Prevalence of schizophrenia disability and associated mortality among Chinese men and women

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**Abstract**

Schizophrenia is a major cause of psychiatric disability in China. In the present study, we estimated total and age-specific prevalence of both schizophrenia disability and associated mortality among Chinese men and women. We further examined whether sex differences in prevalence were attributable to mortality differences between men and women. Data from the Second China National Sample Survey on Disability (2006) and the 2007–2010 follow-up studies were utilized. Possibly psychiatrically disabled individuals were administered the World Health Organization Disability Assessment Schedule, Version II and the ICD–10 Symptom Checklist for Mental Disorders by trained clinical psychiatrists. In total, 0.37% of men and 0.44% of women were living with schizophrenia disability in China. We did not find statistically significant differences in the 4-year cumulative mortality between men and women. Overall standardized mortality ratios for the age groups of 18–29, 30–39, 40–49, 50–59, 60–69, and 70+ years were 120.89, 29.56, 15.06, 9.16, 10.57, and 4.95, respectively. In conclusion, mortality differences between men and women were unlikely to be a major contributor to sex differences in prevalence. Premature death among younger individuals experiencing schizophrenia disability warrants urgent attention.

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1. Introduction

Schizophrenia is a major cause of disability, affecting social functioning across critical broad areas including self-care, occupational functioning and social participation. The epidemiology of schizophrenia has been intensively studied (Susser and Wandering, 1994; Jablensky, 2000; McGrath et al., 2008). Established evidence generally shows that schizophrenia affects men more often than women (McGrath et al., 2004) and women tend to have a more favorable prognosis (Abel et al., 2010). Yet, potential sex differences in the prevalence of schizophrenia remain a controversial issue in China. The majority of studies conducted to date report that more women than men live with schizophrenia and related functional disabilities (Cooper and Sartorius, 1996; Fu et al., 1998; Zhang et al., 1998; Phillips et al., 2004). Proposed explanations for these differences in findings include a higher mortality rate among men versus women (Ran et al., 2007), an increased disease risk in women (Cooper, Sartorius, 1996), as well as methodological issues across studies (Phillips et al., 2009).

The prevalence of schizophrenia disability is influenced by the dynamic interaction of multiple factors including the prevalence of the disease, the occurrence of disability among individuals with schizophrenia, the recovery and remission rate, as well as mortality among those who are disabled. Of particular interest is the influence of mortality. A follow-up study of 500 schizophrenics living in rural China found that the 10-year cumulative mortality was much greater among male patients (25%) compared to female patients (15%) (Ran et al., 2007). Based on these prospective data, it has been proposed that the greater likelihood of premature death among men with schizophrenia contributes to the unusual sex prevalence pattern of the disorder observed in China (Ran et al., 2007).

The importance of considering the joint impact of both sex and age on prevalence estimates has also been highlighted in prior investigations. Murray and Lopez (1996) summarized population-based data for incidence, prevalence, and mortality estimates of schizophrenia around the world two decades ago (Murray and Lopez, 1996). Their report suggested that prevalence was higher among men than women at younger ages whereas the sex gap tended to diminish during later years. Sex comparisons in mortality also varied with age and different patterns were observed in...
different parts of the world (Murray and Lopez, 1996). Updated data on age- and sex-specific prevalence of schizophrenia and associated mortality in China is lacking. We consider that such data may not only illustrate the distribution of prevalence and mortality among men and women in different age groups, but also provide information on the interrelationship between these two measures. We hypothesized that if sex-specific mortality has influenced prevalence distributions, we would observe both a significantly higher mortality among men than women and a significantly higher prevalence among women than men in the same age range.

In the current study, our primary objective was to assess the prevalence of schizophrenia disability and associated mortality among community dwelling men and women in China. We conducted analyses to examine age-specific prevalence and mortality by sex. In doing so, we are able to comment on whether sex differences in mortality may be a plausible contributor to sex differences in the prevalence of schizophrenia disability. In addition, we report on specific causes of death among those with schizophrenia disability.

