RESEARCH ARTICLE

Mortality of Urinary Tract Cancer in Inner Mongolia 2008-2012

Ke-Peng Xin, Mao-Lin Du, Zhi-Jun Li, Yun Li, Wuyuntana Li, Xiong Su, Juan Sun*

Abstract

The aim of this study was to determine the mortality rate and burden of urinary tract cancers among residents of Inner Mongolia. We analyzed mortality data reported by the Death Registry System from 2008 to 2012. The rate of mortality due to urinary tract cancer was 2.04 per 100,000 person-years for the total population, 2.91 for men, and 1.11 for women. Therefore, the mortality rate for men was 2.62-fold the mortality rate for women, constituting a statistically significant difference ($p<0.001$). Over the period 2008 through 2012, the total potential years of life lost was 1388.1 person-years for men and 777.1 person-years for women, and the average years of life lost were 7.71 years per male decedent and 12.0 years per female decedent. Mortality due to urinary tract cancers is substantially greater among the elderly population. Further, the mortality rate associated with urinary tract cancers is greater for elderly men than it is for elderly women. Therefore, in Inner Mongolia, urinary tract cancers appear to pose a greater mortality risk for men than they do for women.

Keywords: Urinary - mortality - potential years of life lost (PYLL) - Inner Mongolia - China

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Introduction

Of all deaths due to urinary tract cancers, the majority are attributable to kidney and bladder cancers. The mortality rate associated with urinary tract cancers is higher in Western countries than it is in Asian countries (Jemal et al., 2011), and among Asian countries, it is especially high in Japan and Korea (Jung et al., 2011). As of 2010, the Third National Death Sampling Retrospective Study indicated that the rate of urinary tract cancer mortality was lower in China (0.64 per 100,000 person-years) than it was in Western countries(1.41 per 100,000 person-years) (Control et al., 2010). However, urinary tract cancer mortality has increased in recent years (Gupta et al., 2008; Sujun et al., 2013). Hence, accurate projections of urinary tract cancer mortality are important for public health and public planning. However, few studies have evaluated urinary tract cancer mortality in Inner Mongolia. The aim of the present study was to determine the mortality and burden associated with urinary tract cancers in Inner Mongolia over the period 2008-2012.

Materials and Methods

This study examined data from Inner Mongolia, January 2008 to December 2012. Data on deaths were collected through the Death Registry System (DRS). DRS uses a multistage cluster probability sampling strategy with stratification according to eastern, central and western of China, the local gross domestic product (GDP) and proportion of rural dwellers, the total population of local areas. For the present study, data were used from 8 monitoring points. Five of these were from the DRS established by the Chinese Ministry of Health. Another three monitoring points were from Inner Mongolia, established by the Inner Mongolia CDC. We used data from a total of 8 monitoring points, which were located in the eastern region and other regions of Inner Mongolia. The eastern and other regions were separated on the basis of differences in geographical location, historical evolution, traditional lifestyle, and certain policies and laws. The Eastern region included the Yakeshi city, Kailu County, and Bairin Youqi monitoring points. The other regions included the Sonid Youqi, Muslims District, Tumd Youqi, Ejin Horo Qi, and Linhe District monitoring points.

The death database included information on primary cause of death, date of death, sex, and age. Cause of death was coded according to the International Classification of Disease, 10th Revision (ICD-10). For the purposes of the present study, we included deaths that were assigned ICD-10 codes for malignant neoplasm of the kidney, except the renal pelvis (C64); malignant neoplasm of the renal pelvis (C65); malignant neoplasm of the ureter (C66); bladder cancer (C67); and malignant neoplasms of other and unspecified urinary organs (C68). C64, C65, and C66 were each considered to be forms of kidney cancer. A death was considered to be attributable to urinary tract cancer if any of the 5 codes (C64, C65, C66, C67, or C68) was

*Inner Mongolia Medical University, Hohhot, China *For correspondence: cnsunjuan@aliyun.com*

listed as the primary cause.

