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Gender differences among homicide offenders with schizophrenia in Hunan Province, China

Jun Wang^{a,b,#}, Si-mei Zhang^{a,c,#}, Shao-ling Zhong^a, Graham Mellsop^d, Hui-juan Guo^a,
Qi-guang Li^a, Jian-song Zhou^a, Xiao-ping Wang^{a,*}

^a Mental Health Institute of the Second Xiangya Hospital, Central South University, National Clinical Research Center on Mental Disorders & National Technology Institute on Mental Disorders, Hunan Key Laboratory of Psychiatry and Mental Health, 139 Middle Renmin Road, Changsha, Hunan 410011, China

^b Department of Psychiatry, The Affiliated Wuxi Mental Health Center of Nanjing Medical University, Wuxi, Jiangsu 214151, China

^c Shenzhen Institute of Mental Health, Shenzhen Kangning Hospital, Shenzhen 518003, China

^d Waikato Clinical Campus, University of Auckland, New Zealand

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ABSTRACT

This study aimed to understand the demographic, clinical and criminological characteristics of Chinese homicide offenders with schizophrenia from a gender-based perspective. Information on all homicide offenders with schizophrenia who received forensic psychiatric assessment between 2010 and 2016 in Hunan Province, China, was systematically retrieved ($n = 669$). Gender differences in the above characteristics were analyzed, and independent correlates of homicide were explored. The male to female ratio of homicide offenders was about 4:1. Proportionally more males were single, unemployed and younger when committing their first crime than was apparent in females. Male perpetrators were more often influenced by delusions. Females were more likely to target their close family members. For males, living in rural areas and having a family history of mental disorder were positively associated with homicide, while having a criminal history and being unemployed were negatively associated. For females, younger age was positively, while being unmarried and unemployment were negatively associated with homicide. Our results indicate significant gender differences among Chinese homicide offenders with schizophrenia in demographic, clinical and criminological characteristics and in independent correlates of homicide. Further research in this field, especially aims at determining risk factors for crime in this population, should take the gender differences into account.

1. Introduction

There is a well documented gender difference in criminal behavior across ethnicities and countries: men are more violent than women (Steffensmeier and Allan, 1996; Krakowski and Czobor, 2004). The United States Department of Justice collected data on homicides from 1980 to 2008, and found that males accounted for 89% (Cooper and Smith, 2011). In a national study in England and Wales, males accounted for 90% of the total number of homicide perpetrators (Shaw et al., 2006). Interestingly, the gender gap in violence would substantially narrows in individuals with mental disorders (Stueve and Link, 1998; Krakowski and Czobor, 2004). Existing evidence suggests that the effect of severe mental disorders like schizophrenia (SCZ) on the risk of crime is much stronger for women than for men (Schanda et al., 2004; Fleischman et al., 2014).

SCZ, a mental disorder that mainly characterized by hallucinations, delusions, impaired cognition and abnormal behaviors (van Os and Kapur, 2009), has been frequently reported as associated with increased risk of violent offences, particularly homicide (Fazel et al., 2009a, 2009b; Fleischman et al., 2014). In most populations studied the lifetime prevalence of SCZ is approximately 1% (McGrath et al., 2008), however, it has been claimed that more than 6% of total homicides are committed by people with SCZ (Large et al., 2009). A German cohort was reported to demonstrate a 16-fold increased risk of committing homicide by people suffering from SCZ (Erb et al., 2001). However, previous studies have primarily focused on males, or have combined the sexes when analyzing (Fazel et al., 2009c,a,b; Bo et al., 2011; Witt et al., 2013; Fleischman et al., 2014). Gender differences among offenders with SCZ have not been studied in depth. In addition, existing reports were mainly from western countries (Fazel et al., 2009c,b; Fleischman

* Corresponding author.

E-mail address: xiaop6@csu.edu.cn (X.-p. Wang).

These authors contributed equally to this work.

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et al., 2014).

China is a populous developing eastern country with a large number of patients with SCZ (Phillips et al., 2009). Socioeconomic and cultural backgrounds, which could play a role in the gender gap in criminology, are different in China from those in western countries (Messner, 1988; Abel et al., 2010). Of particular note is that the prevalence of drug abuse in China is much lower than in many other countries (Hao et al., 2002), while elevated risk of violence in SCZ might be mediated by comorbid substance abuse to a large extent (Fazel et al., 2009a,b). Therefore, it is of necessity to understand the gender differences among offenders with SCZ in China by studying a Chinese sample rather than generalizing results yielded from other countries.