2. Methods

2.1. The Second China National Sample Survey on Disability

We utilized data from the Second China National Sample Survey on Disability (2006) (Office of the Second China National Survey on Disability, 2007; Zheng et al., 2011). The survey, approved by the China State Council, aimed to investigate the prevalence, causes, and severity of disabilities, as well as the living conditions and health service needs of the disabled. As detailed elsewhere (Zheng et al., 2011; Liu et al., 2013), multistage stratified clustered probability sampling was employed to select a representative sample of non-institutionalized Chinese citizens. In total, 734 counties and 5964 communities (with approximately 420 people living in each community) across China were selected for the survey. Data from 771,797 households and 2,526,145 individuals were collected. We restricted our analysis to 1,209,205 participants who were aged 18 years or older. All participants consented to participate in the survey and, if required, to be subsequently examined by clinicians. A post-survey quality check involving the reinvestigation of 99 communities showed that only 0-13% of people living in the selected communities and 0-11% of the disabled were not recorded (Office of the Second China National Survey on Disability, 2007).

2.2. Schizophrenia disability assessment

In the current study, persons with schizophrenia whose activities of daily living and social participation had been influenced by the disorder were identified as those living with schizophrenia disability. This was accomplished using a three step approach (see Fig. 1). First, a questionnaire, administered by trained staff during a face-to-face household interview, was used to identify individuals who were likely to be psychiatrically disabled (with social function limitations). The screening questionnaire for disability was developed for the survey according to the ‘Guide lines and Principles for the Development of Disability Statistics’ recommended by the United Nations (2001) (see Table 1). The questionnaire has been shown in three pilot studies to have very good validity (Zhang, 2010). The questionnaire consists of five items and participants were asked to report on themselves and other household members. If a positive response was given to any of the screening questions, the identified person was labeled as likely to be psychiatrically disabled.

Next, psychiatrists with 5 or more years of clinical experience assessed those who screened positive for possible psychiatric disability in a private, quiet room (Office of the Second China National Survey on Disability, 2006). If needed, family members or caregivers were permitted in the interview room and answered questions. The World Health Organization Disability Assessment Schedule, Version II (WHO DAS II) (World Health Organization, 1999) was administered to evaluate social function limitations. Individuals who received a score of 52 or higher were identified as being psychiatrically disabled. Lastly, those diagnosed as psychiatrically disabled were assigned to subsequent diagnostic procedures for mental disorders. The International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) Symptom Checklist for Mental Disorders was administered to diagnose schizophrenia. ICD-10 diagnostic criteria have been widely used in the diagnosis of schizophrenia and have very good validity (St. Clair et al., 2005; Xiang et al., 2008) and reliability (Janca et al., 1993). These procedures further allowed us to determine whether diagnosed psychiatric disability was due to schizophrenia.

![Fig. 1. Flowchart of the case ascertainment procedure. Note: WHO DAS II: The World Health Organization Disability Assessment Schedule, Version II; ICD-10: The International Statistical Classification of Diseases and Related Health Problems 10th Revision.](image)

2.3. Mortality assessment

Following the 2006 China National Sample Survey on Disability, a sub-sample of people with disability was selected for follow-up studies every year. In 2007 and 2008, the follow-up sample included those from 734 randomly selected study sites in 734 counties, one site for each county. In 2009 and 2010, an additional site was added in each county, resulting in a sample of 1468 sites in 734 counties. The purpose of the follow-up investigation was to monitor the living conditions, socioeconomic status, treatment and rehabilitation, service use, as well as the home and community environment of people with disabilities. For those who were deceased, date and cause of death were recorded. Among people with follow-up records, 2071 adults had schizophrenia disability. A flow chart of the study sample from the 2006 national survey and the 2007–2010 follow-up surveys is provided in Fig. 2.

