World Journal of Gastroenterology

Online Submissions: http://www.wjgnet.com/esps/
wjg@wjgnet.com
doi:10.3748/wjg.v19.i7.979

World J Gastroenterol 2013 February 21; 19(7): 979-983
ISSN 1007-9327 (print) ISSN 2219-2840 (online)
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TOPIC HIGHLIGHT

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Colorectal cancer mortality in Hong Kong of China, Japan, South Korea, and Singapore

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Supported by Basic Science Research Program through the National Research Foundation of Korea funded by the Ministry of Education, Science and Technology, No. 2010-0010276; A Research Grant from the National Cancer Center of Korea, No. 1010160
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Received: September 19, 2012 Revised: January 8, 2013
Accepted: January 23, 2013
Published online: February 21, 2013

Abstract

To clarify the trend in colorectal cancer mortality in Asian countries. We analyzed the colorectal cancer mortality in four Asian countries using the World Health Organization mortality database and the Korea National Statistics Office database. The annual age-standardized rates and truncated rated for the three age groups (30-49, 50-69 and ⩾ 70 years) for Hong Kong of China (1969-2009), Japan (1955-2009), South Korea (1985-2006), and Singapore (1966-2009) were estimated. A joinpoint regression model was used to detect significant trends in mortality rates. Colorectal cancer mortality in men started to decrease in 1992 in Japan followed by Singapore and Hong Kong of China in 1995. The mortality rates in women stared to decrease in 1980 in Singapore, followed by Hong Kong of China and Japan in 1996. In all countries and both genders, except for women in Singapore, the decrease in mortality began in the younger age groups. The colorectal cancer mortality in the four studied Asian countries has started to decrease, and the decrease occurred first in the younger age groups.

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Key words: Colorectal cancer; Mortality; Joinpoint regression; Trends; Early detection of cancer; Mass screening

Shin A, Jung KW, Won YJ. Colorectal cancer mortality in Hong Kong of China, Japan, South Korea, and Singapore. *World J Gastroenterol* 2013; 19(7): 979-983 Available from: URL: http://www.wjgnet.com/1007-9327/full/v19/i7/979.htm DOI: http://dx.doi.org/10.3748/wjg.v19.i7.979

INTRODUCTION

Colorectal cancer is responsible for 8% of all cancer deaths worldwide, with an estimated 608 000 deaths annually, and it is ranked as the fourth most common cause of death from cancer[1]. It has been estimated that the numbers of deaths due to colorectal cancer will reach approximately 376 700 by 2020 in Asia[1].

A decline in colorectal cancer mortality has been observed in most western and northern European countries[2] and the United States[3]. Among Asian countries, the mortality started to decrease in the early 1990s in Japan[4,5]. The trends in colorectal mortality differ by geographic region, sex, and age group[6]. In this review, we analyzed the trends in colorectal cancer mortality in 4 Asian countries stratified by sex and age groups.

DATA ANALYSIS

Colorectal cancer mortality data were extracted from the World Health Organization (WHO) mortality data-

base[7]. The 3 countries or regions with data available for the longest period were Japan (since 1955), Singapore (since 1966) and Hong Kong of China (since 1969) were included in the analysis. In addition, Korean data were available from the WHO mortality database for 1985 to 2006 and from the Korea National Statistics Office for 2007 to 2010 and were included in the study[8]. The annual age-standardized rates (ASR) and the truncated rates for the 3 age groups (30-49, 50-69 and ⩾ 70 years) were estimated using the world standard population.

The trends in colorectal cancer mortality were tested using joinpoint regression models, using Joinpoint software version 3.5.3. The software was developed by the Surveillance Research Program of the United States National Cancer Institute and is based on the Poisson assumption[9]. A maximum of 3 joinpoints was allowed, and the default settings were used.

Table 1 shows the age-adjusted mortality rates for colorectal cancer in the 4 countries. Singapore showed the highest female mortality rates of the 4 countries from 1966 to 2009. Singapore also showed the highest male mortality during the same period, except for 2005, when males in Hong Kong of China showed a slightly higher rate. Korean men and women showed the lowest rates among the 4 countries.

Table 2 shows the results for the joinpoint regression analyses. Colorectal cancer mortality in men started to decrease in 1992 in Japan, followed by Singapore and Hong Kong of China in 1995. The mortality rates in women stared to decrease in 1980 in Singapore, followed by Hong Kong of China and Japan in 1996. In South Korea, the mortality rates plateaued in 2002 in men and started to decrease in 2004 in women.

