. No adjustment for circumstances in A-bomb survivors was made because they correlate with the distance of the exposed place from the hypocenter.

Discussion

In the present study carried out in 2008, over 60 years after the atomic bombings, 30.25% of Korean A-bomb survivors scored 25 or more in IES-R with the mean (SD) of 19.9 (14.3).

The following results have been reported for studies related to PTSD in Koreans using the IES-R. In a survey on Koreans conducted by Yoon et al[19], the mean (SD) of IES-R score among 65 individuals diagnosed with PTSD was 40.6 (16.9).

Studies by Bahk et al[20] and Kim et al[21] reported the mean (SD) of IES-R score as 53.1 (13.0), and 49.8 (11.9), respectively, for individuals diagnosed with PTSD. These studies are subject to people got the PTSD was evaluated immediately after exposure to stress reactions (1 month). The IES-R levels of the precedent studies were higher than that of our study. We guess the reason as follows: the subjects of survey being patients given a diagnosis of PTSD, and the evaluation time was one month later exposed to severe stress in the precedent studies.

IES-R questionnaires given to survivors of the Nagasaki atomic bombing[12] showed that 28.2% were high scorers (25 points or higher). This study results, though preliminary, indicate that A-bomb survivors in Korea have also mental health problems similar to those observed in Japanese A-bomb survivors,

The study by Honda et al[12] reported that 8.4% of Nagasaki survivors were in the GHQ high scoring group (4 points or higher). In the present study, 48.1% of Korean survivors were in the GHQ-12 high scoring group (4 points or higher). These percentages are higher than those of Japanese survivors, suggesting that Korean survivors have some mental health problems.

Surveys conducted in Korea related to the GHQ-12 scale revealed the mean (SD) of GHQ-12 score calculated by Likert scale method as 17.7 (5.5) in subjects who showed a tendency towards depression.[22] A Korean study conducted by Han et al[23] on patients with depression or anxiety disorder who were receiving primary care reported mean GHQ-12 scores calculated by Likert scale method of 13.8 for those with depression and 15.3 for those with panic disorder. In the present study, the mean (SD) of GHQ-12 score calculated by Likert scale method in Korean survivors was 14.1 (6.0), which is roughly equal to the score in the above study. This study results were similar to the group that any psychiatric problems.

When we calculated odds ratios to test the influence of various factors on GHQ-12 score, we found that gender and age had little effect on the rise of GHQ-12 scores, but the effect from presence/absence of A-bomb exposure was large. As a result, it was suggested that a being bombed experience adversely affected the mental health of the A-bomb survivors.

Research conducted by Bae et al[24] on K-SGDS of older Korean psychiatric outpatients revealed the mean (SD) of the score as 10.82 (3.00) in those with major depression and 5.71 for those without depression. The mean (SD) of K-SGDS score found in this study was 5.8 (4.5). However, in other study,[25] the mean (SD) of K-SGDS score in patients with early dementia was 5.5 (4.0). Therefore, it

cannot be said that a mean of K-SGDS in results of this study is low unconditionally. The percentage of high scorers in the K-SGDS questionnaire with scores of 8 points or higher was 34.6% (56 people) for survivors. From the above, the percentage of depression among Korean A-bomb survivors was high.

In the MMPI K scale as well, the percentage of high scorers in the MMPI K questionnaire with scores of 20 points or higher was 34.1% (39 people) for survivors of Korean survivors were high scorers. High MMPI K scorers are said to be defensive towards the investigation, while low scorers are said to be frank and self-critical.[16,17] The fact that scores for this scale were high in Korean survivors suggests that they may be leading their lives without being aware of their own psychological confusion.

When we tested the difference between those within or outside of a 2.5 km perimeter from the hypocenter during exposure, we did not find any significant differences in any items of the GHQ-12, K-SGDS, or MMPI scales, suggesting that distance from the hypocenter did not affect psychiatric health. Other studies related to the mental health of survivors[10,13,15] have reveal the influence of distance from the hypocenter on psychiatric health of survivors. In those studies, survivors who were within 2.0 km of the hypocenter when exposed to the A-bomb presented with acute symptoms due to radiation from exposure. Following exposure, they felt anxiety regarding their own health, as well as anxiety from such experiences as deaths in their family and destruction of their home. Such anxiety is considered to be a factor that leads to poorer mental health. 51.2% of subjects of this study were 5 years old or younger at the time of A-bomb exposure. Therefore, memory at being bombed is vague, and the possibility that affected the anxiety about the being bombed is inferred. We think that more detailed examination will be necessary about the association between being bombed distance and mental health.

The present study has several limitations, including the probable biases stemming from that the Korean A-bomb survivors participated in the study were only those who participated in consultation program, and the smallness in the sample size. Addressing these issues in further research is important for increasing our understanding of psychiatric health problems in Korean survivors.

The above-mentioned results, in the present that passed from atom bomb being bombed more than 60 years, it was found that the A-bomb survivors residing in Korea had a problem in mental health associated with a being bombed experience.

Conclusion

This study is the first to focus on psychiatric health problems in Korean A-bomb survivors. The results demonstrated the poor psychiatric health of Korean survivors, and suggested that atomic bomb exposure may be a major causal factor. Further studies are needed to provide detailed examinations of mental health problems among Korean survivors.

Acknowledgments

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