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ORIGINAL ARTICLE

High mortality from hepatic, gastric and esophageal cancers in mainland China: 40 years of experience and development



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Summary The disability-adjusted life-years caused by hepatic, gastric and esophageal cancers in mainland China are among the highest in the world. During the past four decades, improvements in primary prevention of these cancers, particularly in the isolation of risk factors, have been a nationwide goal, and secondary prevention has also been advanced. Nationwide primary preventative measures, including active vaccination against hepatitis B virus in neonates, consensus on screening and eradication of *Helicobacter pylori*, and quality improvement of dietary and drinking water, have been performed. Additionally, serum alpha-fetoprotein and endoscopic screening were developed and implemented as efficient secondary preventative measures for early diagnosis. Substantial strides toward cancer prevention were taken and have resulted in improved risk factors identification and more efficient screening in mainland China. Despite a reduction, HBV prevalence remained relatively high, potentially contributing to the increase in hepatic cancer-induced mortality. Because the slight decrease in *H. pylori* prevalence was not associated with an increase in the proportion of early diagnosis of gastric cancer, gastric cancer mortality appeared stable. Esophageal cancer incidence and mortality was reduced, principally due to the improvement in dietary habits and quality, as well as nutritional status. Nationwide isolation of risk factors and the implementation of high-risk candidate screening have been useful approaches to control mortality due to hepatic, gastric and esophageal cancers, and must be continued to secure a future reduction in mortality.

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According to a systematic analysis based on GLOBOCAN 2008, mainland China's rates of three types of digestive system cancer, hepatic, gastric and esophageal, were all among the highest in the world. Additionally, the disability-adjusted life-years (DALYs) caused by these cancers were double the global average levels [1]. Adjusted by the 2008 sex distribution (M:F=1.061) in China, we found that the sum of adjusted DALYs for these three cancers together composed 43.7% of all DALYs, and composed 50.9% of the DALYs in the male population. Although the DALYs due to lung cancer in China were above the global average but not among the top few, the sex-adjusted DALYs still accounted for 19.6%, following that of hepatic cancer (20.0%).

The mortality induced by digestive system cancers remains a heavy health burden and the leading contributor to cancer-induced mortality in mainland China; the contribution of these cancers is increasing [2]. At the beginning of this century, the nationwide incidence of malignancies was approximately 18–20/100,000, and the mortality due to malignancies was approximately 14–15/100,000, which comprised approximately 20% of overall mortality in mainland China [2,3]. Currently, there are over 1.3 billion people in mainland China; therefore, the absolute count of deaths due to malignancies is very large and, in fact, one of the highest in the world.

Epidemiological experience

What experiences and attempts have we witnessed regarding hepatic, gastric and esophageal cancers in the past 40 years in mainland China? To address this question, raw mortality rates were retrieved from the China Health Statistical Yearbook (2008) from the Ministry of Health of China [4]. Available data were retrospectively sampled from studies conducted over the past four decades, spanning the periods of 1973–1975, 1990–1992 and 2004–2005. The overall domestic raw mortality rate due to malignancies increased in mainland China with time, especially in the male population, with a 75.7% increase compared to the rates 40 years ago (Table 1). The raw mortality rate due to hepatic, gastric and esophageal cancers ranked among the top three causes of cancer-related death during the earlier periods and gradually increased, but in the first decade of this century, the raw mortality rate from lung cancer sharply increased and became the most fatal malignancy in mainland China, most

likely due to increased tobacco consumption and environmental factors (Figs. 1 and 2).

The situation and temporal changes were similar in both the male and female population, although the male-to-female ratios for these three cancers were all greater than 2:1 (Fig. 1). Regarding different economic statuses, there were some differences in hepatic, gastric and esophageal cancer epidemiology between urban and rural areas; the raw mortality rates were slightly higher in rural areas with rural-to-urban ratios of 1.08:1 in hepatic cancer, 1.11:1 in gastric cancer and, notably, 1.58:1 in esophageal cancer (Fig. 2). In particular, in rural mainland China, hepatic cancer was the most fatal cancer, whereas in urban areas it was lung cancer (rural-to-urban ratio 0.63:1). Therefore, digestive system cancers, mainly consisting of hepatic, gastric and esophageal cancers, accounted for a great deal of the malignancy-related health burden in mainland China.

National cancer control

In 1969, the government of the People's Republic of China established the National Cancer Research and Control Office (NCRCO) to manage prevention and control of malignancies in mainland China [5]. Moreover, the annual health expenditure on patients with malignancies was expanded annually to 10 billion RMB, according to a recent estimate [2]. Along with an improvement in social and economic conditions and healthcare quality, the life expectancy in the population has increased, while the proportion of post-adolescent and middle-aged individuals in the population pyramid has also increased. However, the mortality rate of some cancers has increased in the Chinese population [3].

Comparing raw mortality rates of gastric cancer between 2003 and 2007 by age group showed that, for people over the age of 70 years, the raw mortality rates increased in major and small- to medium-sized cities, especially among the male population (Fig. 3). For esophageal cancer, there was also a trend of increasing raw mortality rates in older people, but this was most obvious in men living in rural areas and small to medium-sized cities. Encouragingly, in small- to medium-sized cities, the raw mortality rates of hepatic cancer clearly decreased among both the male and female populations in individuals between the ages of 45 and 75 years. These problems have challenged national public healthcare dramatically and have instigated the implementation of more efficient primary and secondary prevention methods.

Table 1 Overall raw malignancy-induced mortality in mainland China (per 100,000).

	1973–1975		1990–1992		2004–2005	
	Mortality	Increase	Mortality	Increase	Mortality	Increase (%)
Male	96.31	Ref	134.91	40.1%	169.19	75.7
Female	70.43	Ref	80.04	13.6%	98.97	40.5
Male:Female	1.37:1		1.69:1		1.71:1	
Urban	91.8	Ref	#	—	146.57	59.7
Rural	80.79	Ref	106.76	32.1%	128.63	59.2
Urban:Rural	1.14:1		—		1.14:1	

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