The Fifth Japan-Nepal Health Scientific Expedition : Comparative Epidemiological Studies on the Genesis of Hypertension : Jomosom Study

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The Fifth Japan-Nepal Health Scientific Expedition

Comparative Epidemiological Studies on the Genesis of Hypertension
—Jomosom Study—

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1. Name of the Expedition
   Japan-Nepal Health Scientific Expedition
   —Comparative Epidemiological Studies on the Genesis of Hypertension—

2. Country of the Expedition:
   Japan

3. Sponsored by:
   Kyushu University

4. Financed by:
   Salt-Science Research Fund (No. 92035)
   Chiyoda Mutual Life Foundation

5. Personnel (Japanese Side)
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6. Objects of the Expedition

During the summer of 1987, an International Joint Research titled "Tribhuvan University-Kyushu University Hypertension Project(TUKUHP)" was carried out by the "Japan-Nepal Health Scientific Expedition(JANESE '87)" group, which was composed of the Dean and professors of the Institute of Medicine, Tribhuvan University, and Japanese specialists of hypertensiology, exercise physiology, nutrition, and cultural geography including the applicants. The ultimate goal of this project was to clarify the factors which affect the pathogenesis of hypertension. To know the important conditions which generate the hypertension, the health status, dietary practice, and physical activities of the Nepalese people, whose blood pressures are low in general, were compared with those of the Japanese.

The blood pressure, body fat mass, blood chemistries including complete blood counts, nutritional intakes of the inhabitants were measured and ECG was taken at the two sites in Nepal: one of which was a hilly village, named Kotyang in Kabhre District, the other a suburban village, named Bhadrapali in Kathmandu District. The prevalence rates of the hypertensives in both sites (0.7% in Kotyang, 6.9% in Bhadrapali) were by far lower than those in Japan (25-30% in general) in spite of the fact that the levels of average salt intake of the two countries were almost identical (about 12 g/day). Taking the other results into consideration, we assumed that the blood pressure might be influenced by physical activity, fat free mass and nutrient intake rather than by the amount of daily salt intake, although a weak positive link of salt consumption to blood pressure was detected statistically.

On the basis of these results, we have already presented them at several international meetings of medical and nutritional science and have published 2 books (244 pages in 1989; 107 pages in 1991).

The purpose of the fifth TUKUHP investigation is to measure the difference of body composition, blood pressure, electrocardiogram, blood chemistries, nutrient intakes and physical activities in Mustang District and to compare the people living in the mountain area with those who had been investigated in the first (Kotyang and Bhadrapali) and the third TUKUHP study (Jawalakhel). It is said that the people living in the mountain area have taken salt tea staff in their life and their salt consumption is more than 15 g per day.

The similar methods to the previous TUKUHP studies were applied to the fifth one so that the data can be compared.

Annexed Objects are:

1) Diagnosis and treatment of the people concerned.
2) A contribution to the accumulation of the information on the amelioration of nutritional status in Nepal.
3) A contribution to the development of the scientific fields included in this project in Nepal.
4) The promotion of the scientific relationship between Japan and Nepal.

7. Schedule of Survey

The field research was carried out at Tukuche and Marpha areas in Mustang District at or above 2,600 meters above sea level. We left Kathmandu for Tukuche on September 5th, 1992. It was possible to charter a flight from Kathmandu to Jomosom airport directly. The research started on September 7th and lasted for 4 days. Because of the lack of the participants, the survey area was changed to Marpha and the research there was continued for 5 days from September 12th till 16th.

8. Temporary View on the Results

1) The subjects investigated

A total of 434 subjects more than 20 years old investigated in the two areas are shown by sex and age group in Table 1. No sex differ-
ence was observed between the two areas. Since the people living in the two areas are ethnologically identical, both Takhari Tribes, the numbers of the subjects are presented by the sum of the two areas investigated.

2) Nutritional Survey [Appendix I]

A) Methods

The survey for the nutrient intakes was carried out by 24-hour recall method to obtain the individual food consumption using the food models and the chart as shown in Appendix-I.

The measurement method was also applied to about 10% of total subjects.

B) Results and Comments

(1) Diet mainly consisted of Phapar Dhindo or Bhat, Dal and Tarkari, and occasionally of Achar in both areas. Sattu and salt tea or sugar tea were usually taken for breakfast.

(2) All were habitually drinking salt tea or sugar tea in both areas. The approximate amount ranging from 1,000 to 2,500 ml per person. The women took salt tea more than the men, while young generation preferred sugar tea.

