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Self-reported diabetes and mortality in a prospective Chinese elderly cohort study in Hong Kong

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ABSTRACT

Objective: In Western countries, diabetes mellitus is positively associated with death from all- and specific-causes including cancer, cardiovascular and respiratory diseases. In a Chinese setting with a different disease pattern: high diabetes rates in a relatively non-obese population with low ischemic heart disease (IHD) rates where diabetes is positively associated with IHD, we examined the association of self-reported diabetes with death among older people.

Methods: Multivariable Cox regression analysis was used in a population-based prospective cohort of 66,820 Chinese (65+ years) enrolled from July 1998 to December 2001 at Elderly Health Centers of the Hong Kong Government Department of Health, followed until May 31, 2012.

Results: During 10.9 years of follow-up, 19,845 deaths occurred. Self-reported diabetes was associated with death from all-causes (hazard ratio (HR) = 1.56, 95% confidence interval (CI) 1.51, 1.62), cardiovascular disease (HR = 1.84, 95% CI 1.72, 1.96), cancer (HR = 1.11, 95% CI 1.03 to 1.20), liver cancer (HR = 1.38, 95% CI 1.13 to 1.69) and stomach cancer (HR = 1.38, 95% CI 1.03 to 1.85), adjusted for age, sex, socio-economic position, alcohol use, smoking, exercise and body mass index.

Conclusion: Such a pattern of associations suggests that further investigation into the drivers of diabetes is required in this and similar populations.

Introduction

With economic development and corresponding changes, population aging and longer survival after diagnosis, type 2 diabetes is increasing globally and is a leading complex chronic disease (Hu, 2011; Wild et al., 2004). The number of people with diabetes is projected to increase globally by 54% from 2010 to 2030, almost twice the growth rate of the adult population in that period (Shaw et al., 2010). The overall prevalence of diabetes in China was 11.6% (12.1% for men and 11.0% for women) in 2010, having almost tripled during the previous decade (Xu et al., 2013b). The prevalence is similar in Hong Kong, the most economically developed and westernized Chinese city (Pan et al., 1997; Wong and Wang, 2006; Yang et al., 2010). In the West, diabetes is consistently associated with higher death rates from all- and several specific causes such as cardiovascular disease and cancer in younger and middle-aged people (Coughlin et al., 2004; Hu et al., 2001; Stamler et al., 1993). These associations have also been observed in prospective studies from Asian settings, but socio-economic position was not considered (Jee et al., 2005; Wen et al., 2005). In addition, this association is unclear in older people (65+ years), where the burden of diabetes is the greatest (Lipscombe and Hux, 2007; McBean et al., 2004), raising an important issue for risk stratification, etiology and public health.

The patterns of diabetes differ in Chinese from Western settings, i.e. high rates of diabetes in a relatively non-obese population with low rates of ischemic heart disease (IHD) (Ogden et al., 2006; Wu, 2006; Berghöfer et al., 2008; Whitlock et al., 2009), but a higher relative risk of IHD in people with diabetes. Many possible explanations exist for this particular pattern of chronic diseases in this setting, whose identification could be relevant to prevention. To provide a preliminary situational analysis we examined the pattern of association of diabetes with mortality rates in a Chinese setting, because the pattern of associations of diabetes with cause-specific mortality might reveal some contextually specific consequences of or risk factors for diabetes in this large proportion of the global population. Moreover, Hong Kong has an ethnic Chinese population (>95%) who have already

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease; CI, confidence interval; EHC, elderly health center; HR, hazard ratio; ICD, International Classification of Disease; IHD, ischemic heart disease.

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experienced the epidemiological transition from pre-industrial to post-industrial living conditions in a single lifetime. With the epidemiological transition the major causes of morbidity and mortality change from infectious diseases to "man-made" or non-communicable diseases (Omran, 1971). This transition took place many years ago in settings such as Western Europe and North America, but is still underway in China. As a rapidly developed non-western setting, the rates of disease in Hong Kong may act as a sentinel for China and other similar settings, where rapid transition is currently underway (Maddison, 2007). Here we took advantage of a large cohort of older Chinese people from Hong Kong to examine prospectively the association of self-reported diabetes with death from all-causes and specific causes and whether these associations varied by sex or age.

Methods

Source of data

Since July 1998, eighteen elderly health centers (EHC) have been established by the Hong Kong Government Department of Health to offer older people screening services and medical examinations, aiming to enhance primary health care by improving self-care ability, encouraging healthy living and strengthening social integration. All residents of Hong Kong aged ≥65 years were encouraged to enroll in these centers for a small annual fee of HK$ 110 (US$1 = HK$7.8; waived for those on public social security assistance). This study covered all 66,820 enrollees from July 1998 to December 2001, representing about 9% of older residents (≥65 years) of Hong Kong (Census and Statistical Department HKG, 2001). More women were enrolled than men (44,140 versus 22,680); otherwise, age, socioeconomic position, current smoking status and hospital use were similar to the general older population in Hong Kong (Schooling et al., 2006; Xu et al., 2013a).