Annual midyear population figures for 2008-2012 were obtained from the Centers for Disease Control of Inner Mongolia, which allowed us to calculate age-specific mortality rates and annual mortality rates per 100,000 persons. Death percentages and rates of mortality from urinary tract cancers were calculated on the basis of the 8 monitoring points. We also calculated disease-specific mortality rates and proportions for kidney cancer, bladder cancer, and malignant neoplasms of other and unspecified urinary organs.

Life expectancy (LE), life expectancy after elimination of urinary tract cancer (LEEUTC), potential years of life lost (PYLL), rate of PYLL (PYLLR), and average years of life lost (AYLL) were calculated for men and women. PYLL are used to evaluate premature mortality by estimating the average time a person would have lived had he or she not died of the cancer. By estimating PYLLs, we were able to assess how changes in urinary tract mortality over the period 2008-2012 contributed to overall life expectancy. PYLL was specifically calculated as PYLL=Σ (ai×di), where ai=loss of life-years for a certain age group, i, and di=the number of deaths in that particular age group. PYLLR=(PYLL/n)×1000‰, where n is the total population at risk. AYLL=PYLL/Σdi, that is the average difference value between the life expectancy and the actual age at death (Qingyun et al., 2008).

Microsoft Excel software (Microsoft, Co., Redmond, WA, USA) and SPSS 13.0 statistical software (IBM SPSS, Inc., Chicago, IL, USA) were used for data management and analyses. The χ^2 test was used to assess differences in rates, with a significance level of 0.05.

Table 1. Urinary Tract Cancer Mortality ($1/10^5$) in Different Regions of Inner Mongolia

Monitoring points	Total	Men	Women
Yakeshi city	3.33	4.48	2.12
Kailu County	1.74	2.64	0.81
Bairin Youqi	2.22	3.04	1.36
Sonid Youqi	2.69	4.19	1.10
Muslims District	1.73	2.97	0.48
Tumd Youqi	0.59	1.00	0.14
Ejin Horo Qi	0.33	0.38	0.26
Linhe District	2.79	3.79	1.75

Table 2. Age-specific Mortality and Constituent Ratio of Urinary Tract Cancer in Inner Mongolia, 2008-2012

Age group (Years)	Mortality ($1/10^5$)	Mortality($1/10^5$) Men	Women	Constituent Ratio (%)	Sex Ratio
0-	0.15	0.00	0.30	0.41	—
5-	0.00	0.00	0.00	0.00	—
10-	0.32	0.30	0.34	0.82	0.91
15-	0.00	0.00	0.00	0.00	—
20-	0.00	0.00	0.00	0.00	—
25-	0.00	0.00	0.00	0.00	—
30-	0.00	0.00	0.00	0.00	—
35-	0.33	0.64	0.00	1.63	—
40-	0.17	0.17	0.18	0.82	0.93
45-	0.97	1.31	0.60	4.08	2.17
50-	2.03	3.50	0.46	7.35	7.56
55-	1.66	1.91	1.40	4.90	1.36
60-	4.58	7.89	1.36	8.16	5.80
65-	10.33	15.95	5.12	14.29	3.11
70-	17.23	23.00	11.48	20.82	2.00
75-	24.53	36.45	12.57	17.55	2.90
80-	46.22	70.48	23.18	14.29	3.04
85+	52.67	83.74	24.93	4.90	3.36
Total	2.04	2.91	1.11	100.00	2.62

Results

Table 1 presents rates of mortality due to urinary tract cancer for each of the 8 monitoring points in Inner Mongolia. The city of Yakeshi and Linhe District had the highest urinary tract cancer mortality rates (3.33 per 100,000 person-years and 2.79 per 100,000 person-years, respectively). In contrast, urinary tract cancer mortality rates were lowest in Tumd Youqi and Ejin Horo Qi (0.59 per 100,000 person years and 0.33 per 100,000 person-years, respectively).

