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Trends in Mortality and Morbidity of Uterine Cervix, Female Breast, and Ovarian Cancer in Korea†

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= Abstract =**In Korea, leading causes of death have dramatically changed from infectious diseases to chronic degenerative illnesses, including malignant neoplasms since 1960. However, little is known about the long-term trends of female malignancies in Korea. This study was conducted to find epidemiological evidence of changes in mortality and morbidity of uterine cervix, female breast, and ovarian cancer through a long-term trends analysis with data representative of the Korean population. Age-standardized mortality rates of three female malignancies were markedly increasing throughout the observation period. Increment ratios in mortality were about two to five during the period 1981-1990. As a proxy estimate of incidence, age-standardized admission rates of female malignancies, as well as proportion index of admission due to each cancer to total admissions, showed a similar increasing trend from 1981 to 1990 in Korea. These results are highly suggestive of the view that both the mortality and morbidity for uterine cervix, female breast, and ovarian cancer must be increasing during the ten-year period since 1981 in Korea. Of the female malignancies, it is most likely that morbidity and mortality of uterine cervix cancer begin to decline after the end of the 1980s in Korea. Particularly noteworthy was a shift of the prevalent age for uterine cervix cancer to older women.**

Key Words: *Cancer epidemiology, Female breast cancer, Ovarian cancer, Trends in cancer, Uterine cervix cancer,*

INTRODUCTION

In Korea, leading causes of death have dramatically changed from infectious diseases to chronic degenerative illnesses since 1960 (Kim 1989). Malignant neoplasms have been becoming a more important cause of death, next to cerebravascular accidents (National Bureau of Statistics 1990). A hospital admission study based on a large general population reported a marked increase in cancer morbidity (Yoo *et al.* 1988). Suggestive evidence of actual increase of female malignancies, as for both incidence and mortality, could be drawn from some reports on epidemiologic characteristics. However, little is known about the long-term trend of female malignancies in Korea. This study was conducted to find epidemiological evidence of changes in morbidity and mortality of female malignancies, i.e., female breast, uterine cervix, and ovarian cancer, using data rep-

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resentative of the Korean population.

MATERIALS AND METHODS

For the trend in mortality, data for national death certificates was used (National Bureau of Statistics 1981-1990). Since the proportion of deaths diagnosed by physicians has been still less than 50%, classifiable deaths registered was used in the observation of long-term trends in mortality. Crude mortality rate for each year was standardized based on the age distribution of the census population in 1985 (National Bureau of Statistics 1985). For the standardization, the estimated population in each age group was obtained from an abridged census data on population and housing performed yearly by the government (National Bureau of Statistics 1981-1990).

For the changing pattern in morbidity of female malignancies, data on admissions, as a proxy estimate of morbidity, was collected from a health insurance data, 1981-1990 (Korea Medical Insurance Corporation 1981-1990). It covers all of the beneficiaries with their dependents, composed of governmental employees, private school teachers and staff, and pensioners. The total number of beneficiaries benefitting from the insurance was steadily increasing from 3,044,421 persons in 1979 to 4,603,361 persons in 1990. It covers about 10% of the whole Korean population, for which no evidence of non-representativeness has been found so far. Cancer admission was regarded as an admission of each cancer patient whenever a claim against his/her renumeration to the Corporation occurred. All the cases were diagnosed clinically or pathologically in each hospital they visited.

All the cases diagnosed as female malignancies were classified by the 9th revision of ICD code; ICD 180 for uterine cervix, ICD 174 female breast, and ICD 183 for ovary (WHO 1979). Two indices were used to observe long-term trends in morbidity of female malignancies; age-standardized admission rate and proportion index. Age-standardized admission rate per 100,000 was also calculated based on the national census of 1985 as a reference population (National Bureau of Statistics 1985). For the proportion indices, the proportion of cancer admissions of a specific site to that of the total number of admissions was used to adjust the unexpected effect of high medical utilization.