In this paper, we focused on homicide offenders with SCZ, since homicide is the most serious and heinous manifestation of violence. We hypothesized that there would be some gender differences in demographic, clinical and criminological characteristics; more importantly, independent correlates of homicide might be different for male and female Chinese offenders suffering from SCZ.

2. Methods

2.1. Study site and subjects

This was a retrospective cross-sectional study carried out in Hunan Province, China. Hunan is a middle-economic-level province located in central China. The Gross Domestic Product of Hunan ranks around the 10th out of the 32 provinces, municipalities and autonomous regions of China. According to data released by the National Bureau of Statistics of the People's Republic of China (<http://www.stats.gov.cn/>), the total population of Hunan Province was around 65.7 million in 2010.

To ensure pre-existing SCZ prior to the crime rather than developing SCZ after committing offence, we carried out the present study in a forensic sample. Article 18 of the *Chinese Criminal Code* stipulates that a mentally ill person who commits offence when he/ she is unable to recognize or control his/ her own conduct shall not bear criminal responsibility (Wang et al., 2006). Accordingly, an offender suspected of having a significant mental disorder is mandated to receive a forensic psychiatric assessment so as to ascertain his/ her mental status when committing the offence, and if abnormal, to determine its influence on his/ her criminal act. In China, only the public security units are qualified to start such an assessment (Li et al., 2016). All assessments are conducted in authorized, neutral, independent institutions rather than under the forensic psychiatric experts' personal names. Generally speaking, the assessment consists of an interview and evaluation by at least two qualified experts, psychological tests (usually including personality, intelligence and memory tests), radiological examination (usually head computed tomography) and electrophysiological examination (electroencephalogram and event related potential, when necessary). More detailed descriptions of forensic psychiatric assessment in China have been previously published (Wang et al., 2006; Hu et al., 2010; Li et al., 2016).

The inclusion criteria for subjects were: (1) aged 14 and above (corresponding to the threshold age of bearing criminal responsibility according to the *Chinese Criminal Code*), (2) diagnosed as suffering from SCZ according to the criteria of the International Classification of Diseases, 10th Revision (ICD-10) (WHO, 1993) based on a clinical diagnostic interview by at least two qualified forensic psychiatric experts. (3) received the forensic psychiatric assessment between January 1st 2010 and December 31st 2016 in Hunan province. Exclusion criteria were: (1) SCZ was developed after the crime rather than existed prior to the crime, (2) information needed was unavailable, and (3) non-Hunan residents, in order to minimize the impact of social-cultural difference among subjects. Eligible subjects were selected by screening forensic archives of all criminal suspects who received forensic psychiatric assessment in Hunan province between 2010 and 2016.

There are 8 qualified forensic psychiatric assessment institutions in

Hunan Province. This study was launched by the Forensic Assessment Center of the Second Xiangya Hospital, and was approved and supported by the remaining 7 qualified institutions. The study protocol was approved by the Ethics Committees of the Second Xiangya Hospital. All researchers signed a written commitment to protect the privacy of subjects.

2.2. Data collection

All data were retrieved from the forensic archives. Prior to the forensic psychiatric assessment, the law enforcement agency was required to provide all necessary information for the assessment, including the offender's demographic information, medical records and criminal files.

Three aspects of information were collected using a purpose designed standard data collection form for the present study. That is, subject's demographic information (including sex, ethnicity, year of birth, marital status, education level, place of residence, occupation, history of substance abuse and family history of mental disorder), clinical information (including history of psychiatric treatment, diagnosis and subtype of mental disorders) and criminological information (including criminal history, age at the current crime, index offence (i.e. crime type), psychotic symptoms that homicide acts directly related to, criminal responsibility and information of victim). For protection of privacy, subjects' names were not collected, but a unique ID was assigned to each subject for data checking. Two investigators independently extracted and recorded data using the software EpiData version 3.1 (<http://www.epidata.dk/>). After double entry, a validation was performed to check the consistency. Inconsistencies were resolved by a third investigator checking the corresponding forensic archives.

