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Abstract: The incidence of gastric cancer is declining in Japan and all over the world. In a study conducted in Osaka prefecture, the age-adjusted mortality rate for gastric cancer decreased from 84 (1963–65) to 41 (1987–89) for males and from 41 to 18 for females during the same period, and the age-adjusted incidence rate also decreased from 108 (1963–65) to 68 (1987–89) for males and from 52 to 30 for females in the same period. Since a decline in gastric cancer mortality has been observed in countries where secondary prevention (screening) is not available, primary prevention is considered important in preventing gastric cancer. Several reports indicate that food type intake as a primary prevention method is important in preventing gastric cancer. Favorable food, said to prevent gastric cancer, includes green, yellow and other fresh vegetables, and milk, while salty food, stock fish, fish in salt, and too much rice are considered candidates to avoid in preventing gastric cancer. Although the decline in mortality is higher than that of incidence, almost half of the number of patients with gastric cancer in Japan are expected to die. Primary and secondary prevention, as well as advances in treatment, will be important to reduce gastric cancer mortality.

Key words: Gastric cancer; Mortality; Incidence; Primary prevention; Secondary prevention

Introduction

Incidences of gastric cancer are decreasing worldwide, and Japan is no exception. In 1998, deaths caused by gastric cancer reached 50,680, accounting for 17.9% of the mortality attributable to all types of cancers in Japan. Gastric cancer mortality has been showing a definite decrease both in males and females since around 1960. When changes in age-adjusted cancer mortality among the Japanese was investigated by cancer type, gastric cancer still accounted for a high percentage of mortality among females while lung cancer took the place of gastric cancer and was ranked the first in mortality among males in 1993 (Fig. 1). The global male/female ratio of mortality by gastric cancer is about 2.0 to 2.5, indicating a
Is the incidence of gastric cancer on the decrease?

The question “is the incidence of gastric cancer on the decrease?” is a very simple one, but it is unexpectedly difficult to give an appropriate answer because there is a different nuance depending on whether the decreased figure refers to the mortality, morbidity (incidence), or the number of deaths. The most straightforward variable that shows the decrease in gastric cancer is either the mortality or morbidity. A demographic survey conducted by the Ministry of Health, Labor & Welfare discloses the former but the figures published are for mortality corrected by age and they do not necessarily indicate the number of deaths by gastric cancer. Deaths by gastric cancer among both males and females reached 31,211 in 1950 and 37,306 in 1955. The number increased, however, to reach 50,620 in 1979 and 50,076 in 1995, due to the aging of the Japanese population and an increase in the population in which the onset of gastric cancer is more common. When the incidence of gastric cancer mortality during this period is corrected to take into effect the aging of the population, the age-adjusted mortality rate decreased to 45.4 in males and 18.5 in females in 1995 as opposed to 87.3 and 48.0 respectively in 1950.

To correctly assess the yearly changes by comparing past and present increases and decreases in gastric cancer mortality, it is necessary to use the age-adjusted mortality rate calculated for each age range. The result calculated by this method clearly indicates a decrease in the mortality of gastric cancer among the Japanese (Fig. 2).3,4)

Information on morbidity can only be obtained from a population that has complete cancer records. Since December 1962, the Osaka Prefecture Medical Association, Osaka Prefectural Department of Environmental Health and Osaka Prefectural Adult-Onset Disease Center have continued to promote a project to encourage the registration of cancer

Fig. 1 Age-adjusted cancer mortality by major site, year, and sex (1970 to 1999) [Statistics Information Department, Secretariat of Ministry of Health, Labor & Welfare]
information in Osaka Prefecture. An examination of the mortality rates by prefecture reveals that Osaka has one of the highest mortality rates among the prefectures, but its age-adjusted gastric cancer morbidity rate among both males and females has continued to decrease. While the age-adjusted morbidity in males in 1963 to 65 was 108, a decrease to 68 was observed from 1987 to 89. The morbidity in females decreased from 52 to 30 during the same period. The decrease in age-adjusted mortality was more remarkable than that of the morbidity. That is, during the same period, a decrease from 84 in 1963 to 65 to 41 in the period from 1987 to 89 was observed among males while a decrease from 41 to 18 was noted among females.

Figure 2 shows the age-adjusted gastric cancer mortality and morbidity rate estimates published by the Regional Cancer Information Registration Study Group (Chief researcher: Akira Oshima), operating under cancer research subsidies from the Ministry of Health, Labor & Welfare. The estimated gastric cancer morbidity in Japan in 1995 among both males and females was 100,842, or 2.01 times higher than 50,076, which was the number of gastric cancer deaths in the same year. Though morbidity has decreased among both males and females, gastric cancer morbidity is higher than that of lung cancer and is ranked the first among males while the morbidity in females is ranked second to breast cancer.