RESULTS

1. Trends in mortality for female malignancies

As shown in Fig. 1, the age-standardized mortality rates for three female malignancies were markedly increasing throughout the observation period. The patterns of increase at each cancer site were quite similar. The age-standardized mortality rate for breast cancer was 1.41 per 100,000 in 1981, and then rising up to 2.52 per 100,000 in 1990. The increment ratio was about two in mortality rate. On the other hand, the age-standardized mortality rate for uterine cervix cancer in 1990 was about five times higher than the rate in 1981; 0.31 per 100,000 in 1981, and 1.43 per 100,000 in 1990. It was noticeable that a decreasing

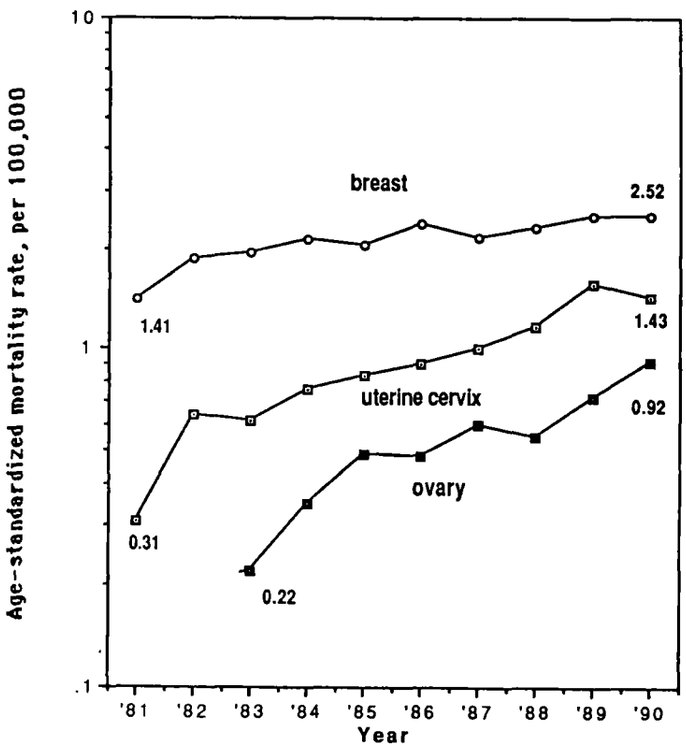

Fig 1. Age-standardized mortality rates for uterine cervix, breast, and ovarian cancers in Korea, 1981-1990.

Table 1. Crude and age-standardized mortality rates for female malignancies, 1981-1990

Sites	Age	Rates	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90
Uterine cervix (ICD 180)	All	Crude rate#	0.28	0.60	0.58	0.72	0.83	0.91	1.03	1.22	1.66	1.56
		Std. rate@	0.31	0.63	0.61	0.76	0.83	0.90	1.01	1.18	1.57	1.43
	Over 35	Crude rate#	0.88	1.80	1.74	2.16	2.43	2.57	2.95	3.36	4.54	4.14
		Std. rate@	0.90	1.82	1.74	2.20	2.42	2.55	2.92	3.33	4.51	4.14
Female breast (ICD 174)	All	Crude rate#	1.29	1.74	1.86	2.05	2.04	2.40	2.22	2.39	2.66	2.73
		Std. rate@	1.41	1.87	1.95	2.14	2.04	2.39	2.17	2.30	2.52	2.52
	Over 35	Crude rate#	3.67	4.98	5.30	5.72	5.59	6.45	6.01	6.27	6.90	6.76
		Std. rate@	3.70	5.01	5.31	5.74	5.59	6.43	5.99	6.25	6.91	6.79
Ovary (ICD 183)	All	Crude rate#	na	na	0.21	0.33	0.49	0.48	0.62	0.58	0.76	1.00
		Std. rate@	na	na	0.22	0.35	0.49	0.48	0.60	0.55	0.72	0.92
	Over 35	Crude rate#	na	na	0.51	0.87	1.28	1.13	1.47	1.44	2.08	2.29
		Std. rate@	na	na	0.51	0.88	1.28	1.13	1.45	1.43	2.07	2.28

Crude mortality rate, per 100,000.
@ Age-standardized mortality rate to the 1985 Korean population, per 100,000.
na: not available.

