Incidence Estimation of Stomach Cancer Among Koreans

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A series of incidence estimation studies of cancers among Koreans through a nationwide survey has been undertaken by authors since 1988. The medical records were studied of inpatients with diagnoses of either ICD-9 151(malignant neoplasm of the stomach), or 197 (secondary malignant neoplasm of the respiratory and digestive systems), or 211(benign neoplasm of other parts of the digestive system) in claims sent in by medical care institutions throughout the country to the Korea Medical Insurance Corporation(KMIC) during the period from January 1, 1986 to December 31, 1987. These records were abstracted in order to identify and confirm the new cases of stomach cancer among the beneficiaries of the KMIC, which covers about 10% of whole Korean population. Using these data from the KMIC, the incidence patterns of stomach cancer among Koreans were estimated as of July 1, 1986 to June 30, 1987.

The crude incidence rates of stomach cancer among Koreans are estimated to be 36.2(95% tonfidence Interval ; 35.3—36.9) and 21.0 (95% CI ; 20.3—21.6) per 100,000 in males and females, respectively. The cumulative rates for age spans 0—64 and 0—74 are 3.8% and 7.3% in males, respectively. In females they are 1.8% and 3.0%. The adjusted rates for the world population are 57.9 in males and 25.1 in females, which are similar to those of Shanghai, China '78—'82 but lower than those of Osaka, Japan. The truncated rates for ages 35—64 years, however, are 108.3 in males and 49.1 in females, which may be the highest in the world. Among Koreans in Korea, an increased risk of stomach cancer in this age group is the notable finding.

Incidence patterns of stomach cancer by age, sex, and area, which are the first report in Korea, are analyzed and presented.

Key Words : *Stomach cancer, Incidence, Korean*

INTRODUCTION

Stomach cancer (ICD-9 151) is the most common maligant neoplasm among Koreans. The admission rate of stomach cancer per year among medical beneficiaries is around 119 per 100,000 for males and 61 for females (Yoo et al., 1988). The point prevalence rate of stomach cancer is reported to be about 74 and 45 per 100,000 in males and females, respectively, by Kim et al.(1988). The relative frequency of stomach cancer to all cancer sites is about 30% in males, the first in rank, followed by liver and lung, and about 17% in females, 2nd in rank, preceded by cervix uteri (Ministry of Health and Social Affairs, 1989 ; Lee et al., 1988). According to an annual report on the cause of statistics of deaths based on vital registration (National Bureau of Statistics, 1988), the death rate by stomach cancer was 40.5 per 100,000 for males and 24.8 for females, which is about 31.6% of the total deaths dus to malignancies in 1987. However, among the death registrations in 1987, only 40% of the causes of deaths have been issued by physicinans.

In addition, the incidence data on stomach cancer have not yet been available for Korea as a whole. Even though the goverment has operated the central cancer registry since July 1980, still the cases registered are too small to be used for producing incidence statistics. Recently, cancer incidence data for a rural area, Kangwha county, were reported (Kim IS et al., 1990). According to the report, a total of 217 cases of stomach cancer, 151 for males and 66 for females, were identified during 5 years, which is equivalent to an incidence rate of 69.1 per 100,000 per year in males and 29.5 in females. But this statistics could not be a representative one for Korea as a whole, since the data are based on a small number of cases and population.

A series of nationwide incidence estimation studies of cancers among Koreans through specially designed surveys has been undertaken by the authors since 1988. Some of the results, such as incidence of primary liver cancer, have already been reported (Ahn et al., 1989). This study is another report of a series of sutdies presenting the incidence patterns of stomach cancer among Koreans by sex, age group, and residential area.

MATERIALS AND METHODS

The study population of this investigation was the beneficiaries of the Korea Medical Insurance Corporation (KMIC) during the period of 1986-1987 as described in the previous report (Ahn et al., 1989).

Potential cases of stomach cancer were screened by sorting out all admitted cases diagnosed as either stomach cancer (ICD-9 151), or secondary cancer of respiratory and digestive systems (ICD—9 197), or benign tumor of other parts of the digestive system (ICD-9 211) in the claims sent in by medical care institutions throughout the country to the KMIC during the period from January 1, 1986 to December 31, 1987. In the claims, 3 diagnostic names are usually indicated per case. A total of 4941 admitted patients (8343 claims) were selected and listed as potential stomach cancer patients during the period.

