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Changing Patterns of Cancer in Korea; Six-Year Experience of Cancer Admissions in the Beneficiaries of Korean Medical Insurance Corporation[1]

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= Abstract = To figure out the epidemiologic characteristics of cancer in Korea during recent years, changing patterns of cancer admission — as a proxy of cancer morbidity — were observed by analysing the cancer admission data of the beneficiaries of Korean Medical Insurance Corporation, 1981-1986. There was a marked increase in age-adjusted cancer admission (ICD 140-208), which was higher in male. Proportion indices of cancer admission (ICD 140-208) to total admission was also increasing by year, suggesting a substantial increase in cancer morbidity in Korea. In male, stomach, lung, liver and colorectum were the most common sites of cancer, while in female, stomach, uterine cervix, breast and colorectum were the top four sites. The order of frequency was almost constant during the period. Epidemiological characteristics of some selected cancer sites were briefly discussed.

Key words: ***Changing patterns of cancer, Cancer in Korea, Cancer admission, Medical insurance beneficiaries***

INTRODUCTION

In recent years in Korea, as in many western industrialized countries, chronic degenerative diseases have been more important health problems than acute communicable diseases. Annual trends in the causes of death certified by the government are seen such that infectious diseases, like respiratory or gastrointestinal diseases, which were prevalent in 1960's, have been decreasing with continuous increase of chronic illnesses (KIPH 1983). Malignant neoplasms ranked the 5th major cause of death in 1960's, but has moved up to the 2nd in 1980's.

Unfortunately, we have no precise, nation-wide data on cancer morbidity and/or mortality yet, because of no population-based cancer registry and low rate in vital registration (i.e. death certification by doctor). In order to meet the need of figuring out the epidemiological characteristics of cancer morbidity among Koreans, authors analyzed changing patterns of cancer during recent 6 years, observing cancer admissions in the beneficiaries of Korean Medical Insurance Corporation (KMIC 1979-1986), as a proxy of cancer morbidity.

MATERIALS AND METHODS

Authors analyzed the health insurance morbidity data of the beneficiaries of KMIC from 1981 to 1986. The KMIC insurance system has been adopted by the Government since July 1, 1979. All government employees, private school teachers and staffs, and pensioners are to be insured with their dependents. Demographic characteristics of the study population were as follows; as of December 31, 1981, the total number of the beneficiaries was 3,977 thousands, reaching to 4,329 thousands in 1986. In other words, this insurance system has covered about 10 per cent of the national popula-

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tion every year. Age and sex composition was consistent over years, representing the pot shape of population pyramid. Beneficiaries were from every provinces in the whole country.

Cancer admission was defined as admission of a cancer patient, requesting renumeration for his/her hospital charges. All of the cases were diagnosed clinically and/or pathologically. All of the cancer admissions during 1981 to 1986 were classified according to the 9th revision of ICD code (WHO 1979), not avoiding duplication, and analyzed for the changing trends in cancer admission. Several indices on cancer admission by sites were used in the analysis. Firstly, crude admission rate or age-specific admission rate was calculated; cases of cancer admitted per a hundred thousand beneficiaries. Secondly, crude rate was standardized to world population for the purpose of trend analysis (Kunihara *et al.* 1984). In the early period of insurance system, admission rush phenomena might affect the patterns of annual cancer admission. In order to minimize such effect, the proportion of cancer admission to total admission, and the proportion of cancer admission of a specific site to that of total sites were used, thirdly.

RESULTS

1. Trends in cancer admission of all sites (ICD 140-208)

Fig. 1 shows the annual trends in age-adjusted admission rate for cancers of all sites in the beneficiaries. There was a marked increase in age-adjusted cancer admission rate from 1981 to 1986, and this increase was higher in male than in female.

Considering the possible effect of medical utilization on cancer admission, as is shown in Fig. 2, proportion of cancer admission to total admission was also increasing by year in both sex. While increasing pattern was not so rapid as in Fig. 1, the proportion of cancer admission was always higher in male.

