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Incidence Estimation of Female Breast Cancer among Koreans

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The authors conducted a nationwide survey to estimate the incidence rates of female breast cancer among Korean women in 1990-1991. We identified potential breast cancer cases based on the claims sent by medical care institutions throughout Korea to the Korea Medical Insurance Corporation (KMIC) from January 1988 to December 1989, whose diagnoses in the claims included one of the following diagnostic codes; ICD-9 174-175 (malignant neoplasms of the breast), 217 (benign neoplasms of the breast), 610-611 (benign mammary dysplasia and other disorders of the breast), 233 (carcinoma in situ of the breast and genito-urinary system), or 195-199 (malignant neoplasms with uncoded sites). In order to collect the final diagnosis of the potential cases, abstracting medical records was performed through visiting or mailing an abstracting format to the corresponding medical institutions. Thereafter oncologists reviewed the abstracting formats and confirmed the incident cases of female breast cancer among the potential breast cancer cases. Using these data from the KMIC, the incidence patterns of female breast cancer among Korean women were estimated as of July 1, 1988 to June 30, 1989. The incidence rate of female breast cancer adjusted for the Korean population was estimated to be 9.9 (95% confidence interval: 9.5-10.4). The cumulative rates for the ages 0-64 and 0-74 were 0.85% and 1.0%, respectively. The standardized rate for the world population was 10.9, which was lower than those of any other Asian country including China and Japan in 1983-1987. The truncated rate for ages 35-64 was 28.9, which might also be the lowest in the world. Incidence patterns of female breast cancer by age and residential area, which is the first report of its kind in Korea, are analyzed and presented.

Key Words : *Female breast cancer, incidence, Korean.*

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INTRODUCTION

Up to this date, various statistics have been available on the magnitude of female breast cancer in Korea. The relative frequency of female breast cancer in all cancer sites is about 7.2%, the 3rd in rank, proceeded by cancers of the uterine cervix and stomach(Yoo et al., 1988). The point prevalence rate of female breast cancer was reported to be about 16.3 per 100,000 (Kim et al., 1988). The mortality rate of female breast cancer in the Kyŏngsangnam-do was estimated to be 3.9 per 100,000, which was about 5.9% of the total deaths due to malignancies among women in 1989-1990 (Lee et al., 1992).

The incidence data on female breast cancer, which must be a very important source of information for the etiologic investigations of breast cancer, have not yet been available for Koreans as a whole. Even though the Korean Ministry of Health and Social Affairs (MOHSA) has operated a Central Cancer Registry since July 1980, the low registration rate and unclearly defined denominators for incidence rate estimation have made it hard to get a valid estimator of the incidence rate. Recently, cancer incidence data from a rural area, Kangwha county, was reported (Kim IS et al., 1990), which could not be representative for Korea as a whole, since the data were obtained from a small population and a geographically restricted area.

To get a valid estimator of incidence rate, a clear delineation of incident cases during a specified period and information on the age and sex distributions of the denominator or the base population are necessary. The beneficiaries of the KMIC were suitable for this purpose for two reasons. First, health insurance morbidity data of the KMIC, i.e. computerized databases on the medical care utilization of the beneficiaries are available to find all incident cases during a specified period with the appropriate adjustment for the correctness of diagnosis and time of onset of the disease. For the latter, the beneficiaries are clearly defined and the age and sex distributions are described in the annual report of the institute. In addition, the beneficiaries of the KMIC comprise about 10% of the Korean population and are distributed over all the provinces in Korea so that the age and sex specific incidence rates estimated from the beneficiaries can be applied to the Korean population to yield representative incidence statistics on the Korean population.

Using the beneficiaries of the KMIC as the base population in estimating incidence rates, we have conducted a series of incidence estimation surveys on some cancers among Koreans through specifically designed surveys in 1988 to 1989 (Ahn et al., 1989 ; Ahn et al., 1991a, 1991b, 1991c). In 1990, the authors conducted another nationwide incidence estimation survey for some cancers which had not been covered in the 1988 survey. This is the first report of the 1990 incidence estimation survey on the incidence rates of various sites including the breast, lung, colorectum, uterine cervix, and bone, presenting the incidence patterns of female breast cancer among Korean women by age group and residential area.

MATERIALS AND METHODS

The base population of this study were the beneficiaries of the Korea Medical Insurance Corporation (KMIC) during the period of 1988-1989 as described in a previous report (Ahn et al., 1989). In addition, the KMIC compiles computerized databases of medical care utilization using the first 2 diagnostic codes in the claims sent from medical care institutions throughout the country to the KMIC, which is a valuable basic data source for identifying the potential incident cases of cancer during the period.

