Cancer Illness

among Residents of Miyagi Prefecture, Japan, 1951

By

Mitsuo Segi, Ichiro Fukushima, Yoshihiko Mikami,

(瀬木 三雄) (福島 一郎) (三神 芳彦)

Susumu Fujisaku and Minoru Kurihara

(藤 咲 通) (栗 原 登)

*From the Department of Public Health, Faculty of Medicine,
Tohoku University, Sendai. Director: Prof. M. Segi*

(Received for publication, July 14, 1953)

In Japan deaths by tuberculosis have markedly decreased these several years, while the proportion of deaths by cerebral haemorrhage and cancer ("cancer" mentioned here in this report means malignant neoplasm) has become large in the total deaths. In 1953, when the deaths of the Japanese people due to various causes were recorded by their order, cerebral haemorrhage occupied the first place, followed by cancer and tuberculosis. To make an effective cancer control, it is not sufficient to study only death cases, but, it is essential to know the status of geographical morbidity of cancer. In various foreign countries, geographical surveys on cancer patients have been conducted and the results have been published. In Japan, however, such kind of survey has not yet been conducted.

To provide such information, the Department of Public Health, Tohoku University collected the reports on cancer patients treated by physicians in whole districts of Miyagi Prefecture and tabulated the results with the cooperation of Miyagi Prefectural Government and Miyagi Prefectural Medical Association (President: Dr. Yoshihiko Koga). This survey was started with the patients seen or treated during 1951. The results of 1951 are reported here, and the results of 1952 are scheduled to be published later.

Miyagi Prefecture thus surveyed is located in the north east of Honshu (the mainland), Japan and is a coastal area of the Pacific Ocean, with the population of approximately 1.7 million and the area of 7,000 square km. City of Sendai is the political and cultural center of this prefecture. The Tohoku University is located here in Sendai. Adjacent areas to the prefecture have lower cultural level than Miyagi Prefecture. So many cancer patients of adjacent prefectures receive treatment at clinics

of this university. But few residents of Miyagi Prefecture visit hospitals of other prefectures.

In Japan, medical institutions which have twenty beds or more and can meet the definite standards prescribed are called "hospitals" and those which have less than twenty beds are called "medical offices." In 1951, there were 88 hospitals and 731 medical offices, and the Tohoku University Hospital was the largest of all.

Survey Method

We distributed survey schedules to all hospitals and medical offices in the prefecture and required to record all the cancer patients who were seen, treated or observed for any kind of cancer and all the cancer deaths whose death certificates were made in those hospitals and medical offices during the period from Jan. 1, 1951 to Dec. 31, 1951 inclusive. The schedules were returned to the Department of Public Health of Tohoku University. The schedule made provisions for recording name, address, sex, age, marital status of the patients, previous consultations by other clinics or hospitals, first subjective symptom, date, first subjective symptom appeared, first seen (in the clinic concerned), diagnosis made, and last seen for cancer, clinical diagnosis, diagnostic methods, histological diagnosis, methods of therapy, period of hospitalization, and whether alive or dead. We then made individual cards of the patients in accordance with the schedules returned. If the same patient was reported from more than one place, only one card was made to avoid counting him as two or more cases. Moreover, in order to find out deaths occurred to the patients reported and to obtain the completeness of reporting from hospitals and medical offices, members of the Department visited 15 Health Centers in this prefecture and recorded cancer deaths by the copies of death notifications of 1951 and 1952. The Department of Public Health of Tohoku University assumed the whole responsibility for the computation of the data thus collected.

Number of Cases Reported and Completeness of Reporting

A total of 2,711 cases of cancer were seen in 1951. In this survey, nonresidents accounted for nearly one-sixth of the cases seen. The proportion of cases seen during the study year that the first subjective symptom had appeared in earlier years—approximately two-fifths (Table I).

Of the 1,061 cases of cancer among male residents seen during 1951, 35 per cent had presented their first subjective symptoms during a prior year; of the 1,201 cases among female residents, 45 per cent had presented the first subjective symptom prior to 1951.

