

Review Article



Epidemiology of gynecologic cancers in China

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ABSTRACT

Cancer has become a major disease burden across the globe. It was estimated that 4.29 million new incident cases and 2.81 million death cases of cancer would occur in 2015 in China, with the age-standardized incidence rate (ASIR) of 201.1 per 100,000 and age-standardized mortality rate (ASMR) of 126.9 per 100,000, respectively. For females, 2 of the top 10 most common types of cancer would be gynecologic cancers, with breast cancer being the most prevalent (268.6 thousand new incident cases) and cervical cancer being the 7th most common cancer (98.9 thousand new incident cases). The incidence and mortality of gynecologic cancers have been constantly increasing in China over last 2 decades, which become a major health concern for women. Survival rates of gynecologic cancers are generally not satisfactory and decrease along with advancing stage, though national data on survival are still not available. It is of great importance to overview on the epidemiology of gynecologic cancers, which may provide scientific clues for strategy-making of prevention and control, and eventually lowering the incidence and mortality rate as well as improving the survival rate in the future.

Keywords: Genital Neoplasms, Female; Epidemiology; Incidence; Mortality; Survival; China

INTRODUCTION

It is internationally accepted that population-based cancer registry (PBCR) is a common approach for collecting cancer information as well as a statistic system aiming to collect, analyze and report the incidence, mortality, and survival rate. The National Central Cancer Registry (NCCR) of China was established in 2002, which is responsible for the collection (from local registries), evaluation, and publication of cancer data, acting as a federal bureau for systematic management of cancer surveillance in China. The number of NCCR included local registries has increased from 54 in 2008 (population coverage of 110 million) to 308 (population coverage of 300 million) in 2015 [1,2].

According to the data from NCCR [1,3], the incidence and mortality of cancer have been increasing rapidly in China. In recent years, cancer has been the leading cause of death among city residents and the second cause of death among rural residents, which has become a stark public health issue in China [4]. According to the NCCR, an estimated 4.29

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Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Author Contributions

Conceptualization: J.X., C.T.; Data curation: J.X., T.H., C.T.; Formal analysis: J.X., C.T.; Funding acquisition: C.T.; Investigation: J.X., C.T.; Methodology: J.X., C.T.; Project administration: T.H., C.T.; Resources: J.X., C.T.; Software: J.X., C.T.; Supervision: C.T.; Validation: J.X., C.T.; Visualization: J.X., T.H., C.T.; Writing - original draft: J.X., C.T.; Writing - review & editing: J.X., C.T.

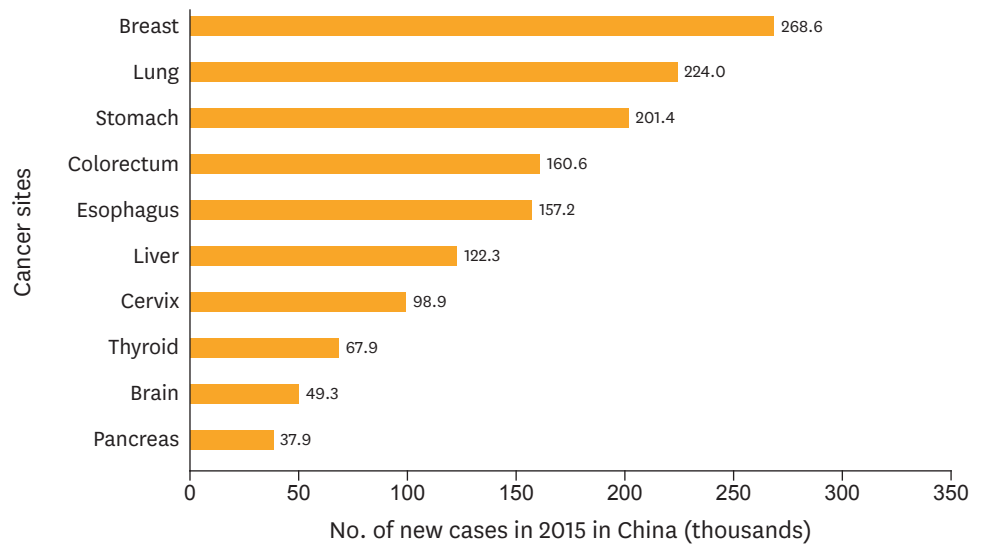


Fig. 1. Ten most common cancers in women in 2015 in China (estimated).