We identified potential cases of female breast cancer by screening all the admitted cases coded as either malignant neoplasms of the breast (ICD-9 174-175), or benign neoplasms of the breast (ICD-9 217), or benign mammary dysplasia and other disorders of the breast (ICD-9 610-611), or carcinoma in situ of the breast and genito-urinary system (ICD-9 233) or malignant neoplasms with uncoded sites (ICD-9 195-199) from January 1, 1988 to December 31, 1989 in the database of the KMIC. A total of 4,031 admitted patients (7,357 claims) were screened and listed as potential female breast cancer patients during the period.

These potential cases were classified into three categories by the diagnostic code in the claims. The first category included cases, which were highly suspicious of female breast cancer, i.e. coded as malignant neoplasms of the breast (ICD-9 174-175), benign neoplasms of the breast (ICD-9 217), or benign mammary dysplasia and other disorders of the breast (ICD-9 610-611). The second one comprised the cases coded as carcinoma in situ of the

breast and genito-urinary system (ICD-9 233). The last category involved the cases coded as malignant neoplasms with sites not coded (ICD-9 195-199), whose possibility of female breast cancer seemed to be very low.

The medical records of all the potential cases were abstracted through two methods : visiting each medical care institution to abstract medical records by visiting abstractors, and mailing an abstracting format to be filled out by the physicians who cared for the patients. Visiting abstractors were recruited among the junior or senior medical students of Seoul National University College of Medicine and trained on how to review and abstract the medical record of each case using an abstracting format. They were then assigned to the respective hospitals or clinics, where 5 or more potential cases had been claimed. For the other institutions, where less than 5 cases were listed, the abstracting formats were mailed to be filled out and mailed back by the physicans who cared for the corresponding patients. Out of the total 4,031 potential cases, the medical records of 3,065 cases (76.0%) were abstracted by visiting 248 institutions and mailing to 174 institutions. The abstraction rates were different according to the three categories of the potential cases : 81.4%, 67.9%, 54.0%, respectively.

Diagnoses of female breast cancer were confirmed through a review of the abstracting formats by the oncologist in the department of general surgery (Dr. DY Noh). A female breast cancer was defined as "a primary cancerous mass in the breast proven by patholgic findings or other definite imaging techniques". The date of onset of the majority of cases was determined based on the date of patholgic diagnosis. In a few cases whose date of pathologic diagnosis were unknown, the date of the first admission to the medical care institution was regarded as the onset date. Out of 3,085 abstracts, 613 patients (20.0%) were confirmed as female breast cancer. Out of these, 225 cases, whose date of onset was between July 1, 1988 and June 30, 1989, were decided as incident cases.

To minimize the underestimation effect due to incomplete abstraction of medical records, the correction factors of 1.23, 1.47, and 1.85 according to the categories of the potential cases were applied to the 225 confirmed cases based on the assumption that the proportion of incident breast cancer cases among non-abstracted potential cases would be the same as that among the abstracted cases. Finally, the total number of incident cases of female breast cancer occurred among KMIC beneficiaries between July 1, 1988 and June 30, 1989 was estimated to be 274 cases.

RESULTS

Distribution of female breast cancer cases by age group and residential area

The proportion of breast cancer cases showed increasing tendency until the age of 54 with a peak in age group 50-54 (18.2%), and then showed a decreasing trend after the age of 55 (Table 1). By residential area, almost half of the cases (45.6%) were from Kyŏnggi-do including Seoul and Incheon. And those in the Kyŏngsangnam-do including Pusan and in the Kyŏngsangbuk-do including Taegu were about 1/3 of all incident cases (Table 2).

Table 1. Age distribution of female breast cancer cases among KMIC beneficiaries, '88. 7.~'89. 6.

Age Group	No	%
under 19	0	0.0
20-24	1	0.4
25-29	10	3.6
30-34	25	9.1
35-39	29	10.6
40-44	37	13.5
45-49	47	17.2
50-54	50	18.2
55-59	31	11.3
60-64	21	7.7
65-69	10	3.6
70-74	8	2.9
75 and over	5	1.8
Total	274	100.0

Table 2. Geographical distribution of female breast cancer cases among KMIC beneficiaries, '88. 7.~'89. 6.

