Cancer Patterns and Lifestyle Among Japanese Brazilian in São Paulo

Shoichiro Tsugane

Brazil's total Japanese population was estimated at 1.2 million in 1988, 290 thousand of whom lived in the city of São Paulo. The authors investigated their cancer patterns and their lifestyle. When the age-adjusted rates of cancer incidence among Japan-born immigrants were compared with those among Japanese in Japan, the rate of cancer of the stomach in both sexes, pancreas and lung in men and rectum in women were significantly lower, while non-melanoma skin cancer, prostate and breast cancer were higher. No significant increase of colon cancer was recognized. The mortality data showed a similar trend, although no significant decrease of stomach cancer was detected in either sex. A cross-sectional study of randomly selected Japanese residents in the city of São Paulo showed some lifestyle modifications when the results were compared with data from a cross-sectional study conducted in five Japanese populations in Japan using similar protocol. Japanese Brazilians smoked less and drank less. Their dietary habits were more like the pattern seen in Western countries with higher intake of beef and dairy products, although they consumed vegetables more frequently. Serum level of total cholesterol, uric acid and total carotene revealed significantly higher values, while serum selenium was much lower than Japanese in Japan. The differences in lifestyle shown between Japanese residents in São Paulo and in Japan were discussed in relation to the cancer pattern between them.

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Materials and Methods

Cancer Mortality

Official death certificates during 1979-81 were collected when the place of birth was specified as Japan, or the father's and/or mother's name was of Japanese origin, and when the address was in the city of São Paulo. Among them, 828,000 lived in the state of São Paulo and 290,000 in the city of São Paulo. Despite this large population, however, only a limited number of reports published and no precise analyses of cancer mortality and incidence had been performed before our investigations. We have been conducting various epidemiological surveys since 1987, targeting Japanese immigrants and their descendants in the city of São Paulo, which has a total population of 12 million and covers an area of 1400 square kilometers.
(287 males and 170 females) were found among Japan-born residents; out of 1,325 deaths (797 males and 528 females), 183 (94 males and 89 females) were due to cancer among Brazil-born residents.

**Cancer Incidence**

The source of data was the Cancer Registry of São Paulo, which actively collected information on incident cancer cases of residents of the city of São Paulo from hospitals, clinics, pathology laboratories, and other sources. During the 10-year interval from 1969 to 1978, a total of 2,179 cases of cancer among Japan-born residents (1,288 males and 891 females) and 623 among Brazil-born residents (255 males and 368 females) were found in the registry.

**Lifestyle and Health Related Indicators**

We conducted a cross-sectional study of Japanese residents in the city of São Paulo to determine the cause of these differences in cancer mortality and incidence. A questionnaire on lifestyle and social characteristics, anthropometric measurements, and blood and urine collections were administered to 411 randomly selected Japanese first- and second-generation residents aged 40 to 69 years in the city of São Paulo. A total of 251 (61%) subjects, 118 men and 133 women, 90 first- and 161 second-generation, participated in the study. Data from 47 males 40 to 49 years of age, 10 first- and 37 second-generation, were compared with correspondent Japanese subject groups of the cross-sectional study in five areas in Japan (Ninohe in Iwate, Ishikawa in Okinawa, Yokote in Akita and Saku in Nagano Prefectures, and Katsushika-ku in Tokyo Metropolis). In this cross-sectional study in Japan using similar protocol, the subjects were also randomly selected men aged 40 to 49 years. The study was carried out during August and September 1989, which corresponds to the winter season in São Paulo, the same season as the cross-sectional study in Japan.

**RESULTS AND DISCUSSIONS**

**Cancer Mortality**

Age-adjusted (world population) death rates (AADR) of selected sites of cancer per 100,000 population were shown in Table 1 for Japan-born residents and those for the total population in the city of São Paulo and in Japan are also listed. On the basis of mortality in Japan, AADR for Japan-born residents in São Paulo revealed a significantly higher value for cancer of the prostate and lower values for cancer of the all sites, male esophagus, male rectum, liver, gallbladder and female lung. Stomach cancer was the most frequent cancer in male Brazil-born residents and was the second most in females, next to breast.

