RESEARCH ARTICLE

Esophageal Cancer Mortality during 2004-2009 in Yanting County, China

Qing-Kun Song[1], Jun Li[2]*, Hai-Dong Jiang[2], Yu-Ming He[2], Xiao-Qiao Zhou[3], Cheng-Yu Huang[3]

Abstract

Objective: Yanting County is a high risk area for esophageal cancer (EC) in China. The purpose of this study was to describe the mortality and mortality change of EC from 2004 to 2009 in Yanting County. Methods: EC mortality data from 2004 to 2009 obtained from the Cancer Registry in Yanting were analyzed. Annual percentage changes (APC) were calculated to assess the trends in EC mortality. Age-standardized mortality was calculated based on world standard population of 2000. Results: The average EC mortality was 54.7/10^5 in males and 31.6/10^5 in females over the 6 years. A decline in EC mortality with time was observed in both genders, with a rate of -8.70% per year (95% CI: -13.23%~3.93%) in females and -4.11% per year (95%CI: -11.16%~3.50%) in males. Conclusion: EC mortality decreased over the six years in both genders, although it remained high in the Yanting area. There is still a need to carry out studies of risk factors for improved cancer prevention and further reduction in the disease burden.

Keywords: China - esophageal cancer - mortality - mortality change - Yanting County

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Introduction

Esophageal cancer (EC) is one of the deadliest cancers worldwide, ranking the sixth most common cause of cancer deaths (Parkin et al., 2005). In 2002, EC was responsible for 386,000 deaths globally (Parkin et al., 2005). The survival rate is uniformly low, with less than 8% of 5-year survival (Mitry et al., 2008). The threat of EC is even more serious to the Chinese population, who is among those at the highest risk. According to 2002 data, the age-standardized mortality of EC was 21.6/10^5 for males and 9.6/10^5 for females in China, in contrast to 9.6/10^5 and 3.9/10^5 in the world, 5.1/10^5 and 1.2/10^5 in United States, 7.5/10^5 and 1.1/10^5 in Japan, for males and females, respectively (Ferlay et al., 2004). Even within China, a big geographic variation has been observed. There are six high-risk areas, including Cixian and Shexian in Hebei Province, Linzhou in Henan Province, Yangcheng in Shanxi Province, Nan'ao in Guangdong Province and Yanting in Sichuan Province. In these high risk areas, EC mortality was higher than 65/10^5, compared with 5/10^5 or below in Beijing, Shanghai and Guangzhou from 1998 to 2002 (Zou et al., 2007).

Yanting county, located at the northeast of Sichuan Province and had the population of 606,400 in 2007, of which majority were composed of agricultural population. During 1998 and 2002, the mortality of EC was 118.3/10^5 for males and 67.6/10^5 for females (Zhang et al., 2006). Previously, the general cancer burden in Yanting had been reported and cancers had variated changing mode (Li et al., 2011). In this paper, we focused the available data of EC from 2004 to 2009, and described the changing trend in EC mortality in this area.

Materials and Methods

Data source

Yanting Cancer Registry took the charge of death registration among the whole county. Death certificate contained the information of the cases' age, gender, death date and death cause. More than 95% of EC cases in this area had undergone examination of endoscopy, and over 80% cases had histological confirmation. The deaths due to esophageal cancer between January 1, 2004 and December 31, 2009 were identified and extracted for analysis. The classification of EC based on the code of ICD-10 C15. The data collection followed the guideline of Cancer Incidence in Five Continents Vol. IX from IARC (Curado et al., 2007).

Statistical Analysis

Age-specific EC mortality was calculated in both genders and compared among the different years. Age-standardized mortalities during the 6 year time periods were calculated based on the world standard population in 2000 (Guha et al., 2007). The data were analyzed by

*[1]Department of Cancer Epidemiology, Cancer Institute/Hospital, The Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, [2]Yanting Cancer Research Institute, Mianyang, [3]School of public health, Sichuan University West China Center of Medical Sciences, Chengdu, China *For correspondence: liji0326@163.com*

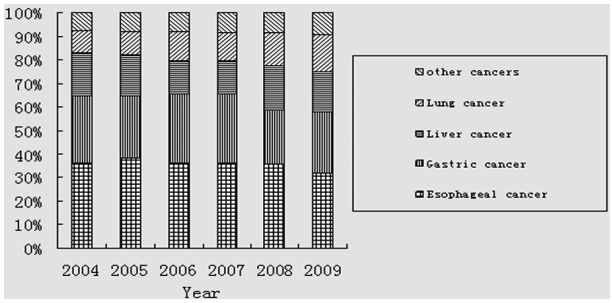

Figure 1. Ranks of Each Cancer among the Cancer Deaths in Yanting Population, 2004-2009