Area	No	%
Seoul, Inch'ŏn Kyŏnggi-do	125	45.6
Kangwon-do	11	4.0
Ch'ungch'ŏngbuk-do	7	2.6
Taejŏn Ch'ungch'ŏngnam-do	16	5.8
Chŏllabuk-do	14	5.1
Kwangju Chŏllanam-do	24	8.8
Taegu, Kyŏngsangbuk-do	29	10.6
Pusan, Kyŏngsangnam-do	48	17.5
Cheju-do	0	0.0
Total	274	100.0

Table 3. Percentage distribution of female breast cancer by subsite

Site, anatomical	No	%
Right Breast	121	47.8
Upper Outer Quadrant	49	19.4
Upper Inner Quadrant	17	6.7
Lower Outer Quadrant	15	5.9
Lower Inner Quadrant	7	2.8
Around Nipple	6	2.4
>1 Quadrants	26	10.3
Site Unknown	1	0.4
Left Breast	129	50.1
Upper Outer Quadrant	56	22.1
Upper Inner Quadrant	22	8.7
Lower Outer Quadrant	13	5.1
Lower Inner Quadrant	6	2.4
Around Nipple	6	2.4
>1 Quadrants	24	9.5
Site Unknown	2	0.8
Bilateral	3	1.2
Total	253	100.0

Table 4. Percentage distribution of female breast cancer by histologic type

Histologic Type	No	%
Carcinoma in situ	10	4.0
Intraductal Carcinoma	9	3.6
Lobular Carcinoma	1	0.4
Ductal Carcinoma	220	87.6
Lobular Carcinoma	5	2.0
Medullary Carcinoma	5	2.0
Others	11	4.4
Total	251	100.0

Table 5. Age-specific annual incidence rate of female breast cancer among Koreans, '88. 7.~'89. 6.

Age group	Incidence Rate per 100,000
under 19	0.00
20—24	0.60
25—29	4.02
30—34	12.78
35—39	20.42
40—44	30.75
45—49	33.48
50—54	36.16
55—59	26.99
60—64	24.50
65—69	13.51
70—74	14.80
75 and over	6.17
Total	1) 9.92(9.47—10.35)
	2) 10.91
	3) 28.86

1) Age adjusted rate for the Korean population as of 1985(95% CI). The cumulative rates for 0-64 and 0-74 are 0.85%, 1.0%, respectively. The estimated number of newly-occurring female breast cancer patients per year are about 2,000 in Korea.
2) Age adjusted rate for the world population.
3) Truncated(35-64 years of age) rate for the world population.

Distribution of female breast cancer by subsite

Table 3 shows the percentage distribution of female breast cancer subsites among classifiable cases (N=253). The right and left breast were affected at almost the same percentage. Among the four quadrants of each side of the breast, the upper outer quadrant was the most common subsite of female breast cancer (around 40%), followed by the upper inner quadrant (about 20% of all classifiable cases).

Distribution of female breast cancer by histologic type

Almost 90% of the cases were ductal carcinoma and the remaining 10% consisted of carcinoma in situ (4.0%), lobular carcinoma (2.0%), medullary carcinoma (2.0%), and other types of cancer (4.4%) (Table 4).

Age-specific incidence rate of female breast cancer among Koreans

Under 25 years of age, female breast cancer might be a very rare disease in Korean females. Afterwards, the age-specific incidence rates showed rapid increase by 2 or 3 fold with every 5 years until 40 years of age. After 40 years of age, a mild attenuation of the degree of increase ratio was noted, with a peak incidence at age 50-54 as 36.2 per 100,000 women. The age-specific incidence rates were lowered in those over 54 years of age, especially after the age of 64 (Table 5).

Around 2,000 incident cases of female breast cancer per year were estimated to occur in Korea based on the age-specific incidence rates of the beneficiaries of the KMIC applying to the age dis-

tribution of the Korean population. The Korean population-adjusted incidence rate was estimated to be 9.9 per 100,000 women (95% confidence interval : 9.5-10.4). According to the age-specific incidence rates, the cumulative rate in the age groups of 0 to 74 years of age was 1.0%, i.e. breast cancer can occur in the probability of one out of one hundred women from birth to 74 years of age in Korean women. The world population-adjusted rate was 10.9 per 100,000 women, and the truncated rate for those of 35-64 years of age was 28.9 per 100,000 women.

Table 6. Standardized incidence ratio of female breast cancer by geographical area in Korea

Geographical Area	Number of		SIR@
	Observed	Expected	
Seoul, Inch'ŏn Kyŏnggi-do	125	110	1.14
Kangwon-do	11	16	0.69
Ch'ungch'ŏngbuk-do	7	10	0.70
Taejŏn, Ch'ungch'ŏngnam-do	16	19	0.84
Chŏllabuk-do	14	15	0.93
Kwangju Chŏllanam-do	24	26	0.92
Taegu, Kyŏngsangbuk-do	29	33	0.88
Pusan, Kyŏngsangnaw-do	48	42	1.14
Cheju-do	0	4	0.00

@ Standardized incidence ratio(number of observed/number of expected).