2.3. Definitions

In this study, homicide referred to murder and attempted murder, while non-homicide referred to all other types of offences. Minority referred to the other 55 non-Han ethnicity. Unmarried included the never married, divorced or widowed at the time of committing the crime. Unemployed was defined as being unemployed for at least half a year before the crime. Lower education level referred to an education level of junior high school and below, which is corresponding to the China's Compulsory Education Law implemented in 1986. History of drugs referred to ever used or currently using illicit drugs which are banned by the Chinese government, such as opium, heroin, methamphetamine and cannabis, but not including cigarettes or alcohol. History of psychiatric treatment was defined as having a history of receiving antipsychotic treatment, but not including those who visited a doctor after the crime for which they were accused. Criminal history was defined as having ever committed an offence and been punished by the criminal law. Younger age at the crime was defined as being younger than 30 when committing the offence, since there was evidence that people under 30 are more likely to commit violence than older ones (Yang et al., 2013; Wang et al., 2017). Criminal responsibilities of offenders with mental disorders are divided into three categories in China, that is, full, diminished and no responsibility (Hu et al., 2010). Family members referred to close relatives including spouses, parents, offspring and siblings, as well as other relatives who live closely together with the offenders.

2.4. Statistical analysis

All data were analyzed using the software IBM SPSS Statistics for windows, version 22. The significance level was set at 0.05 (2-sided). Comparisons between two independent groups were conducted using independent-samples *t*-test for normally distributed continuous variables or Mann-Whitney U test for non-normally distributed continuous variables, as appropriate. The one-sample Kolmogorov-Smirnov test

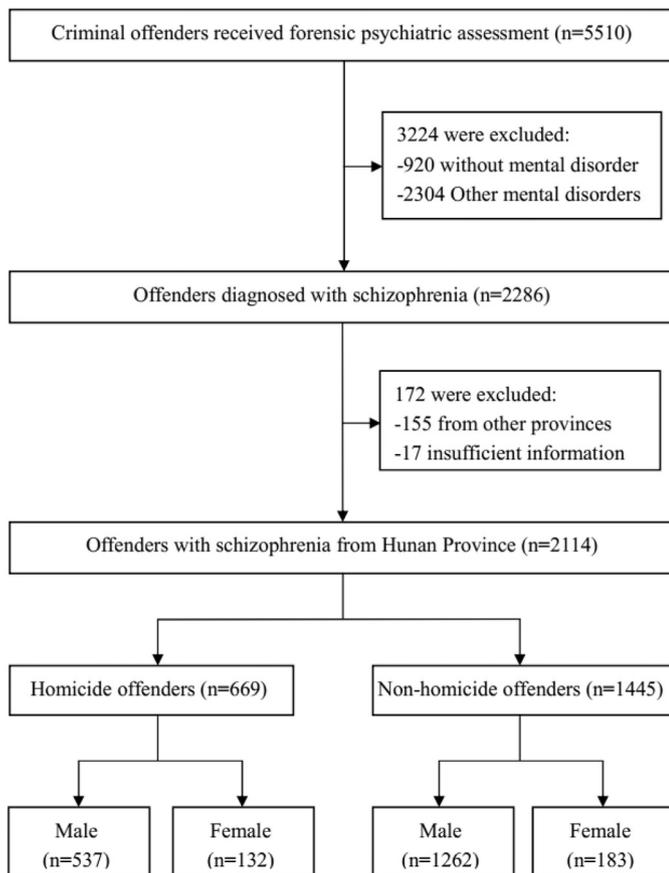


Fig. 1. Flow chart of subject selection.

was employed to check the normality of distribution for continuous variables. Categorical variables were compared by Chi squared test. Binary logistic regression analyses were performed to explore the associations between homicide and other variables. Firstly the univariate analyses were employed to find potential risk factors, and then the forward stepwise (Likelihood Ratio method) logistic regression analyses

were conducted to identify independent correlates of homicide. Index offence (homicide or non-homicide) was set as the dependent variable, while variables with *p*-value less than 0.2 in the univariate analyses were entered as independent variables in the multivariate analyses.

