Psychiatry Research 219 (2014) 518–524

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Rapid spread of suicide by charcoal burning from 2007 to 2011 in Korea

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ARTICLE INFO

Article history:
Received 16 October 2013
Received in revised form
19 June 2014
Accepted 22 June 2014
Available online 28 June 2014

Keywords:
Charcoal burning
Carbon monoxide poisoning
Suicide
Media
Risk factor
Trend
Korea

ABSTRACT

Despite rapid increase of suicide by charcoal burning within 5 years, little is known about the characteristics of charcoal burning suicide in Korea. This study aimed to examine the trends and risk factors in the spread of suicide using this method. We identified an association between media reporting of suicide by charcoal burning and its incidence. Data on suicide from 2007 to 2011 were obtained from the Korean National Statistical Office. Cross-correlation analysis was used. Increasing incidence of suicide by charcoal burning was correlated with higher education levels, male sex, and the latter half of the year. Victims of charcoal burning suicide were more likely to be young, male, single, highly educated, professional, urban-based, and to die between October and December. Internet reports of suicide via charcoal burning tended to precede the increased incidence of suicide using this method, but only during the early period of the suicide epidemic. Our findings suggest that one episode of heavy media coverage of a novel method, such as charcoal burning, is sufficient to increase the prevalence of suicide by that method even after media coverage decreases. These findings are expected to contribute to the prevention of increasing rates of suicide by charcoal burning.

1. Introduction

During the past 50 years, suicide rates have increased 60% worldwide (World Health Organization, 2006). Every year, almost one million people in the world die by suicide, which roughly corresponds to one death every 40 s (World Health Organization, 2012). In 1998, suicide accounted for 1.8% of the total disease burden, and this is estimated to increase to 2.4% by 2020 (Bertolote and Fleischmann, 2009). The suicide rate in Korea is the highest among members of the Organization for Economic Cooperation and Development (OECD) (Kim and Yoon, 2013). In 2011, the suicide rate in Korea was 31.7 per 100,000 people, which is 2.6 times greater than the OECD average and represents a two-fold increase during the last decade (Korean National Statistical Office, 2012). Suicide is the fourth leading cause of death following cancer, stroke, and cardiovascular disease in Korea (Korean National Statistical Office, 2012). Therefore, it is considered one of the most serious and urgent public health and social issues in our country (Jeon et al., 2010).

While hanging and jumping from heights have traditionally been prevalent methods of suicide (Huh et al., 2009), suicide by charcoal burning is currently one of the most common methods of suicide in Asian countries and accounts for approximately 20% of all suicides in Hong Kong and Taiwan (Chan et al., 2005; Tsai et al., 2011; Wu et al., 2012; Kato et al., 2013). The charcoal burning method is typically conducted by burning charcoal or briquettes in a sealed space such as in a vehicle or indoors, resulting in carbon monoxide (CO) intoxication (Breindl and Pollak, 1989; Nordentoft, 2007; Pan et al., 2010). This method tends to be recognized as an easy, effective, and comfortable means of suicide (Huh et al., 2009). Therefore, among all of the methods of suicide, burning charcoal has become a serious problem (Lin and Lu, 2008). In addition, suicide by burning charcoal has sharply emerged as a new suicide method in Korea. The number of charcoal burning suicides among Koreans increased 14 times in 2011 compared with 2007, and accounted for 8% of all suicide deaths. However, in spite of dramatic increases in suicide by charcoal burning, little is known about the characteristics of charcoal burning suicides in Korea.

Prior studies suggest that media reports of suicide have a high association with suicide deaths (Yip et al., 2010; Chen et al., 2013; Yang et al., 2013). After suicide by charcoal burning was widely publicized by the media in Hong Kong for the first time in November 1998, it was not long until charcoal burning became the third most common method of suicide in Hong Kong (Leung et al., 2002; Chan et al., 2005). In Korea, prior to 2008, charcoal burning was a lesser-known method of suicide. However, when a celebrity in Korea committed suicide by burning ignition coal in an enclosed car in 2008, the charcoal burning method was vividly reported by the media and then became widely used with

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http://dx.doi.org/10.1016/j.psychres.2014.06.037
0165-1781/

increasing frequency. It thus appears that the charcoal burning method is influenced by mass media. Nevertheless, no prior research has examined the relationship of mass media attention to the incidence of suicide by charcoal burning in Korea.

In our current study, specific trends for the increasing use of the charcoal burning as a method of suicide were examined by analyzing the socio-demographic characteristics of suicides in Korea. Moreover, we investigated distinct risk factors of charcoal burning suicide by comparing the socio-demographic characteristics between charcoal burning suicides and other methods of suicide. In addition, we explored whether the increase of media reporting was associated with a subsequent rise in suicide by charcoal burning.

2. Methods

The data analyzed in this study on victims who have committed suicide during 2007–2011 were obtained from the Korean National Statistical Office. For the purposes of this study, the International Classification of Disease version 10 (ICD-10) codes X60–X84 (intentional self-harm) were used to define suicide deaths. Data on suicide methods were obtained from the World Health Organization (WHO) mortality database. Suicide methods were classified into two categories according to the ICD-10 codes: charcoal burning (X67) and other methods (X60–66, X68–84). The other methods included hanging, drowning, jumping from a high place, poisoning using medications, pesticides and others. A total of 71,720 suicide cases were reported during the overall study period. All of the recorded suicides included information on the age, sex, occupation, marital status, residence of the victims, and the date of death.