million new incident cases (12 thousand per day) and 2.81 million death cases (7.5 thousand per day) would occur in 2015 in China. This corresponds to the age-standardized incidence rate (ASIR) of 201.1 per 100,000 and age-standardized mortality rate (ASMR) of 126.9 per 100,000, respectively [3]. For women, 2 of 10 most common cancers are gynecologic cancers, with breast cancer (268.6 thousand new cases) being the most prevalent and cervical cancer (98.9 thousand new cases) being the seventh most common cancer; other 10 most common cancers are lung, stomach, colorectal, esophageal, liver (6th), thyroid (8th), brain, and pancreatic cancers (**Fig. 1**).

In this paper, we overview on the epidemiology of gynecologic cancer in China, aiming to provide a basis for the development of strategies for prevention and control of gynecologic cancer in China in the near future.

GYNECOLOGICAL CANCERS

1. Cervical cancer

Cervical cancer is the most common cancer of female genital system in China. The ASIR has changed from 2.79 per 100,000 in 1989–1990 to 8.53 per 100,000 in 2007–2008 [5] (**Fig. 2A**). An increasing trend of the ASIR was observed during the period of 1989 to 2008, with average annual percent change (AAPC) of 7.1%. According to the latest data [6], 100 thousand new incident cases occurred in 2013. The ASIR was overall 10.3 per 100,000, with 10.1 per 100,000 and 10.5 per 100,000 in urban and rural areas, respectively [6]. An estimated 98.9 thousand new incident cases would occur in 2015, with 53.2 thousand and 45.7 thousand in urban and rural areas, respectively [3]. Incidents of cervical cancer tend to be younger. The peak incidence was 45–49 age group. Geographic disparities in incidences were found between urban and rural areas, and among different regions in China. Interestingly, the latest data showed that rural residents have higher incidence rates than those of urban residents, and higher incidence rates occurred in middle China, followed by western China and eastern China [6]. These geographic disparities may be partly attributed to the differences in screening. Screening program has been nationwide implemented since 2009 and is currently