3. Results

3.1. Overview of all homicide offenders with SCZ

During the study period, a total of 5510 criminal suspects received forensic psychiatric assessment. Of whom 2286 were identified as having SCZ when committing the offence. 172 were excluded from analyzing for reasons listed in Fig. 1. The remaining 2114 patients with SCZ included 669 homicide offenders and 1445 non-homicide offenders.

For homicide offenders, most of the perpetrators were male (80.3%), unmarried (60.1%), living in rural areas (91.8%) and had relatively lower education levels (79.9%). About two fifths of them were unemployed, 15.7% had a family history of mental disorder, 1.0% had a history of illicit drugs, 72.0% of them had a history of psychiatric treatment, and approximately a half were diagnosed as having paranoid SCZ. 5.7% perpetrators had a criminal history. The average age of committing their first crime of all offenders was 36.9 ± 11.2 year-old. This age was significantly lower in male than in female offenders. The 669 homicide offenders caused 725 deaths and around three-fifths of the victims were male. Notably, nearly half of the victims were perpetrators' family members. Over four-fifth of homicide offenders were assessed as not being criminally responsible. There was no significant difference across gender, but this figure was much higher than that for non-homicide offenders (83.3% vs. 56.6%, $\chi^2 = 142.835$, $p < 0.001$). More than half of offences were directly related to positive psychotic symptoms, particularly delusions. There were no significant gender differences in total positive psychotic symptoms and hallucinations, however, a greater proportion of male perpetrators' homicide behaviors were directly related to delusions (45.6% vs. 34.8%, $\chi^2 = 5.006$, $p = 0.025$) (Table 1).

3.2. Comparisons between male and female homicide offenders with SCZ

A higher proportion of males was unmarried and/or unemployed

Table 1
Demographic, clinical and criminological characteristics of homicide offenders with SCZ (n, %).

Variable	All (n = 669)	Males (n = 537)	Females (n = 132)	χ^2/t	<i>p</i> -value
Demographic characteristics					
Male	537 (80.3)	–	–	–	–
Unmarried	402 (60.1)	378 (70.4)	24 (18.2)	120.429	<0.001
Unemployed	269 (40.2)	229 (42.6)	40 (30.3)	6.712	0.010
Family history of mental disorder	105 (15.7)	89 (16.6)	16 (12.1)	1.587	0.208
Living in rural areas	610 (91.2)	493 (91.8)	117 (88.6)	1.324	0.250
Lower education level	540 (80.7)	429 (79.9)	111 (84.1)	1.202	0.273
Minority	84 (12.6)	66 (12.3)	18 (13.6)	0.175	0.676
History of drugs	7 (1.0)	6 (1.1)	1 (0.8)	<0.001 [#]	>0.999
Clinical characteristics					
History of psychiatric treatment	482 (72.0)	384 (71.4)	98 (74.2)	0.393	0.531
Paranoid schizophrenia	329 (49.2)	269 (50.1)	60 (45.5)	0.912	0.340
Criminological characteristics					
Criminal history	38 (5.7)	35 (6.5)	3 (2.3)	3.564	0.059
Age at the first crime (years)	36.9 ± 11.2	36.4 ± 11.2	38.7 ± 11.1	2.076	0.038
Number of victims	725	590	135	–	–
Male victims	432 (59.6)	360 (61.0)	72 (53.3)	2.693	0.101
Victims were family members	327 (45.1)	243 (41.2)	84 (62.2)	19.634	<0.001
No criminal responsibility	557 (83.3)	443 (82.5)	114 (86.4)	1.137	0.286
Offence directly related to positive psychotic symptoms	342 (51.1)	282 (52.5)	60 (45.5)	2.113	0.146
directly related to delusions [@]	291 (43.5)	245 (45.6)	46 (34.8)	5.006	0.025
directly related to hallucinations [@]	127 (19.0)	102 (19.0)	25 (18.9)	<0.001	0.988

[#] Adjusted by continuity correction.

[@] Some offences were directly related to both hallucinations and delusions.

than was the case for females (both $p < 0.05$). No significant gender difference was observed in other demographic characteristics as listed in Table 1 (all $p > 0.05$).

A larger proportion of the males had a criminal history despite the difference was marginal ($p = 0.059$). Males were younger than females when committing the first crime ($p = 0.038$). More proportion of victims was male in cases committed by male offenders, but this difference did not reach the statistical significance ($p = 0.101$). Worth noting is that a much higher proportion of victims were the perpetrators' family members for homicide committed by females than for those by males ($p < 0.001$).