By checking all death certificates on which cancer is recorded in the

TABLE I
Cases of Cancer First Subjective Symptom Appeared
During and Prior to the Study Year, 1951

	Total	First subjective symptom appeared during study year		First subjective symptom appeared prior to study year
		reported cases	recorded from death certifi- cates	
Total*	2,711	972	566	1,166
Residents				
All cases	2,262	784	566	912
Male	1,061	386	302	373
Female	1,201	398	264	539
Nonresidents				
All cases	439	187	—	252
Male	209	99	—	110
Female	230	88	—	142

* Including 10 cases unknown address and date first subjective symptom appeared.

TABLE II
Total Resident Cases First Subjective Symptom Appeared
During the Study Year and Cases Recorded from Death
Certificates only, by Sex and Primary Site, 1951

Primary site	Total case//	First subjective symptom appeared during study year		
		total	recorded from death certificates only	
			number	percent
All cases	2,262	1,350	566	41.9
Male	1,061	688	302	43.9
Female	1,201	662	264	39.9
Buccal cavity and pharynx	21	12	4	33.4
Digestive organ and peritoneum	1,406	929	446	48.0
Respiratory system	83	44	19	43.1
Breast	119	51	6	11.8
Female genital organs*	363	158	38	24.1
Male genital organs	18	7	3	42.9
Urinary organs	19	10	6	60.0
Skin	19	8	—	0
Other and unspecified sites†	39	18	2	11.1
Eye, brain and nervous system	12	7	1	14.3
Lymphomas‡	59	37	13	35.2
Leukemias and aleukemias	34	31	16	51.6
Sarcomas§	53	30	8	26.7
Other and unspecified malignant neoplasms	17	8	5	62.5

* Including chorionepithelioma. † Carcinoma only. ‡ Including Hodgkin's disease.

§ Including all sites. // Total cases, first subjective symptom appeared during or prior to the study year.

column of cause of death against the file of reported cases, it was possible in this survey to find out cancer deaths which were not reported as cases by hospitals or medical offices. In 1951, cancer deaths that had not been reported as cases accounted for 42 per cent (566 cases) of the total known resident cases. Among the total of patients, the percentage by site of the cases, not reported from hospitals or medical offices but confirmed only by death certificates are indicated in Table II.

It is the fact that in Japan, there are many cancer patients expected to die are discharged from hospitals and die at their own houses. In Miyagi Prefecture in 1949, 1950 and 1951, among the total of cancer deaths, the percentage of deaths at hospitals and medical offices was 18.8 per cent in male and 15.3 in female and the rest almost all died at their own houses. There are many physicians who are requested by the families of dead persons to visit their houses only to make death certificate and, in such case, most of these physicians are not the physicians who cared of the cancer patients.

It is presumed that many physicians who were in such condition did not report of death in this survey. For this reason, it is presumed that there will be found out a large percentage of deaths not reported in this survey.

The number of hospitals who reported survey schedules and the hospitals to which members of the Department of Public Health visited to make survey schedules was 63. That of medical offices was 176. The number of beds of hospitals from which we obtained the survey schedules corresponds to 86 per cent of the total of beds in all hospitals.

Accuracy of Reports

Each respondent was requested to indicate on the report whether the diagnosis of cancer was confirmed by a microscopic examination of tissue, operation or X-ray examination. Table III shows this information for this survey, classified by primary site of neoplasm.

Whether the diagnosis of cancer is confirmed by microscopic examination depends in part upon the accessibility of the tissue affected, especially for living cases. For example, among patients with cancer of the liver and biliary passages, an inaccessible site, 2.6 per cent of diagnosis were confirmed microscopically, while 43.2 per cent of cancer of the uterus, an accessible site, were microscopically confirmed. It seems that percentage of diagnosis by operation or X-ray examination can become reference data for accuracy of diagnosis.