2. Relative frequency by site of cancer

The ten most frequent cancer sites accounted for over 70% of all sites in male and over 60% in female. Stomach, lung, liver and colorectum were the 4 most common sites of cancer in male, and the order remained almost constant during the period. The other sites of cancer in male were buccal cavity and pharynx, esophagus, pancreas, urinary bladder, larynx and gallbladder, in order (Table

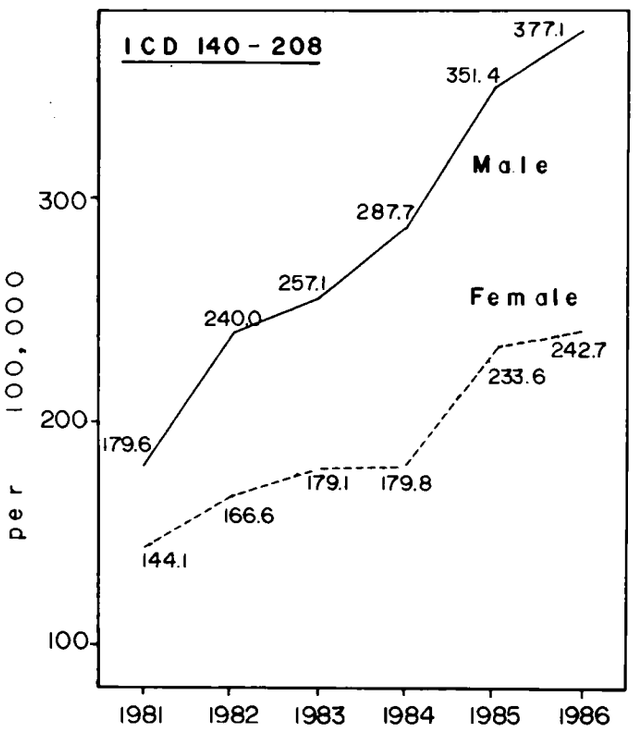

Fig. 1. Age-adjusted admission rates for cancers of all sites (ICD 140-208), 1981-1986, per 100,000.

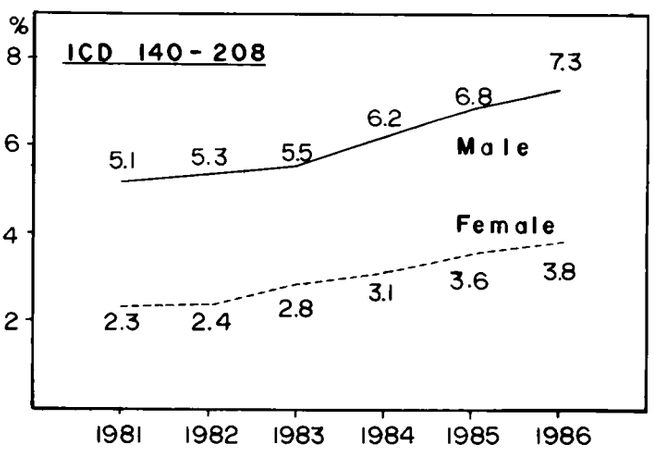

Fig. 2. Proportion of cancer admission (ICD 140-208) to total admission, by sex, 1981-1986.

1). In female, stomach, uterine cervix, breast and colorectum were the top four sites. The other sites of cancer were ovary, lung, liver, thyroid, gallbladder and pancreas, in order.

3. Trends in cancer admission by site

1) Ten most frequent cancer sites

Observing the trends of age-adjusted admission

Table 1. Relative frequencies of the 10 most frequent cancer sites among Koreans, 1981-1986

Order	1981		1983		1986	
			M A L E			
1	Stomach	32.0%	Stomach	31.4%	Stomach	31.1%
2	Liver	16.0	Liver	16.0	Lung	15.0
3	Lung	10.1	Lung	13.0	Liver	14.4
4	Colorectum	6.7	Colorectum	6.0	Colorectum	6.7
5	Leukemia	3.7	Leukemia	3.5	Buccal c.	2.8
6	Esophagus	2.8	Esophagus	2.8	Esophagus	2.7
7	Bladder	2.5	Bladder	2.8	Pancreas	2.6
8	Buccal c.	2.3	Pancreas	2.3	Bladder	2.5
9	Pancreas	2.2	Buccal c.	2.0	Leukemia	2.2
10	G.B.	2.0	Larynx	1.8	Larynx	2.1
			F E M A L E			
1	Stomach	18.8%	Stomach	20.8%	U.cervix	19.7%
2	U.cervix	15.5	U.cervix	17.6	Stomach	18.3
3	Breast	8.6	Breast	8.4	Breast	7.2
4	Colorectum	5.9	Colorectum	5.5	Colorectum	6.6
5	Liver	5.0	Ovary	5.0	Ovary	6.4
6	Lung	4.7	Liver	5.0	Lung	6.0
7	Thyroid	4.4	Lung	4.2	Liver	4.6
8	Ovary	3.8	Leukemia	3.6	Leukemia	3.2
9	Leukemia	3.2	Thyroid	3.5	Thyroid	2.9
10	G.B	1.7	Pancreas	1.9	G.B.	2.1

rates of the leading cancer sites, it could be said that there was an upward trend for most of the leading cancer sites in both sex (Fig. 3). It could be also seen that the ten most frequent sites of cancers were still the same as presented in Table 1.