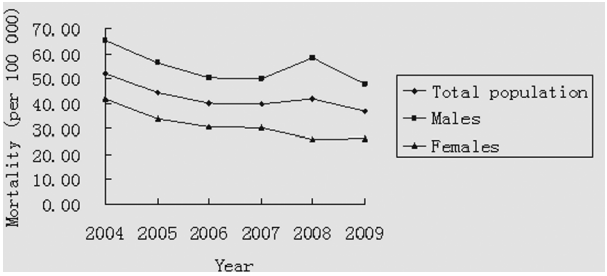

Figure 2. Age-standardized Mortality of Esophageal Cancer in Yanting 2004-2009* (*All the data was adjusted by the world standard population)

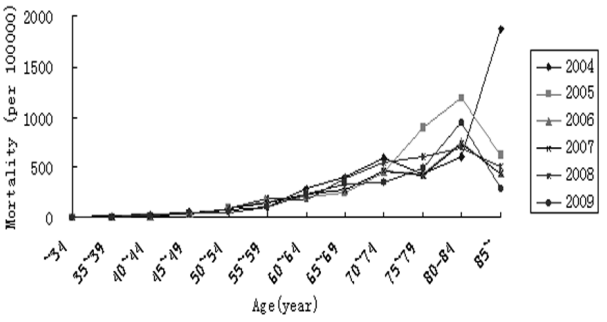

Figure 3. EC Mortality by Age Group in Males in Yanting County, 2004-2009

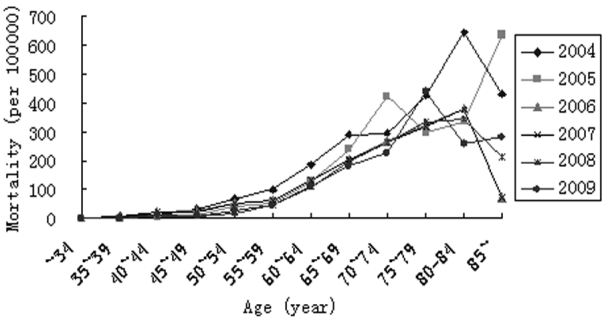

Figure 4. EC Mortality by Age Group in Females in Yanting County, 2004-2009

using SPSS 16.0 software. The average change rate of EC mortality by the 6-year period was expressed by Annual Percentage Change (APC), which was calculated by fitting a linear regression line to the natural logarithm of the rates using calendar year as a regressor variable, i.e. y = mx + b, where y = ln (rate) and x = calendar year. Then APC was obtained from $100*(e^m-1)$ (Siesling et al., 2003). In this analysis, the tested hypothesis was that APC was equal to zero, which was equivalent to that the slope of the regression line was zero, using the t-distribution of m/standard error of m (SEm). The degree of freedom was the number of calendar years minus 2. The standard error of m, i.e. SEm, was obtained from the fit of the regression line. This calculation assumed that the rates increased/decreased at a constant rate over the entire period (Siesling et al., 2003). In the above formula, the "rate" denoted age-standardized mortality of EC.

Table 1. Annual Percentage Changes in EC Mortality in Yanting County, 2004-2009#

Population	APC (%)	95% CI (%)	
total	-5.16*	-0.21	-9.87
Males	-4.11	3.5	-11.16
Females	-8.70*	-3.93	-13.23

#Adjusted by world standard population, * p<0.05

Results

Age-standardized EC mortalities during the years of 2004 to 2009 in Yanting were $54.7/10^5$ in males and $31.6/10^5$ in females. EC ranked the first cause of death among all cancers, accounting for 33.62%, 35.57%, 34.33%, 34.23%, 33.24% and 28.80% of the all cancer deaths from 2004 to 2009 (Figure 1). Gastric cancer, liver cancer and lung cancer were following cancer death causes after EC (Figure 1).

When age-standardized EC mortality was represented by year, as shown in Figure 2, a declining trend was seen over time (p<0.05) (Figure 2). The trend was displayed in both genders and females had lower mortalities of EC than males. Table 1 shows APC for EC mortality from 2004 to 2009. As a whole population, the mortality decreased by 5.16% per year (p<0.05). In females, however it decreased by 8.70% per year (p<0.05), in contrast to -4.11% in males. Figure 3 and 4 display EC age-specific mortality in males and females, respectively. EC mortality increased with age for both genders. In males, an upward trend started obviously after age of 50 years, and reached a peak after 80 years old. On the other hand, EC mortality tended to decline with calendar years across the age groups, though a variation existed. The similar trends were also observed in females.

