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Short communication

Suicide by gassing in Hong Kong 2005–2013: Emerging trends and characteristics of suicide by helium inhalation

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ABSTRACT

Background: Increased use of lethal suicide methods can have a profound impact on overall suicide incidence; the epidemic of suicide by barbecue charcoal gas poisoning in some East Asian countries is a recent example. There have been concerns about recent rises in suicide using gases in some Western countries.
Methods: We investigated suicide by gassing in Hong Kong (2005–2013) using Coroner's files data. The characteristics were compared between suicide by helium inhalation, charcoal gas poisoning, and other methods.
Results: About one sixth (1407/8445, 16.7%) of all suicides used gases. Charcoal-burning suicides constituted the majority (97.5%) of them but showed a reduction over the 9-year period (−33%). Helium suicide was not recorded in 2005–2010 but increased from one in 2011 to three in 2012 and 11 in 2013, accounting for 1.2% of all suicides in 2013. Similar to the profile of charcoal-burning suicides, helium suicides were younger and more likely to have debt problem and less likely to receive psychiatric treatment than other suicides. Internet involvement related to the method was found in one third of cases of helium suicide.
Limitations: The small number of helium suicides ($n=15$) limits the power to examine their characteristics.
Conclusion: Suicide by charcoal burning showed a downward trend whilst there was an alarming increase in helium suicide in Hong Kong. Public health measures to prevent an epidemic of helium suicide similar to that of charcoal-burning suicide may include close monitoring of trend, responsible media reporting, and restricting online information about and access to this method.

1. Introduction

Increased use of high-lethality suicide methods can have a profound impact on the overall incidence of suicide (Yip et al., 2012). For example, the rise in suicide from carbon monoxide poisoning using barbecue charcoal gas has been found to contribute to an increase in overall suicide rate in Taiwan and Hong Kong in the early 2000s (Chang et al., 2014). It is thus important to closely monitor emerging suicide methods that are easily accessible, highly lethal, and acceptable or even appealing to vulnerable individuals as there is a potential that a rise in their use may increase overall suicide rates (Gunnell, 2015).

Previous studies of individuals who killed themselves using the charcoal burning method in Hong Kong and Taiwan showed distinct characteristics compared to suicides by other methods – they were more likely to be male, economically active and have debt or financial problems, and were less likely to have pre-existing mental illness or contact with psychiatric services (Chan et al., 2005; Chen et al., 2009; Pan et al., 2010). These features suggest that the method may have attracted a new group of vulnerable individuals who are different from those who used other conventional methods; they might not have died from suicide if the method were unknown or unavailable to them (Yip and Lee, 2007). However, it is unknown whether individuals who used other novel gases for suicide would show similar characteristics to those using the charcoal burning method.

There have been recent concerns about the increased use of helium gassing as a method of suicide in some Western countries such as England and Wales (Gunnell et al., 2015) and some regions

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in the US (Cantrell and Lucas, 2014; Hassamal et al., 2015). On September 9, 2012, the Hong Kong media, including all of the four major local newspapers, extensively covered a suicide by a young man using helium inhalation and some newspapers claimed it was the first time the method was used for suicide in Hong Kong (e.g. The Sun, 2012). The newspaper articles showed the photos of this young man and helium canisters, and described how and where the helium could be purchased locally. Furthermore, one newspaper produced an animation to illustrate the process of the suicide and published it on its official website. Within ten days, this incident was followed by another suicide using the same method by an individual of the same sex and age as the index case, raising the concern for a copycat effect and further local spread of the method.

The aims of this study were to investigate trends in suicide using different types of gases in Hong Kong, to examine the characteristics of individuals using helium gas compared to those using the already locally popular charcoal burning method, and to identify factors that may influence the choice of helium for suicide and access to helium.

2. Methods

We extracted data from the Coroner's files for suicides that occurred in Hong Kong in 2005–2013. Files for all suicides coded using the International Classification of Diseases, Tenth-revision (ICD-10) codes X60-X84 were obtained. A range of socio-demographic and psychiatric/medical history variables were derived from extracted data (Table 1). Suicides by gassing, i.e. suicides that involved gas inhalation, were identified by screening all suicides coded using the following ICD-10 codes: X66 (self-poisoning by organic solvents and halogenated hydrocarbons and their vapours), X67 (self-poisoning by other gases and vapours), and X70 (hanging, strangulation and suffocation). These codes would cover all gassing suicides where the cause of death was determined as either the toxic effect of gases (X66 and X67) or asphyxiation due to oxygen deprivation (X70). Information on the exact gases used for suicide was extracted by carefully reviewing the reports from the witness, police investigation, and autopsy and toxicology examination. Detailed information regarding the circumstance of death and any evidence of online searching for the gas before death was also extracted for suicides by helium inhalation.