In terms of proportion index of the ten most frequent cancer sites, actual increase in cancer admission seemed to be real in male cases of stomach, lung, liver and colorectum, which was more marked in stomach, lung, and liver. However, the proportions in female remained stationary or slightly decreased in almost every sites, which means the possibility of the effect of increase in medical utilization in female patients (Fig. 4).

2) Stomach (ICD 151)

Fig. 5 and 6 shows the changing pattern of stomach cancer admission by age and sex. Age-specific admission rates for stomach cancer increased exponentially by age, and over 60 it declined or remained constant in both sexes, which means the possibility of the effect of selective mortal force in

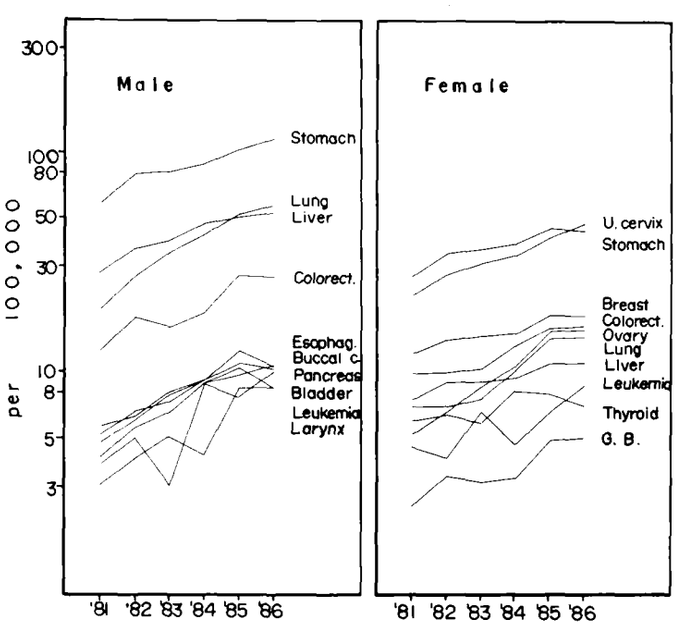

Fig. 3. Trends in age-adjusted admission rates of the 10 most frequent cancer sites, by sex, 1981-1986, per 100,000.

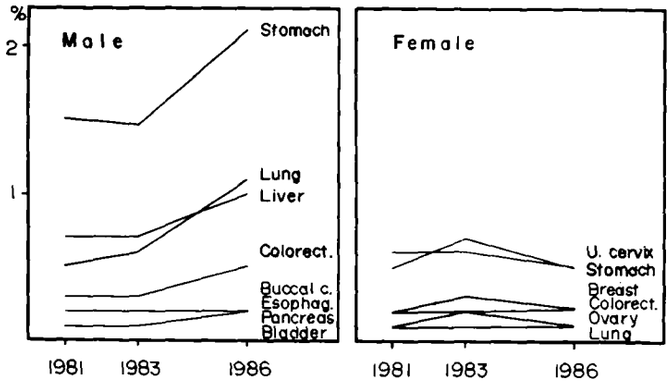

Fig. 4. Trends in proportion indices (cancer admission to total admission) of the ten most frequent cancer sites, by sex, 1981-1986.