In men, the decline in mortality started for younger age groups first. In Japan, mortality started to decrease in 1977 for the 30-49 years age group, in 1995 for the 50-69 years age group, and in 1998 for the 70 and older age group (Table 2). A similar trend was observed for Hong Kong of China, Singapore and South Korea. Similarly, a significant decrease in APC was first observed for younger age groups in Hong Kong of China, Japan and South Korea in women. For example, in Hong Kong of China, female mortality began to decrease in 1992 for the 30-49 years age group, in 1994 for the 50-69 years age group, and in 2002 for the 70 years and older age group. Whereas, for women in Singapore, the decrease began in 1980 in the 50-69 years age group, which was 4 years earlier than among the 30-49 years age group (Table 2). Figure 1 shows the trends in colorectal cancer mortality rates for the 3 age groups in Hong Kong of China, Japan, South Korea, and Singapore between 1955 and 2010.

DISCUSSION

Colorectal cancer mortality in the European Union has declined since the early 1980s. These decreases were observed in most western and northern European countries, whereas a persistent excess in mortality was observed in Hungary and the Czech Republic[6]. In the United States, colorectal cancer mortality rates in white men began to decline in 1978[10]. The APC for white men was -0.6% between 1973 and 1978 and -2.0% in 1986[10]. The decline in the mortality of white women was more rapid, with an APC of -2.1% between 1973 and 1997[10].

In Asia, a reduction in colorectal cancer mortality has been observed for economically advanced regions, such as Japan, Hong Kong of China, Singapore, and more recently, in South Korea. Notably, the decline started in younger age groups. A more favorable mortality trend and a consequent widening of the survival gap between the elderly and middle age groups were observed in Europe[2,6,11].

In contrast, the incidence rates for colorectal cancer in these countries have increased, except for men and women in Japan and women in Hong Kong of China[4,12-14]. Singapore experienced a sharp increase in the colorectal cancer incidence between 1968 and 2002, particularly among older men[12]. In Hong Kong of China, the ASR peaked in 1994 and has since declined in women, whereas the ASR progressively increased in men[14]. The increase was notable among men above 60 years old and women above 70 years old[14]. Similarly, the APCs for the incidence rate of colorectal cancer was prominent among older Korean men and women between 1999 and 2009[13]. Japan is the only Asian country in which the incidence rates for colorectal cancer have decreased in both men and women[4]. The Osaka Cancer Registry data showed that the overall colorectal cancer incidence in women has decreased since 1995. In men, the rate has been stabilized since 1996[9].

Changes in risk factors, particularly those related to lifestyle, have been suspected as main contributors to the colorectal cancer increase. Among modifiable lifestyle factors, alcohol consumption, obesity, cigarette smoking, and dietary habits (*e.g.*, red meat and processed meat consumption) have been associated with colorectal cancer risk[15,16]. In a study for population-attributable fractions of cancer in Japan, 31%-33% of the colorectal cancer incidence or mortality was explained by known preventable risk factors, such as alcohol consumption, cigarette smoking, obesity, and physical inactivity[17] when men and women combined. Among them, alcohol consumption was attributed for the greatest portion, followed by cigarette smoking and obesity. In a Chinese study, the population-attributable fraction of known preventable risk factors for cancer death was 14.6% for colon cancer and 2.2% for rectal cancer[18]. Alcohol consumption was accountable for 32.9% of male colorectal cancer and 2.1% of female colorectal cancer in Japan[17]. In China, alcohol consumption was accountable for 2.1% and 0.2% of colorectal cancer cases in men and women, respectively[19]. The prevalence and amount of alcohol consumption in these countries and South Korea have not decreased during the last few decades[17,18,20]. However, the prevalence of obesity, particularly in men, and a sedentary lifestyle has increased in Hong Kong of China, South Korea, and Japan[14,17,21]. Fortunately, the prevalence of cigarette smoking has declined in South Korea, Japan, and China[17,18,20]. These changes may explain the transition in the colorectal cancer epidemiology in these Asian countries.

Table 1 Colorectal cancer mortality rates in Hong Kong of China, Japan, South Korea and Singapore, 1955-2010 (age-standardized mortality rates per 100 000)

Country or area	Period	Men				Women			
		1955	1975	1995	2005	1955	1975	1995	2005
Hong Kong (China)	1969-2009	-	29.7	40.7	37.8	-	18.8	26.1	23.4
Japan	1955-2009	14.5	23.8	38.2	34.8	12.5	18.3	22.3	20.8
South Korea	1985-2010	-	-	8.6	30.5	-	-	11.8	17.2
Singapore	1966-2009	-	37.2	52.1	36.8		26.1	31.7	27.5

Table 2 Joinpoint analysis for colorectal cancer mortality at all ages and at age 30-49, 50-69 and ⩾ 70 year in Hong Kong of China, Japan, South Korea and Singapore, 1955-2010

