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Original Research

Incidence and mortality of gynaecological cancers: Secular trends in urban Shanghai, China over 40 years

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Abstract ***Aim:*** Appraisal of cancer trends is essential for future cancer control, but relevant studies in China are scarce due to a lack of long-term data. With 40-years of cancer registry data, we sought to evaluate secular time trends in incidence and mortality of gynaecological cancers in an urban Chinese population.

Materials and methods: Data on incidence and mortality of invasive cervical, uterine and ovarian cancer were collected by the Shanghai Cancer Registry. Age-standardised incidence and mortality rates were calculated for women aged 20–84 in urban Shanghai between 1973 and 2012. Age-period-cohort Poisson regression models were used to evaluate age, period and cohort effects. Overall linear trends, interpreted as the estimated annual percentage change (EAPC), were derived from the net drift in age-drift models.

Results: Overall, cervical cancer incidence and mortality substantially decreased (EAPC = −4.5% and −5.5%, respectively); however, an upward trend was apparent among younger women (age <60). Uterine cancer incidence increased slightly (EAPC = 1.8%), while mortality decreased over time (EAPC = −2.4%). Ovarian cancer incidence and mortality both increased, although the increase in incidence (EAPC = 1.8%) was larger than mortality (EAPC = 0.6%). While cohort

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effects were most evident for cervical cancer incidence and mortality, significant age, period, and cohort effects were found for all three gynaecological cancers evaluated.
Conclusions: These secular trends in incidence and mortality of gynaecological cancers in Shanghai likely reflect changing risk factor profiles and improved cancer prognosis over time, and suggest new priorities and call for additional efforts for gynaecological cancer prevention and control for women in China.

1. Introduction

Gynaecological cancers include three of the seven most common cancers among women worldwide. In 2012, cervical, uterine and ovarian cancer account for 5.0%, 5.9%, and 2.8%, of all worldwide cancers among women respectively [1]. Generally, risk factors for gynaecological cancers include behavioural, reproductive, hormonal and genetic factors [2]. Uterine and ovarian cancer occur more frequently in developed countries and are most often associated with increasing obesity, decreasing parity and other reproductive factors, and oestrogen-related exposures [3]. Cervical cancer is distinct in that chronic infection with the sexually transmitted human papillomavirus (HPV) is necessary, and the disease predominantly affects women in lower-resource countries [3,4]. In developed countries, healthcare, health education, and widespread use of screening programs contribute to a lower cervical cancer incidence and mortality [4–6].

Due to rapid socioeconomic development and accelerated urbanisation, dramatic changes in behavioural and reproductive characteristics have occurred among Chinese women [7]. For example, the total fertility rate (average number of children born per women) has dropped tremendously from 6.1 to 1.2 over the past half century; this is mainly attributed to the implementation of a nationwide family planning program in China [8]. Other changes, such as an increasing prevalence of obesity, an earlier age at menarche, a later age at menopause, and an increasing number of lifetime sexual partners, also likely contribute to the burden of gynaecological cancers in China [9]. Assessment of trends in cancer incidence and mortality is of the utmost importance to cancer control and public health planning. However, relevant studies in China are scarce largely due to the lack of long-term cancer incidence data. With 40-years of cancer registry data, we conducted this study to evaluate secular time trends in incidence and mortality of cervical, uterine and ovarian cancers among women in urban Shanghai. This study was undertaken not only to lay the groundwork for future cancer control efforts in Shanghai, but also to provide reference for other rapidly developing regions.

2. Materials and methods

2.1. Incidence, mortality and population data

Gynaecological cancers, including cancers of the cervix uteri (C53), corpus uteri (C54), uterus not otherwise unspecified (C55), and ovary (C56), were selected from the Shanghai Cancer Registry (SCR) based on International Classification of Diseases, 10th Revision (ICD-10) codes. Cancers of the vulva (C51), vagina (C52), and other female genital organs (C57) were not included due to their very low incidence and mortality rates. Briefly, the SCR was established in 1963. It is the oldest population-based cancer registry in China, and one of the largest cancer registries in the world [10]. Complete cancer incidence and mortality data have been collected since 1973 for urban areas and since 2002 for rural areas. SCR data for urban areas, which cover 289 km^2 and an average of 7 million residents, have consistently reached standards set by the International Agency for Research on Cancer, and have been published in its quinquennial publications: Cancer Incidence in Five Continents, volumes IV–X. Annual population data were provided by the Department of Vital Statistics, Shanghai Municipal Center for Disease Control and Prevention. The study population for the current analysis included an average of 3.1 million permanent female residents of urban Shanghai from January 1, 1973 to December 31, 2012.

2.2. Statistical analysis

Incidence and mortality age-standardised rates (ASR) were calculated using the Segi/Doll 1960 world standard population [11]. Age (A), calendar period (P), and birth cohort (C, C = P−A) effects on incidence and mortality were evaluated with age-period-cohort (APC) Poisson regression models [12,13]. APC models can be written as $\log(\lambda(A \cdot P)) = f(A) + g(P) + h(C)$, where A, P and C represent the mean age, period and birth cohort for the observational units, and $\lambda(A \cdot P)$ is the incidence or mortality rate for women of age A in period P and birth cohort C. We restricted our APC analyses to women aged 20–84 to avoid statistical instability due to the small numbers of cancer cases among younger women