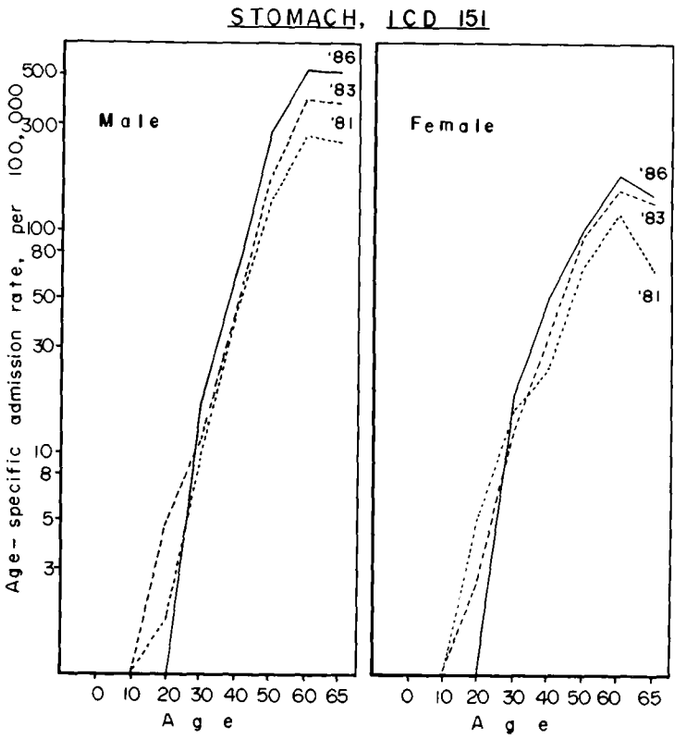

Fig. 5. Age-specific admission rate for stomach cancer (ICD 151), by sex, 1981-1986, per 100,000.

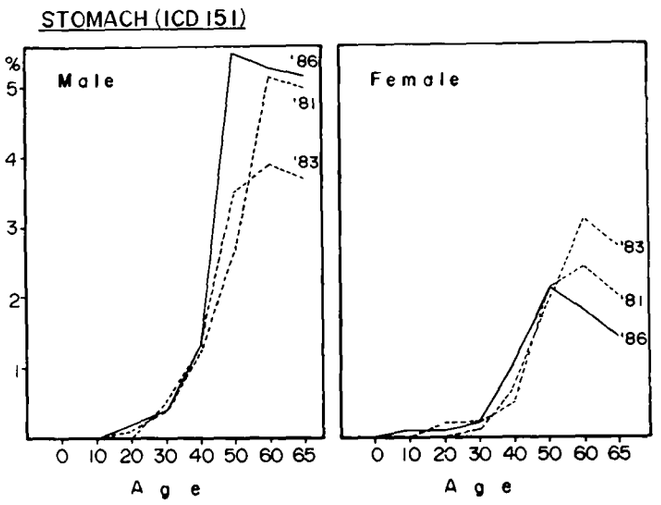

Fig. 6. Proportion of stomach cancer admisison (ICD 151) to total admission, by sex, 1981-1986.

senile group or of birth cohort effect. Considering the sexual difference, admission rates in male were always higher than in female (Fig. 5). However, in terms of proportion index, annual trend of age distribution was changing especially over 40's in male; variation under 30's was almost negligible by year, but more marked fluctuation was observed after 40's, suggesting that changes in contributing factors (i.e. salty diet, hot food, nitrite-containing water, alcohol, etc) or other factors (i.e. accessibility to medical facilities, diagnosibility, reporting, etc.) might lie dormant. And in female we could see a similar pattern of age-related change over 50's (Fig. 6).

3) Lung (ICD 162)

In the cases of malignant neoplasms of trachea, bronchus and lung, a very similar exponential increasing pattern of age-specific admission rate, as in stomach cancer, was observed in both sexes. But the most prominent feature was the continuous increasing pattern of age-specific rate after 60's in male (Fig. 7). Using the proportion index, the very age pattern could also be seen. In male, annual change in age distribution of the proportion index was marked over 40's and the substantial increase continued to over 60's especially in male, suggesting that the force of morbidity due to lung cancer in relation to smoking habit in Korean male, was still high even in recent years (Fig. 8). However, significant finding was not seen in female.

4) Liver (ICD 155)

Annual changes of age distribution in liver cancer admission were not so significant as in stomach and in lung. Over the age of 50 in male, a little change was observed in age-specific admission