The medical records for each potential case were abstracted through two methods : visiting each medical care institution to abstract medical records by visiting abstactors, and mailing an abstract format to be filled out by the doctors 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 records of each cases using an abstracting format. They were then assigned to visit the hospitals or clinics, where 5 or more potential cases had been claimed. For the other institutions, where 4 or fewer cases were listed, the abstract formats were mailed to be filled out and brought back by the doctors who cared for the patients. Out of the total 4941 potential cases, the medical records of 4180 cases (84.6%) were abstracted by visting 177 institutions and mailing to 287 instituions.

Diagnosis of stomach cancer was confirmed through a review of the abstracts by the oncologists

(Drs. NK Kim and DS Heo). A stomach cancer case was defined as "an ulcerative and/or fungating mass in the stomach based on upper gastrointestinal radiologic studies, gastroscopy, or laparatomy with/without pathologic diagonsis." The date of the onset of the disease was determined on the date of the first admission to the medical care institution. In the case of a delay in the admission of more than one month, however, the onset date was determined on the date of diagnosis, which was the date when the positive findings were found in upper gastrointestinal radiology or gastroscopy for the first time. Out of 4180 abstracts, 3398 patients(81.3%) were confirmed as stomach cancer. Out of these, 1444 cases, whose dates of onset were between July 1, 1986-June 30, 1987, were

Table 1. Age Distribution of Stomach Cancer Cases Occurring Among KMIC Beneficiaries During One Year of 1986-87

Age Group	Male		Female		Total	
	No.	%	No.	%	NO.	%
Under 19	2	.2	—	-	2	.1
20—24	1	.1	2	.4	3	.2
25—29	8	.7	18	3.0	26	1.5
30—34	18	1.6	27	4.6	45	2.6
35—39	25	2.2	23	3.8	48	2.8
40—44	37	3.3	26	4.4	63	3.7
45—49	100	9.0	52	8.8	152	8.9
50—54	179	16.1	65	11.0	244	14.3
55—59	190	17.1	87	14.7	277	16.3
60—64	190	17.1	93	15.7	283	16.6
65—69	183	16.5	87	14.7	270	15.9
70—74	102	9.1	53	9.0	155	9.1
75—79	54	4.6	40	6.8	94	5.5
80—84	19	1.7	15	2.6	34	2.0
85 and over	4	.3	4	.6	8	.4
Total	1,112	100.0	592	100.0	1,704	100.0

Table 2. Geographical Distribution of Stomach Cancer Cases Occurring among KMIC Beneficiaries During One Year of 1986-87

Area	Male		Female		Total	
	No.	%	No.	%	NO.	%
Seoul, Incheon, Kyunggi	373	33.5	210	35.5	583	34.2
Kangwon Province	52	4.7	37	6.2	89	5.2
Chungbuk Province	57	5.1	28	4.8	85	5.0
Taejeon, Chungnam	116	10.4	55	9.4	171	10.0
Jeonbuk Province	74	6.7	45	7.6	119	7.0
Kwangju, Jeonnam	96	8.6	46	7.8	142	8.3
Taegu, Kyungbuk	147	13.3	75	12.7	222	13.1
Pusan, Kyungnam	165	14.9	78	13.1	243	14.3
Jeju Province	12	1.1	6	1.0	18	1.0
Unknown	20	1.8	12	2.0	32	1.9
Total	1,112	100.0	592	100.0	1,704	100.0

sorted out.

Finally, the total number of new cases of stomach cancer occurring among the KMIC beneficiaries during one year of July 1, 1986-June 30, 1987 was estimated to be 1704 cases by applying the correction factor of 1.18(1/0.846) to the 1444 confirmed cases based on the assumption that the number of stomach cancer patients in the non-abstracted potential cases would be proportional to that in the abstracted cases.

RESULTS

1. Distribution of stomach cancer cases by sex, age group, and area

Male patients outnumbered females with a ratio of 187.8 males per 100 females.

The age distribution of male and female stomach cancer patients was similar to each other. The majority of male and female patients were between 50 and 69 years of age, comprising 66.8% and 56.1% of the tatal patients, respectively (Table 1).

By residential area, 33,5% of the male patients and 35.5%of the female patients were from Kuunggi Province including Seoul and Incheon. Kyungnam area including Pusan, reflected 14.9% and 13.1% of the male and female cases, respectively, and the Kyungbuk area including Taegu showed 13.3%of the male and 12.7% of the female (Table 2).