| ICD | Cancer site | Males Japan 1980 | Immigrants 1979-81 | São Paulo 1980 | Females Japan 1980 | Immigrants 1979-81 | São Paulo 1980 |
|-----|-------------|-----------------|-------------------|----------------|------------------|-------------------|----------------|
| 140-208 | All sites | 148.2 | 119.9* | 149.6 | 85.0 | 71.9 | 98.9 |
| 150 | Esophagus | 7.2 | 3.4* | 10.7 | 1.5 | 0.5 | 1.5 |
| 151 | Stomach | 48.5 | 41.4 | 25.4 | 23.9 | 18.3 | 11.6 |
| 153 | Colon | 6.1 | 7.2 | 5.2 | 5.0 | 4.2 | 4.9 |
| 154 | Rectum | 6.2 | 1.8* | 3.9 | 3.6 | 3.7 | 2.8 |
| 155 | Liver | 15.5 | 6.0* | 5.4 | 5.1 | 1.2* | 2.9 |
| 156 | Gall-bladder | 4.4 | 1.4* | 1.7 | 4.6 | 0.0a | 2.4 |
| 157 | Pancreas | 7.2 | 8.3 | 5.0 | 4.1 | 3.6 | 3.7 |
| 162 | Lung | 24.3 | 19.9 | 25.6 | 7.1 | 2.9* | 6.5 |
| 174 | Breast | --- | --- | --- | 5.5 | 3.6 | 16.0 |
| 179-182 | Uterus | --- | --- | --- | 6.9 | 11.2 | 11.6 |
| 183 | Ovary | --- | --- | --- | 2.9 | 2.5 | 4.3 |
| 185 | Prostate | 2.7 | 6.1* | 12.7 | --- | --- | --- |
| 188 | Bladder | 2.5 | 3.6 | 5.0 | 0.9 | 0.3 | 1.0 |
| 191 | Brain | 0.8 | 1.2 | 2.2 | 0.6 | 0.8 | 2.1 |
| 200-203 | Lymphoma | 4.7 | 2.0 | 5.2 | 2.5 | 2.3 | 2.6 |
| 204-208 | Leukemia | 4.4 | 3.4 | 4.8 | 3.0 | 0.6 | 4.5 |

* Statistically significant difference with the rate for Japan at 0.05 level.
Table 2. Age-adjusted Incidence rate of selected sites of cancer for Japan-born residents in the city of São Paulo, Brazil, 1969-78, together with those for Japan and São Paulo, 1980.

| ICD   | Cancer site       | Males Japan 1973-77 | Males Immigrants 1969-78 | Males São Paulo 1973 | Females Japan 1973-77 | Females Immigrants 1969-78 | Females São Paulo 1973 |
|-------|-------------------|---------------------|--------------------------|----------------------|------------------------|---------------------------|-------------------------|
| 140-208 but 173 | All sites but skin | 204.0               | 195.2                    | 265.1                | 139.5                  | 147.3                     | 235.9                   |
| 150   | Esophagus         | 10.3                | 10.2                     | 14.1                 | 2.4                    | 1.8                       | 2.8                     |
| 151   | Stomach           | 80.3                | 69.3*                    | 45.7                 | 38.6                   | 32.0*                     | 19.0                    |
| 153   | Colon             | 8.0                 | 8.3                      | 11.4                 | 6.8                    | 8.4                       | 9.7                     |
| 154   | Rectum            | 8.6                 | 6.6                      | 7.9                  | 5.6                    | 3.3*                      | 6.9                     |
| 157   | Pancreas          | 6.9                 | 5.0*                     | 5.4                  | 4.0                    | 3.9                       | 4.0                     |
| 162   | Lung              | 26.6                | 22.5*                    | 31.1                 | 7.8                    | 7.2                       | 6.4                     |
| 174   | Breast            | ---                 | ---                      | ---                  | 15.2                   | 24.0*                     | 56.2                    |
| 180   | Cervix            | ---                 | ---                      | ---                  | 16.2                   | 18.0                      | 37.5                    |
| 185   | Prostate          | 4.1                 | 7.1*                     | 22.2                 | ---                    | ---                       | ---                     |
| 173   | Skin              | 1.2                 | 5.1*                     | 53.6                 | 0.7                    | 4.0*                      | 47.5                    |

* Statistically significant difference with the rate for Japan at 0.05 level.

Table 3. Lifestyle characteristics among male Japanese Brazilians aged 40 to 49 years in São Paulo and five Japanese populations in Japan.

| Items             | Frequency | São Paulo, Brazil (n=47) | Ninohe, Iwate (n=134) | Yokote, Akita (n=133) | Katsushika-Kita, Tokyo (n=118) | Saku, Nagano (n=120) | Ishikawa, Okinawa (n=129) |
|-------------------|-----------|--------------------------|-----------------------|------------------------|-------------------------------|----------------------|--------------------------|
| Smoking           | regularly (%) | 42.6                    | 52                    | 56                     | 64                            | 60                   | 47                       |
| Drinking          | ≥5/week (%) | 32.6                    | 47                    | 59                     | 53                            | 49                   | 19                       |
| Green vegetables  | ≥5/week (%) | 59.6                    | 35                    | 32                     | 28                            | 54                   | 56                       |
| Yellow vegetables | ≥5/week (%) | 27.7                    | 12                    | 12                     | 11                            | 28                   | 22                       |
| Beef              | ≥1/week (%) | 100.0                   | 28                    | 48                     | 69                            | 52                   | 76                       |
| Dairy products    | ≥5/week (%) | 51.1                    | 34                    | 31                     | 38                            | 48                   | 36                       |

