Epidemiological characteristics of gynecologic malignancies in Korean women

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Summary

Purpose of investigation: The aim of this study was to review the changes in the epidemiological characteristics of cervical, ovarian, and uterine corpus cancers in Korean women. *Materials and Methods:* Data were obtained from the websites of Statistics Korea and the National Cancer Center. The total diagnosed cases were compared from 1999 to 2012, and five-year survival rates from 1993 to 2011. Age-standardized incidence rates (ASR) for each type of cancer were compared from 1999 to 2012. The authors also compared these data according to the spread status of the disease. Percentage changes in incidence rates for all three cancers according to age group were compared from 1999 to 2011 in four-year intervals. *Results:* The highest ASR for cervical cancer was 18.6 per 100,000 in 1999, whereas for ovarian and uterine corpus cancer they were 6.5 and 5.9 per 100,000 in 2012, respectively. Five-year survival rates of cervical and ovarian cancer showed no significant improvement, but that of uterine corpus cancer slightly improved. Most patients with cervical cancer (79%) and uterine corpus cancer (84%) were diagnosed at either localized or regional spread status. The age-specific incidence rates for cervical cancer decreased in all age groups except the 20-29-year-old and above 85-year-old age groups. *Conclusion:* The decreasing trend of incidence of cervical cancer may be the result of well-organized and an improved participation rate in the national cancer screening program. This review could be a reference for predicting the future status of these cancers among women in less developed countries.

Key words: Cervical cancer; Ovarian cancer; Uterine corpus cancer; Korea; Epidemiology.

Introduction

Cancer is one of the leading causes of death in both developed and underdeveloped countries. Changes in economic status, healthcare systems, lifestyles, and population composition are believed to affect the epidemiological characteristics of certain diseases. This is evident in gynecologic malignancies, of which cervical, uterine corpus, and ovarian cancers are the most significant.

Cervical cancer, the fourth most common malignant disease in women worldwide, is still one of the leading causes of cancer-related deaths in developing countries [1, 2]. The incidence of cervical cancer is two-fold lower in developed countries compared to their underdeveloped counterparts (10.3 *vs*. 19.1 per 100,000 person years, respectively), likely as a result of the National Cancer Screening Program [2]. Similarly, uterine corpus cancer is a common gynecologic malignancy in many developed countries, accounting for approximately 14.7% of all newly diagnosed malignancies and 2.3% of cancer-related deaths in women worldwide [1]. The incidence and mortality rates of ovarian cancer in developed countries are approximately two-fold higher in comparison to those in underdeveloped countries (9.1% *vs*. 5.0% and 5.0% *vs*. 3.1% respectively).

The dramatic change in overall social status in Korea over the last several decades has likely affected disease patterns. Thus, based on data provided by the Korea Central Cancer Registry (KCCR), the authors aimed to review changes in the epidemiological characteristics of gynecologic malignancies among women in Korea.