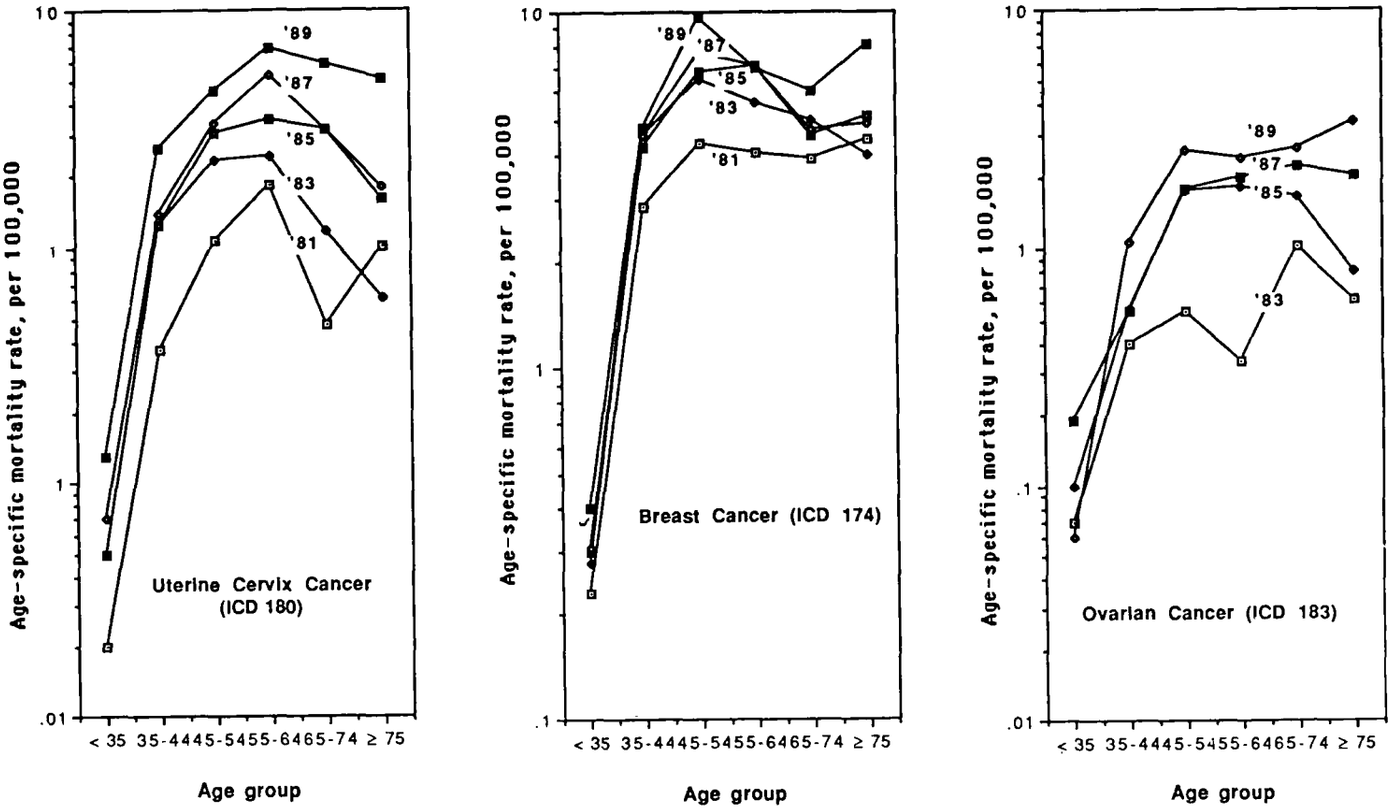

Fig 2. Age-specific mortality rates for uterine cervix, female breast, and ovarian cancer in Korea, 1981-1990.

trend in mortality rate of uterine cervix cancer has begun since 1989. Even though the age-standardized rate of ovarian cancer was lower than that of the other cancers, an increasing trend was also observed, resulting in an increment ratio of more than four.