3.3. Independent correlates of homicide for offenders with SCZ

The independent correlates of homicide comparing with non-homicide offences were explored by binary logistic regression analyses. When all subjects were pooled together, univariate analysis showed significant between-group difference in 7 variables, including living in rural areas, criminal history, unemployed, unmarried, lower education level, history of drugs and younger at the first crime. In the multivariate analysis, however, only the first four variables survived, of which living in rural areas was positively, while having a criminal history, being unemployed and/ or unmarried were negatively related to homicide (all $p < 0.05$) (Table 2).

We further performed subgroup analyses by gender. For male offenders, living in rural areas and having psychiatric family history were positively associated with homicide in both uni- and multivariate analyses, while having a criminal history and being unemployed were negatively associated (all $p < 0.05$). Other variables failed to enter the multivariate analyses or the final model, despite younger at the first crime and lower education level were of significance in the univariate analyses (Table 3).

For females, younger at the first crime was positively associated with homicide in the multivariate analysis, while being unmarried and being unemployed were negatively associated (all $p < 0.05$). Living in rural areas, which was an independent correlate of homicide for male offenders, however, did not survive in the final model for females (Table 4).

4. Discussion

In the present study, from a large forensic sample, we found that male homicide offenders with SCZ were more often single, unemployed and had a past criminal history than were female offenders who suffered from SCZ. Males tended to be younger when committing the homicide and their offences were more often directly related to delusions. Female perpetrators were more likely to target their close family members. What's more, we revealed a notable gender difference in independent correlates of homicide. For males, the independent correlates included place of domicile, family history of psychiatric disorders,

criminal history and unemployment. For females, however, independent correlates were younger age at the first crime, being unmarried and unemployed. We think this is the first study that systematically examines the gender difference among Chinese homicide offenders with SCZ.

A universal phenomenon in criminology is that men are more likely to commit violent crimes than are women (Steffensmeier and Allan, 1996; Krakowski and Czobor, 2004). No data on Chinese male to female ratio of homicide offenders is available. Reports from several other countries have shown that, in the general population, about 10% of homicides were committed by women (Shaw et al., 2006; Häkkänen-Nyholm et al., 2009; Cooper and Smith, 2011; Sea et al., 2017). In our sample, female perpetrators accounted for approximately one-fifth of the total number of homicide offenders with SCZ. This indicates an obviously narrowed gender gap for homicide among people with SCZ as compared with the general population. In a 25-year study on 1087 Austrian homicide offenders, Schanda et al. (2004) found women with SCZ were at a much higher likelihood of committing homicide when compared with men (ORs 18.38 vs. 5.85). Our data, together with previous findings, supported the opinion that SCZ would have a stronger effect on the risk of violence in women than in men (Schanda et al., 2004; Fleischman et al., 2014).

The gender gap in homicide rates is diminished in people with SCZ, nevertheless, gender differences in offenders' characteristics are still worthy of attention, because several gender differences in SCZ have been reported across countries (Ochoa et al., 2012). In our sample, more male offenders were unmarried and unemployed, and males tended to be younger when committing the homicide. These gender differences could be understood from the perspective of gender difference in SCZ and the sex ratio in China (Ochoa et al., 2012; Edlund et al., 2013). As reported, onset ages of SCZ in men are usually earlier than that of women, and men often have a more limited response to treatment (Ochoa et al., 2012). In addition, the male-biased sex ratio in China has caused numerous "surplus" men in recent decades (Edlund et al., 2013). Therefore, it is not surprising that men with SCZ are less likely to be married or employed than women. As for offender-victim relationships, female homicide offenders with SCZ were more likely to target their family members. This was congruent with findings in the general population (Häkkänen-Nyholm et al., 2009; Sea et al., 2017). Scholars explained this difference from the point that women are under greater stress from family relationship problems than men (Kim et al., 2014). This information was not collected in the present study, thus, it is difficult to judge whether female homicide offenders with SCZ had experienced more family pressure than their male counterparts in our sample.