Geographical variations of the incidence rates of female breast cancer within Korea

The geographic variations of the incidence rates were evaluated by indirect standardization. Table 6 shows the standardized incidence ratio (SIR) in each residential area. The Kyŏnggi-do including Seoul and Inch'ŏn and the Kyŏngsangnam-do including Pusan showed incidence levels above average (SIR=1.14), and the incidence levels in other provinces were below the average in Korea. But no statistically significant departure from the nationwide level of incidence in any province was found by testing the SIRs based on the Poisson distribution (Nelder, 1964).

DISCUSSION

Several topics should be discussed relating to the nationwide incidence estimation survey in Korea. First, the feasibility of the KMIC population as the resource for the estimation of the national level incidence should be discussed. Second, the validity of case identification and the representativeness of the cases should be reviewed. Third, the characteristics of the incidence patterns of female breast cancer among Koreans compared with those of other races or countries in the world should be reviewed. The fourth point refers to the geographical variations in the incidence level of female breast cancer in Korea.

The first and the second points were fully discussed in the report of the previous incidence survey (Ahn et al., 1989), which could support this survey as a valid and representative one for the moment.

In regard to the second point, the distribution of cases by subsite was compared with that reported in a previous study on the pathologic characteristics of breast cancers from a seven-year experience in a hospital (Lee et al., 1987). Similar to the previous study, female breast cancer was slightly more prevalent in the left breast. Furthermore, percentages of breast cancer cases in each quadrant were compatible with the findings in the previous study. These findings could be regarded as supporting evidence of the validity and representativeness of the cases in our study. Therefore, the other two were regarded as the major points to be discussed.

This study showed that the incidence level of female breast cancer among Koreans in Korea is one of the lowest in the world, lower than that of non-Jews in Israel (IARC, 1992) (Table 7). The truncated rate is also among the lowest in the world (non-Jews in Israel, 41.9). The age pattern of female breast cancer incidence among Koreans in Korea is

Table 7. Comparison of the age-standardized and cumulative incidence rates of female breast cancer among some selected races and areas

Race/Area	Year	World	Truncated	0—64*	0—74*
Koreans/South Korea	'88—'89	10.9	28.9	0.9	1.0
〃 /L.A.	'83—'87	16.9	36.3	1.2	2.0
Japanese/Osaka	'83—'87	21.9	53.8	1.7	2.4
〃 /Hawaii	'83—'87	64.0	140.2	4.6	7.6
〃 /L.A.	'83—'87	72.7	158.4	5.3	9.4
Chinese/Shanghai	'83—'87	21.2	49.9	1.6	2.3
〃 /Singapore	'83—'87	31.6	74.8	2.4	3.4
〃 /Hawaii	'83—'87	75.6	165.7	5.4	8.4
〃 /L.A.	'83—'87	48.7	101.8	3.4	5.8
Non-Jews,/Israel	'83—'87	17.0	41.9	1.4	1.7
White/CT, USA	'83—'87	88.9	184.8	6.2	10.2

also characteristic. Compared with whites in the Unites States showing the continuously increasing trend of age-specific incidence rates of female breast cancer with age (IARC, 1992), the incidence pattern of the Korean population showed an increasing trend followed by a decrease after the age of 54. In Osaka, Japan, the incidence pattern is similar to that of Korea, but the decreasing trend appeared about five years later (IARC, 1992). The incidence pattern among Korean women is typical of those observed in countries with low incidence rates (Kelsey et al., 1991), but the decreasing trend was more pronounced.

Two possibilities could be considered for the decreasing trend found in the elderly in this study. In the first place, the birth cohort effect might be one possible explanation. During the recent several decades, the Korean population has experienced abrupt changes in lifestyle and dietary habits due to rapid westernization. As indicated in the study on the Japanese migrants to the United States (Buell, 1973), recent changes in the risk factors related to lifestyle and diet could be the possible explanation for the birth cohort effect. Secondly, the possibility of under-reporting of the breast cancer cases in the old-aged women as a result of underutilization of medical care might be considered.

Incidence rates by residential area show little geographical variation within Korea. Previous incidence studies on stomach and liver cancer showed statistically significant variations by residential areas (Ahn et al., 1989, 1991a). This implies that the incidence levels of female breast cancer are homogeneous across geographical areas in Korea so that the distributions of the risk factors of female breast cancer may not differ significantly among areas in Korea. But we couldn't exclude the possibility that the size of this study was not large enough to detect geographical variations.

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