Lifestyle and Health Related Factors Among Randomly Selected Japanese Residents in the City of São Paulo, Brazil, and their Comparisons with Japanese in Japan

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Our previous studies on mortality and cancer incidence showed a changing disease pattern among Japanese immigrants in São Paulo, Brazil from that among Japanese in Japan. To clarify the cause of this change, a cross-sectional study was conducted for evaluating lifestyle and health-related factors among a representative sample of Japanese residents in São Paulo. The results obtained were compared with those from a cross-sectional study in five areas of Japan in which the similar protocol had been used.

A questionnaire on lifestyle, anthropometric and blood pressure measurements, and blood and urine collections was 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. Smoking and drinking habit, anthropometric measures and blood pressure level, and serum biochemical parameters were examined according to sex and age group. The level of total cholesterol, triglycerides and uric acid in sera, body weight and body mass index, and both systolic and diastolic blood pressures revealed a significantly higher value when compared with five Japanese groups in Japan, while serum HDL cholesterol and the percentage of smokers and drinkers were lower.

These differences of lifestyle and health-related factors were discussed in relation to ischemic heart and cerebrovascular diseases and some types of cancer. J Epidemiol, 1994; 4: 37–46.
mortality and incidence, we conducted this cross-sectional study. We collected data on the prevalence of lifestyle factors, including biological and anthropometric characteristics, from a representative sample of Japanese residents in the city of São Paulo. A cross-sectional study in five areas of Japan using a similar protocol, makes it possible to compare these lifestyle data with those in Japan and to correlate them with disease mortality rates among Japanese population in various locations in Japan and in São Paulo.

SUBJECTS AND METHODS

Subjects of this study were selected from the database of a special census survey for Japanese population in Brazil. The survey conducted a brief interview to find out any person of Japanese origin in all households located in some randomly selected areas. If at least one family member was recognized as Japanese origin, the name, sex, birth date and birth place were ascertained for all members in that family. In the city of São Paulo, 264 randomly selected geographic areas were surveyed; among the selected areas, a total of 273 households which included at least one family member of Japanese origin were identified. We selected the subjects of this study from these 273 households, on condition that they were first-generation Japanese immigrants or second-generation Japanese descendants, both parents were Japanese, and aged 40 to 69 (as of June 30, 1989). According to this condition, a total of 411, 147 first- and 264 second-generation, Japanese residents were selected for this study. The distribution of these subjects was shown in Table I by sex, age-class and generation.

We mailed bilingual (Portuguese and Japanese) letters to all subjects twice to ask their participation to this study. The first letter submitted approximately one month before the starting day explained the goal and importance of the study and assured the confidentiality of information and the right to refuse. The second letter, 20 days later from the first one, made a strong request for participation in the study and informed the individual of the place and date of the examination. The confirmations were made by a reply stamped letter and by telephone.

Two places were settled for the examination of participants, one in the Japanese clinic affiliated with Beneficência Nipo-Brasileira de São Paulo (Japan-Brazil beneficent organization) and another in the Health Center attached to the School of Public Health of University of São Paulo, both located in the central of city. We performed the following items to all participants mostly at our centers and partly in their homes.

1. QUESTIONNAIRE BY INTERVIEW

The questionnaire used in the Japanese cross-sectional study was translated to Portuguese with minimal revision of some particular items. Trained nurses or nutritionists conducted the interview. The content of this questionnaire included personal data with immigration history, medical history, smoking and drinking history, dietary pattern, physical activity level, stress history, a personality assessment and others. An assessment of gynecological and reproductive history was included for women.

2. HEALTH EXAMINATION

A brief health examination was performed for anthropometric measures such as height and weight. To measure blood pressure we used an automatic manometer (Takeda Medical, UA751) to avoid observer bias and to maintain comparability with the cross-sectional study in Japan. Three consecutive measures at right arm in the seated position were done. The first measure was used for detecting appropriate maximum pressure level and the average of second and third measurement was used for the actual measurement.