Previously many researchers have concentrated on examining risk factors for violence (Fazel et al., 2009c,a; Bo et al., 2011; Witt et al., 2013). According to the result of a systematic review and meta-regression analysis by Witt et al. (2013), criminal history was the strongest risk factor for violence among individuals with psychoses, followed

Table 2
Binary logistic regression analyses for homicide in all offenders with SCZ (n, %).

Variable	Index offence		Univariate analysis		Multivariate analysis	
	Homicide (n = 669)	Non-homicide (n = 1445)	OR (95% CI)	p-value	OR (95% CI)	p-value
Living in rural areas	610 (91.2)	1210 (83.7)	2.0 (1.5–2.7)	<0.001	1.9 (1.4–2.6)	<0.001
Criminal history	38 (5.7)	171 (11.8)	0.4 (0.3–0.6)	<0.001	0.5 (0.3–0.7)	<0.001
Unemployed	269 (40.2)	731 (50.6)	0.7 (0.5–0.8)	<0.001	0.7 (0.6–0.9)	0.001
Unmarried	402 (60.1)	961 (66.5)	0.8 (0.6–0.9)	0.004	0.8 (0.7–1.0)	0.032
Lower education level	540 (80.7)	1098 (76.0)	1.3 (1.1–1.7)	0.016	NS	
History of drugs	7 (1.0)	37 (2.6)	0.4 (0.2–0.9)	0.028	NS	
Younger at the first crime	208 (31.1)	513 (35.5)	0.8 (0.7–1.0)	0.047	NS	
Family history of mental disorder	105 (15.7)	187 (12.9)	1.3 (1.0–1.6)	0.088	NS	
Minority	84 (12.6)	149 (10.3)	1.2 (0.9–1.7)	0.126	NS	
History of psychiatric treatment	482 (72.0)	1036 (68.2)	1.0 (0.8–1.2)	0.867	NE	

NS: not significant in the final model; NE: not entered the stepwise multivariate analysis.

Table 3
Binary logistic regression analyses for homicide in male offenders with SCZ (n, %).

Variable	Index offence		Univariate analysis		Multivariate analysis	
	Homicide (n = 537)	Non-homicide (n = 1262)	OR (95% CI)	P-value	OR (95% CI)	P-value
Living in rural areas	493 (91.8)	1067 (84.5)	2.0 (1.5–2.9)	<0.001	1.9 (1.4–2.7)	<0.001
Criminal history	35 (6.5)	161 (12.8)	0.5 (0.3–0.7)	<0.001	0.5 (0.3–0.7)	<0.001
Unemployed	229 (42.6)	647 (51.3)	0.7 (0.6–0.9)	0.001	0.8 (0.6–0.9)	0.011
Family history of mental disorder	89 (16.6)	151 (12.0)	1.5 (1.1–1.9)	0.009	1.4 (1.1–1.9)	0.021
Younger at the first crime	173 (32.2)	479 (38.0)	0.8 (0.6–1.0)	0.021	NS	
Lower education level	429 (79.9)	947 (75.0)	1.3 (1.0–1.7)	0.027	NS	
History of drugs	6 (1.1)	33 (2.6)	0.4 (0.2–1.0)	0.053	NS	
Minority	66 (12.3)	129 (10.2)	1.2 (0.9–1.7)	0.197	NS	
Unmarried	378 (70.4)	895 (70.9)	1.0 (0.8–1.2)	0.822	NE	
History of psychiatric treatment	384 (71.5)	899 (71.2)	1.0 (0.8–1.3)	0.907	NE	

NS: not significant in the final model; NE: not entered the stepwise multivariate analysis.

by substance misuse and then demographic factors. What is worth noting is that the overwhelming majority of studies included paid no attention to the gender difference in criminology. In our study, to better recognize independent correlates of homicide in Chinese SCZ offenders, data were particularly examined by gender.