When observation was restricted to an age group over 35, such increasing trends for each female malignancy were virtually the same as patterns observed in all the age groups (Table

1). The age-standardized rate of uterine cervix in the age group over 35 in 1990 (4.14 per 100,000) was about five times higher that that of 1981 (0.90 per 100,000). The rate of breast cancer increased about two times during the ten-year period; 3.70 per 100,000 in 1981 to 6.79 per 100,000 in 1990. For ovarian cancer, the increment ratio was about four during 1983-1990; 0.51 per 100,000 in 1983, and 2.28 per 100,000 in 1990.

2. Age-specific mortality rates for female malignancies

The overall pattern in age-specific mortality rates of uterine cervix and breast cancer showed an inverted V-shape in each year (Fig. 2). The rates peaked in the age group of 55-64 for uterine cervix cancer, and in the age group of 45-54 for breast cancer. The age-specific mortality rate of ovarian cancer was steadily increasing with increasing age. However, such a trend has been more marked in recent years. Shifting of the peak age group for mortality was not observed.

3. Trends in admission rates for female malignancies

As a proxy estimate of incidence, age-standardized admission rates of female malignancies from 1981 to 1990 in Korea are shown in Fig. 3. The age-standardized admission rate for uterine cervix cancer was exponentially increasing from 20. 57 per 100,000 in 1981 to 48. 64 per 100,000 in 1989. But it decreased to the rate of 40.09 per 100,000 in 1990. Increasing trends of breast cancer and ovarian cancer were also observed from 11.54 per 100,000 in 1981 to 19.19 per 100,000 for breast cancer, and from 5.12 per 100,000 in 1981 to 25.19 per 100,000 for ovarian cancer. These findings of changes in admission rates were quite compatible to those in mortality rates as seen in Fig. 1. Slopes in the age-standardized curves of breast cancer were less steep than those for the other malignancies (Fig. 3).

The proportion of admission due to each cancer to total admission showed a similar increasing trend to that of the admission rate (Fig. 4). The proportion index of uterine cervix canedr was 0.31% in 1981, and afterwards steadily increased upto 0.77% in 1988. A

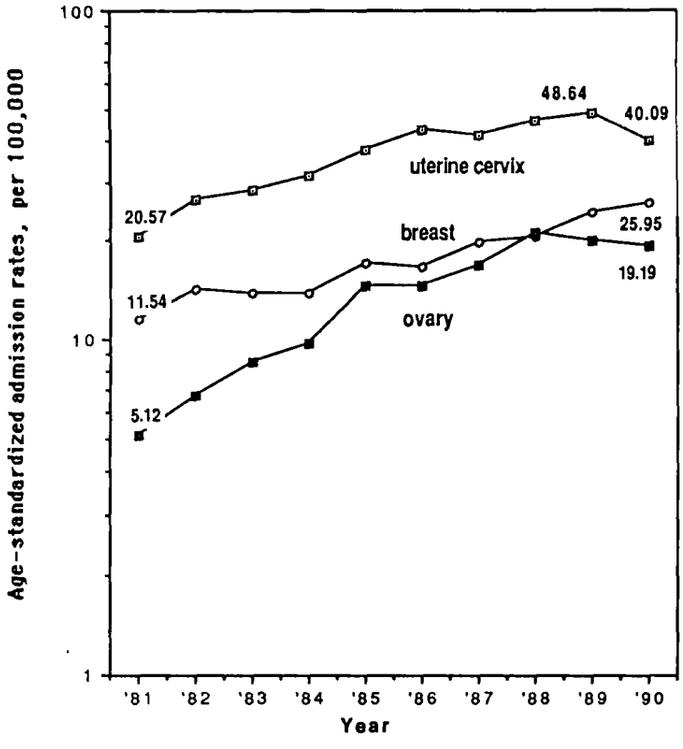

Fig 3. Age-standardized admission rates for uterine cervix, female breast, and ovarian cancer in Korea, 1981-1990.