2.4. Analytic strategy

Data were weighted to estimate the prevalence of schizophrenia disability among the overall non-institutionalized Chinese population. Design weights were used to adjust for unequal sampling fractions at 31 provincial-level administrative divisions. For each region, the design weight was the total population in the region divided by the survey sample size. We further obtained post-stratification weights to account for location of residence (city, town, or village) and age (in five year age ranges) by sex distribution. Both design weights and post-stratification weights were accounted for in analyses. Prevalence estimates and respective standard errors were estimated with Taylor series linearizations that further adjusted for heterogeneities across villages and for possible homogeneity within each household.

Standardized mortality ratios were calculated by dividing the observed mortality rates among people with schizophrenia disability by the expected mortality rates predicted by age- and sex-specific mortality rates in the general population. Mortality rates for the general population were calculated by using published data from the Disease Surveillance Points system in China (Yang et al., 2005). Logistic regression was utilized to quantify the association between sex and the risk of death among people with schizophrenia disability adjusting for age, location, marital status, education, and income.

All statistical analyses were conducted using SAS 9.2 software. (SAS Institute, Inc., Cary, North Carolina).

3. Results

Table 2 describes the characteristics of the study sample. In total, 1,209,205 community people at least 18 years of age participated in the 2006 survey. The mean age was 44.3 years.
(Standard Deviation (S.D.) = 16.1), 50.2% were women, 64.6% lived in a rural area, 79.8% were married, and 28.5% reported a household income for 2005 lower than 1000 US dollars. According to data for 2006 released by the China National Bureau of Statistics, male to female sex ratios for the total Chinese population as well as people living in cities, towns and villages were 1.03, 0.99, 1.03 and 1.06, respectively. In our study sample, the corresponding sex ratios of 1.03, 0.97, 1.04, and 1.06, were similar to those in the general population.

Among those sampled, 7628 persons were identified as having schizophrenia disability. Among them, 55% were women. Men with schizophrenia disability were, on average, 48 years old (S.D. = 14.4 years) and women were, on average, 43.6 years old (S.D. = 13.7 years). In comparison to women, men were more likely to have a higher level of educational attainment and less likely to be married.

Among people with schizophrenia disability, 2071 were selected for follow-up assessments occurring from 2007 to 2010. Generally, the characteristics of the follow-up sample were very similar to the baseline sample, except that more people living in urban areas were assessed in the follow-up investigations.

Table 3 provides the point prevalence of schizophrenia disability overall by sex and in five age groups by sex. In total, 0.41% (95% confidence interval (CI): 0.40, 0.42) of the non-institutionalized adult Chinese population were living with schizophrenia disability in 2006, and the prevalence was higher among women (0.44% (95% CI: 0.4, 0.43)) than among men (0.37% (95% CI: 0.34, 0.36)). Although prevalence generally first increased then declined with increasing age for both sexes, specific age-related prevalence patterns were found for men versus women. Whereas the prevalence started decreasing among men in middle age; the decrease in prevalence among women did not occur until old age. Additionally, although schizophrenia disability was statistically significantly less prevalent among women than men less than 30 years old (Prevalence Ratio: 0.78, 95% CI: 0.68, 0.88), it was significantly more prevalent among women than men in the groups 40 years of age or older (Prevalence Ratio: 1.44, 95% CI: 1.35, 1.54). A markedly higher prevalence among women was observed in the age groups 50 years of age or older (Prevalence Ratio: 1.69, 95% CI: 1.56, 1.83).

Table 4 shows the 4-year crude cumulative mortality and standardized mortality ratio of men and women with schizophrenia by age group. In total, we observed death among 7.48% of men and 6.7% of women. Crude mortality for men aged 50–59 years was statistically significantly higher than women in the same age group (9.4% vs. 3.0%). No statistically significant differences in crude mortality were observed among the other age groups. In comparison with the general population, men with schizophrenia