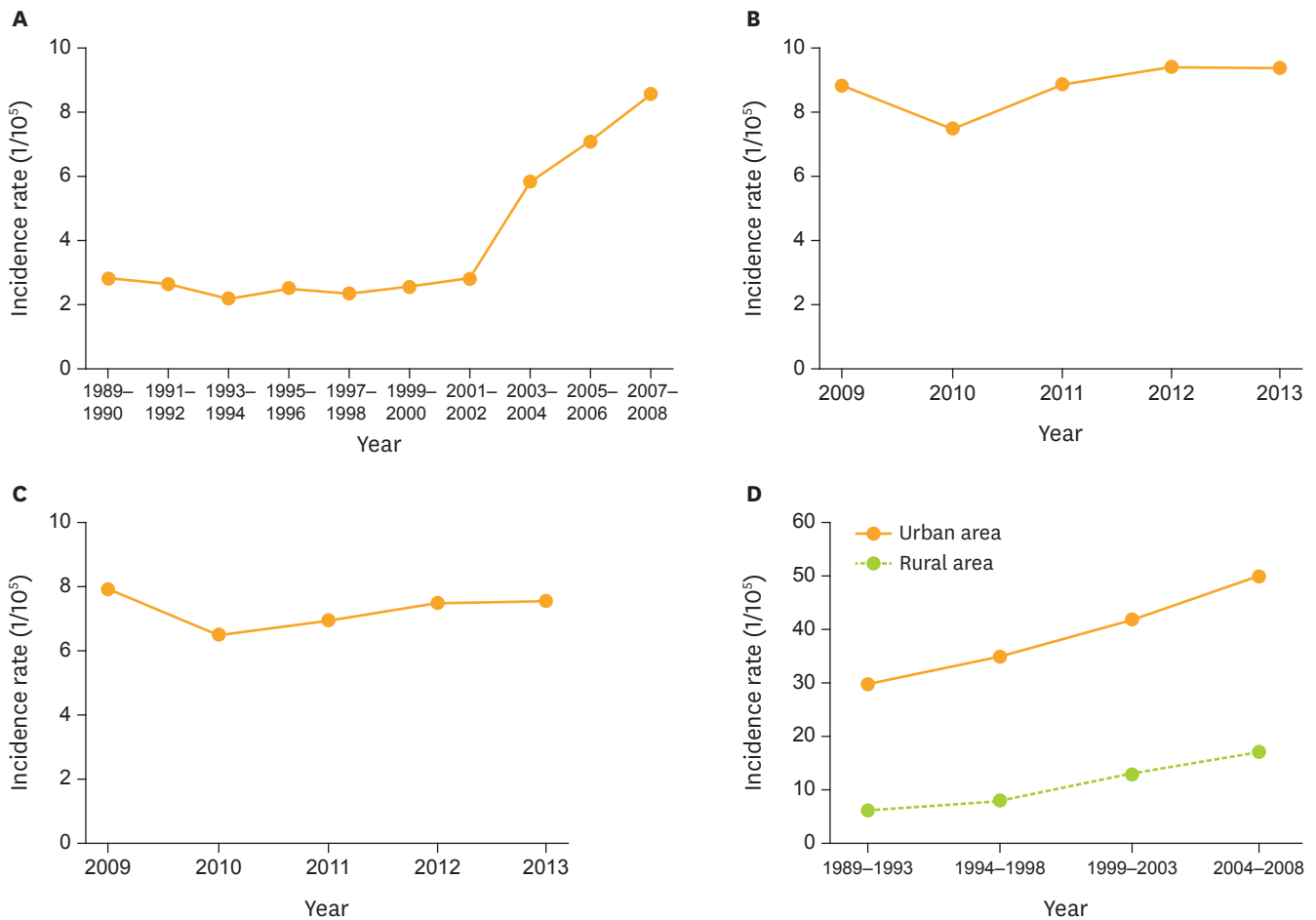


Fig. 2. Trends in incidence rates of 4 major gynecologic cancers in China: (A) cervical cancer, (B) endometrial cancer, (C) ovarian cancer, and (D) breast cancer.

the main strategy for cervical cancer prevention. Nevertheless, some high-risk population from less developed areas could be missed out due to low sensitivity of the screening protocols and bad performance of healthcare facilities. Additionally, accessibility to regular screening is limited due to the lack of knowledge and awareness for screening programs [7]. It is well known that high-risk subtypes of human papillomavirus (HPV) infection causes cervical cancer after Prof. Harald zur Huasen (from German Cancer Research Center where the corresponding author worked for 7 years) was awarded Nobel Prized in Medicine in 2008. HPV vaccines, the best approach for prevention and control of cervical cancer, have been approved and widely used in more than 160 countries since 2006 [7]. Fortunately, after a decade delay, HPV vaccine was just approved in China in 2016 and the widespread use of HPV vaccine across China is highly warranted, though the high costs and other issues shall be somehow solved as soon as possible. For cervical cancer, the increasing trend of incidence may be related to the inadequate screening, increasing prevalence of HPV infection and the lack of HPV vaccine [8-10]. Since HPV vaccine was just introduced in China, it will take a long time to fully implement HPV vaccine across China; screening alone can not solve the problem. Consequently, the integration of screening and HPV vaccine will be more effective in acting as a comprehensive strategy for cervical cancer prevention and control in the future.

The ASMRs of cervical cancer were 1.94 per 100,000 in 1989-1990 and 2.25 per 100,000 in 2007-2008, which showed a rising trend during the period of 1989 to 2008, with annual percent

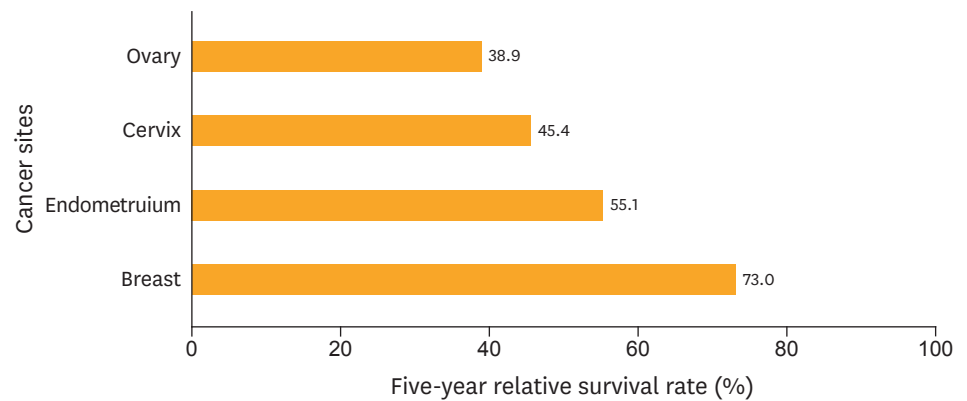


Fig. 3. Five-year relative survival rates of 4 major gynecologic cancers in China.