Posts on internet community services, internet news articles, and search data from internet search engines were analyzed. Through "Naver,", one of the leading social media analysis and consulting firms in Korea, we counted the number of articles and posts written during 2007–2011 that included Korean words "yuntan" (which means briquette) or "Bungaetan" (which means ignition coal), and "Jasal" (which means suicide). In addition, the number of searches for "yuntan" or "bungaetan", and "jasal" were collected during the same period. All media information was analyzed on a weekly basis, and media data of 261 weeks was used. Moreover, suicide data using the charcoal burning method were analyzed on a weekly basis to match with the media data.

We presented socio-demographic characteristics of people who committed suicide by charcoal burning as the mean and standard deviation for continuous variables, and as numbers or percentages for categorical variables. A chi-square test for trends was performed to investigate the existence of a particular trend in the spread of suicide by charcoal burning. Chi-square and *t* tests were used to confirm the distinct risk factors of the method. Finally, cross-correlation analysis was performed to investigate the correlation between exposure to information in the media and charcoal burning suicide. All statistical analyses were performed using the SPSS software (version 18.0; SPSS Inc., Chicago, IL), with statistical significance defined at alpha level = 0.05.

3. Results

We identified 3101 victims who had committed suicide using the charcoal burning method from 2007 to 2011 in Korea. The socio-demographic characteristics of victims of charcoal-burning suicides from 2007 to 2011 are presented in Table 1. Suicide by charcoal burning increased rapidly, from 87 victims in 2007 to 1254 victims in 2011. The average age at death did not differ

Table 1
Socio-demographic characteristics of Korean victims of charcoal burning suicides from 2007–2011.

	2007 (*N*=87)	2008 (*N*=293)	2009 (*N*=766)	2010 (*N*=701)	2011 (*N*=1254)	*r*	*p*
Age (S.D.)	42.0 (14.5)	38.7 (13.6)	40.3 (12.9)	39.8 (12.1)	40.2 (12.4)	0.016	0.376
Under 20	2 (2.3)	9 (3.1)	15 (2.0)	10 (1.4)	21 (1.7)		
20–30	15 (17.2)	78 (26.6)	150 (19.6)	144 (20.5)	238 (19.0)		
30–40	24 (27.6)	90 (30.7)	247 (32.2)	215 (30.7)	422 (33.7)		
40–50	27 (31.0)	60 (20.5)	175 (22.8)	189 (27.0)	297 (23.7)		
50–60	10 (11.5)	26 (8.9)	102 (13.3)	95 (13.6)	180 (14.4)		
Over 60	9 (10.3)	30 (10.2)	77 (10.1)	48 (6.8)	96 (7.7)		
Sex, *n* (%)							0.014*
Male, *n* (%)	67 (77.0)	228 (77.8)	629 (82.1)	589 (83.7)	1048 (83.6)		
Female, *n* (%)	20 (23.0)	65 (22.2)	137 (17.9)	114 (16.3)	206 (16.4)		
Marital status, *n* (%)							0.227
Single	34 (40.0)	135 (46.1)	334 (43.8)	308 (44.1)	576 (46.0)		
Married	31 (36.5)	95 (32.4)	253 (33.2)	252 (36.1)	418 (33.4)		
Widowed & divorced	20 (23.5)	63 (21.5)	176 (23.1)	138 (19.8)	257 (20.5)		
Education, *n* (%)						−0.060	0.001**
Under 6	9 (10.7)	33 (11.4)	84 (11.2)	82 (11.9)	115 (9.3)		
6–9	14 (16.7)	44 (15.2)	110 (14.7)	92 (13.4)	140 (11.3)		
9–12	40 (47.6)	119 (41.0)	345 (46.0)	322 (46.7)	565 (45.6)		
Over 12	21 (25.0)	94 (32.4)	211 (28.1)	193 (28.0)	420 (33.9)		
Occupation, *n* (%)							0.205
Professional & office work	17 (22.1)	55 (19.8)	161 (21.9)	126 (18.9)	275 (23.1)		
Service	13 (14.9)	22 (7.5)	102 (13.3)	110 (15.7)	152 (12.1)		
Agriculture & forestry	1 (1.1)	6 (2.0)	14 (1.8)	12 (1.7)	25 (2.0)		
Technical post & labor	3 (3.9)	30 (10.8)	67 (9.1)	86 (12.9)	97 (8.2)		
Student & house work & unemployed	43 (55.8)	165 (59.4)	390 (53.1)	333 (49.9)	639 (53.8).		
Residence, *n* (%)							0.205
Metropolis	35 (42.2)	138 (47.3)	329 (43.0)	295 (42.5)	511 (41.0)		
Urban area	38 (45.8)	135 (46.2)	356 (46.5)	331 (47.7)	618 (49.0)		
Rural area	10 (12.0)	19 (6.5)	80 (10.5)	68 (9.8)	116 (9.3)		
Quarter of a year, *n* (%)						−0.049	0.007**
Jan.–Mar.	26 (29.9)	29 (9.9)	187 (24.4)	165 (23.5)	260 (20.7)		
Apr.–Jun.	28 (32.2)	29 (9.9)	238 (31.1)	207 (29.5)	336 (26.8)		
Jul.–Sep.	11 (12.6)	52 (17.7)	150 (19.6)	145 (20.7)	293 (23.4)		
Oct.–Dec.	22 (25.3)	183 (62.5)	191 (24.6)	184 (26.2)	365 (29.1)		

* $p < 0.05$.
** $p < 0.01$.