3. BLOOD AND URINE COLLECTIONS

A total of 23 ml of blood was collected by venous puncture using 25 ml syringe with 21 gauge needle. We

| Table 1. Distribution of subjects by sex, generation and age class. |
|-----------------------------|-----------------|-----------------|-----------------|-------|
|                             | 40-49yo. | 50-59yo. | 60-69yo. | Total |
| Males                       |          |          |          |       |
| First-generation            | 20       | 18       | 34       | 72    |
| Second-generation           | 71       | 46       | 16       | 133   |
| Total                       | 91       | 64       | 50       | 205   |
| Females                     |          |          |          |       |
| First-generation            | 10       | 21       | 44       | 75    |
| Second-generation           | 62       | 50       | 19       | 131   |
| Total                       | 72       | 71       | 63       | 206   |
Cross-Sectional Study on Japanese Brazilian

39

1989, which corresponds to the winter season in São Paulo, the same season with the cross-sectional study in Japan.

RESULTS

Participation rate

251 subjects (61%), 118 men (58%) and 133 women (64%), 90 first-generation (61%) and 161 second-generation (61%), responded to this survey and their distribution by sex, age-class and generation was shown in Table 2. Five participants were excluded from the successive analysis because their ages had been recognized to be out of the age range (40 to 69 years old) after their participation. The details of the five participants were 32 years old second- and 70 years old first-generation men, and 35 years old second-, 72 years old first- and 77 years old second-generation women. These phenomenon occurred by misidentification of their age in the Japanese census survey which was original source of our study population.

Within the group of 160 non-respondents, 140 refused to participate, 9 were stayed in Japan to work, 8 were failed to contact and 3 were deceased.

Immigration history of participants

The average year of immigration to Brazil was 1947 [range: 1925-1980] in men and 1941 [1919-1980] in women among forty-one men and forty-four women of first-generation (three unknown). Twenty men (49%) and thirty-one women (70%) entered in Brazil before the Pacific War (1941-45). The original prefectures in Japan (in the case of second-generation, original prefectures of their fathers were applied) were widely spread from north to south, however concentration was found in some prefectures. Okinawa had the largest number (30), which was followed by Kumamoto (22), Hokkaido (20), Fukuoka (13), Fukushima (12) and Nagano (12).

Table 2. Number of participants and response rates (%) in parenthesis by sex, generation and age class.

|           | 40-49yo. | 50-59yo. | 60-69yo. | Total |
|-----------|---------|---------|---------|-------|
| Males     |         |         |         |       |
| First-generation | 10 (50) | 10 (56) | 23 (68) | 43 (60) |
| Second-generation | 37 (52) | 24 (52) | 12 (75) | 73 (55) |
| Total     | 47 (52) | 34 (53) | 35 (70) | 116 (57) |
| Females   |         |         |         |       |
| First-generation | 5 (50)  | 12 (57) | 28 (64) | 45 (60) |
| Second-generation | 42 (68) | 29 (58) | 14 (74) | 85 (65) |
| Total     | 47 (65) | 41 (58) | 42 (67) | 130 (63) |

5 participants (32yo. second- and 70yo. first-generation men, and 35yo. second-, 72yo. first- and 77yo. second-generation women) were out of age range from 40 to 69 y.o.
Marital status, education and occupation

The marital status, educational background, and occupational status are presented in the Table 3. This Table shows that 87.9% of males and 80.0% of females were married. In general more males have achieved higher educational levels than females, 31.0% of males and 11.5% of females have been educated more after graduating from high school, that is more than 11 years education. This percentage is the highest in the 40-49 years group either in males with 53.2% and females with 25.5%, then declining steadily with increasing of age in both sexes. In the 60-69 years age group the rate was found only 2.9% in males and 0% in females. The distribution of occupations reflects the educational background, showing that 34.0% of 40-49 years males and 14.9% of females were classified as professional or technical workers, and then the percentage in both sexes depicts a decreasing tendency toward older age groups. Males in their fifties and sixties had higher percentage of sales and service workers, with the same pattern being observed for females.