For male offenders, interestingly, having a criminal history appeared to be negatively associated with homicide in our study. This was the opposite to what, Witt et al. (2013) reported in their meta-analysis, but was in line with a recent study (94.6% subjects were men) that found mentally disordered non-homicide offenders tended to have more previous convictions than homicide offenders (Clarke et al., 2016). Inconsistencies among these studies may be because the control group in the meta-analysis by Witt et al. (2013) was the general population rather than non-homicide offenders, and their outcome index was violence in general rather than specifically homicide. Considering only 6.5% of our homicide offenders had a criminal history, our data also indicate that for most perpetrators with SCZ this was their first offence. Accordingly, homicide risk should not be ignored in those patients without a criminal history. As for demographic variables, living in rural areas would be the most important risk factor for homicide. This was consistent with the findings of previous studies that the homicide rate was higher in rural than in urban areas (Francisco and Chénier, 2002). The positive association between place of domicile and homicide might be mediated by poverty, since poverty has been noted internationally to be a risk factor for crime (Pare and Felson, 2014), and it remains a critical problem for rural residents in China (Glauben et al., 2012). Having a psychiatric family history was also a possible risk factor for homicide. This tallied with previous findings that offspring of people with mental disorder were at higher risk of criminality than those without parental disorder (Dean et al., 2012; Valuri et al., 2017). Unemployed status was negatively related to homicide. Since more than half of the victims were not perpetrators' family members, we conjecture this association would be at least partly due to unemployment-related reduction in social interactions with people outside the family.

From this point of view, the assessment of risk of violence for patients during social rehabilitation may be also necessary.

For female offenders, younger age would have substantially increased the risk of homicide. This was similar to the findings of our previous study on association between SCZ and violence amongst Chinese female offenders (Wang et al., 2017). There were many explanations of the relationship between younger age and higher risk of crime (Males and Elizabeth, 2014; Pechorro et al., 2014). Whatever, this finding provides new evidence on the relationship between age and risk of homicide in Chinese female patients with SCZ. Unmarried status was negatively associated with homicide for females. This could be interpreted from the point of offender-victim relationship, since more than three-fifth of the victims were female offenders' family members. This result was consistent with previous finding that SCZ patients living alone were less likely to engage in violence than those living with family (Swanson et al., 2006). Unemployment was also negatively associated with homicide, and this was the only shared independent correlates of both male and female offenders. Little overlap in independent correlates of homicide between genders highlighted the importance of paying attention to gender differences when study in this field. What we reported in the present study may have some help for making management strategies for high-risk individuals with SCZ in China.

Substance abuse is common in individuals with SCZ in many countries (Regier et al., 1990; Nesvåg et al., 2015; Tekin and Güleç, 2016). The exact co-morbidity rate of substance abuse among people with SCZ in China is unclear. In our study, the prevalence of illicit drugs was only 1% for homicide offenders. This rate was lower than the lifetime prevalence of illicit drugs in the general population of several areas in China (Hao et al., 2002), and much smaller than that of SCZ patients in western countries (Regier et al., 1990; Nesvåg et al., 2015; Tekin and Güleç, 2016). The variable "history of drugs" failed to enter the final model in multivariate analyses whenever the subjects were pooled together or analyzed by gender, suggesting that co-morbid drug

Table 4
Binary logistic regression analyses for homicide in female offenders with SCZ (n, %).

Variable	Index offence		Univariate analysis		Multivariate analysis	
	Homicide (n = 132)	Non-homicide (n = 183)	OR (95% CI)	P-value	OR (95% CI)	P-value
Unmarried	24 (18.2)	66 (36.1)	0.4 (0.2–0.7)	0.001	0.4 (0.2–0.7)	0.002
Younger at the first crime	35 (26.5)	34 (18.6)	1.6 (0.9–2.7)	0.094	2.1 (1.2–3.8)	0.010
Unemployed	40 (30.3)	84 (45.9)	0.5 (0.3–0.8)	0.005	0.6 (0.4–1.0)	0.036
Living in rural areas	117 (88.6)	143 (78.1)	2.2 (1.1–4.1)	0.017	NS	
Family history of mental disorder	16 (12.1)	36 (19.7)	0.6 (0.3–1.1)	0.077	NS	
Criminal history	3 (2.3)	10 (5.5)	0.4 (0.1–1.5)	0.173	NS	
History of drugs	1 (0.8)	4 (2.2)	0.3 (0.04–3.1)	0.339	NE	
Minority	18 (13.6)	20 (10.9)	1.3 (0.7–2.5)	0.467	NE	
Lower education level	111 (84.1)	151 (82.5)	1.1 (0.6–2.0)	0.712	NE	
History of psychiatric treatment	98 (74.2)	137 (74.9)	1.0 (0.6–1.6)	0.901	NE	

NS: not significant in the final model; NE: not entered the stepwise multivariate analysis.

abuse, possibly due to the low prevalence, would have exerted a relatively small impact on the risk of homicide for individuals with SCZ in China, despite it has been reported to be a very important risk factor for violence in Western countries (Fazel et al., 2009a,2009b; Witt et al., 2013). This finding further demonstrated that results observed from other countries cannot simply be generalized to China.