During 2008-2012, 245 deaths in Inner Mongolia were attributable to urinary tract cancers (180 in men and 65 in women), and the associated ages at death ranged from 4 to 96 years (average age at death: 68.8 years). Across the 5-year period of this study, urinary tract cancer mortality did not change significantly among men (χ^2=4.1, p=0.39) or among women (χ^2=9.0, p=0.06). We combined the 5 years of data for all further analyses. The overall rate of urinary tract cancer mortality was 2.91 per 100,000 person-years (95% confidence interval [CI]: 2.70-3.12) for men and 1.11 per 100,000 (95%CI: 0.98-1.24) for women. These rates were not significantly different (χ^2=6.0, p=0.20). After combining the data on men and women, the overall rate of mortality due to urinary tract cancer

Table 4. LE, LEEUTC, PYLL, PYLLR and AYLL of Inner Mongolia Population, 2008-2012

Sex	LE (Years)	LEEUTC (Years)	PYLL (Person-years)	PYLLR (‰)	AYLL (Years)
Men	73.93	73.97	1388.1	0.22	7.71
Women	79.69	79.71	777.1	0.13	11.96
Total	76.53	76.57	2296.7	0.19	9.37

Table 3. The Mortality and Constitution of Causes of Death for Urinary Tract Cancer, 2008-2012

Cause of death	Mortality ($1/10^5$)	Proportion (%)	Men		Women	
			Mortality ($1/10^5$)	Proportion (%)	Mortality ($1/10^5$)	Proportion (%)
Kidney Cancer (C64-C66)	0.66	32.24	0.79	27.22	0.51	46.15
Bladder Cancer (C67)	1.37	66.94	2.10	72.22	0.58	52.31
Other Cancer (C68)	0.02	0.82	0.02	0.56	0.02	1.54

was 2.04 per 100,000 person-years (95%CI: 1.92-2.16).

Age-specific rates, constituent ratios, and sex ratios for urinary tract cancer mortality in Inner Mongolia (2008-2012) are presented in Table 2. With the exception of the 0-4 and 10-14 year age-groups, no deaths due to urinary tract cancer were recorded at any of the 8 monitoring points for persons younger than 35-years-old. Men tended to die from urinary tract cancer at younger ages than did women. Between 40 and 59 years of age, mortality from urinary tract cancer was low for both men and women. In the 40-44 years age group, women faced slightly higher mortality from urinary tract cancer than did men. For both men and women, urinary tract cancer mortality rates gradually increased with age. Especially at ages older than 60 years, men faced significantly higher urinary tract mortality rates than did women. The age distribution of deaths due to urinary tract cancer indicated that most deaths occurred in persons older than 65 years. The 70-74 years age group accounted for one-fifth of all deaths due to urinary tract cancer. Mortality was greater among men than it was among women. The overall sex ratio for mortality (men to women) was 2.62, which constituted a statistically significant difference (χ^2=47.7, p<0.001).

Table 3 presents mortality rates and distributions for the previously mentioned subtypes of urinary tract cancer. Deaths caused by kidney cancer and bladder cancer accounted for 99% of all deaths associated with urinary tract cancers. The kidney cancer mortality rate was 0.66 per 100,000 person-years (95%CI: 0.59-0.73), 0.79 per 100,000 man-years (95%CI: 0.68-0.90), and 0.51 per 100,000 woman-years (95%CI: 0.43-0.60). Analogous values for bladder cancer were 1.37 per 100,000 person-years (95%CI: 1.26-1.47), 2.10 per 100,000 man-years (95%CI: 1.93-2.28), and 0.58 per 100,000 woman-years (95%CI: 0.49-0.68).

Table 4 presents estimates related to the burden of urinary tract cancer mortality in Inner Mongolia, 2008-2012. The LE was 76.53 years and the LEEUTC was 76.57 years. Urinary tract cancer was responsible for a loss of 0.04 years of LE among men and women, 0.04 among men alone, and 0.02 among women alone. The PYLL associated with urinary tract cancer was 2296.7 person-years for men and women, 1388.1 person-years for men alone, and 777.1 person-years for women alone. The AYLL for urinary tract cancer was 9.37 years for men and women, 7.71 years for men alone, and 11.96 years for women alone. The PYLLR was 0.19‰ for men and women, 0.22‰ for men alone, and 0.13‰ for women alone.