Discussion

Yanting Cancer Registry was founded in 1970s, taking charge of cancer registration, all death causes registration, cancer prevention and control. Additionally, Yanting Cancer Registry included a pathology department, which conducted pathological test and had some professional workers. The long experience of cancer registration and the professional pathological evidence warranted the reliable confirmation of EC deaths. This study did not focus on cancer incidence, that because the incidence data of recent 6 years was unavailable. In 2006, screening program for EC was initiated which could not interfere cancer mortality occurring from 2005 to 2009. And the survival of EC was poor so the improvement of survival time could be excluded.

In this study, we analyzed the changes in EC mortality in Yanting, one of the highest risk areas in China. The

mortality in Yanting was much higher than the average rate in China (Ferlay et al., 2004). The age-standardized EC morality was $54.7/10^5$ in males and $31.6/10^5$ in females during year of 2004 and 2009. Overall, EC remained the first cause of deaths among all cancers. The mortality in Yanting was significantly higher than the average figure of China (Ferlay et al., 2010). There were many factors related with the high risk of EC: in Western Countries, smoking and alcohol drinking played the major role, but in China dietary factors were the first rank contributors for the high occurrence of EC (Parkin et al., 2005). Less consumption of fresh vegetable and fruit, intake of pickled vegetable and salted meat all associated with the high incidence of EC (Li and Yu, 2003; Tran et al., 2005; Yamaji et al., 2008; Kamangar et al., 2009). It was necessary to do next analysis to investigate the risk factoring contributing to the high incidence of EC in Yanting.

We used recently 6-year data and obtained the results that EC mortality decreased with time, with an overall decline rate of 5% annually. The recent 6-year mortality decline was consistent with previous report of Yanting (Chen et al., 2005). A similar decrease trend was also observed in two other high-risk areas: Linxian and Nan'ao (Li, 2002). Meanwhile, EC incidence also declined in Yanting: EC incidence reduced in both genders from 1992 to 2003 (Chen et al., 2005). The decline trend of incidence and mortality might have something to do with changes in risk factors. Low socio-economic status was believed to be a risk factor for esophageal cancer (Wu et al., 2006; Baastrup et al., 2008). Yanting is a very poor area and its economic status has been below the average level of the whole Sichuan Province, in 1999 the average GDP per capita in Yanting was 3133 RMB, on the other hand the corresponding figures of Sichuan and China were 4473 and 6534 RMB, respectively (National Bureau of Statistics of China., 2000; Sichuan Bureau of Statistics., 2000). However, the situation has been in change in the recent decades: from 1985 to 1995, the GDP per capita in Yanting increased to 2394 RMB from 385 RMB and in 2007 the corresponding figure increased to 7138 RMB (Sichuan Bureau of Statistics, 2008). The improved socio-economic status might have led to some changes in individual lifestyle to more healthy one, e.g., eating more amounts of fresh vegetables, fruits, egg and fresh meat, which were considered to be protective factors (Tran et al., 2005; Yamaji et al., 2008) and decreasing intake of pickled vegetables, salted meat and foods with long-term preservation, which were found to increase EC risk (Li and Yu, 2003; Kamangar et al., 2009) Therefore, the overall decreased EC mortality might be explained by the improved economic status leading to a healthier diet and personal behavior changes.

As observed, the mortality of esophageal cancer in males was much higher than in females. This was consistent with the results from other studies (He et al., 2003; Lu et al., 2003; Su et al., 2007). The gender difference was a common phenomenon for many cancers, which may partly due to a gender variation in exposure to risk factors, such as tobacco smoking and alcohol drinking, as well as exposure to some environmental and occupational chemicals.

EC mortality increased with age, in which 50 years old appeared a starting point of rapid increase. It was reported that apparently risky age for the occurrence of esophageal cancer was above 45-year old (Chen et al., 2005) and its 5-year survival rate was very low (Mitry et al., 2008). Therefore, a rapid increase of mortality could be observed at age of 50 years or above. On the other hand, a bigger variation in EC mortality with calendar year was seen in older age groups in both genders. This could be explained by the competing causes of death that increased with age.

In summary, the mortality of esophageal cancer in Yanting County had a downward trend in both genders during 2004 and 2009. However, the mortality of esophageal cancer remained the first death cause among all cancers, leaving a big challenge in the prevention and control of the disease in this area, as well as the whole country. This warrants a further research on etiological factors, based on which implementation of effective intervention strategies is possible

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