Incidence, Prevalence and Mortality Rates

Incidence, prevalence and mortality rates were computed based on

TABLE III
Percentages of Reported Cases of Cancer with Microscopic
Confirmation, Operation and X-ray, by Primary Site, 1951

Primary site	Total cases reported	Microscopic confirmation		Operated cases, without mentioning microscopic confirmation		X-ray examination only	
		number	%	number	%	number	%
Total	1,515	425	28.1	352	23.2	323	21.3
Buccal cavity and pharynx	17	9	52.9	1	5.9	—	0
Digestive system	851	134	15.7	195	22.9	294	34.5
Esophagus	69	11	15.9	3	4.3	39	56.5
Stomach	598	99	16.6	157	26.3	213	35.6
Intestines	24	9	37.4	4	16.7	1	4.2
Rectum	61	13	21.4	20	32.8	4	6.5
Liver and biliary passages	78	2	2.6	6	7.2	27	34.8
Pancreas	17	—	0	3	17.7	10	58.9
Peritoneum	4	—	0	2	50.0	—	0
Respiratory system*	32	12	37.6	1	3.1	12	37.6
Accessory sinuses	23	6	26.0	3	13.0	4	17.4
Breast	105	33	31.4	54	51.4	—	0
Uterus†	257	111	43.2	66	25.7	—	0
Other female genital organs‡	35	11	31.4	10	28.6	3	8.6
Male genital organs	14	8	57.0	1	7.1	—	0
Urinary organs	11	3	27.4	2	18.2	3	27.4
Skin	16	7	43.6	3	18.7	—	0
Thyroid gland	15	11	73.4	2	13.3	—	0
Other and unspecified sites§	19	7	36.8	2	10.5	3	15.8
Eye	7	6	86.0	—	0	—	0
Brain and nervous system	5	4	80.0	—	0	—	0
Lymphomas	37	22	59.4	1	2.7	—	0
Hodgkin's disease	6	4	66.7	2	33.4	—	0
Leukemias and aleukemias	17	14	82.4	—	0	—	0
Sarcomas//	40	20	50.0	8	20.0	2	5.0
Other and unspecified malignant neoplasms	8	3	37.6	1	12.5	1	12.5

* Excluding accessory sinuses † Excluding chorionepithelioma. ‡ Including chorionepithelioma. § Carcinoma only. // Including all sites.

the figure obtained by this survey. The full value of morbidity data can be obtained only by relating the number of cases to the population from which they are drawn through the computation of rates per unit of population. The population used in computing the rates given in this report was based on the October 1, 1950 population census (though this is the previous year's population of this survey, this is the newest one officially announced). The total population of Miyagi Prefecture is enumerated at 1,663, 442 in 1950 (829,050 males and 834, 392 females). The rates were defined as follows:

1. *Incidence rate.* The number of cases whose first subjective symptom of cancer appeared during the study year, per 100,000 population. In this kind of survey in the United States, incidence rate is

computed by the number of cases first diagnosed with cancer during the study year instead of by the above mentioned definition. But in this survey, we considered it is difficult to make this date of diagnosis standard. The reasons are that it is hard to require full reports from all physicians and, in Japan, most physicians who made the first diagnosis do not tell patients as cancer cases apparently. In the survey schedule, there is an item "Date first seen with cancer" in the United States, but since there will be probability not to obtain complete answers from patients, we made an item "Date first subjective symptom appeared" in addition. The defects of our method are that in case subjective symptom first appeared at the end of the study year and first seen by a physician next year, this case will not be recorded. Accordingly the first year's study will be underestimated than the exact number. Now at present, we are studying at 1952 study year. If we finish enumeration of this 1952 year's survey, we shall be able to obtain the cases that symptom first appeared at the end of 1951 and seen by physicians in 1952.

2. *Prevalence rate.* The number of cases known to have had cancer at any time during the study year, per 100,000 population. (The patients who visited physicians for diagnosis only during the study year and did not receive any medical care were included.)

3. *Mortality rate.* The number of deaths during the study year, per 100,000 population. We considered such case that, in the death certificate, in the column of "Disease or condition directly leading to death" as a matter of course, in that of "Antecedent causes" or "Other significant conditions" also cancer is recorded as cancer death. In Japan, the copies of important columns of death certificates have been kept in Health Centers since 1948.

The number of resident cases of cancer in 1951 in the prefecture collected from this survey and death certificates is 2,262, 47 per cent in male and 53 percent in female. The items of 2,262 resident cases are as follow: 1,350 persons (60 percent of total cases) were cases whose first subjective symptom appeared in 1951, including 566 deaths revealed by death certificates only (we counted backward from the interval between onset and death recorded on death certificates to determine when the symptom first appeared in the death cases not reported from physicians); 912 cases (40 per cent of total) presented their first symptom during 1950 or in previous year and received medical care or visited physicians for only being observed their process during 1951.