Cancer Incidence

The estimated age-adjusted (world population) incidence rates (AAIR) per 100,000 population are shown in Table 2 for Japan-born residents together with those for the total population of São Paulo and the average of 3 populations in Japan (Fukuoka, Osaka and Miyagi). The values of AAIRs at all sites (except non-melanoma skin cancer) among Japanese immigrants were similar to those of Japanese in Japan for both sexes. Rates of cancer of the stomach, male pancreas and lung, and female rectum were lower in Japanese immigrants in São Paulo compared with Japanese in Japan, while the values of non-melanoma skin, prostate, and breast cancer were remarkably higher. Those cancers except rectum among immigrants shifted toward the rates of the host country. In Brazil-born Japanese, stomach cancer was the most frequent cancer in men, while breast cancer in women.
Table 4. Serum nutrient level among male Japanese Brazilians aged 40 to 49 years in São Paulo and five Japanese populations in Japan.

| Nutrients           | Units | São Paulo, Brazil (n=47) | Niigata, Iwate (n=134) | Yokote, Akita (n=133) | Katsushi ka-kita, Tokyo (n=118) | Saku, Nagano (n=120) | Ishikawa, Okinawa (n=129) |
|---------------------|-------|--------------------------|------------------------|-----------------------|-------------------------------|----------------------|---------------------------|
| Total cholesterol   | mg/dl | 213                      | 193                    | 195                   | 202                           | 196                  | 202                       |
| Uric acid           | mg/dl | ±47                      | ±37                    | ±34                   | ±34                           | ±35                  | ±33                       |
| Total carotene      | μg/l  | ±1.5                     | ±1.3                   | ±1.3                  | ±1.2                          | ±1.5                 | ±1.4                      |
| Selenium            | μg/ml | ±0.21                    | ±0.19                  | ±0.17                 | ±0.17                         | ±0.31                | ±0.21                     |

Lifestyle and Health Related Indicators

1. Smoking and drinking habits

Smoking and drinking habits among male Japanese residents in São Paulo, which are two major behavioral habits of human beings, are shown in Table 3 together with those among the five populations in Japan. The percentage of regular smokers was 43% in Japanese Brazilians, the lowest among the six Japanese populations. The smoking rate in São Paulo was much lower than the 64% in Tokyo, although both are urban areas with over 10 million population. The percentage of daily drinkers of alcohol in São Paulo was lower than those in four areas in Japan and higher than that in Okinawa. In general, São Paulo Japanese consumed fewer cigarettes and less alcohol, and these behavioral differences may have been associated with the relatively lower rate of cancer of all sites, lung and esophagus among these male Japanese immigrants.

2. Dietary habits

Dietary intake of green-yellow vegetables and foods rich in fat among male Japanese residents in São Paulo are shown in Table 3 together with those of the five populations in Japan. The frequency of consuming green and yellow vegetables, beef, and dairy products was higher among Japanese Brazilians than in the five areas of Japan. In general, Japanese Brazilians consumed much vegetables and fat, and these kind of modification may have been associated with some changes in cancer occurrence such as the decrease in stomach cancer and the increase in prostate and breast cancer. Moreover, more frequent intake of vegetables among Japanese Brazilians may have countered the effect of a high fat diet for the increased risk of colon cancer.

3. Blood nutrients

We measured the level of blood nutrients to assess the dietary pattern quantitatively and objectively. Serum level of total cholesterol, uric acid, total carotene and selenium are shown in Table 4. The level of total cholesterol and uric acid showed significant higher values among Japanese Brazilians when compared with each of the five populations in Japan. These higher values are thought to be due to higher intake of high fat food such as beef. The level of total carotene also corresponded to frequency of green-yellow vegetable intake. Japanese Brazilian has the highest values among six populations. In contrast, serum selenium showed a much lower value. In our multiple regression analysis among Japanese immigrants, rice (a staple of the Japanese diet) and fish intake (a typical Japanese side dish) increased serum selenium, while it was decreased by vegetable intake and duration of residence in Brazil. That is, the lower level of serum selenium among Japanese Brazilians was associated with a deviation from the Japanese style diet which is thought to be major source of selenium. The significantly lower value of serum selenium did not provide an increased incidence of cancer at all sites, however.

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