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Screening questions for psychiatric disability*.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please report whether you or any household member has the following listed problems:</td>
<td></td>
</tr>
<tr>
<td>(1) Has a poor memory (forgetful)?</td>
<td></td>
</tr>
<tr>
<td>(2) Has difficulty in concentration (his/her mind often wanders)?</td>
<td></td>
</tr>
<tr>
<td>(3) Has difficulty controlling their emotions (moody, too joyful or too joyless)?</td>
<td></td>
</tr>
<tr>
<td>(4) Has strange language and/or weird behavior that could not be understood or accepted by a normal person?</td>
<td></td>
</tr>
<tr>
<td>(5) Drinking alcohol on an empty stomach (for at least five times per week); or hypnotic drug overdose.</td>
<td></td>
</tr>
</tbody>
</table>

* Screening questions were administered during the household face-to-face interview by trained staff.
disability were 10.17 times as likely to die and women were 12.42 times as likely to die. The risk of death among young patients was strikingly greater than that expected in the general population. Standardized mortality ratios for males and females aged 18–29 years old were 75.02 and 239.26, respectively. The mortality ratios rapidly decreased with age. For males and females with schizophrenia disability aged 70 years or older, the mortality ratios were 5.17 and 5.16, respectively.

Table 5 displays results from a logistic regression analysis aimed at estimating the association between sex and mortality among those with schizophrenia disability, adjusting for the potential confounding influences of age, community, education, marital status and income. Results revealed no statistically significant sex difference with regards to the risk of death. Increased mortality was associated with an older age of 60 or more years, as well as single or divorced marital status.

Table 6 provides causes of death among persons with schizophrenia disability. Among the 2071 patients with follow-up records, 146 (7.05%) were deceased and 52 (2.51%) were lost and could not be found by their families. The majority of the recorded deaths were caused by medical diseases (84.2%), 7.5% died from accidents, and 4.8% had committed suicide.
Table 4
The 4-year cumulative crude mortality and standardized mortality ratio for men and women with schizophrenia disability, by age.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Men (Total N=922)</th>
<th>Women (Total N=1149)</th>
<th>( \chi^2 ) test p value</th>
<th>Standardized mortality ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Death (n)</td>
<td>Mortality (%)</td>
<td>Death (n)</td>
<td>Mortality (%)</td>
</tr>
<tr>
<td>18–29</td>
<td>152</td>
<td>8</td>
<td>105</td>
<td>8</td>
</tr>
<tr>
<td>30–39</td>
<td>258</td>
<td>7</td>
<td>271</td>
<td>10</td>
</tr>
<tr>
<td>40–49</td>
<td>209</td>
<td>11</td>
<td>264</td>
<td>6</td>
</tr>
<tr>
<td>50–59</td>
<td>180</td>
<td>17</td>
<td>267</td>
<td>8</td>
</tr>
<tr>
<td>60–69</td>
<td>82</td>
<td>12</td>
<td>152</td>
<td>22</td>
</tr>
<tr>
<td>70+</td>
<td>41</td>
<td>14</td>
<td>90</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>922</td>
<td>69</td>
<td>1149</td>
<td>77</td>
</tr>
</tbody>
</table>

Table 5
Relation between sex and risk of death among people with schizophrenia disability.

<table>
<thead>
<tr>
<th>Follow-up (n=2071)</th>
<th>Death (n=146)</th>
<th>Odds ratio (95% Confidence interval)</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>922</td>
<td>69</td>
<td>1.02 (0.67, 1.55)</td>
</tr>
<tr>
<td>Women</td>
<td>1149</td>
<td>77</td>
<td>1.02 (0.67, 1.55)</td>
</tr>
</tbody>
</table>

Community

| Rural (n=1408) | 101 | 1 |
| Urban (n=663)  | 45  | 0.96 (0.63, 1.48) |

Marital status

| Married (n=1130) | 59 | 1 |
| Single (n=581)   | 46 | 2.73 (1.59, 4.69) |
| Divorced (n=182) | 14 | 2.55 (1.29, 5.03) |
| Widowed (n=178)  | 27 | 1.28 (0.76, 2.16) |

Education

| Primary school or less (n=1229) | 108 | 1 |
| Junior high school (n=571)     | 24  | 0.67 (0.40, 1.12) |
| Senior high school or more (n=271) | 14 | 0.7 (0.37, 1.35) |