Thus, 81 out of every 100,000 persons living in Miyagi Prefecture had first subjective symptom of cancer during the study year, and 136 out of every 100,000 persons were under treatment or under observation for cancer during this period (Table IV).

TABLE IV
Cancer Incidence, Prevalence and Mortality Rates per 100,000
Population, by Sex and Primary Site, 1951

Primary site	Incidence rate			Prevalence rate			Mortality rate		
	Both sexes	Male	Fe- male	Both sexes	Male	Fe- male	Both sexes	Male	Fe- male
Total	81.2	83.0	79.3	136.0	127.9	143.9	75.4	78.6	72.1
Buccal cavity and pharynx	0.7	0.8	0.6	1.3	1.3	1.2	0.3	0.4	0.2
Lip	0.1	0.1	0.1	0.4	0.5	0.2	0.1	0.1	0
Tongue	0.4	0.5	0.2	0.5	0.5	0.6	0.1	0.1	0.1
Other mouth	0	0	0	0.1	0.1	0	0	0	0
Pharynx	0.2	0.2	0.2	0.3	0.2	0.4	0.1	0.1	0.1
Digestive organs and peritoneum	55.8	68.0	43.7	84.5	102.8	66.4	54.1	65.0	43.3
Esophagus	4.5	5.7	3.4	6.7	8.7	4.8	4.9	6.3	3.6
Stomach	35.7	45.7	25.8	56.3	71.4	41.2	34.6	43.4	25.9
Intestines	1.9	1.9	1.9	2.7	2.8	2.6	1.6	1.7	1.6
Rectum	2.4	2.2	2.6	5.0	4.9	5.0	2.0	2.2	1.9
Liver and biliary passages	9.8	11.2	8.4	11.7	13.1	10.2	9.5	10.0	9.0
Pancreas	1.1	1.1	1.2	1.4	1.3	1.6	0.8	0.8	0.7
Peritoneum	0.3	0.1	0.5	0.7	0.4	1.0	0.5	0.5	0.6
Other digestive	0.1	0.1	0	0.1	0.1	0	0.1	0.1	0
Respiratory system	2.6	3.6	1.7	5.0	6.0	4.0	2.8	3.5	2.0
Accessory sinuses	0.7	1.1	0.4	1.9	1.9	1.9	0.8	0.8	0.8
Larynx	0.5	0.5	0.5	1.0	1.4	0.6	0.4	0.6	0.2
Bronchus and lung	1.1	1.7	0.6	1.6	2.2	1.0	1.2	1.7	0.7
Pleura	0.3	0.4	0.2	0.4	0.4	0.5	0.2	0.2	0.2
Mediastinum	0	0	0	0.1	0.1	0	0.1	0.1	0
Breast	3.1	0.2	5.9	7.2	0.4	13.9	1.3	0	2.5
Female genital organs	9.5	...	18.9	21.8	...	43.5	8.0	...	15.9
Uterus	8.1	...	16.2	19.4	...	38.7	7.0	...	13.9
Cholionepithelioma	0.7	...	1.4	1.1	...	2.2	0.5	...	1.0
Ovary	0.4	...	0.8	0.7	...	1.4	0.5	...	1.1
Other female genital	0.2	...	0.5	0.6	...	1.2	0	...	0
Male genital organs	0.4	0.8	...	1.1	2.2	...	0.4	0.8	...
Prostate	0.1	0.2	...	0.4	0.7	...	0.2	0.5	...
Testis	0.2	0.4	...	0.4	0.7	...	0	0	...
Other male genital	0.1	0.2	...	0.4	0.7	...	0.2	0.4	...
Urinary organs	0.6	0.8	0.4	1.1	1.4	0.8	0.5	0.6	0.5
Kidney	0.1	0.2	0	0.3	0.5	0.1	0.1	0.1	0
Bladder	0.5	0.6	0.4	0.8	1.0	0.7	0.4	0.5	0.2
Other urinary	0	0	0	0	0	0	0.1	0	0.2
Skin	0.5	0.5	0.5	1.1	1.0	1.3	0.2	0.1	0.2
Thyroid gland	0.5	0.4	0.6	0.9	0.5	1.3	0.2	0.2	0.1
Other and unspecified sites*	0.6	0.5	0.7	1.4	1.0	1.9	0.9	0.8	1.0
Eye	0.3	0.5	0.1	0.4	0.7	0.1	0.1	0.1	0
Brain and nervous system	0.1	0.1	0.1	0.3	0.4	0.2	0	0	0
Lymphatic and haematopoietic tissues	4.1	4.8	3.4	5.6	6.4	4.8	4.0	4.6	3.5
Lymphomas	1.8	2.1	1.6	2.8	3.1	2.5	1.7	1.9	1.4
Hodgkin's disease	0.4	0.5	0.4	0.7	1.0	0.5	0.5	0.7	0.4
Leukemias and aleukemias	1.9	2.3	1.4	2.0	2.3	1.8	1.8	1.9	1.7
Sarcoma, all sites	1.8	1.2	2.4	3.2	2.8	3.6	1.7	1.4	1.9
Other and unspecified malignant neo-plasms	0.5	0.6	0.4	1.0	1.2	0.8	1.0	1.0	1.0