change (APC) of 6.8% between 1999 and 2008 [5]. In 2013, 26.4 thousand patients died of cervical cancer. The ASMR was overall 2.6 per 100,000, with 2.4 per 100,000 and 2.9 per 100,000 in urban area and rural area, respectively [6]. An estimated 30.5 thousand deaths would occur in 2015, with 13.6 thousand and 16.9 thousand in urban area and rural area, respectively [3]. Higher mortality rate occurred in middle China, followed by western China and eastern China [6]. The mortality rates increase with age and reach its peak at the age group of 85+.

According to a population-based study conducted by NCCR, 5-year relative survival rate of cervical cancer was overall 45.4% in China [11] (**Fig. 3**). Survival rates are higher among patients with early diagnosis, compared to those with advanced stage, though the data on national level is not available. According to the stage classification by International Federation of Gynecology and Obstetrics (FIGO), data retrieving from a retrospective population-based study in Hong Kong showed that 5-year relative survival rates were 90.9%, 71.0%, 41.7%, and 7.8% for the stage I, II, III, and IV, respectively [12].

2. Endometrial cancer

Cancer of the corpus uteri (commonly called endometrial cancer) is the second common cancer of female genital system in China. Between the years of 2000 and 2011, an increasing trend of the ASIR was observed, with an APC of 3.7% [3]. In 2011, there were 57.7 thousand new incident cases [1]. In 2013, 61.9 thousand new incident cases occurred, which correspond to the ASIR of 6.33 per 100,000 [6]. In sum, incidence has been increasing during the period of 2000 to 2013, with an AAPC of 3.4% (**Fig. 2B**). It was estimated that 63.4 thousand new incident cases would occur in 2015 [3]. For endometrial cancer, the ascending trend of incidence may be attributed to reproductive factors, menopause delay and increased use of exogenous hormone [13,14]. Incidence rates are higher among urban residents than those in rural residents.

The mortality rates of endometrial cancer were relatively stable between the years of 2000 and 2013. An upward trend of the ASMR was showed during the period of 2000 to 2005, with an APC of 3.4%. A downward trend was observed during the period of 2005 to 2013, with an APC of -2.4% [6]. In 2013, there were 17.9 thousand death cases, which correspond to the mortality rate of 2.70 per 100,000 [6]. It was estimated that 21.8 thousand death cases would occur in 2015 [3].

Five-year relative survival rate of endometrial cancer was overall 55.1% in China [11] (**Fig. 3**). Survival rates decreased along with advancing stage, while the data on national level is still not available. According to a population-based study in Taiwan, 5-year relative survival rate

of females with endometrioid adenocarcinoma (83.2%) was higher than that of females with clear cell carcinoma (58.3%), serous carcinoma (54.4%), and carcinosarcoma (35.2%) [15].

3. Ovarian cancer

Ovarian cancer is the third common cancer of female genital system in China. The ASIR showed an ascending trend during the period of 2000 to 2013, with an AAPC of 1.4% [6] (**Fig. 2C**). In 2013, 50 thousand new incident cases occurred, with the ASIR of 5.32 per 100,000 [6]. It was estimated that 52.1 thousand new incident cases would occur in 2015 [3]. It was reported that several factors including reproductive factors, hormonal factors and lifestyle factors were associated with an elevated risk of ovarian cancer [16]. The rising trend of incidence may reflect changes of these factors in the past few years. Higher incidence rate occurred in urban area as well as in middle China, followed by western China and eastern China [17]. Incidences can occur since very young age, and increase with age after the age of 40 until reaching its peak at the age group of 55–59. The most common histological type of ovarian cancer is serous carcinoma, followed by mucinous carcinoma and endometrioid carcinoma.