2. Distribution of stomach cancer by subsite

Subsite of stomach cancer could not be identified exactly because of many missing and inaccurate descriptions on medical records and abstracts. Table 3 shows the percent distribution of stomach cancer subsites among classifiable cases. For the classification of subsites, two conventional criteria were applied, e.g., anatomical and gastric wall subsite. The number of classifiable cases by anatomical subsite was only 831 (57.5% of 1,444 abstracts) and 411 (28.5%) by gastric wall subsite.

By anatomical subsite, antrum and pylorus(ICD-O 151.1-151.2) are the most common subsites of stomach cancer (48.7%), followed by mixed (27.7%), and body (ICD-O 151.4 17.3%). By gastric wall subsite, most subsite occured in the lesser curvature (ICD-O 151.5, 46.7%), followed by mixed sites (21.0%), and greater curvature (ICD-O 151.6, 14.1%)

3. Age-specific incidence rate of stomach cancer among Koreans by sex

Under 19 years of age, stomach cancer is a very rare disease among Koreans in both sexes. Afterward, the incidence rate increases exponentially with age in both sexes. In the male, the annual incidence rate of stomach cancer per 100,000 increases by two or threefold every 5 years until 55 years of age, where a mild attenuation of the increasing pattern is noted, with a peak incidence at age 65-69 as 383.2 per 100,000, followed by a slight decrease in those over 70 years of age. In the female, the incidence rate also increases with age, but not as remarkably as the male, with a peak incidence rate in the same age group as in the male, 65-69 as 140.65 per 100,000. However, a marked (approximately two fold) increase in incidence at two age periods, in the early thirties and mid-fifties, was noted in the female (Table 4).

The crude incidence rate of stomach cancer among Koreans in Korea was estimated to be 36.2 per 100,000 (95% Confidence Interval ; 35.3-36.9) in the male and 21.0 (95% CI ; 20.3-21.6) in the female. Around 11,550 new cases of stomach cancer (7,320 for male and 4,230 for female) a year are estimated to occur in Korea. The cumulative rates for the age spans 0-64 and 0-74 were 3.79%, 7.31% in the male and 1.78%, 3.00% in the female, respectively. The adjusted rated for the world population are 57.9 in the male and 25.1 in the female, and the truncated rates for those 35-64 years of age are 108.3 and 49.1 in the male and female, respectively.

When comparing the age-specific incidence rates between males and females under the age of 30, the female incidence rate was one and a half times or twice as high as that of the male. This female preponderance is reversed just after the age of 35, where the male incidence rates became much higher than those of the female with increased age, showing threefold maximum in the age group of 70-74.

4. Geographical variations of the incidence rates of stomach cancer within Korea

The incidences of stomach cancer based on residential areas were compared geographically with each other by the method of indirect standardization. Table 5 shows the standardized incidence ratio (SIR) in each area. Among males, the incidence of stomach cancer is higher in the Chungnam Pro-

Table 3. Percent Distribution of Stomach Cancer by Subsite

Subsite, anatomical	%	Subsite, gastric wall	%
Cardia (ICD-O 151.0)	2.5	Lesser curvature (ICD-O 151.5)	46.7
Fundus (ICD-O 151.3)	1.1	Greater curvature (ICD-O 151.6)	14.1
Body (ICD-O 151.4)	17.3	Anterior wall (ICD-O 151.8)	7.3
Antrum and Pylorus (ICD-O 151.1/2)	48.7	Posterior wall (ICD-O 151.8)	10.9
Mixed subsites	27.7	Mixed	21.0
Entire	2.7		
Total	100.0	Total	100.0

Table 4. Age-specific Annual Incidence Rate per 100,000 of Stomach Cancer Among Koreans by Sex, 1986-87

Age Group	Male	Female
Under 19	.31	
20—24	.65	1.21
25—29	3.85	7.52
30—34	10.24	15.62
35—39	19.14	16.82
40—44	29.78	21.61
45—49	75.83	36.95
50—54	135.61	47.93
55—59	200.21	86.30
60—64	282.47	121.23
65—69	383.17	140.65
70—74	320.65	105.00
75 and over	266.32	94.60
Total 1)	36.2 (35.3-36.9)	21.0 (20.3-21.6)
2)	57.9	25.1
3)	108.3	49.1

1) Crude rate for Korean population as of 1985 (95% CI). The cumulative rates for 0-64 and 0-74 are 3.79 %, 7.31% in male and 1.78%, 3.00% in female, respectively. The estimated number of newly-occurring stomach cancer patients per year are about 7,320 for males and 4,230 for females in Korea
2) Age adjusted rate for the world population
3) Truncated (35-64 years of age) rate for the world population

vince area including Taejeon, and lower in the Kyunggi Province area including Seoul and Incheon, than other areas. Among females, however, no difference in incidence by residential area was noted.