Smoking and drinking habit

Smoking and drinking habits are given in table 4. The percentages of regular smoker were 39% in men and only 4% in women, declining with age in both groups. The average number of cigarettes smoked were about one pack per day in males. Almost one third of males were ex-smokers, while 90% of females were found to be never-smokers.

The percentage of males classified as daily alcohol drinkers was higher than females, 31.3% in men and only 2.3% in women. Weekly ethanol consumption among male drinker was 189 g, in which more than a half (100 g) came from beer and one third (53 g) from pinga (distilled liquor from sugar cane).

Anthropometric measures and blood pressure

The means and standard deviations of the height, weight, body mass index (kg/m²), and blood pressure level were shown in Table 5. The height and weight decreased slightly in older age groups, and were higher in males than
### Table 4. Smoking and drinking habits.

| Smoking habits          | 40-49yo. | 50-59yo. | 60-69yo. | Total |
|-------------------------|----------|----------|----------|-------|
| Never (%)               | 23.4     | 38.2     | 31.4     | 30.2  |
| Ex (%)                  | 34.0     | 23.5     | 31.4     | 30.2  |
| Occasional (%)          | 0.0      | 0.0      | 2.9      | 0.9   |
| Regular (%)             | 42.6     | 38.2     | 34.3     | 38.8  |
| No. cigarettes/day in regular smokers* | 22.3 ± 7.9 | 21.9 ± 12.2 | 17.6 ± 6.4 | 20.9 ± 9.0 |

(mean ± standard deviation)

| Drinking habits          | 40-49yo. | 50-59yo. | 60-69yo. | Total |
|--------------------------|----------|----------|----------|-------|
| < 1 day/month (%)        | 30.4     | 35.3     | 60.0     | 40.9  |
| 1-3 days/month (%)       | 19.6     | 11.8     | 5.7      | 13.0  |
| 1-4 days/week (%)        | 17.4     | 17.6     | 8.6      | 14.8  |
| ≥ 5 days/week (%)        | 32.6     | 35.2     | 25.7     | 31.3  |

Ethanol (g)/week in drinkers ≥ 1/month

| < 1 month (%)            | 197.6 ± 190.6 | 167.1 ± 204.0 | 205.5 ± 262.3 | 189.4 ± 208.4 |

(mean ± standard deviation)

### Table 5. Anthropometric measures and blood pressure (mean ± standard deviation).

| Males                  | 40-49yo. | 50-59yo. | 60-69yo. | Total |
|------------------------|----------|----------|----------|-------|
| Height (cm)            | 164.2 ± 5.6 | 162.0 ± 5.3 | 160.0 ± 6.9 | 162.2 ± 6.2 |
| Weight (kg)            | 67.1 ± 11.2 | 62.2 ± 11.3 | 61.2 ± 12.2 | 63.9 ± 11.7 |
| Body Mass Index        | 24.8 ± 3.4  | 23.7 ± 4.0  | 24.0 ± 4.1  | 24.2 ± 3.8  |
| Systolic BP (mmHg)     | 131.8 ± 15.3 | 141.5 ± 24.9 | 140.0 ± 21.1 | 137.1 ± 20.5 |
| Diastolic BP (mmHg)    | 87.0 ± 10.8  | 91.2 ± 18.3  | 85.8 ± 13.6  | 87.9 ± 14.2  |

| Females                | 40-49yo. | 50-59yo. | 60-69yo. | Total |
|------------------------|----------|----------|----------|-------|
| Height (cm)            | 153.0 ± 5.5 | 150.2 ± 3.9 | 147.4 ± 5.7 | 150.3 ± 5.6 |
| Weight (kg)            | 55.6 ± 9.3  | 56.3 ± 5.7  | 51.2 ± 5.9  | 54.4 ± 7.6  |
| Body Mass Index        | 27.3 ± 3.3  | 25.0 ± 2.6  | 23.7 ± 3.0  | 24.1 ± 3.0  |
| Systolic BP (mmHg)     | 124.6 ± 19.1 | 140.9 ± 28.4 | 148.1 ± 25.4 | 137.3 ± 26.2 |
| Diastolic BP (mmHg)    | 80.9 ± 12.1  | 86.3 ± 12.4  | 83.1 ± 11.9  | 83.3 ± 12.2  |

*One subject has no information for drinking habit*
in females in all age groups. Body mass index was around 24 regardless of their age and sex.