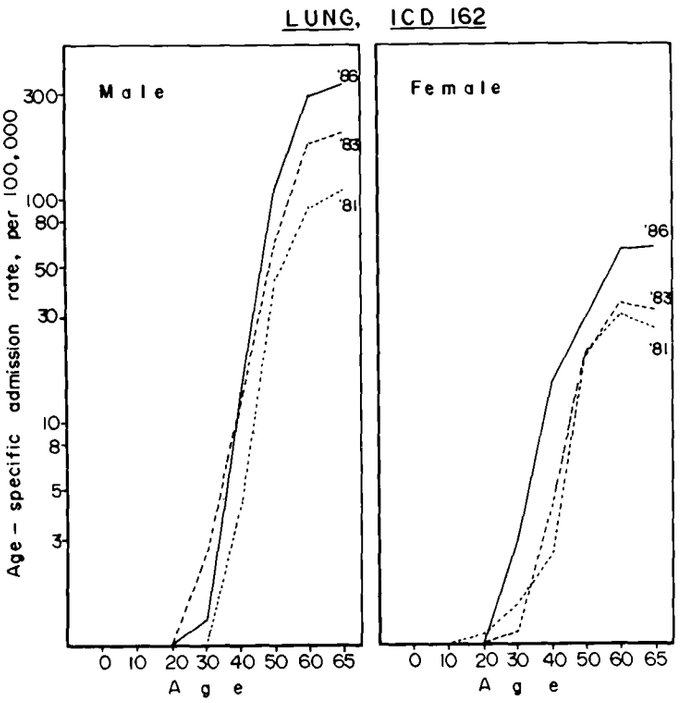

Fig. 7. Age-specific admission rate for lung cancer (ICD 162), by sex, 1981-1986, per 100,000.

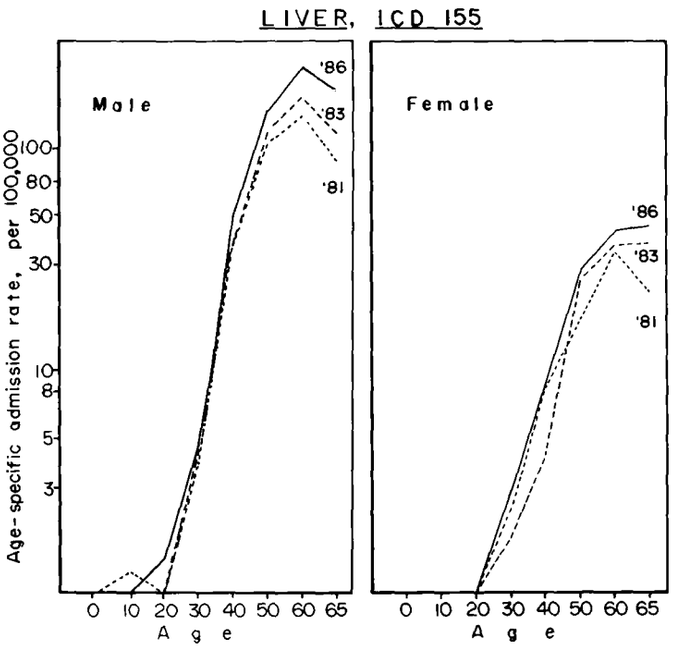

Fig. 9. Age-specific admission rate for liver cancer (ICD 155), by sex, 1981-1986, per 100,000.

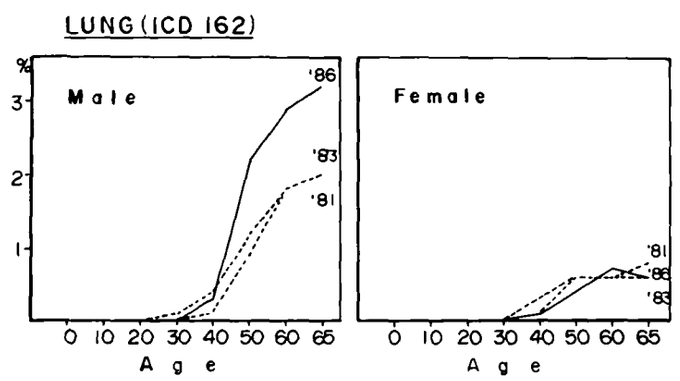

Fig. 8. Proportion of lung cancer admission (ICD 162) to total admission, by sex, 1981-1986.

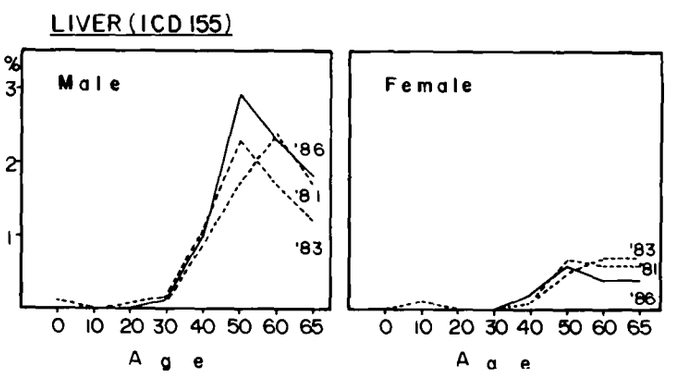

Fig. 10. Proportion of liver cancer admission (ICD 155) to total admission, by sex, 1981-1986.

rate by year, but over 60's, marked decrease was observed as in stomach, strongly suggeting the selective mortality effect in older age group (Fig. 9). Proportion index also showed that in male, some changes in age distribution were observed over 40's during the same period, but not in female (Fig.10). These findings may be the results of changes in some contributing factors (i.e. HBV infection, aflatoxin-containing food intake, alcohol, etc.), which might play an important role in the causation of liver cancer in Korea.