	Trend 1		Trend 2		Trend 3		Trend 4	
	Year	APC	Year	APC	Year	APC	Year	APC
Men								
All ages								
Hong Kong (China)	1969-1995	1.3[1]	1995-2009	-0.1				
Japan	1955-1975	2.0[1]	1975-1992	1.2[1]	1992-2004	-0.4[1]	2004-2009	-2.21
South Korea	1985-2002	7.9[1]	2002-2010	0.3				
Singapore	1966-1995	1.4[1]	1995-2009	-1.5[1]				
30-49 yr								
Hong Kong (China)	1969-2009	-1.1[1]						
Japan	1955-1960	-1.0	1960-1977	3.8[1]	1977-1998	-0.5[1]	1998-2009	-2.51
South Korea	1985-2002	2.5[1]	2002-2010	-2.1				
Singapore	1966-1989	0.5	1989-2009	-2.6[1]				
50-69 yr								
Hong Kong (China)	1969-1994	1.2[1]	1994-2009	-0.4				
Japan	1955-1963	0.4	1963-1995	2.9[1]	1995-2009	-1.6[1]		
South Korea	1985-2003	6.5[1]	2003-2010	-1.4[1]				
Singapore	1966-1989	2.1[1]	1989-2009	-1.2[1]				
⩾ 70 yr								
Hong Kong (China)	1969-2001	1.9[1]	2001-2009	-0.8				
Japan	1955-1980	3.4[1]	1980-1998	2.0[1]	1998-2009	-0.9[1]		
South Korea	1985-1994	14.0[1]	1994-1998	5.9	1998-2002	12.2[1]	2002-2010	1.11
Singapore	1966-1995	1.7[1]	1995-2009	-0.9				
Women								
All ages								
Hong Kong (China)	1969-1996	1.5[1]	1996-2009	-1.7[1]				
Japan	1955-1960	14.3[1]	1960-1983	2.9[1]	1983-1996	0.9[1]	1996-2009	-0.71
South Korea	1985-1994	9.9[1]	1994-2004	4.3[1]	2004-2010	-1.2[1]		
Singapore	1966-1980	4.7[1]	1980-1998	-0.2	1998-2009	-2.6[1]		
30-49 yr								
Hong Kong (China)	1969-1992	0.4	1992-2009	-2.4[1]				
Japan	1955-1963	0.2	1963-1974	3.1[1]	1974-1991	0.3	1991-2009	-2.11
South Korea	1985-1991	8.8[1]	1991-2010	-0.6				
Singapore	1966-1984	2.8	1984-2009	-3.2[1]				
50-69 yr								
Hong Kong (China)	1969-1994	1.0[1]	1994-2009	-2.3[1]				
Japan	1955-1963	0.4	1963-1992	1.4[1]	1992-2004	-0.8[1]	2004-2009	-2.51
South Korea	1985-1994	8.3[1]	1994-2003	3.3[1]	2003-2010	-1.1		
Singapore	1966-1980	4.4[1]	1980-2009	-1.8[1]				
⩾ 70 yr								
Hong Kong (China)	1969-2002	2.5[1]	2002-2009	-1.9[1]				
Japan	1955-1975	3.1[1]	1975-1999	1.1[1]	1999-2009	-0.9[1]		
South Korea	1985-1993	16.9[1]	1993-2003	7.7[1]	2003-2010	0.0		
Singapore	1966-1981	5.8[1]	1981-2000	0.9[1]	2000-2009	-2.6[1]		

[1]$P < 0.05$ *vs* the younger age groups. APC: Annual percent change.

A rapid increase in the incidence among older age groups may reflect the accumulated exposure to risk factors[22]. In contrast, a major contributor to the mortality reduction for colorectal cancer in the younger generation is the adaptation of screening programs. In Japan, a colorectal cancer screening program using a fecal occult blood test (FOBT) has been in place since 1992 under the Health Services Law for the Aged[23]. Colorectal cancer screening programs were introduced as a part of the National Cancer Screening Program for Medical Aid