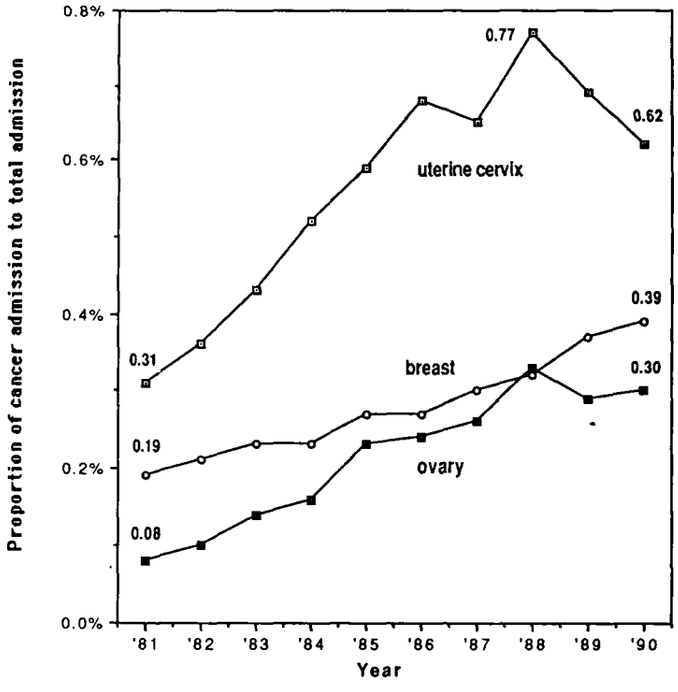

Fig 4. Proportion indices in admissions due to uterine cervix, female breast, and ovarian cancer in Korea, 1981-1990.

