

RESEARCH ARTICLE

Epidemiology of Esophageal Cancer in Yanting - Regional Report of a National Screening Programme in China

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Abstract

Background and Objectives: Yanting in Sichuan Province is one of the highest risk areas of esophageal cancer (EC) in the world. We here summarize the epidemiology of EC in Yanting using data from the national screening programme during 2006-2011. **Methods:** Random cluster sampling was used to select a proportion of natural villages from six towns in Yanting, and residents aged 40-69 years old were invited for screening. Participants were screened using endoscopy with iodine staining and then confirmed by histological examinations. **Results:** The overall detection rates of low-grade hyperplasia (LH), moderate hyperplasia (MH), high-grade hyperplasia (HH), carcinoma in situ (CIS), intramucosal carcinoma (IC) and invasive carcinoma (INC) were 5.33%, 1.28%, 0.68%, 0.15%, 0.06% and 0.29%, respectively. The detection rates of LH, MH, HH and INC increased with age, reaching the peak among those aged 60-65 years, and the prevalences of LH and MH were higher among men than among women. In addition, the detection rates of hyperplasia were much higher in mountainous than in hilly areas. **Conclusions:** Among the high risk population, there are a great number of people with early-stage EC or precancerous conditions who do not have presenting symptoms. In particular, the elderly, men, or those living in mountainous areas are the most vulnerable population. It is therefore important to reinforce health education and screening services among such high risk populations.

Keywords: Esophageal cancer - screening assessment - Yanting, China - high risk population

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Introduction

Esophageal cancer (EC) is one of the most common malignant tumors, with both a high incidence and mortality rate (Ministry of Health Disease Prevention and Control Bureau, 2011). According to the Chinese national annual cancer registration reports in 2011, the incidence rate of EC was 20.85/100,000, which ranks as the sixth most common malignant tumor in China (National Cancer Center, 2012). Yanting in Sichuan Province is one of the highest risk areas of EC in the world (Zou et al., 2007; Li et al., 2009; Zhong et al., 2011). Surveillance data suggested that in 2008, the incidence and mortality rates of EC in Yanting were 92.81/100,000 and 77.50/100,000, respectively (Hao et al., 2012). This mortality was 3.38 times of the average mortality rate of EC in Sichuan Province during the same period (Liu et al., 2011), making EC the most common cause of cancer death in Yanting. Although EC has been a major public health burden in Yanting, the prevalence and its distributions are relatively underreported.

Since 2006, a government-backed project aimed at promoting early diagnosis and treatment of cancer was

launched by the Chinese Ministry of Health (MOH), and has been providing free cancer screening service among high risk populations. The present paper aims to summarize the results of this EC screening program in Yanting from 2006 to 2011, and provide epidemiological evidence for better implementing early diagnosis and treatment of EC in the area.

Materials and Methods

Participants

Residents from the six towns (Linnong, Gaodeng, Jinji, Xize, Lianghe and Fuyi) with the highest incidence of EC in Yanting were the targeted screening population. Random cluster sampling method was used to select a proportion of natural villages in each town, and residents aged 40-69 years old in the selected villages were invited for screening. The whole screening lasted from May 2006 to July 2011, including screening in 7 villages from Linnong and 14 villages from Gaodeng from 2006 to 2008, screening in 19 villages from Jinji in 2009, screening in 15 villages from Xize, 18 villages from Lianghe and 24 villages from Fuyi during 2010-2011.

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Table 1. Age and Sex Distributions of the Prevalence of Different Diagnosis

	LH	MH	HH	CIS	IC	INC
Sex						
Men	503(6.55)	118(1.54)	56(0.73)	13(0.17)	6(0.08)	25(0.33)
Women	300(4.07)	75(1.02)	46(0.62)	9(0.12)	3(0.04)	18(0.24)
<i>p</i>	<0.01	<0.01	0.43	0.45	0.35	0.35
Age						
40-45	81(2.90)	12(0.43)	4(0.14)	0(0.00)	0(0.00)	1(0.04)
45-50	71(3.19)	14(0.63)	6(0.27)	3(0.13)	1(0.04)	4(0.18)
50-55	163(5.66)	46(1.60)	11(0.38)	3(0.10)	3(0.10)	10(0.35)
55-60	218(7.16)	48(1.58)	28(0.92)	5(0.16)	3(0.10)	10(0.33)
60-65	198(7.72)	53(2.07)	33(1.29)	7(0.27)	1(0.04)	13(0.51)
65-70	76(4.87)	20(1.28)	20(1.28)	4(0.26)	1(0.06)	5(0.32)
<i>p</i>	<0.01	<0.01	<0.01	0.14	0.6	0.04

Results are presented as number (prevalence %)

Table 2. Time and Geographical Distributions of the Prevalence of Different Diagnosis