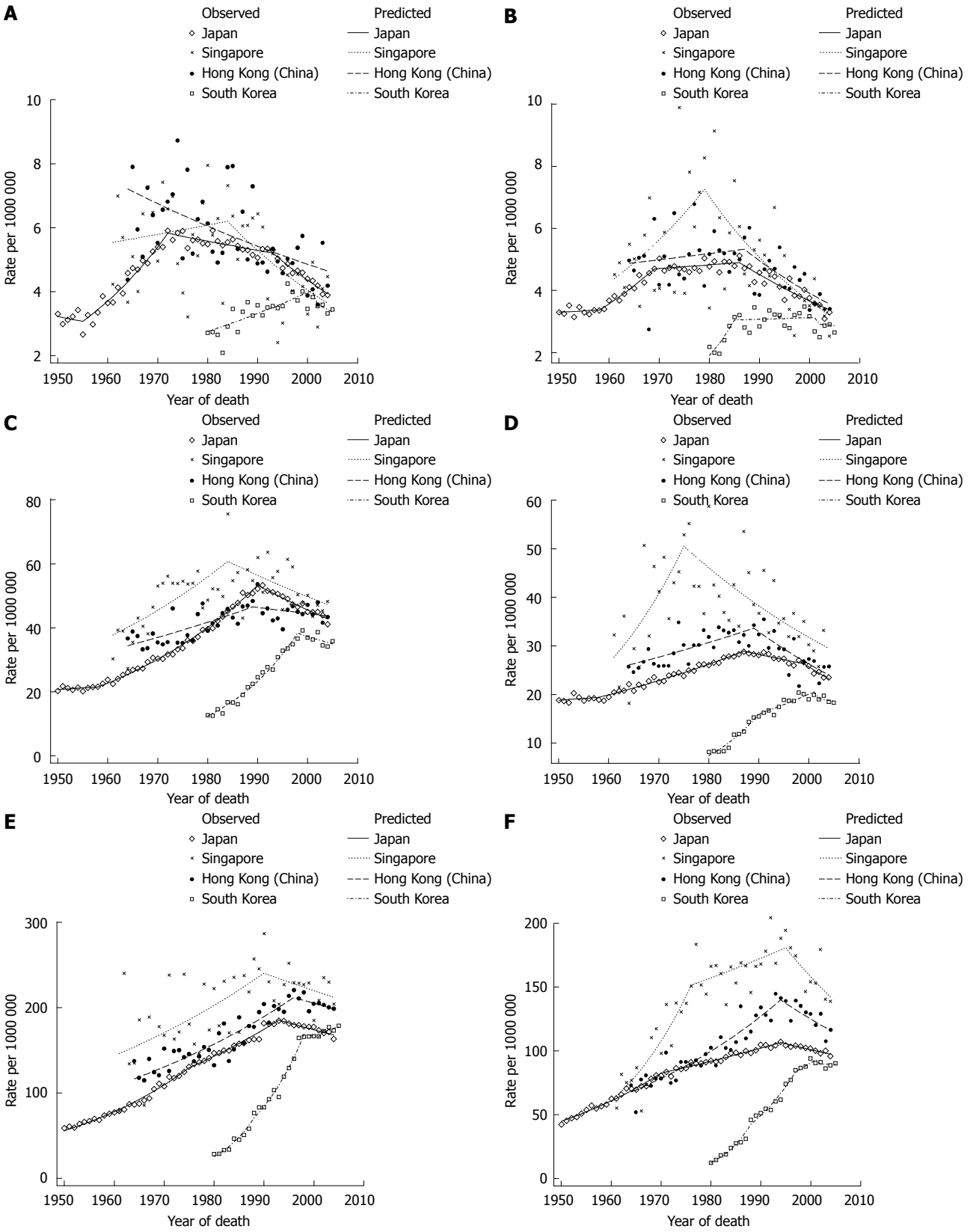

Figure 1 Trends in age-standardized colorectal cancer mortality rates per 100 000 in Hong Kong of China, Japan, South Korea and Singapore, 1955-2010. A: Men 30-49 yr; B: Men 50-69 yr; C: Men ≥ 70 yr; D: Women 30-49 yr; E: Women 50-69 yr; F: Women ≥ 70 yr.

recipients and National Health Insurance beneficiaries in the lower income bracket in 2004 in South Korea[24]. The FOBT is provided free of charge as a primary modality for men and women aged 50 years or older. FOBT-positive individuals were provided follow up by either colonoscopy or a double-contrast barium enema[24]. According to the Korean National Cancer Screening Survey, which covers both organized and opportunistic cancer screen-

ing programs, the lifetime screening rates for colorectal cancer were 25.3% in 2004 and 54.2% in 2010[25]. Although colorectal cancer screening for the average-risk population is recommended to start at 50 years of age, a national screening program is not available in Singapore[26]. However, compliance with opportunistic screening in Singapore was reasonably high[26].

CONCLUSION

In Hong Kong of China, Japan, South Korea and Singapore in which economic development and the westernized lifestyle were adopted early, colorectal cancer mortality has started to decrease. The decline or stabilization of mortality occurred the earliest in younger age groups and in women. The most important contributor to the decline in mortality is the introduction of colorectal cancer screening programs, although the role of the transition of lifestyle risk factors needs to be addressed.

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