Materials and Methods

Data for cervical, uterine corpus, and ovarian cancer were obtained from the websites of Statistics Korea and the Korea National Cancer Center [3, 4], and epidemiological characteristics were compared. The data compared were the total numbers of diagnosed cases, five-year survival rates, five-year-survival rates according to disease spread, age-standardized-incidence rates (ASR), age-standardized-prevalence rates, percentage changes in the incidence rates, and the total number of cases according to the spread of each cancer. The total numbers of Korean patients diagnosed with cervical cancer, ovarian cancer, and uterine corpus cancer were compared from 1999 to 2012. The authors also obtained five-year-survival rates from 1993 to 2011, five-year-survival rates according to cancer spread from 2007 to 2011, and the total number of cases according to spread from 2005 to 2011. The spread of the respective cancers were categorized as localized, regional, distant, and unknown. ASRs for each cancer were compared from 1999 to 2012, but age-standardized-prevalence rates for each cancer were obtained only from 2007 to 2012. The percentage changes in incidence rates of cervical cancer, ovarian cancer, and uterine
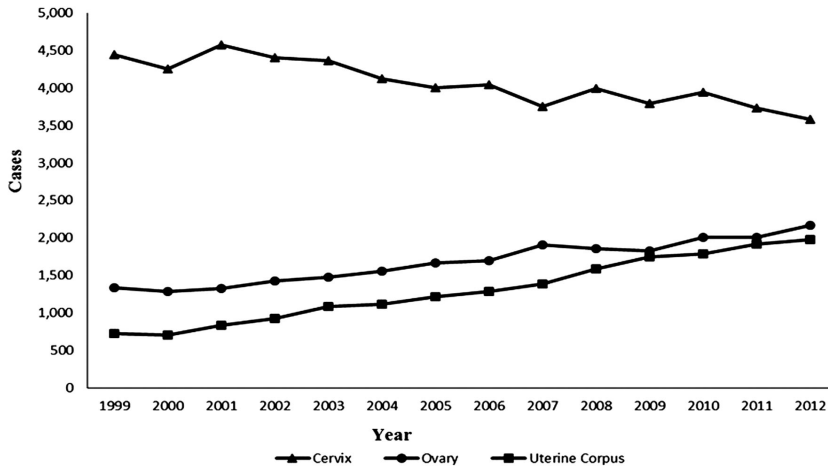
Figure 1. — Total number of cervical, ovarian, and uterine corpus cancer cases from 1999-2012.
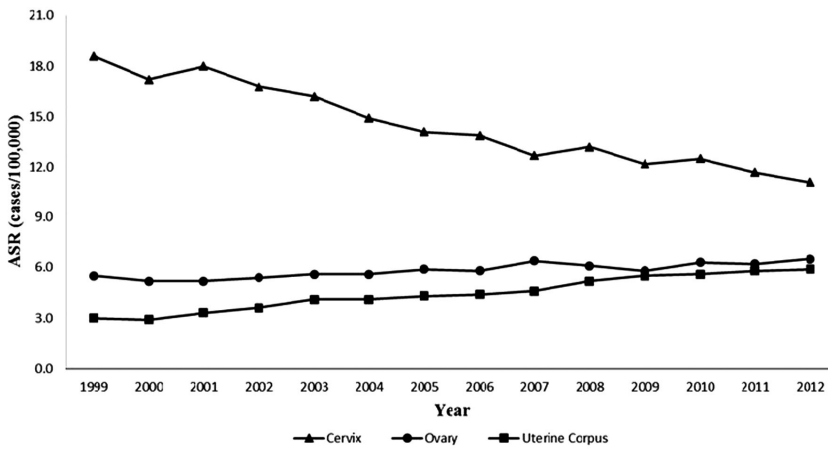

Figure 2. — Age-standardized incidence rates for cervical, ovarian, and uterine corpus cancer from 1999-2012.
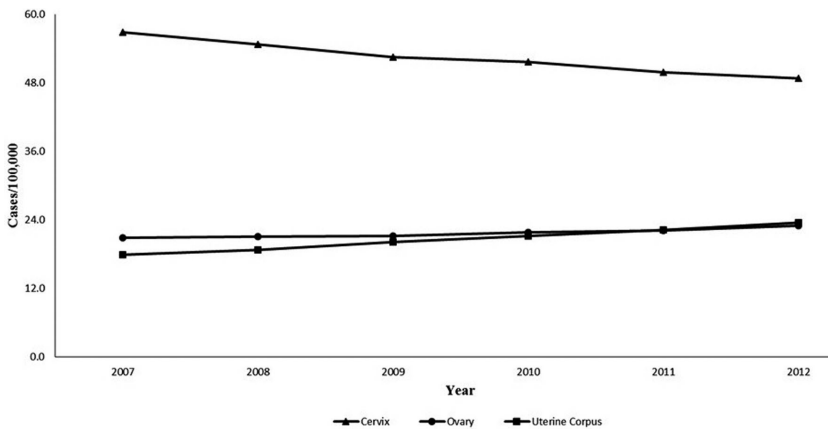

Figure 3. — Age-standardized prevalence rates for cervical, ovarian, and uterine corpus cancer from 2007-2012.

corpus cancer according to age groups were also compared from 1999 to 2011 at four-year intervals.