* Carcinoma only.

There were 1,254 resident deaths in 1951 for cancer, a mortality rate of 75 per 100,000 population.

The recorded cancer incidence rate among males exceeded that for females by about 5 per cent (83.0 compared to 79.3). But in prevalence rate, the relation is opposite. The female cancer prevalence rate exceeded the male rate by about 12 per cent (143.9 compared to 127.9).

This apparent difference is a reflection of the large number of cases of uterus and breast cancer among female.

Male incidence rates were greater than those of the females for cancer of the esophagus, stomach, and bronchus and lung. The incidence rate of bronchus and lung cancer for males was three times as great as that for females.

In cancer mortality, the male rate was 9 per cent greater than the female rate (79 and 72 per 100,000).

Survival Rates

Data on resident cases of cancer newly diagnosed in 1951 were analyzed with respect to survival after diagnoses. The basic information on survival was obtained by checking the names of reported cases against death certificates for the period January 1, 1951—December 31, 1952.

Fifty-two out of every 100 cases newly diagnosed in 1951 survived 12 or more months after diagnosis while 63 out of every 100 survived at

Fig. 1. Percent of cases of cancer diagnosed in 1951 surviving to end of month indicated; all sites, by sex

TABLE V
Six- and Twelve-month Survival Rates for Cases of Cancer
Newly Diagnosed during 1951, by Sex, Age and Primary Site

Sex, age and primary site	Number of cases diagnosed	6-month survival		12-month survival	
		rate	standard error	rate	standard error
All cases	1,211	0.63	0.01	0.52	0.01
Male	592	.54	.02	.43	.02
Female	619	.72	.02	.61	.02
Selected primary sites:					
Digestive system	725	.55	.02	.44	.02
Stomach	506	.54	.02	.42	.02
{ Male	336	.53	.03	.41	.03
{ Female	170	.57	.04	.43	.04
{ Operated cases	193	.70	.03	.55	.04
{ Non-operated cases	313	.45	.03	.34	.03
Esophagus	59	.42	.06	.34	.06
Liver and biliary passages	75	.43	.06	.39	.06
Respiratory system	46	.67	.07	.52	.07
Breast (female only)	58	.97	.02	.91	.04
Female genital organs	204	.86	.03	.74	.03
Uterus*	179	.87	.03	.75	.03
{ Operated cases	55	.91	.04	.84	.05
{ Radiotherapy only	56	.89	.04	.79	.05
{ Not mentioned, operation or radiotherapy	68	.81	.05	.65	.06
Lymphatic and haematopoietic tissues	52	.32	.06	.23	.06
Age groups:					
Under 30 years	71	.58	.06	.46	.06
30 years—39 years	82	.77	.05	.71	.05
40 years—49 years	225	.73	.03	.64	.03
50 years—59 years	365	.64	.03	.52	.03
60 years—69 years	329	.60	.03	.47	.03
70 years and over	134	.46	.04	.38	.04

* Excluding cholinepithelioma.

least 6 months. In other words, 5 out of every 10 patients died within 1 year of diagnosis, but 4 of these died during the first 6 months. This relationship reflects the relatively high death rate among cancer patients during the first few months after diagnosis. The survival rates given in Table V and in Figs. 1 and 2.