We calculated the number and percent of suicide using the gassing method by the gas used and calendar year in Hong Kong in 2005–2013. The characteristics of suicides were compared between those using a relatively novel gas (helium), a locally commonly used gas (barbecue charcoal gas), and all other suicides using analysis of variance (ANOVA) for continuous variables (e.g. age) and chi-square or Fisher's exact test for categorical variables (e.g. sex). Multinomial logistic regression models were also used to compare helium suicides/charcoal-burning suicides with other suicides (other suicides as the reference group) and helium suicides with charcoal-burning suicides (charcoal-burning suicides as the reference group); multinomial logistic regression is statistically more efficient than a set of separate binary logistic regression models (Agresti, 2002). All analyses were conducted using IBM SPSS Statistics Version 20.

3. Results

There were 8445 suicides aged 10 years or above in Hong Kong over the 9-year period (2005–2013). Among them 1407 (16.7%) used gases, and seven types/sources of gases were identified, with the majority using carbon monoxide from barbecue charcoal gas (97.5%), followed by helium (1.1%), domestic coal gas (0.6%), car exhaust gas (0.4%), butane (0.1%), petroleum (0.1%), and nitrogen (0.1%).

The number of suicides by gassing decreased around 28% from 213 in 2005 to 153 in 2013, whilst there was no obvious trend in non-gassing suicide (Table 1). The decline in gassing suicide over the study period reflected the decrease in charcoal-burning suicides, which decreased from 212 cases in 2005 to 142 cases in 2013 (a 33% reduction). The number of non-charcoal-burning gassing suicides was small, mostly below three a year, and showed no obvious trends except helium suicide, which was not recorded in 2005-2010 until one case was reported in 2011, followed by three in 2012 and 11 in 2013, accounting for 1.2% of all suicides in 2013.

The characteristics of the 15 helium suicides were compared with those of charcoal-burning suicides ($n=1372$) and all other suicides ($n=7194$) (Table 2). Overall, helium suicides were more similar to charcoal-burning suicides than those using other methods. The mean age of helium suicides (33 years; range 22–49) was 9 and 20 years younger than charcoal-burning suicides (42 years) and other suicides (53 years) respectively. The proportions of males were higher for helium suicide and charcoal-burning suicide than other suicides, and the two groups of gassing suicides were less likely to be married. Helium suicides appeared to be more likely to be unemployed and have debt problems than the other two groups. Helium suicides and charcoal-burning suicides were less likely to receive psychiatric treatment in the past or around the time of death or have medical conditions than other suicides.

Multinomial logistic regression analysis adjusting for age and/or sex showed that the statistical evidence for a difference

Table 1
Time trend in suicide by gassing in Hong Kong, 2005–2013.

	2005		2006		2007		2008		2009		2010		2011		2012		2013		**2005–2013**	
Method	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	***n***	**(%)**
Suicides by gassing	213	(21.7)	168	(18.0)	143	(15.8)	168	(17.2)	178	(18.1)	134	(14.0)	129	(14.9)	121	(13.4)	153	(16.4)	**1407**	**(16.66)**
Helium	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(0.1)	3	(0.3)	11	(1.2)	**15**	**(0.18)**
Butane	0	(0.0)	1	(0.1)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(0.1)	0	(0.0)	0	(0.0)	**2**	**(0.02)**
Petroleum	1	(0.1)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(0.1)	0	(0.0)	0	(0.0)	**2**	**(0.02)**
Nitrogen	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	2	(0.2)	0	(0.0)	0	(0.0)	**2**	**(0.02)**
Charcoal gas	212	(21.6)	165	(17.7)	142	(15.7)	168	(17.2)	174	(17.7)	132	(13.8)	123	(14.2)	114	(12.6)	142	(15.2)	**1372**	**(16.25)**
Car exhaust gas	0	(0.0)	0	(0.0)	1	(0.1)	0	(0.0)	1	(0.1)	0	(0.0)	1	(0.1)	3	(0.3)	0	(0.0)	**6**	**(0.07)**
Domestic gas	0	(0.0)	2	(0.2)	0	(0.0)	0	(0.0)	3	(0.3)	2	(0.2)	0	(0.0)	1	(0.1)	0	(0.0)	**8**	**(0.09)**
Non-gassing suicide	766	(77.9)	760	(81.5)	758	(83.8)	808	(82.7)	799	(81.2)	821	(85.6)	727	(84.0)	781	(86.3)	772	(82.7)	**6992**	**(82.79)**
Overall	**983**	**(100.0)**	**933**	**(100.0)**	**905**	**(100.0)**	**977**	**(100.0)**	**984**	**(100.0)**	**959**	**(100.0)**	**865**	**(100.0)**	**905**	**(100.0)**	**934**	**(100.0)**	**8445**	**(100.0)**