Results

A total of 56,989 women were diagnosed with cervical cancer: 23,532 with ovarian cancer and 18,298 with uterine corpus cancer from 1999 to 2012. Despite a slight increase

in the total number of cases of cervical cancer in 2001, rates of cervical cancer have steadily decreased annually to 3,584 cases in 2012. The total number of cases of ovarian cancer and uterine corpus cancer showed trends similar to one another; the number of cases of both cancers slightly decreased in 2000, followed by gradual increases until 2012 (Figure 1). The highest ASR for cervical cancer was 18.6 per 100,000 in 1999, whereas for ovarian cancer and uterine corpus cancer,
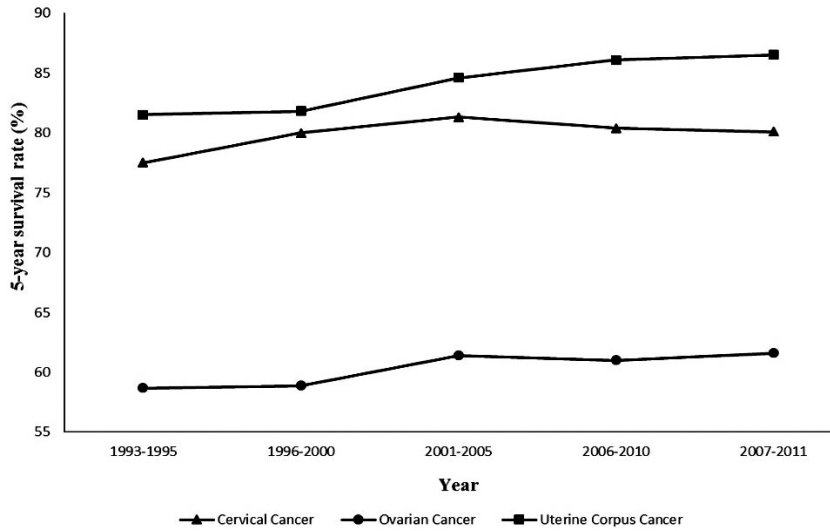
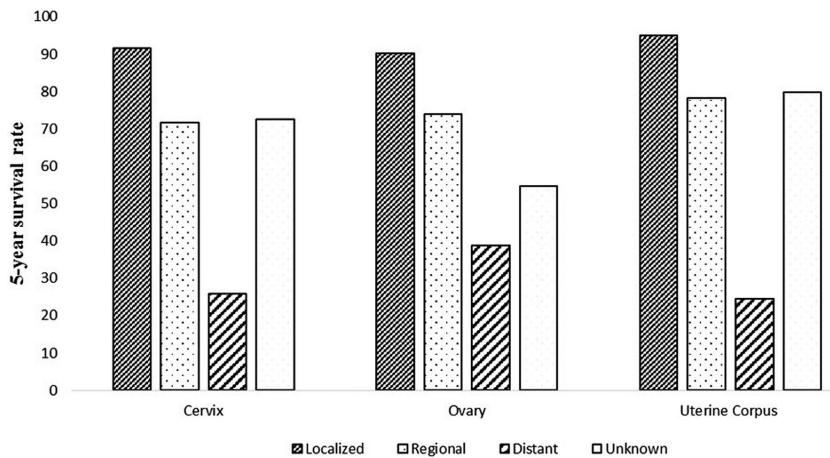Figure 4. — Five-year survival rates for cervical, ovarian, and uterine corpus cancer, from 1993-2011.