5) Colorectum (ICD 152-154)

Fig. 11 and 12 show the changing patterns of admission due to colorectal cancer. Age-specific admission rates were somewhat different to those of the three, mentioned above. The annual changes of age distribution could be seen even in younger age groups, both sexes, which were similar to that in Fig. 12. These findings suggest that contributing factors (i.e. high fat diet, alcohol, etc.) of colorectal cancer have changed certainly more

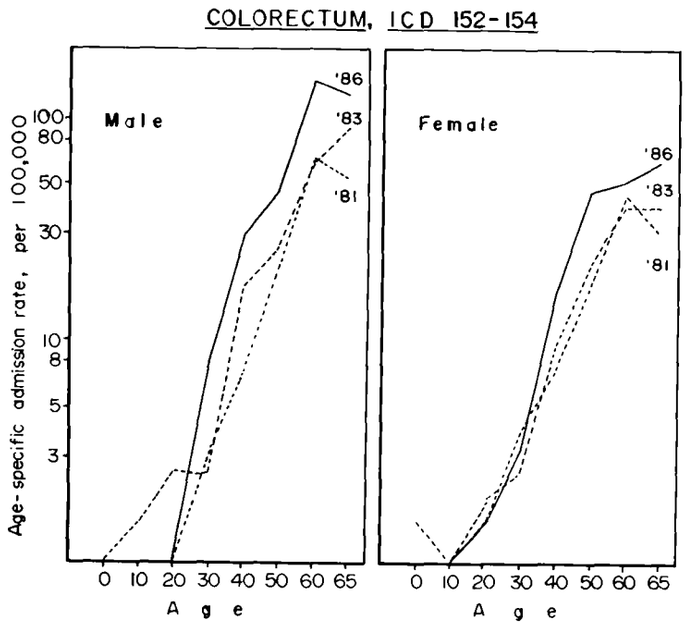

Fig. 11. Age-specific admission rate for colorectal cancer (ICD 152-154), by sex, 1981-1986, per 100,000.

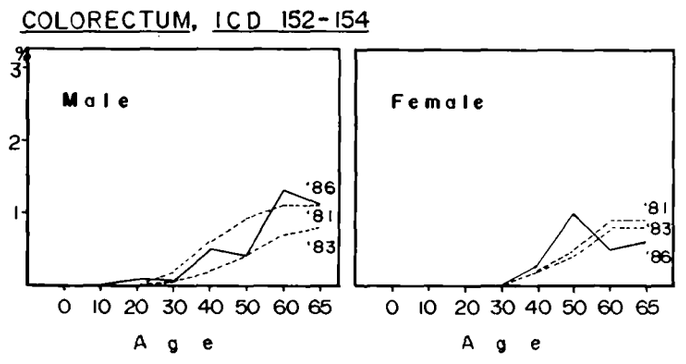

Fig. 12. Porportion of colorectal cancer admission (ICD 152-154) to total admission, by sex, 1981-1986.

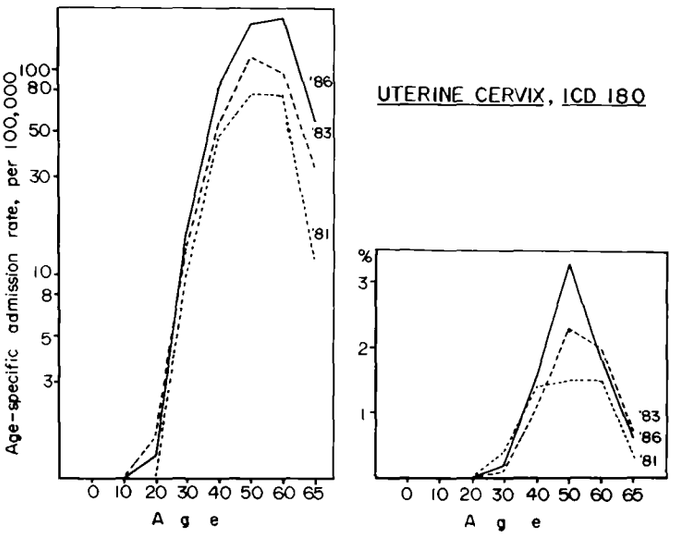

Fig. 13. Age-specific admission rate and proportion of uterine cervix cancer (ICD 180), by sex, 1981-1986.