Household income (for year 2005 in US dollars)

| <599 (n=1103) | 84 | 1 |
| 1000–1999 (n=539) | 38 | 1.04 (0.68, 1.58) |
| 2000–4999 (n=363) | 21 | 0.88 (0.52, 1.50) |
| 5000+ (n=66)    | 3  | 0.67 (0.19, 2.33) |

4. Discussion

This population-based study of adult community-dwelling Chinese found that the total prevalence of schizophrenia disability was 0.41% (0.40, 0.42), with a higher percentage of women affected than men. An age-stratified analysis showed that the prevalence comparison between men and women varied by age, with a higher prevalence among men than among women in the youngest age group (18–29 year olds), and a lower prevalence among men than among women in older age groups (40 years or older). The 4-year cumulative crude mortality was 7.05% with no sex difference. An age-stratified analysis found that mortality was higher among men than women aged 50–59 years old, whereas no statistically significant difference in mortality was observed in the other age groups. While mortality of young patients was strikingly higher than that of the general population of similar age, this gap narrowed across older ages. No association was found between sex and the risk of death among people with schizophrenia disability. The majority of the patients died from medical diseases, with a small proportion caused by accidents and suicide.

A wealth of data exists on the prevalence of schizophrenia in different parts of the world. A recent review reported that the 10–90% quintiles for the point prevalence of this disease ranged from 0.19% to 1%, with a median of 0.46% (Saha et al., 2005). Our prevalence estimation of 0.35% (0.34, 0.36) falls within this range. Yet since individuals with schizophrenia not experiencing disability were excluded from our estimation, our prevalence estimates are likely lower than if we had included all affected persons.

While there is a large body of literature concerning the prevalence of schizophrenia, fewer have examined schizophrenia-related disability. To the best of our knowledge, only two China national surveys report data on the prevalence of schizophrenia disability. The 1987 First China National Sample Survey on Disability found that 0.2% of men and 0.26% of women were living with schizophrenia disability (Office of the First China National Sample Survey, 1989). The sampling procedure and measurement tools for the two national surveys on disabilities (1987 and 2006) were generally comparable. The 2006 prevalence estimates of 0.35% among men and 0.41% among women were higher than those reported in the 1987 survey. This suggests that the prevalence of schizophrenia disability in China might have increased during the past 2 decades while the prevalence gap between women and men remained. In addition, an epidemiological survey on mental disability and intellectual impairment in seven areas of China that was conducted in 1993 reported that around 0.54% of women and 0.29% of men suffered from schizophrenia disability (Fu et al., 1998); the sex difference in schizophrenia disability was consistent with that in the current report.
A person’s disability is considered as a dynamic interaction between health conditions and environmental and personal factors (World Health Organization, 2001). Schizophrenia disability was not only determined by the nature of the disease, but by other factors such as access to healthcare, treatment compliance, and family environment. Although we observed a sex difference in the prevalence of the disability, it is unclear whether the observation was determined by sex differences in the nature of the disease or other environmental or personal factors. The observation of more women than men living with disability does not necessarily mean the disease occurred in women more often than in men. To date, sex differences in the prevalence of schizophrenia in China remain controversial. The majority of previous surveys have reported that more Chinese women than men were living with schizophrenia (Cooper, Sartorius, 1996; Zhang et al., 1998; Phillips et al., 2004); however, a recent survey employing more stringent diagnostic criteria found no sex difference in the prevalence of the disorder (Phillips et al., 2009).

Longitudinal data on mortality among individuals with schizophrenia in China is sparse. To the best of our knowledge only one previous study, following 510 patients with schizophrenia in a rural area for 10 years, reported that the crude mortality for men and women was 25% and 15%, respectively (Ran et al., 2007). According to these findings, it was proposed that excess deaths among males with schizophrenia may account for the higher observed prevalence of schizophrenia among women than men. Since the length of follow-up and location of sample selection differs across the two studies, we could not directly compare levels of mortality. In the present study, although we found that mortality was significantly higher among men than among women in those aged 50–59 years (where the prevalence of schizophrenia disability was higher among women than among men), no statistical difference in mortality was observed in the other age groups.