Figure 5. — Five-year survival rates for cervical, ovarian, and uterine corpus cancer according to cancer spread from 2007 to 2011.

the highest ASRs were 6.5 and 5.9 per 100,000, respectively, in 2012 (Figure 2). The ASR for cervical cancer has shown a decreasing trend over the years, but it has been increasing in the other two cancers. Age-standardized-prevalence rates of cervical cancer decreased from 56.9 per 100,000 in 2007 to 48.8 per 100,000 in 2012, but those of ovarian cancer and uterine corpus cancer have gradually increased from 2007 to 2012, peaking at 23.0 per 100,000 and 23.5 per 100,000 respectively in 2012 (Figure 3). Figure 4 shows the comparison between the five-year survival rates of the three cancers from 1993 to 2011. The five-year survival rate for uterine corpus cancer has slightly improved over the years but no significant improvement was seen for cervical and ovarian cancers. The overall survival rates for uterine corpus cancer are higher than those for cervical and ovarian cancers. The five-year survival rates of the three cancers were further analyzed according to the spread of each cancer from 2007 to 2011 (Figure 5). The overall survival rates for cancers

Table 1. — *Total number of cervical, ovarian, and uterine corpus cancer cases according to cancer spread from 2005 to 2011.*

Cancer type	Cancer spread				
	Localized (%)	Regional (%)	Distant (%)	Unknown (%)	Total cases (%)
Cervix	14,778 (54.6)	6,707 (24.8)	1,685 (6.2)	3,912 (14.4)	27,082 (100)
Ovary	3,572 (27.7)	2,042 (15.8)	5,293 (41.0)	1,996 (15.5)	12,903 (100)
Uterine corpus	6,778 (66.7)	1,776 (17.5)	607 (6.0)	1,000 (9.8)	10,161 (100)

demonstrating localized spread were the highest for all cancers, followed by regional spread and unknown spread. Interestingly, patients with ovarian cancer diagnosed with distant disease spread fared better than those with cervical or uterine

Table 2. — *Percentage changes in comparison to incidence rates of cervical cancer in 1999.*

Age group (years)	1999 IR (% change)	2003 IR (% change)	2007 IR (% change)	2011 IR (% change)
20-24	0.5 (0.0)	1 (100)	0.6 (20)	0.6 (20)
25-29	4.6 (0.0)	4.4 (-4.3)	5.6 (21.7)	6.5 (41.3)
30-34	14.5 (0.0)	11.5 (-20.7)	11.4 (-21.4)	12.7 (-12.4)
35-39	25.2 (0.0)	21.2 (-15.9)	16.5 (-34.5)	15.5 (-38.5)
40-44	38.6 (0.0)	32.4 (-16.1)	22.4 (-42)	19.6 (-49.2)
45-49	39.2 (0.0)	31.8 (-18.9)	27.2 (-30.6)	24.6 (-37.2)
50-54	41.2 (0.0)	36.9 (-10.4)	25.8 (-37.4)	23.9 (-42)
55-59	45.2 (0.0)	39.6 (-12.4)	28.1 (-37.8)	25.4 (-43.8)
60-64	48.4 (0.0)	37.4 (-22.7)	30.9 (-36.2)	26.4 (-45.5)
65-69	50.7 (0.0)	44.2 (-12.8)	33 (-34.9)	26.9 (-46.9)
70-74	47.4 (0.0)	44.5 (-6.1)	33.2 (30)	28.1 (-40.7)
75-79	35.9 (0.0)	44.2 (23.1)	32.9 (-8.4)	29.2 (-18.7)
80-84	25.2 (0.0)	42 (66.7)	32.5 (29)	29.3 (16.3)
≥85	7.9 (0.0)	30.2 (282.3)	23.4 (196.2)	24.6 (211.4)

Table 4. — *Percentage changes in comparison to incidence rates of uterine corpus cancer in 1999.*