The ASMR of ovarian cancer has been ascending between the years of 2000 to 2013, with an AAPC of 4.5% [6]. In 2013, 21.3 thousand patients died of ovarian cancer, corresponding to the mortality rate of 3.21 per 100,000 [6]. It was estimated that 22.5 thousand death cases would occur in 2015 [3]. Higher mortality rate was observed in urban area, and mortality rate was higher in middle China than those in eastern China and western China [17]. The mortality rates increase with age, which reach its peak at the age group of 75–79.

Five-year relative survival rate of ovarian cancer was overall 38.9% in China [11] (**Fig. 3**). Survival rate of ovarian cancer is lower than those of cervical and endometrial cancers. The major reason for its poor survival is that ovarian cancer is commonly found at an advanced stage due to its anatomic location. Survival rates decreased sharply along with advancing stage, e.g., 5-year relative survival rates were 90.2%, 68.3%, 32.9%, and 16.1% for the stage I, II, III, and IV, respectively, according to the data from a historical cohort study in Hong Kong [18], while the data on national level is still not available.

4. Breast cancer

Breast cancer is the most common cancer in females. Incidences of breast cancer have been rising in the past few decades. The incidence rates were 50.1 per 100,000 and 17.3 per 100,000 in 2004–2008 for urban and rural areas, which showed an increase from 29.9 per 100,000 and 6.5 per 100,000 in 1989–1993, respectively [19] (**Fig. 2D**). In 2013, 278.8 thousand new incident cases occurred. The ASIR was 28.0 per 100,000, with 33.4 per 100,000 and 22.1 per 100,000 in urban and rural areas, respectively [6]. An estimated 268.6 thousand new incident cases would occur in 2015, with 189.5 thousand and 79.0 thousand in urban and rural areas, respectively [3]. For breast cancer, the increasing trend of incidence may reflect changes in reproductive behavior in China in recent decades because of the one-child policy implemented since the 1970s [20]. Incidence rate in urban area is higher than that in rural area, and higher incidence rate occurred in eastern China, followed by middle China and western China [6]. Incidents of breast cancer tend to be younger, which can occur from the age of 15, and increase rapidly after the age of 30 until reaching its peak at the age group of 45–49. The most common histological type of breast cancer is ductal carcinoma.

The mortality rates of breast cancer showed an increasing trend during the period of 1989 to 2008. The mortality rate has elevated from 9.81 per 100,000 to 10.82 per 100,000 and 4.42

per 100,000 to 5.82 per 100,000 between the years of 1989–1993 and 2004–2008 for urban and rural areas, respectively [21]. In 2013, 64.6 thousand patients died of breast cancer. The ASMR was 6.4 per 100,000, with 7.0 per 100,000 and 5.6 per 100,000 in urban and rural areas, respectively [6]. An estimated 69.5 thousand death cases would occur in 2015, with 43.8 thousand and 25.7 thousand in urban and rural areas, respectively [3]. Higher mortality rates were observed in urban area as well as middle China [6]. The mortality rates increase with age until reaching its peak at the age group of 85+.

Survival rate of breast cancer is relatively higher than other cancers. Five-year relative survival rate was overall 73%, with 77.8% and 55.9% in urban and rural areas, respectively [11] (**Fig. 3**). Survival rate was higher in urban area than that in rural area. This urban-rural disparity may be related to the poor quality of cancer care and limited access to health care for rural residents. Survival rates decreased along with advancing stage. According to a population-based cohort study in Shanghai, 5-year survival rates were 95.45%, 92.21%, 81.74%, and 67.24% for the stage I, IIA, IIB, and III–IV, respectively [22].

CONCLUSION

The incidence and mortality of gynecologic cancers have been constantly increasing in China over last 2 decades, which become a major health concern for women. Survival rates of gynecologic cancers are generally not satisfactory and decrease along with advancing stage, though national data on survival are still not available. It is of great importance to overview on the epidemiology of gynecologic cancers, which may provide scientific clues for strategy-making of prevention and control, and eventually lower the burden of gynecologic cancers in the future. Currently, several nationwide screening programs have been implemented for the early detection, early diagnosis, and early treatment. Nevertheless, for cervical and female breast cancers, the situation of prevention and control is still grim. In the future, screening protocols need to be updated according to the region disparity and period change. For cervical cancer, the integration of screening and vaccine should be considered in the process of developing prevention and control strategy, while for breast cancer, screening should be further strengthened nationwide.

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