Based on our mortality data, we conclude that excess mortality among men is not likely to be a major contributor to the observed sex difference in the prevalence of schizophrenia disability. Other factors may have played a more important role. For instance, it has been proposed that gender inequality may contribute to the unusual sex prevalence pattern (Cooper, Sartorius, 1996). Gender inequality that embodies unequal distribution of resources, such as treatment, may increase women’s risk of developing disability. It had also been reported that, in comparison to Chinese men, women are less often covered by health insurance and are less likely to receive effective treatment (Pearson, 1995). In addition, late onset schizophrenia (which was relatively more common among women) may be possibly contributing to the sex difference in prevalence in the older age groups.

A recent review study summarized population-based mortality data from around the world and reported that the 10% and 90% quintiles of the standardized mortality ratio ranged from 57.2 to 301.7 (Saha et al., 2007). The levels of the estimated standardized mortality ratio in the current study fall within this range. We further conducted an age-stratified analysis and found that the risk of death among young patients was hundreds of times greater than that of their healthy counterparts in the general population. The mortality gap diminished greatly during the later years of the age range. These data suggest that premature death among young people with schizophrenia disability warrants urgent attention. More research should be conducted to identify risk factors for mortality, and more health services should be provided to this vulnerable group.

During the follow-up period, we found that a substantial proportion of patients with schizophrenia disability (2.6% of men and 2.44% of women) had been lost (i.e., they had left their home and could not be found by their family). We consider that the chance of survival for homeless individuals with schizophrenia disability might be small, although there is no data available to support this notion. Social functioning among the homeless was usually severely impaired, they had little capacity to support themselves, and the institutions that serve homeless psychiatric patients are sparse in China.

Our data suggested that natural causes (medical diseases) were the main reasons for death among people with schizophrenia disability. Death due to medical disease may be attributable to unawareness of acute medical conditions, noncompliance with treatment regimen, and unhealthy life style (Brown et al., 2000). Although unnatural causes of death were less often recorded, it has been suggested that unnatural causes are likely to be underestimated and reported in the Chinese community (Phillips et al., 2002).

The major strength of this research lies in that it is a very large population-based study, providing a unique opportunity to assess age-stratified prevalence and mortality of a rare condition (schizophrenia disability) by sex. Additionally, the use of the WHO DAS II and the CIDI-10 symptom checklist for mental disorders as the diagnostic tools improved the comparability of the diagnostic process; hence information bias due to different diagnostic procedures among people was minimized. Our study also has notable potential limitations. Mortality, although already alarmingly high, might have been underestimated since some individuals had moved out, become homeless, and were lost to follow-up. The sampling schema of the Second China National Sample Survey on Disability did not include institutionalized patients. As men are more likely to use institutional services than women, we may have overestimated sex differences in the prevalence of schizophrenia disability. Nevertheless, we consider that the potential bias was likely to be small. The treatment rate for psychiatric patients was generally low in China, especially in rural areas where resources (such as access to health care) were more likely to be unequally distributed between men and women due to gender bias. A previous study conducted in the rural area of Sichuan, China found that only 5.9% of patients with schizophrenia had maintained regular antipsychotic treatment for more than one year, and around one-third of the patients never received any treatment (Ran et al., 2001). In addition, several large epidemiologic surveys on mental disorders in China have utilized samples from the non-institutionalized population (Cooper, Sartorius, 1996; Zhang et al., 1998; Phillips et al., 2009).

In sum, the present study suggested that the rate of premature death among young people with schizophrenia was alarmingly high. More Chinese women than men were living with schizophrenia disability, a difference that could not be explained by excess mortality among men.

Contributors

All authors participated in study design, data analysis, interpretation of results, and manuscript preparation. The corresponding author had full access to all study data and had final responsibility for the decision to submit for publication.

Conflict of interest

None declared.

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