Age groups (years)	1999 IR (% change)	2003 IR (% change)	2007 IR (% change)	2011 IR (% change)
20-24	0.3 (0)	0.4 (33.3)	0.4 (33.3)	0.5 (66.7)
25-29	0.8 (0)	1.1 (37.5)	1.3 (62.5)	1.8 (125)
30-34	1.6 (0)	2.2 (37.5)	2 (25)	3.9 (143.8)
35-39	2.6 (0)	2.5 (-3.8)	3.6 (38.5)	4.7 (80.8)
40-44	4.9 (0)	5.3 (8.2)	6.4 (30.6)	8 (63.3)
45-49	6.6 (0)	11.7 (77.3)	10.5 (59.1)	13 (97)
50-54	11.8 (0)	17.8 (50.8)	19.1 (61.9)	21.2 (79.7)
55-59	10.6 (0)	14.7 (38.7)	17.6 (66)	21.3 (100.9)
60-64	8.3 (0)	10 (20.5)	12.7 (53)	16.6 (100)
65-69	6.4 (0)	6.3 (-1.6)	9.2 (43.8)	13.8 (115.6)
70-74	6.1 (0)	8.5 (39.3)	7.9 (29.5)	9.5 (55.7)
75-79	4.9 (0)	6.2 (26.5)	6.9 (40.8)	8.2 (67.3)
80-84	1.5 (0)	3.5 (133.3)	6.1 (306.7)	6.4 (326.7)
≥85	1.4 (0)	1.8 (28.6)	2.9 (107.1)	1.4 (0)

Table 3. — *Percentage changes in comparison to incidence rates of ovarian cancer in 1999.*

Age group (years)	1999 IR (% change)	2003 IR (% change)	2007 IR (% change)	2011 IR (% change)
20-24	2.8 (0)	3.0 (7.1)	2.6 (-7.1)	3.0 (7.1)
25-29	3.0 (0)	3.2 (6.7)	2.9 (-3.3)	2.5 (-16.7)
30-34	3.2 (0)	3.3 (3.1)	3.8 (18.8)	4.5 (40.6)
35-39	4.3 (0)	4.1 (-4.7)	5.1 (18.6)	5.8 (34.9)
40-44	6.9 (0)	7.0 (1.4)	8.2 (18.8)	7.7 (11.6)
45-49	9.6 (0)	10.9 (13.5)	13.7 (42.7)	13.4 (39.6)
50-54	12.6 (0)	13.8 (9.5)	14.7 (16.7)	15.1 (19.8)
55-59	14.1 (0)	14.8 (5)	15.6 (10.6)	14.5 (2.8)
60-64	13.9 (0)	13.4 (-3.6)	16.3 (17.3)	14.8 (6.5)
65-69	13.3 (0)	13.4 (0.8)	16.9 (27.1)	16.4 (23.3)
70-74	14.5 (0)	15.1 (4.1)	15.1 (4.1)	13.2 (-9)
75-79	19.9 (0)	12.6 (-36.7)	19.9 (0)	16.7 (-16.1)
80-84	16.5 (0)	11.7 (-29.1)	23.5 (42.4)	14.4 (-12.7)
≥ 85	9.3 (0)	9.7 (4.3)	13.4 (44.1)	13.5 (45.2)

corpus cancer with distant disease spread. Most patients with cervical (79%) and uterine corpus cancer (84%) were diagnosed at either localized or regional spread status, and more than 40% of patients with ovarian cancer had distant spread (Table 1). The authors also compared age-specific incidence rates per 100,000 women from 1999 to 2011. The incidence rate decreased in all age groups, except between the 20-29-year-old and ≥85-year-old age groups for cervical cancer (Table 2). Age-specific incidence rates of ovarian cancer increased in the 30-69-year-old age groups, and increased in all age groups for uterine corpus cancer (Tables 3, 4).