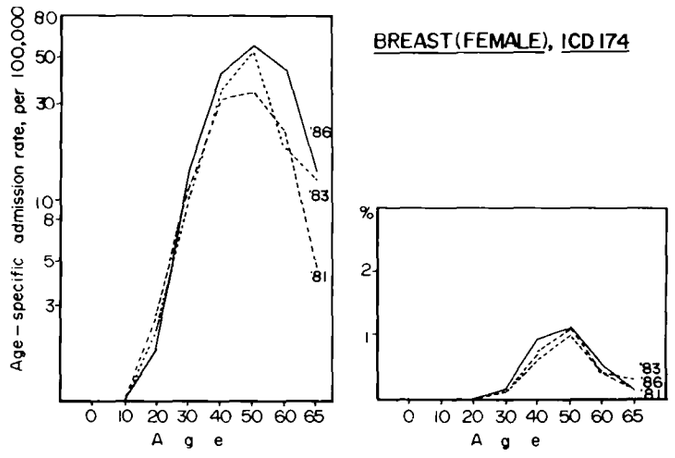

Fig. 14. Age-specific admission rate and proportion of female breatst cancer (ICD 174), by sex, 1981-1986.

than those of other common sites of cancer in recent years.

6) Uterine cervix (ICD 180)

Among the female malignancies, uterine cervix cancer ranked the first or the second in order of frequency. In the left of Fig. 13, age-specific pattern shows inverted U-shape, that is, rapid decreasing pattern over 50's or 60's after the peak in 50's, suggesting that the illness is strongly related with female reproduction (i.e. early marrital age, early pregnancy, multi-parity, multiple partner, etc.). In the right, uterine cervix cancer admission to total admission increased by year in the age of 50's (Fig. 13).

7) Breast, female (ICD 174)

Fig. 14 shows the pattern of female breast cancer admission. Characteristically, there were no changes in age-structure during the six years and were peak in the age of 40-50s with decreasing pattern over 50.

DISCUSSION

It is well known that the assessment of trends in cancer morbidity and mortality is a difficult and risky business, and is subject to various substantial errors. Mortality statistics are only proxy for incidence statistics, and frequently not available or of low accuracy in developing countries (Parkin 1986). Although mortality statistics are published annually by the Government, it is not satisfactory for the comprehensive sources of data, because of inaccurate recordings, resulting from pitfalls in registration, certification and classification of 'cause of death'.

Data from 61 hospital-based cancer registry (pathology-based) are also available in Korea, which can provide useful informations on the relative frequency of different cancer sites, by sex, since 1980 (MOHSA 1986). Few duplicated cases and accurate case definition are the advantages of the hospital-based cancer data, but care is needed in interpretation for the reason of having no defined denominator population. Cancer morbidity data-incidence or prevalence-can only be obtained from population-based cancer registry, which may be difficult to achieve in many countries.

This study is the first, large-scale, population--based one in Korea. Assuming that all of the cancer patients among beneficiaries come out to be admitted to any hospitals in the long run, it can be said that these data have the representativeness to the national population. In addition to that, stability of the study population, over years, made it feasible to analyze the cancer admission trend, successfully. In spite of many advantages, mentioned above, some inherent problems, which might adversely affect the results, are; definition of cases-all of the cases were not confirmed pathologically and only the admissions with requesting renumeration only were counted; double counting of cases admitted in a year; cumulative effects of admissions in another year; admission rush phenomena, which can be observed in the early period of new insurance program. Increase in cancer admission could be, of course, partly due to easiness of medical accessibility, increase in medical utilization, and also due to increase in true incidence. To minimize the effect of medical accessibility and utilization on admission, authors presented the results using the proportion index, and to alleviate the possible effect of admission rush phenomena, authors also took only the data since 1981; 2 years after the KMIC insurance system conducted (1979). Any beneficiaries of KMIC can take admission for 180 hospital-days per year. So, admitted cases in our study is assumed to be about 1.5 times in spell than in person-based calculation per year, being the absolute value overestimated consequently. Nevertheless, relative frequency of cancer sites, changing patterns over years, and age and sex distribution of cancer admission were, anyway, not so influenced by that.