The level of blood pressure showed the expected rising trend with age in both sexes. The diastolic blood pressure showed this increase until 50-59 age group, and then decreased after this age group both in males and females. The males had higher systolic and diastolic blood pressure levels in all age groups than females except for systolic blood pressure at 60-69.

**Standard biochemical data**

The means and standard deviation of total cholesterol, HDL cholesterol, triglyceride and uric acid are shown in table 6. The levels of total cholesterol and HDL cholesterol were slightly higher in females than in males. Total cholesterol and triglyceride tended to decrease with age among males, however total cholesterol had opposing tendency among females.

**Comparison with Japanese in Japan**

Percentages of daily drinker and smoker, average values of height and weight, average values of systolic and diastolic blood pressure, average values of total cholesterol and HDL cholesterol, and triglyceride and uric acid were plotted in figures 1 to 5 for Japanese Brazilian in São Paulo with five Japanese groups. All of them were men

|                | 40-49yo. | 50-59yo. | 60-69yo. | Total |
|----------------|----------|----------|----------|-------|
| **Males**      |          |          |          |       |
| Total cholesterol (mg/dl) | 213± 47  | 209± 43  | 199± 45  | 208± 45 |
| HDL cholesterol (mg/dl)    | 46± 13   | 48± 14   | 45± 8    | 47± 12  |
| Triglyceride (mg/dl)       | 214± 158 | 171± 143 | 160± 111 | 185± 142|
| Uric acids (mg/dl)         | 6.32±1.54| 6.14±1.90| 5.96±1.65| 6.16±1.67|
| **Females**              |          |          |          |       |
| Total cholesterol (mg/dl) | 197± 33  | 229± 39  | 232± 41  | 218± 40 |
| HDL cholesterol (mg/dl)    | 56± 12   | 54± 12   | 55± 11   | 55± 12  |
| Triglyceride (mg/dl)       | 101± 58  | 159± 140 | 136± 79  | 130± 99 |
| Uric acids (mg/dl)         | 4.03±1.06| 4.41±1.06| 4.41±0.88| 4.27±1.01|

**Figure 1.** Prevalence of daily smokers and drinkers among Japanese men aged 40 to 49 years in São Paulo and in five areas of Japan (Tsugane S, et al. J Epidemiol 1992 ; 2 : 83-89) *: statistically significant (p<0.05) percentage of smoker compared with Japanese in São Paulo. $: statistically significant (p<0.05) percentage of drinker compared with Japanese in São Paulo.
aged 40 to 49.

The proportion of daily smokers and drinkers in São Paulo was lower than each Japanese group except when daily drinker rate was compared with Okinawa. A significant difference was found in comparison with Tokyo and Nagano for smoking, and Akita and Tokyo for drinking. Japanese Brazilian drank less and smoked less when compared with Japanese in Japan (Figure 1).

Body weight was highest in São Paulo, while height was the second lowest followed by Okinawa, although significant difference was only found in comparison with Akita for weight (Figure 2). This means that Body Mass Index was almost highest together with Okinawan Japanese and was significantly higher than Akita and Tokyo. The

![Figure 2](image2.png)

Figure 2. Average values of height and weight among Japanese men aged 40 to 49 years in São Paulo and in five areas of Japan (Tsugane S, et al. J Epidemiol 1992 : 2 : 83-89). $ : statistically significant (p<0.05) value in weight compared with Japanese in São Paulo.

![Figure 3](image3.png)

Figure 3. Average values of systolic and diastolic blood pressure among Japanese men aged 40 to 49 years in São Paulo and in five areas of Japan (Tsugane S, et al. J Epidemiol 1992 ; 2 : 83-89). * : statistically significant (p<0.05) value in systolic blood pressure compared with Japanese in São Paulo. $ : statistically significant (p<0.05) value in diastolic blood pressure compared with Japanese in São Paulo.
levels of both systolic and diastolic blood pressure were highest among Japanese Brazilian. Diastolic blood pressure among them showed the significant higher values when compared with any of five Japanese groups (Figure 3).