Discussion

This study aimed to understand and explain the epidemiological characteristics and trends of gynecologic malignancies in Korean women over a 13-year period. The decreasing trend of incidence of cervical cancer is evident, and might be the result of widespread screening, and early diagnosis with adequate treatment for preinvasive disease [5]. Jun *et al.* [6] in their cohort study showed that the screening outcomes were no different if performed one time to never having been done, but those who underwent two or more screenings had a significantly lower risk of cervical cancer. Participation rates in the cervical screening arm of the National Cancer Screening Program have significantly increased, from 15.4% in 2002 to 29.5% in 2009 in Korea [7, 8]. Regarding screening programs and policies, even in European countries, Antilla *et al.* [9] found that wide variations in policies, limitations in data, and variations in monitoring and evaluation were major factors prohibiting improved patient outcomes. However, when compared with low- and middle-income developing countries, due to the lack of efficient screening, lack of financial and human resources, and the inability to sustain such programs over the long term, cervical cancer presents a major public health burden [10-12]. The decreased incidence of cervical cancer in Korean women seems to be the result of well-organized and improved screening, through the improvements in participation and strategies made by the health sectors.

The incidence of ovarian cancer seems to be higher in developed countries. Therefore, the increase in the incidence of ovarian cancer in Korea over the study period might be explained by increasingly westernized behavior, including increased nulliparity and dietary changes [13, 14]. Other factors include increased life expectancy, the improved national medical insurance system, and accessibility to high-quality health providers. Similar factors may contribute to the increasing trend in the incidence of uterine corpus cancer. However, menstrual factors, obesity, hormone use, late menopause, socioeconomic status, family history, dietary habits, diabetes, and hypertension are also

risk factors for uterine corpus cancer [15, 16]. The relationship between body mass index (BMI) and endometroid uterine cancer in Korean women was studied by Jeong *et al.* [17] and they postulated that both obese (BMI > 25kg/m²) and overweight women were at significantly higher risk for developing endometrioid uterine cancer compared to non-obese women (BMI < 23kg/m²). During this study period, obesity (BMI ≥ 25kg/m²) increased from 34% in 1998 to 48% in 2007 in women above 60 years of age, indicating that almost half of all women over age 60 in Korea were obese [18]. The prevalence of obesity slightly decreased to 43.2% in 2010 among women aged 60-69 years, but the prevalence of obesity is still high in this population [19]. Obesity is known to increase blood pressure and blood glucose, and a national survey has shown that the prevalence of hypertension and diabetes has increased among elderly Korean women [19].

Improvements in treatment modalities, increased screening, and increased awareness among the general population have all likely contributed to a gradual increase in the survival rate for cervical cancer [5]. The survival rate for uterine corpus cancer has also increased, possibly for similar reasons. In contrast, the survival rate for ovarian cancer survival remains poor because most patients are diagnosed in the advanced stage. However, compared with previous years, this rate is gradually improving, perhaps due in part to the introduction of new chemotherapeutic agents. Despite this, earlier detection of ovarian cancer could certainly lead to improved survival outcomes [13].

The increase in the incidence of cervical cancer in the 25-29-year-old age group might be the result of changes in sexual behavior, multiple sexual partners, and certain nutritional deficiencies. With the increase in the population of elderly individuals due to the increased overall life expectancy, more people are affected by chronic diseases, which could explain the increasing incidence and prevalence of these cancers in the ≥ 85-year-old group. In addition, changing trends in food habits, increasing obesity rates, declining fertility rates, decreasing breastfeeding rates, and early menarche might affect the epidemiological characteristics of gynecologic malignancies in Korean women.

Conclusion

The epidemiological characteristics of gynecologic malignancies have changed significantly into a westernized pattern due to a dramatic improvement in economic status, a well-organized national medical insurance system, public education, and increased public awareness. These findings could be a reference for predicting the status of these cancers among women in less developed countries such as Nepal.

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