COMMENTS

This incidence estimation study requires further discussion centered on three major points. The first point refers to the use and validity of the KMIC population as the resource for the estimation of national level incidence. The second refers to the methods of case indentification and the representativeness of the studied cases. The third point refers to the characteristics of the incidence patterns of stomach cancer among Korea compared with that of other races/countries in the world.

1. KMIC beneficiaries as a study population

The primary purpose of this study was to estimate an age-specific incidence rate of stomach cancer among Koreans in Korea by sex. Therefore, representativeness of a study population should be justified in terms of both the sufficiency of population-time observed and the characteristics of the population relevant to risk exposure to stomach cancer.

In this study, the population-time observed which was used for the incidence estimation during July 1, 1986 to June 30, 1987 is 2,124,000 person-years for males and 2,204,000 for females. The least observed was the 65-69 age group of the male as about 48,000 person-years. We believe the total population-time observed, about 4.4 million person-years, is sufficient to estimate the incidence.

The occupations of insured persons of KMIC were limited to the government employees, pensioners, and private school teachers and staffs. But the beneficiaries (insured and their dependents) cannot be regarded as a "deviated group to the (higher or lower) risk of stomach cancer," because the distribution of age, sex, and residential area

of the KMIC beneficiaries is similar to that of the total population of Korea, and the kinds of jobs and socioeconomic status of government employees is not confined to a specific work and social class in terms of the jobs of higher or lower risk of stomach cancer (KMIC, 1989).

2. Confirmation of diagnosis and representativeness of the confirmed cases

The diseases diagnosed in the claims sent by hospitals and clinics to the medical insurance organizations were used as the primary source of case identification. However, they cannot be regarded as "accurate diagnoses" because they might have been written as either exclusive diagnostic names or clinical tentative diagnoses whether they were confirmed later or not. Therefore, we reviewed the medical records abstracts filled out with relevant information collected by abstractors (medical students) or physicians who cared for the patients. This approach seems to be erratic but is the best one for the moment in a situation where a cancer registry has not been fully established to produce incidence statistics. Actually, the case finding procedures used in this study were basically the same as those of registration. Instead of voluntary notification of cases by hospitals and general practice, field clerks (abstractors) collected relevant information. Certain claims of medical insurance, like a reportable list in a disease registry, were used as the primary source of case identification.

To minimize under-representation of stomach

Table 5. Geographical Comparison of Stomach Cancer Incidence Within Korea by Indirect Standardization Method Using KMIC Beneficiaries.

Geographical Area	Male			Female		
	Number of		SIR[@]	Number of		SIR[@]
	Observed	Expected		Observed	Expected	
Seoul, Incheon, Kyunggi	373	431	.87*	210	223	.94
Kangwon	52	66	.78	37	34	1.06
Chungbuk	57	43	1.30	28	22	1.23
Taejeon, Chungnam	116	87	1.32*	55	46	1.20
Jeonbuk	74	65	1.15	45	35	1.26
Kwangju, Jeonnam	96	113	.89	46	59	.78
Taegu, Kyungbuk	147	138	1.07	75	73	1.03
Pusan, Kyungnam	165	162	1.02	78	90	.87
Jeju	12	13	.94	6	8	.71

@ : Standardized incidence ratio (number of observed/number of expected)
* : p<.05 by Poisson distribution

Table 6. Medical Records Abstraction Rates from Potential Cases of Stomach Cancer by Sex and Age Group

Age Group	Male			Female		
	Target	Abstracted		Target	Abstracted	
	No.	No.	%	No.	No.	%
Under 30	27	22	81.5	45	32	71.1
30—39	115	86	74.8	118	93	78.8
40—49	387	326	84.2	198	172	86.9
50—59	1,079	926	86.1	483	398	82.4
60—69	1,058	910	86.0	512	434	84.8
70—79	532	460	86.5	280	232	82.9
80 and over	49	41	83.7	61	48	78.7
Total	3,244	2,771	85.4	1,697	1,409	83.0