There are no reports on the level of cancer morbidity (i.e. incidence) in Korea, only except one from a community. Kim *et al.* (1984) reported the annual incidence rate of 147.6 per 100,000 in male and 99.8 in female after observing 88,851 persons in a community during 1982-1984. However, generalization of this result to the national population cannot be plausible, because of many constraints in case detection and its coverage.

Supposing that case fatality rates (survivorship) of cancer did not change considerably every year, time trend of cancer mortality certified by national government (EPB 1985) may be useful in observing the changing patterns of cancer morbidity in recent years. Cancer-specific death rates showed increasing trend, reaching up to 85.4 per 100,000 at 1985, which is compatible with our finding; implicative suggestion of substantial increase in cancer morbidity (esp. lung and stomach in male). There were no significant difference among our findings and other study results (KIPH 1983; Kim *et al.* 1984; MOHSA 1986; Meng and Lee 1987) on the most frequent cancer sites in Korea. In male, stomach, liver and lung were the three common sites of cancer in almost every study results, including our study. And almost the same results could be seen in the study observing mortality among Koreans living in Osaka, Japan (Ubukata *et al.* 1986), in which liver was the most common site of cancer. In female cancer patients, uterine cervix, stomach and breast were the leading sites of cancer in our result, which was consistent with hospital-based cancer registry data (MOHSA 1986). However, somewhat different features are shown by other data sources; stomach,uterine cervix, thyroid in a community (Kim *et al.* 1984) and stomach, liver, uterus among Koreans in Osaka (Ubukata *et al.* 1986).

Further investigations on cancer epidemiology in Korea-on the population-based cancer morbidity

and risk factors of various cancers-should be conducted in the near future.

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= 국문초록 =

의료보험자료를 이용한 암 입원양상의 연차적 변화

서울대학교 의과대학 예방의학교실

유근영 · 안윤옥 · 박병주

우리나라에 있어서의 암의 연차적 변화양상을 관찰하기 위하여, 의료보험관리공단의 적용인구 약 400만명을 대상으로, 이들중 1981-1986년 동안 암으로 입원한 환자의 암종별, 성별 및 연령별 특성을 연도별로 비교분석하였다. 그 결과를 요약하면 다음과 같다.

암으로 입원한 환자의 연령표준화 입원률은 연도에 따라 증가하였으며, 남자가 여자보다 월등히 높았다. 또한 전체입원중 암환자가 차지하는 분률도 매년 증가하고 있었다.

주요 암종의 상대빈도를 보면, 남자에서는 위암, 폐암, 간암 및 대장-직장암이 전체 남성암의 70%를 차지하고 있었으며, 여자에서는 자궁경부암, 위암, 유방암, 대장-직장암 그리고 난소암이 전체의 58%를 차지하고 있었다. 연령표준화 입원률에 있어서는 남·녀의 주요 암종 대부분이 연차적으로 증가하는 경향을 보였으며, 남자에서는 폐암, 위암, 간암, 대장-직장암 등에서 특히 높은 수준을 보였고, 여성에서는 역시 자궁경부암, 위암, 유방암, 대장-직장암 그리고 난소암의 연도별 증가가 현저하였다. 그러나 전체 입원중 암환자가 차지하는 분률에서는 남자에서의 연도별 증가가 현저하였던 반면에, 여성에서는 증가양상이 관찰되지 않았다.

위암은 연령증가에 따라 비교적 급격히 증가하는 경향을 보였으며 연차적인 변동은 주로 40대 이후의 변동에 기인되는 것으로 판단되었다. 이러한 양상은 여성의 경우도 마찬가지였으나 50대 이후의 변동에 기인되었다. 폐암의 경우 연령증가에 따라 가장 급격히 증가하였으며, 연차적 변동은 남자의 경우 40대 이후 그리고 여자의 경우는 특이한 현상이 없었다. 간암의 경우도 역시 연령증가에 따라 매년 증가하였으며, 연차적 변동은 역시 남자는 40대 이후에, 그리고 여자의 경우는 특이한 변동이 없었다. 대장-직장암도 연령증가에 따라 증가하였으나 연도별 변화는 특이하지 않았다. 자궁경부암 및 여성유방암은 50-60대에서 가장 높았으며 연차별 변동은 특이하지 않았다.

이상의 관찰소견으로 보아 우리나라에서도 암이 실질적으로 증가하고 있는 것으로 생각되며, 그 중에서도 남자에서는 폐암, 위암, 간암이 그리고 여자에서는 자궁경부암, 위암의 증가가 문제시 된다고 사료된다.