The levels of total cholesterol showed the highest values, while HDL cholesterol the lowest (Figure 4). This implies that the level of LDL cholesterol is much higher than Japanese in Japan. Both uric acid and triglyceride revealed significantly higher values than any of five
Japanese groups (Figure 5).

**DISCUSSION**

In this cross-sectional survey, we placed emphasis on the representativeness of our target population, from which data on mortality and incidence of cancer were obtained. The final response rate was 61% as a whole. This may be not sufficient to represent Japanese Brazilian in the city of São Paulo; however considering the size of city, having approximately twelve million people, this rate was relatively higher than we expected. In our cross-sectional study in Japanese five regions, Katsushika-kiita area located in metropolitan Tokyo showed the same response rate of 61%, which was the lowest compared with other local areas. However, Katsushika-kiita area is a small part of Tokyo metropolis and has only 150 thousand population.

As one of standards for estimating potential selection bias, we compared the distribution of the original prefecture in our participated subjects with the statistics from emigrants to Brazil according to prefecture in Japan. The leading four prefectures of origin were Okinawa (12%), Kumamoto (9%), Hokkaido (8%), and Fukuoka (5%) in this study, while Kumamoto (10%), Fukuoka (8%), Okinawa (8%), and Hokkaido (7%) were described in the literature. This suggests that our study participants is not a biased sample from Japanese residents in the city of São Paulo.

The level of total serum cholesterol was much higher among Japanese Brazilian than each of five Japanese groups. This finding strongly suggests that higher mortality rate from ischemic heart disease observed in first-generation Japanese residents in São Paulo is linked to the increase level of serum cholesterol. The higher level of blood pressure and body mass index, and lower value of HDL cholesterol are also likely related to increased risk of ischemic heart disease. Despite the higher rates of ischemic heart disease, Japanese Brazilian smoked less. The NI-HON-SAN Study reported a two-fold increase among Japanese men in California and the three-fold increase among Japanese men in São Paulo when compared with Japanese in Japan and this increase was also correlated with the elevated levels of total cholesterol and blood pressure among Japanese American.

The higher level of total cholesterol, as well as that of uric acid in sera, could be also associated with higher mortality from and incidence of prostate and breast cancer. The risk of colorectal cancer is also considered to be associated with fat intake; however both mortality and incidence are not increased among Japanese Brazilian. Other factors, such as fiber and vegetables intake, may account for the difference.

Both systolic and diastolic blood pressure were higher among Japanese Brazilian, although the reason of these increases are unclear. The higher body mass index among them may be partially related. The high level of blood pressure can also increase the risk of ischemic heart disease. However, since blood pressure is one of the most important risk factors for stroke, an increased mortality from cerebrovascular disease would be expected. On the contrary to this expectation, SMR values for cerebrovascular disease among first-generation Japanese residents in São Paulo were as low as 74% in men and 86% in women, both statistically significant, when compared to Japanese in Japan. The low level of total cholesterol was considered as a risk factor for bleeding type of stroke, so that higher level of total cholesterol may protect the occurrence of cerebral bleeding among Japanese Brazilian whose blood pressure are high.

Since the method of sampling was strictly dependent on the original Japanese census survey, we could not have regulated the sample size. This caused the small number of participants to find the difference between the first- and the second-generation in each age-class. We tried to find it for anthropometric measure, blood pressures and biochemical parameters by using analysis of covariance treating age as covariate, however no significant difference could not have been obtained (data not shown). This is probably due to a lack of statistical power and another study is necessary to test the difference of lifestyle factors by generation.

In conclusion, although precise and comparable nutritional data are not available, higher level of serum cholesterol and uric acid as well as body weight suggest the higher intake of total calories and fat among Japanese Brazilian. This change of dietary habit may have caused the increased incidence of ischemic heart disease and cancers such as prostate and breast, and the decreased incidence of stroke among them.

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