Table 7. Comparison of the Age-standardized and Cumulative (0−64, 0−74) Incidence Rates of Stomach Cancer Among Some Selected Races and Areas

Race/Area.	Year	World		Truncated		0−64*		0−74*	
		M	F	M	F	M	F	M	F
Korean/South Korea.	'86−87	57.9	25.1	108.3	49.1	3.79	1.78	7.31	3.00
" /L.A.,	'78−82	44.8	18.6	44.2	25.4	1.80	1.00	7.76	2.18
Japanese/Osaka.	'79−82	76.9	35.9	93.9	48.1	3.87	1.90	9.11	4.03
" /Hawaii.	'78−82	28.4	14.1	28.3	15.9	1.15	.62	2.92	1.47
" /L.A.,	'78−82	25.5	11.4	24.1	19.6	1.03	.77	2.70	1.09
Chinese/Shanghai.	'78−82	58.3	24.6	71.7	32.2	3.02	1.31	7.36	2.96
" /Singapore.	'78−82	37.3	15.4	48.2	18.9	2.02	.76	3.88	1.81
" /L.A.,	'78−82	14.0	8.7	22.7	13.1	.96	.54	1.46	.91
" /Hawaii.	'78−82	11.2	6.7	12.2	11.0	.49	.42	1.15	.56
Colombian/Cali.	'77−81	49.6	26.3	56.7	28.6	2.38	1.17	5.23	2.74
White/CT,USA.	'78−82	10.8	4.3	11.5	4.5	.48	.18	1.29	.47
" /Iceland.	'73−82	31.4	14.0	34.4	13.8	1.44	.59	3.69	1.59

* The cumulative rates denote the number per 100, while the age-standardized(world and truncated, 35−64 years of age,) rates per 100,000.
Source of data : International Agency for Research on Cancer(IARC), Cancer Incidence in Five Continents, Volume V, Lyon, 1987.

cancer, we included patients with diagnoses of either ICD-9 197 (secondary cancer of respiratory and digestive systema) or 211 (benign tumor of digestive system), as potential cases. So, it is conceivable that the confirmed stomach cancer cases comprised 81.3% of the total abstracted medical records (3398 out of 4180 abstracted potential cases). But it is still open to debate whether the cases were under-represented because our review of the abstracts was based soly on the written documents of diagnostic procedures and surgical or pathological reports, regardless of the incompleteness of the medical charts.

Medical record abstracting was completed in about 84.6% of the target numbers, the two main reasons of incomplete abstracting were as follows : one was not to be able to find medical records of some cases in medical institutions duing visiting survery, and the other was non-response of filled out abstracting formats from some institutions after mailing three times through mailing survery, but the abstracting rate was not so different between sexes, and age groups, which supports the opinion that the failure of medical redords abstracting would be evenly distributed throughout the age groups and sexes and would occur non-selectively (Table 6). Therefore, our basic assumption of applying a correction factor of 1.18 to estimate the total newly-occurred cases is acceptable.

3. Incidence patterns of stomach cancer in Korea

This study shows that the incidence level of stomach cancer among Koreans in Korea is one of the highest in the world, similar to that of Shanghai, China and a little lower than that of Osaka, Japan (IARC, 1987). However, the age pattern of stomach cancer incidence among Koreans in Korea is characteristic. The truncated rate is the highest in the world (in Osaka, 93.9 for male and 48.1 for female). The difference in cumulative rates between 0-64 and 0-74 is relatively small among Koreans in Korea compared with the Japanese and Chinese (Table 7). This might suggest that the risk factors of stomach cancer in Korea have operated earlier in time and/or more intensively and that the medical and social impact of stomach cancer on this ecomomically active population would be considerable. Further investigations of risk factors and also effective maneuvers for prevention and early detection are essenial and called for in the near future.

The age incidence pattern by sex shows a female preponderance in those under 35 years of age and reverses to male preponderance over this age. This cross phenomena of stomach cancer incidence curve between the sexes, which was also noted among the Japanese in Osaka (IARC, 1987), may imply that the etiologic nature or major risk factors

of stomach cancer affecting the younger age groups would be different from those of the older age groups. Comparative case studies on some epidemiological and/or biological characteristics of stomach cancer, e.g., distribution of cell types, subsites, progress of the disease, and medical or demographical histories, can be expected as further steps.

Incidence rates by residential area show some geographical variation within Korea. However, these rates require cautious interpretation because we have no further information on the residential histories of the study population.

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