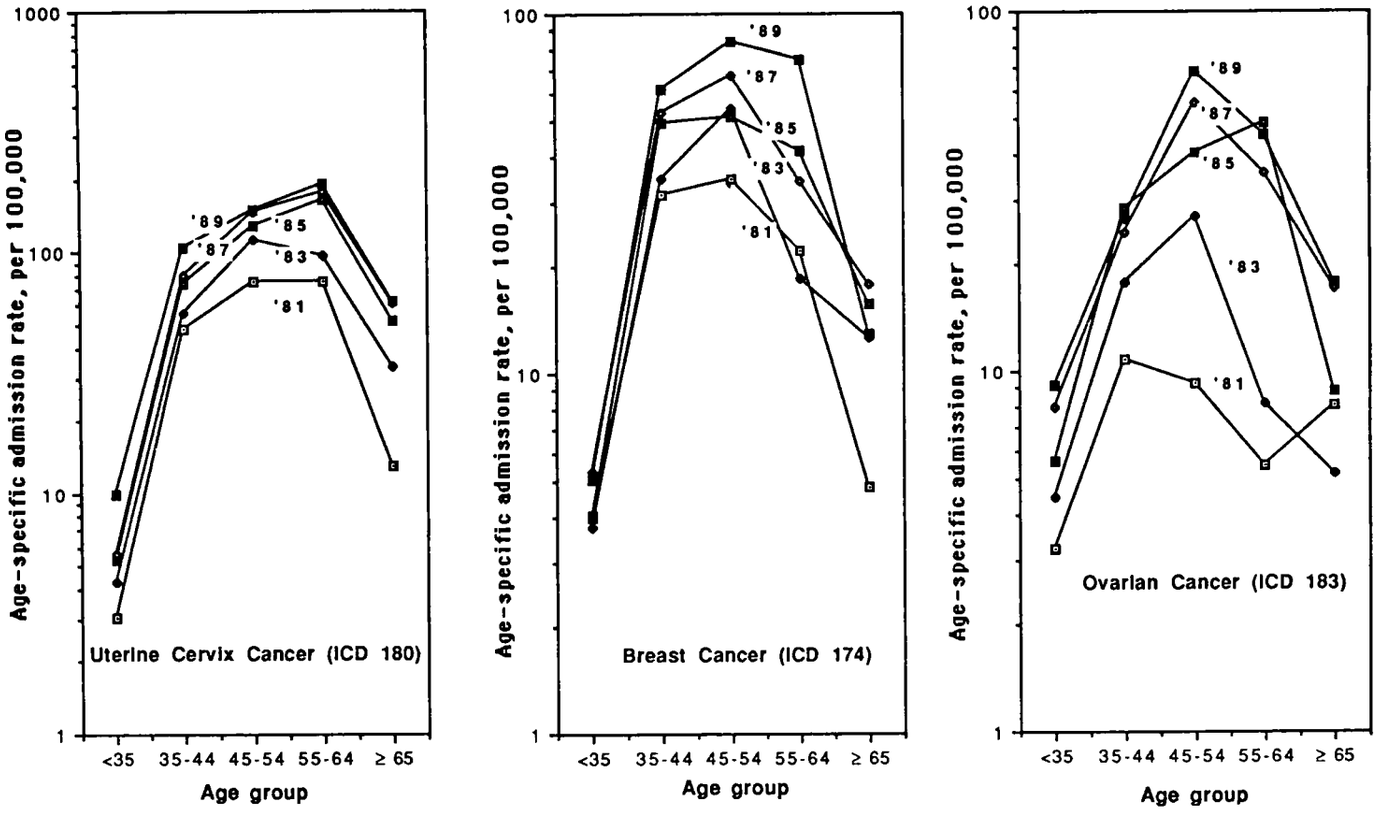

Fig 5. Age-specific admission rates for uterine cervix, female breast, and ovarian cancer in Korea, 1981-1990.

decreasing pattern in the proportion index was also noticeable since 1988. The proportion of admissions due to ovarian cancer was also increasing throughout the observation period. However, the increasing pattern for female breast cancer showed rather slower than those for the other malignancies (Fig. 4).

4. Age-specific admission rates for female malignancies

Age-specific admission rates for uterine cervix cancer can be seen in Fig. 5. Admission rates for uterine cervix cancer increased with age, but decreased over the age group of 55-64. Those patterns were quite consistent over years. Particularly noteworthy was the fact that the peak in age group was shifted from the age group of 45-54 in 1981-1983 to the older age group of 55-64 after 1985 (Fig. 5). For breast cancer, the overall pattern of agespecific admission rates showed an inverted U-shape (Fig. 5). The rate was steadily increasing to its highest peak in the age group of 45-54, and in turn decreased afterwards. There was no shift of peak in age group by years. Ovarian cancer also showed a similar pattern of an inverted U-shape in age distribution, as can be seen in Fig. 5. The apparent shifting pattern of the peak in age was not observed.

DISCUSSION

These results are highly suggestive of the view that both the mortality and morbidity for uterine cervix, female breast, and ovarian cancer must be increasing during the ten-year period since 1981 in Korea. Of the female malignancies, it is most likely that morbidity and mortality of uterine cervix cancer begin to decline after the end of the 1980s in Korea. Particularly noteworthy was a shift of the prevalent age for uterine cervix cancer to older women.

Even though there have been few reports on long-term trends in cancer mortality in

Korea, nor on cancer morbidity, increasing trends in cancer admissions due to uterine cervix, female breast, and ovarian cancer have been similarly observed through a hospital admission study during 1981-1986 (Yoo *et al.* 1988). Even though such increasing pattern of cancer admission in a secular trend analysis may be falsely affected by the cumulative effect of medical utilization or by the improvement in diagnostic accuracy, it is not always so for the mortality rate. In addition, it is believed that such an exponential increase in cancer rates has been generally regarded as a reflection of an actual increase in cancer incidence and/or mortality, not as an artifact effect by easy accessibility to diagnostic facilities for cancer detection. Therefore, it seems to be apparent that there must be an increase in female malignancies in Korean women.