Discussion

In this study, we estimated urinary tract cancer mortality rates in Inner Mongolia to establish the magnitude of this disease's regional burden and provide data for public health planning. Kidney cancer and bladder cancer are the most common cancers of the urinary system. Our results suggest that, for both men and women, kidney cancer mortality in Inner Mongolia is lower than kidney cancer mortality in European countries (Bosetti et al., 2011). Similarly, mortality from bladder cancer among men in Inner Mongolia appears to be lower than that in European countries (Bosetti et al., 2011). However, the bladder cancer mortality among women in Inner Mongolia was higher than that in a few European countries, including Belarus (0.38 deaths per 100,000 woman-years) (Bosetti et al., 2011). This suggests that the prevention of bladder cancer among women is important.

In this study, urinary tract cancer mortality rates differed across the 8 monitoring points. For example, the mortality rate in Yakeshi city was 10 times that in Ejin Horo Qi. Hence, higher mortality areas, such as Yakeshi city and Linhe District, should be afforded additional attention in health planning.

Our results further indicate that men tended to die from urinary tract cancer at younger ages than did women, and that mortality rates were higher among men than they were among women. The higher rates of urinary tract cancer mortality may reflect the greater prevalence of tobacco smoking among men, as well as low vegetable's consumption habit among men. Indeed, tobacco smoking is the most widely recognized risk factor for urinary tract cancer (Hunt et al., 2005; Yaris et al., 2006). Similarly, low vegetable's consumption is also a risk factor for urinary tract cancer (Ahmadi et al., 2012). However, some studies show that women were more likely to be diagnosed with higher stages and to have lower survival rates, so mortality in women is higher than mortality than in men (Madeb and Messing, 2004). This difference probably reflects different sample size for different studies. Thus, further analyses for difference of two sexes seem to be required.

The age-specific mortality rates indicated that urinary cancer mortality is a larger public health issue in the elderly population. Indeed, 71.84% of deaths attributable to urinary tract cancers occurred among persons aged over 65 years. Some studies also show that this cancer presents more frequently in the elderly (Salehi et al., 2011). Elderly people should be classified as a key target for efforts aimed at preventing and treating urinary tract cancer.

Various studies have used PYLL and AYLL in the course of research on cancer deaths, including our own previous work (Kono et al., 2005). Compared with simple mortality rates, LE-related estimates provide more direct reflections of the public health burden of cancer mortality. Our results indicated that both the PYLL and the PYLLR associated with urinary tract cancers were higher in men than in women. Urinary tract cancers may result in greater years of life lost for men than for women. However, AYLL associated with urinary tract cancer were greater for women than for men. Accordingly, urinary tract cancer may result in more years of life lost among the women who died of this cancer than among the men who died of this cancer. The result is consistent with that of a previous study (Qingyun et al., 2008).

Some studies show that obesity was a risk factor for urinary tract cancer (Luke et al., 2011). The pooled analysis reported a slightly higher kidney cancer risk due to obesity in women than men (Mathew et al., 2009). Our results suggest that the mortality of urinary tract cancer was higher in men than in women. It may be that the men smoking rate is higher than women.

In the present study, we determined the rates of urinary

tract cancer mortality based on 8 monitoring points located in Inner Mongolia. Mortality rates differed across the 8 monitoring points, and were higher among the elderly, especially among elderly men. Kidney cancer and bladder cancer are responsible for the majority of deaths related to urinary tract cancers. Urinary tract cancer results in a greater loss of life among men than it does among women. Interventions directed at the general population (but perhaps especially focusing on men) could help reduce the burden of urinary tract cancer mortality in Inner Mongolia.

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