Nurses and doctors conducted health assessments, using standardized structured interviews, and comprehensive clinical examinations. Information on demographic characteristics, socioeconomic position, lifestyle, and disease history was collected. Details of the methods have been reported elsewhere (Schooling et al., 2006; Xu et al., 2013a). Ethics approval was obtained from The University of Hong Kong–Hospital Authority Hong Kong West Cluster Joint Institutional Review Board. The study complied with the Declaration of Helsinki.

Exposure

Diabetes status was based on self-report, obtained by a nurse who identified individuals with doctor diagnosed diseases for special attention and care, ensuring the reliability of self-reported diabetes.

A relatively high proportion of older people in Hong Kong are illiterate, so diabetes status was ascertained during a structured interview, not by use of a self-administered questionnaire. During the structured interview the participants were asked by a nurse about the presence of a number of active diseases/problems following a checklist of common diseases in older people including diabetes. Answers were recorded as "Yes and receiving regular care", "Yes but not receiving health care" and "No". Subsequently the participants were asked about diseases/problems newly diagnosed after the health assessment following a checklist of common diseases including diabetes. Answers were recorded as "Yes" and "No". Participants who reported diabetes as an active disease/problem or as having been newly diagnosed at the health assessment were categorized as having diabetes.

Follow-up

Vital status and cause of death were ascertained from death registration in Hong Kong by record linkage using the unique Hong Kong identity card number. The last date of follow-up or censor date for living participants was May 31, 2012. Most participants in the EHC cohort remain in Hong Kong and any deaths that occur outside Hong Kong are usually registered in Hong Kong by relatives. For those whose vital status could not be ascertained from death registration or record linkage to use of routine services, telephone interviews were conducted on an ongoing basis (i.e., in 2004, 2006 and 2009) to obtain vital status and cause of death. Causes of death were routinely coded by International Classification of Disease (ICD) 9th Reversion before 2001 and 10th Reversion after 2001 and checked by the Department of Health. More than 95% of deaths among

Table 1
Baseline characteristics by self-reported diabetes among 66,813 older people enrolled at elderly health centers in Hong Kong from 1998 to 2001.

		Self-reported diabetes					
		Men			Women		
		No (n = 19,580)	Yes (n = 3097)	p value[a]	No (n = 38,008)	Yes (n = 6128)	p value[a]
Age group (%)	65–74	69.6	71.1		68.6	69.4	
	75–84	27.4	26.8		27.3	27.9	
	≥85	3.0	2.2	0.02	4.1	2.8	<0.001
Alcohol use (%)	Never drinker	48.2	52.6		84.0	87.0	
	Ex-drinker	17.5	21.8		5.4	6.8	
	Social drinker	24.2	18.8		9.5	5.7	
	Regular drinker	10.1	6.8	<0.001	1.1	0.5	<0.001
Smoking status (%)	Never smoker	37.7	39.7		88.1	89.2	
	Current smoker	21.1	16.7		4.2	3.0	
	Ex-smoker	41.2	43.6	<0.001	7.7	7.9	<0.001
Exercise (%)	Never	17.0	14.9		15.0	12.6	
	<30 min/d	24.3	26.4		27.8	29.0	
	≥30 min/d	58.7	58.7	0.004	57.2	58.4	<0.001
Education (%)	Secondary or more	30.4	33.3		10.3	9.2	
	Primary	51.6	49.2		29.3	28.9	
	No formal but literate	10.8	9.4		20.6	18.9	
	Illiterate	7.2	8.1	0.001	39.8	43.1	<0.001
Housing (%)	Private	54.8	56.6		52.8	52.6	
	Public or aided	39.6	38.2		39.9	40.6	
	Temporary, institution or others	5.6	5.2	0.15	7.4	6.8	0.15
Monthly expenditure (%)	<1000HK$	11.8	10.6		16.6	16.2	
	1000–1999HK$	36.3	33.5		39.6	38.1	
	2000–2999HK$	32.0	32.1		29.7	30.3	
	≥3000HK$	19.9	23.9	<0.001	14.2	15.5	0.02
Body mass index (%)	<18.5	6.4	2.3		5.6	2.1	
	18.5–<23	34.6	26.5		31.7	26.6	
	23–<25	23.8	26.5		21.4	23.4	
	≥25	35.1	44.8	<0.001	41.4	47.9	<0.001

[a] Two-sided p value from a χ^2 test.