In the present study, the vast majority of homicide offenders were assessed to have no criminal responsibility for their offences. In other words, most of the perpetrators lost their ability to recognize or control their own conduct when committing the crime. Worth noting is that a much lower proportion of non-homicide offenders with SCZ were judged to be not criminally responsible on account of mental disorder. This suggests that compared with other relatively moderate offences committed by people with SCZ, homicides behaviors in this population would be more affected by the disease per se. Positive psychotic symptoms, particularly paranoid delusions and command hallucinations have been considered to be most closely related to violence in SCZ. However, as Nolan et al. (2003) found in their study, only around 20 percent of the assaultive behaviors among psychiatric inpatients were directly related to positive psychotic symptoms. In a large sample meta-regression analysis on risk factors for violence in psychotic patients, “positive symptoms” was ranked lower than several other risk domains such as substance misuse, demographic and treatment related domain (Witt et al., 2013). Interestingly, in our study, more than half of homicides were directly related to positive psychotic symptoms. This difference may be due to different outcome indices between the present and previous studies, and indicating that severe violent behaviors in SCZ might be more closely related to positive psychotic symptoms than those relatively moderate ones. Moreover, in our study, in male offenders, a greater proportion of homicide behaviors were directly related to delusions, perhaps because males often have poorer treatment response than do females (Ochoa et al., 2012).

Numerous researchers have paid attention to preventive measures, like antipsychotics, for violence in patients with SCZ. As Torrey (2001) claimed, taking antipsychotics can reduce the risk of violence, homelessness and prison. An increasing number of studies have suggested that early and adequate psychiatric treatment by certain antipsychotics can exert a positive effect on reducing the incidence of violence in SCZ. For example, Fazel et al. (2014) found in a large sample that violent crime decreased by 45% in patients receiving antipsychotics as compared with periods when they were not on medication. Notably, in our study more than quarter of offenders with SCZ had never received psychiatric treatment before they committed a crime. Our results showed that the variable “history of psychiatric treatment” had little effect on the index offence, indicating the more important value of pay attention to perpetrator’s recent medication when studying the risk factors for offences in SCZ. Regrettably, due to the limitation of a retrospective study, we failed to collect information about whether offenders were in treatment/ on medication or not when the crimes were committed; therefore, we were unable to determine the potential gender difference in this respect.

The present study has some advantages. On one hand, we retrieved all archives of forensic psychiatric assessments conducted in Hunan Province from 2011 to 2016 and included all eligible subjects; therefore, we had a considerable sample size and our sample was likely to represent all offenders with SCZ in Hunan Province. On the other hand, all the criminological information in our study was retrieved from the offenders’ criminal files, thus our results would be more reliable than those studies based on self-reported surveys which might have been influenced by the social desirability bias (Saunders, 1991).

Several limitations should be addressed as well. Firstly, we only obtained limited information due to the nature of a retrospective study. Some important variables such as subject’s treatment/ medication status at the time of offence, number of episodes of SCZ, history of childhood trauma and parental offending were not available. Therefore, we may have missed some characteristics that are of significance to

homicide. In addition, since we did not have a non-criminal SCZ group or healthy controls, the independent correlates of homicide we found were based on comparisons with non-homicide offenders with SCZ. Thus, there should be caution when generalizing from our results. Finally, only data from Hunan Province were collected, hence the findings need to be verified in other areas of China.

Taken together, we found some gender differences in demographic, clinical and criminological characteristics of Chinese homicide offenders with SCZ. In particular, we revealed remarkable gender differences in independent correlates of homicide. Our findings provide new data in this field, and may have some implications for policy making and further studies. More population based prospective studies are warranted to further understanding homicides by individuals with SCZ in China.

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Disclosure conflict of interest

The authors declare that they have no competing interests.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.psychres.2018.11.039](https://doi.org/10.1016/j.psychres.2018.11.039).

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