Changing patterns of admission rate may not reflect the actual trends in cancer incidence, not only due to duplicate count against person-based admission, but also due to the rush-in-phenomena in admissions in a given year or especially in the early stage of the insurance system. In order to alleviate such spurious effects of bias that may distort the real situation, trends in admissions were observed on the basis of proportion index along with the age-standardized admission rate, as can be seen in Fig. 3-5. Although the cause of death statistics based on vital statistics have been published by the national government, they still contain some problems of under-reporting, inaccuracy, and incompleteness of classifiability of the cause of death reported (Kim 1989). In spite of such weakness in the data, our method used in this study is so far the only way to observe the long-term trend of mortality of any given disease in the whole Korean population, unless a significant change in disease classification or in reporting rate had occurred and seriously affected the real trend. It is, however, less likely that an incidental event occurred during the study period which may result in ambiguity in the long-term trend of cancer mortality.

Another advantage of the study population used in this study was the fact that the insurance population was stable by years, which is favourable to the observation of long-term trend of a disease. Diagnostic inaccuracy in health insurance data is another possibility of false inference of increasing trend in cancer. However, our previous study on the relation of hepatitis B virus infection to liver cancer, which used the same insurance data, revealed that the degree of greement in the diagnosis of liver cancer against presumptive diagnosis for the insurance claims was 0.944 (Yoo *et al.* 1991).

This study showed a decreasing trend for uterine cervix cancer since around 1988-1989, indicating that there might have been an actual decrease in the incidence of the malignancy at the end of the 1980s in Korean female population. It is unclear that it might be a result of cancer detection program, i.e., mass screening. Along with our results, the mortality rate for uterine cancer has been decreasing since 1955 in Japan. On the other hand, the mortality rate for breast cancer was rapidly increasing from 78 per 10,000 in 1955 to 4.31 per 10,000 in 1987 in Japan (The Bureau of Vital Statistics 1989).

The prevalence rate observed in a community-based survey was 36.13 per 100,000 for uterine cervix cancer, and 16.33 per 100,000 for breast cancer in 1987 (Kim 1988). Such discrepancies in actual values in prevalences compared to those in our study seem to be unavoidable because the absolute number of admissions is bound to overestimate the real rate of incidence; partly due to both a double count of cases admitted in a given year and multiple admissions of a patient. Nevertheless, the difference in the prevalence rate was not so big compared to that expected.

Age distribution of cancer mortality or morbidity can provide some clues for an investigation on the etiology of a certain disease. Moreover, change in the age curve of a given cancer could sometimes give more crucial information on changes in risk factors that may exist in the population. The shifting pattern of prevalent age in morbidity for uterine cervix cancer to the older age group may indicate an

increase in medical utilization for the older age group or an acutal increase in the incidence in the age group or some changes in risk factors in the population. Further observation will be needed to support such findings.

The increasing trend of uterine cervix cancer might be due to some changes in sexual behaviour, including multiple partnership in sexual activity, and early age at first coitus in Korea (Lee 1992). In addition, the increase in the number of female smokers, the prevalence of human papillomavirus infection and venereal diseases, and finally the increase in use of oral contraceptives may partly influence such an increasing tendency of uterine cervix cancer in this population. The increase in mortality/morbidity of breast cancer seems to be inevitable in Korea, when we look at the changes in biological and social factors in Korean women that may affect the disease; early age at menarche, late age at menopause, a surge of celibacy, late age at full-term pregnancy, an evasion of breast-feeding, obesity in prepuberty, smoking and alcohol drinking (Yoo *et al.* 1992; Yoo and Ahn 1992).

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