The variation in survival rates naturally depends on stage at diagnosis. In this survey, we requested recording on stage at diagnosis. But we got little recording of accuracy.

Survival rates varied appreciably by sex. The male 12-month survival rate was 43 compared to 61 for female. The differences in survival rates among both sexes are mainly influenced by the cases of the cancer of the uterus and the breast.

Among the various sites, the lowest rates were found among lymphomas (including Hodgkin's disease), leukemias and aleukemias (23 percent

Fig. 2. Percent of cases of cancer diagnosed in 1951 surviving to end of month indicated; selected sites

survived 1 year, and 32 per cent survived 6 months), esophagus (34 per cent and 42 per cent), and liver and biliary passages (39 per cent and 43 per cent). These may be compared with rates of 91 per cent survived 1 year and 97 per cent survived 6 months for the breast.

We computed survival rate on cancer of the stomach and uterus according to that whether operation was made or not. Viewing the results, in stomach cancer, if operated, 12-month survival rate is 55 per cent and if not operated, 34 per cent. In uterus cancer, if operated, 12-month survival rate is 84 per cent. In case only radiotherapy was given, 79 per cent. In case of no operation nor radiotherapy recorded, 12-month survival rate is 65 per cent.

SUMMARY

1. We distributed survey schedules to all the hospitals and medical offices in Miyagi Prefecture, Japan which has about 1,663,000 population and collected reports on all the cancer patients seen or treated during 1951. At the same time, we studied at the cases that cancer is recorded as cause of death out of the copies of the death notifications kept in all the Health Centers in the prefecture. The results obtained by the above mentioned two kinds of survey were enumerated.

2. The case number reported from hospitals and medical offices was 2,804 in total. However, since one patient is likely reported from two or more of hospitals and/or medical offices, the exact number was 1,964. Among the patients, the number of residents of Miyagi Prefecture is 1,515. As there are no any other hospitals equal to or larger than the Tohoku University Hospital in scale in adjacent prefectures, many persons visit this hospital from adjacent prefectures. It is presumed that few residents of Miyagi Prefecture ask to have examination and treatment to hospitals in other prefectures.

The number of such cases that "cancer" was recorded in any column of cause of death in the death certificates was 1,254 (male 652, female 602). Among these cases, 507 were reported from hospitals and medical offices. In 1951, out of residents of Miyagi Prefecture, the exact number of known cancer cases was 2,262 (male 1,061, female 1,201). Among them, 1,350 presented first subjective symptom in the study year.

3. An incidence rate of cancer patients who felt their first subjective symptom in 1951 was 81 (male 83, female 79) per 100,000 population. A prevalence rate of all the cancer cases, cancer deaths and cancer cured cases that physicians dealt with for some reasons in the study year was 136 (male 128, female 144) per 100,000 population. A mortality rate of the cases that cancer were recorded in any column of cause of death in the death certificates was 75 (male 79, female 72) per 100,000 population.

4. Viewing incidence cases by site, in male stomach (55% of total male incidence cases), liver and biliary passages (14%), and esophagus (7%) show large number in frequency. Leukemias and aleukemias, rectum, lymphomas, intestine, and lung succeed the former, but they

have a small proportion. In female, stomach (32% of total female incidence cases), uterus (21%), liver and biliary passages (11%), and breast (7%), esophagus, rectum, and sarcomas succeed the former. Skin and prostate cancer occurs markedly in small frequency.

5. The 12-month survival rate of newly diagnosed patients in 1951 is male, 43 per cent and female, 61 per cent. In stomach cancer male, 41 per cent and female, 43 per cent after twelve months and male, 53 per cent and female, 57 per cent after six months. Comparing a survival rate of a group of patients whose stomach and uterus cancer was operated to that of non-operated group of patients, it was recognized that a survival rate of the former is higher than that of the latter.

This work was carried out by a Grant from the Foundation for Scientific Research of the Ministry of Education.

M. Segi

References

- 1) National Cancer Institute of the National Institutes of Health, Public Health Service, Federal Security Agency, U.S.A., Cancer Morbidity Series, 1950-1952 (Public Health Service Publication Nos. 13, 65, 67, 112, 126, 152, 178, 216, 217, 244).
-