	LH	MH	HH	CIS	IC	INC
Year						
2006	128(6.31)	32(1.58)	7(0.35)	3(0.15)	3(0.15)	7(0.35)
2007	65(3.22)	15(0.74)	9(0.45)	3(0.15)	0(0.00)	4(0.20)
2008	140(6.99)	17(0.85)	8(0.40)	2(0.10)	0(0.00)	1(0.05)
2009	158(7.89)	47(2.35)	30(1.50)	6(0.30)	1(0.05)	7(0.35)
2010	124(6.20)	25(1.25)	17(0.85)	3(0.00)	0(0.00)	8(0.40)
2011	188(3.75)	57(1.14)	31(0.62)	5(0.10)	5(0.10)	16(0.32)
<i>p</i>	<0.01	<0.01	<0.01	0.51	0.18	0.3
Town						
Linnong	110(4.49)	25(1.02)	7(2.94)	2(0.08)	2(0.08)	2(0.08)
Gaodeng	223(6.20)	39(1.08)	17(0.47)	6(0.17)	1(0.03)	10(0.28)
Jinji	158(7.89)	47(2.35)	30(1.50)	6(0.30)	1(0.05)	7(0.35)
Xize	93(4.91)	30(1.58)	17(0.90)	2(0.11)	1(0.05)	8(0.42)
Lianghe	87(4.11)	23(1.09)	8(0.38)	3(0.14)	3(0.14)	5(0.24)
Fuyi	132(4.40)	29(0.97)	23(0.77)	3(0.10)	1(0.03)	11(0.37)
<i>p</i>	<0.01	<0.01	<0.01	0.45	0.61	0.31

Results are presented as number (prevalence %)

Screening and treatment

After giving informed consents, all participants underwent medical history collection and physical examinations. Participants without any contraindications were then screened using endoscopy with iodine staining. Observations on the esophageal mucosa started from 16cm distal to the incisor teeth, and these covered normal mucosa, original states of the lesions as well as the gastric mucosa. The whole esophageal mucosa was then stained with 20ml 1.2% iodine solution. The size of the unstained lesions and their distance to the incisor teeth were carefully recorded, and index biopsies were subsequently performed according to the sizes of the lesions. Diagnosis was confirmed by histological examinations and was classified into basal cell hyperplasia, low-grade hyperplasia (LH), moderate hyperplasia (MH), high-grade hyperplasia (HH)/carcinoma in situ (CIS), intramucosal carcinoma (IC) or invasive carcinoma (INC).

Statistical Analysis

The detection rates of different pathological changes and EC were summarized and calculated by age, sex, year and geographical areas. Comparisons of the rates were done by Pearson's chi-square test. All statistical tests were two-sided, and a *p* value <0.05 was considered statistically significant. Analyses were implemented in SPSS 17.0.

Results

Overview

A total of 15065 people were screened between May

2006 and July 2011, including 2449 from Linnong, 3599 from Gaodeng, 2002 from Jinji, 1895 from Xize, 2119 from lianghe and 3001 from Fuyi. These included 7685 men and 7380 women, with an average age of 53.67±8.05 years old (Table 1). The overall detection rates of LH, MH, HH, CIS, IC and INC were 5.33% (n=803), 1.28% (n=193), 0.68% (n=102), 0.15% (n=22), 0.06% (n=9) and 0.29% (n=43), respectively.

Age, sex, time and geographical distributions

Table 1 shows the distributions of detection rates by age and sex. The detection rates of LH and MH among men (6.55% and 1.54%) were significantly higher (*p*<0.01) than those among women (4.07% and 1.02%). The detection rates of HH, CIS, IC and INC were all higher among men than among women, though the differences were not statistically significant.

The detection rates of LH, MH, HH and INC increased with age before the age of 65, with the highest rates found among those aged 60-65 years old (7.72%, 2.07%, 1.29%, and 0.51% for LH, MH, HH and INC, respectively, *p*<0.05). There was no statistically significant difference in the detection rates of CIS and IC among different age groups.

There were significant differences in the detection rates of LH, MH and HH over the years (*p*<0.001), though no monotonous trend was found. Notably, the yearly detection rates of LH, MH and HH between 2009 and 2011 were much higher than those found during 2006-2008. In particular, the detection rates of HH have increased dramatically. The detection rates of CIS, IC and INC did not change much over the years (Table 2).

As for geographic distributions, Linnong, Gaodeng, Jinji and Xize are mountainous areas whereas Lianghe and Fuyi are both hilly areas. According to table 2, the detection rates of hyperplasia were much higher in mountainous areas than in hilly areas (*p*<0.001), while the detection rates of CIS, IC and INC were not significantly different among different towns.