The decrease in gastric cancer mortality is more marked than that of morbidity. However, the decrease in morbidity itself cannot be explained by the secondary prophylaxis (diffusion of gastric cancer screening test) and improved therapeutic technology. Furthermore, the worldwide decrease in gastric cancer mortality started before 1960 — earlier than the decrease in Japan, which was noted after 1960. Decreased mortality in foreign countries where no gastric cancer screening test (secondary prophylaxis) is conducted means a decrease in morbidity, suggesting the importance of primary prophylaxis.
Decreased gastric cancer morbidity and mortality and primary prophylaxis

When macroscopically viewed, cancer morbidity and mortality trends in Japan are showing the same overall tendencies that have been observed in Europe and the United States, and incidences of gastric cancer are expected to decrease in Japan, despite the fact that Japan is the only country among the developed nations that has a high incidence of gastric cancer morbidity. Dietary changes after World War II (changes in types of foods ingested, changes in food preservation methods — salted food to refrigerated and frozen food) in particular are assumed to be involved in the lowered incidence of gastric cancer.7)

Factors to be avoided in the primary prophylaxis of gastric cancer are “salty food, kippered & salted fish, and a large amount of rice”. Though some case studies and cohort studies pointed out the relation between excessive intake of grain and risk of gastric cancer, there are other reports against such an assumption. Frequent large-volume grain intake is often associated with excessive ingestion of salty foods and an insufficient intake of fruits and vegetables, which all together seems to be connected with a risk of gastric cancer.

On the other hand, the factors required for prophylaxis against gastric cancer are “green and yellow vegetables, raw vegetables, and milk”. A number of case studies and cohort studies worldwide indicate that the ingestion of fruits and vegetables is effective against the onset of gastric cancer. Many studies are drawing attention to the fact that fruits and vegetables contain a large amount of trace nutrients such as vitamin C and carotenoid, which have a prophylactic effect against gastric cancer. Vitamin C is assumed to have a prophylactic effect against the onset of gastric cancer because it inhibits the generation of the carcinogenic substance, N-nitroso compound. Many case studies reported that ingesting a large amount of vitamin C inhibited the onset of gastric cancer. β-carotin is a precursor of retinol. Since retinol itself induces differentiation and demonstrates anti-tumor effects, the relation between retinol ingestion and the incidence of gastric cancer was also investigated, but a definite conclusion has yet to be reached. The prophylactic action of carotenoid and β-carotin ingestion was confirmed in many case studies. However, the effect against the onset of gastric cancer was not confirmed in a large-scale randomized intervention study of β-carotin conducted in Finland and USA. The above results indicate the possibility that green, yellow and other raw vegetables could contain factors that prevent gastric cancer other than vitamin C and carotenoid. Since gastric cancer morbidity is decreasing even in the countries where no screening is conducted, people all over the world may have come to avoid the risk factors in the natural course of time, and we can see that recent dietary changes have contributed to an automatic shift to primary prophylaxis.

Another risk factor for gastric cancer is Helicobacter pylori (“H. pylori”), which has been acknowledged a definite gastric cancer carcinogen by the U.S. FDA. It is easy to see the path from H. pylori infection to the onset of gastric cancer, through atrophy of gastric mucosa due to ammonia produced by H. pylori, to chronic gastritis, and metaplasia of intestinal epithelium and intestinal-type gastric cancer. However, the H. pylori infection rate among adults in Japan is reported to be 60 to 80%. In view of the gastric cancer morbidity of less than 100 to 100,000 (0.1%), it is difficult to assume that H. pylori fully satisfies the conditions for inducing gastric cancer. Furthermore, there is no gender difference in the H. pylori infection rate, which cannot explain why the incidence is higher in males over the world.

A number of case studies and cohort studies have indicated that smoking is a risk factor for gastric cancer. However, considering that the amount of smoking and the incidence do not always correspond, it is difficult to treat smoking as a single independent factor. On the other
hand, few case study and cohort study have indicated that alcohol intake is a risk factor for gastric cancer.

**Conclusion**

Both age-adjusted gastric cancer mortality and its estimated morbidity are on the decrease. Since this tendency is also observed in countries where no secondary prophylaxis is practiced, changes in environmental factors including dietary habits are assumed to play an important role in primary prophylaxis. A slightly higher decrease in mortality in comparison with the decrease in gastric cancer morbidity observed in Japan suggests the importance of improvements in therapeutic technology. However, mortality still accounts for about a half of morbidity, indicating that half of those who have contracted gastric cancer at present are expected to die. Gastric cancer research in Japan, which is the only developed nation to have a high incidence of gastric cancer, is considered very important from a worldwide perspective.

**REFERENCES**