Discussion

Yanting in Sichuan is a high prevalence area for EC in China. After 40 years' prevention and control work of EC, the incidence and mortality rates of EC in Yanting have both declined, though the incidence is still relatively high compared to other parts of the world (Chen et al., 2005; Hao et al., 2012). The detection rates of LH, MH, HH and INC were highest among those aged 60-65 years old, and the prevalence of LH and MH were higher among men than among women. This screening suggested that the detection rates of EC and precancerous conditions (HH and CIS) were 0.35% and 0.83% among this high risk population aged 40-69 years old. These are relatively lower than some of the detection rates found in other populations. Liu et al. (2010) found a detection rate of 0.59% and 1.37% for EC and precancerous conditions among 6048 high risk population aged 40-69 in Linzhou, Henan. Similarly, the detection rates of EC and precancerous conditions were found to be 0.59% and 1.01% among 6189 high risk population in Feicheng (Zhao

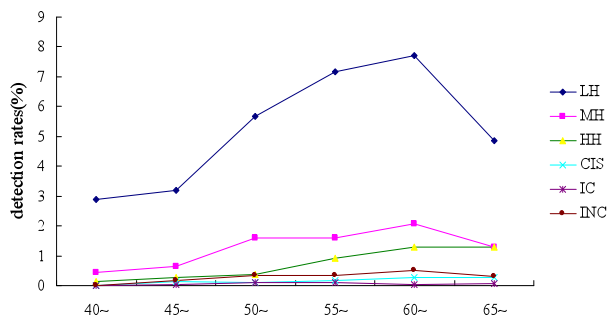


Figure 1. Age Distributions of the Prevalence of Different Diagnosis



Figure 2. Time Distributions of the Prevalence of Different Diagnosis

et al., 2011) and 0.62% and 2.51% among 3227 people in Cixian (Chen et al., 2008). This is probably because the incidence of EC in Yancheng is lower than that in Linzhou, Feicheng and Cixian (Hao et al., 2012). As can be seen from the screening results, there exist a large proportion of people with precancerous conditions among the high risk populations of EC. If these cases can be detected and treated at an earlier stage, their conditions could then be stopped from further development and the incidence of EC would eventually be reduced.

Table 1 shows the age and sex distributions of different diagnosis. The detection rates of LH and MH among men were much higher than those among women, while the differences on the rates of EC and precancerous conditions were not statistically significant. This might be due to the small number of cases of EC and precancerous conditions and thus the limited power. The sex ratios (men: women) of the detection rates of EC and precancerous conditions were 1.46:1 and 1.15:1, respectively, similar to reports from Linzhou and Cixian (Chen et al., 2008; Liu et al., 2010). Figure 1 shows the age distributions of the detection rates of different esophageal conditions. The detection rates of LH, MH, HH and INC increased with age, reaching the peak between 60-65 years old. This suggested that the elderly population should be a target population in the early detection and early treatment of EC. Also with the accelerating population ageing, the incidence of EC and precancerous conditions are likely to increase, especially among the elderly. This brings up new challenges to the primary and secondary prevention of EC.

Previous epidemiological studies (Chen et al., 2005; Li et al., 2010) showed that the incidence and mortality rates of EC have been declining in the past few years. However, our study did not support a declining trend in the detection rates of different esophageal pathological changes. Figure 2 shows the time trend of the detection

rates of different diagnosis. The detection rates of LH, MH and HH were higher during 2009-2011 than during 2006-2008. From a geographical perspective, the target screening population during 2009-2011 came from Jinji, Xize, Lianghe and Fuyi, where the detection rates of LH and MH were lower than people from Linnong and Gaodeng, the target town from 2006 to 2008. Therefore, the differences we found in detection rates may be a result of improvement in screening and diagnostic techniques. Besides, six years may have been too short a period to observe a notable trend, and more time is needed to confirm the time trend. There are also geographical variations in the detection rates of LH, MH and HH. The town with the highest and lowest detection rates came from mountainous and hilly areas, respectively. This might be resulted from the poor living conditions among residents in mountainous areas. As mountainous areas are usually less accessible than hilly areas, residents from mountainous areas tend to consume more preserved food but less fresh vegetables, fruits and meat. Research suggested that consumptions of fresh vegetables, fruits and meat are protective factors of EC while overconsumption of preserved food leads to increased risk of EC (Yamaji et al., 2008; Kamangar et al., 2009). This may help to explain the geographical variations. Table 2 summarizes the time and geographical distributions of the detection rates.

The ultimate goal of EC management is to reduce incidence and mortality rates, and to improve patients' prognosis and quality of life. Currently, a majority of patients who present with symptoms are already at a mid- or late-stage. Many of them can not endure surgeries and 5-year survival rate is lower than 10%, while 10-year survival rate can reach 95% among those who have had surgery at an early stage (Gary et al., 2001; Zhong et al., 2011). The current study suggested that among high risk population, there are a great number of people with early-stage EC or precancerous conditions who do not have presenting symptoms. In particular, the elderly, men, or those living in mountainous areas are the most vulnerable population. Therefore, it is crucial to reinforce health education in high risk areas and increase people's awareness of EC. Also, physical examinations on a regular basis would help to detect early-stage esophageal problems and is thus important for the secondary prevention of EC.

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