(3) High carbohydrate diet was dominant and protein intake was extremely low in both areas, while fat intake was slightly lower than that of Japan.

(4) Protein energy ratio was approximately 7%, being lower than the Japanese.

(5) Animal protein ratio was approximately 10% in most all of the subjects, whereas animal fat ratio was more than 50%, most of which were taken from Tibetan tea.

(6) The intakes of energy per kg of body weight were considered to be 35-45kcal, which were almost equal to those in Tarkegyang and Shermathang investigated in the Fourth study, and higher than those in the Japanese.

3) Morphological & Physiological survey: [Appendix II]

A) Methods

(1) Measurement of body height, weight, skinfold thickness (Triceps, Subscapular, Suprailiac, Umbilical and Calf) for estimating % fat of the body.

(2) Measurement of maximal aerobic power (Margaria's indirect method) and estimation of energy expenditure by 24-hr ECG method.

All subjects shown in Table 1 participated in
### Appendix 1

#### IHS417 NUTRITION SURVEY IN NEPAL 1992

<table>
<thead>
<tr>
<th>Subj.No.</th>
<th>Name:</th>
<th>Sex(M.F)</th>
<th>Age</th>
<th>BH (cm)</th>
<th>BW (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### MENU

<table>
<thead>
<tr>
<th>FOOD</th>
<th>Bihankha Kaja</th>
<th>B.Baht</th>
<th>Khaja</th>
<th>Belukako Khana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice (Bhat)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roti (Bread)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thukpa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Momo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T.Momo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sattu</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pau Roti</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tarukari</td>
<td>Alu (potato)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Simi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parwar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ghiraula</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bodhi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kairo (cucumber)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bandakobi (cabbage)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Gedaguri

<table>
<thead>
<tr>
<th>Massa (Meat)</th>
<th>Chicken</th>
<th>Mutton</th>
<th>Buffalo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achar</td>
<td>Black Tea</td>
<td>Milk Tea Sugar</td>
<td>Salt Tea</td>
</tr>
<tr>
<td>Milk</td>
<td>Daily/Powder Milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dahi (yogurt)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phul (egg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phalaphal (Fruit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chang Jand (Local Beer)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rakshi</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### IHS417 NUTRITION SURVEY IN NEPAL 1992

Subject No. | Name | Activity
--- | --- | ---
1. Please tell me your family numbers. |   | persons
2. Do you smoke? |   | (2) No 1. Yes What kind of smoke?
3. Do you have a drink? |   | (2) No 1. Yes What kind of drink?
9. How many times do you have Dahi? |   | 1. 
11. How long have you been drinking "Tea"? |   | 1. Salt Tea 2. Salt tea & Butter from till till | 1. y.o 2. y.o |
Appendix II
Anthropometry and Physical Fitness

<table>
<thead>
<tr>
<th>ID No</th>
<th>Name</th>
<th>M+F</th>
<th>Age</th>
<th>Date / Sept.92</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Farmer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Publ. Officer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Merchant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Tailor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Teacher</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>1st</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>Shop assist.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>Carpenter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>Soldier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2nd</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Police</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>3rd</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Med.Staff</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Household</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Student</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Misc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Monk</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

- Height (cm)
- Weight (kg)
- Upper Arm Girth (cm)
- Forearm Girth (cm)
- Abdominal Girth (cm)
- Hip Girth (cm)
- Thigh Girth (cm)
- Calf Girth (cm)
- Humerus Breadth (cm)
- Femur Breadth (cm)
- Triceps SF (mm)
- Subscapular SF (mm)
- Suprailiac SF (mm)
- Calf SF (mm)
- %Fat
- MAP (ml/kg/min)

1) Age

2) Results

The mean body height (Ht), weight (Wt), % body fat (%Fat) and maximal aerobic power (MAP) are shown in Table 2.

Mean body height, body weight and %Fat of present subjects were similar to those of hilly villagers (Helambu) and slightly lower than those of the Japanese. Mean maximal aerobic power (MAP) of the present subjects was higher than those in the Japanese. No significant differences in MAP were found between the present subjects and the hilly villagers in all age group. The energy expenditure by 24-hr ECG method was not determined. These data will be analyzed in Japan.

4) Medical survey: [Appendix III]

A) Methods

Table 2. Mean and standard deviation of morphological parameters and maximal aerobic power for subjects by sex

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Ht (cm)</th>
<th>Wt (kg)</th>
<th>%Fat (%)</th>
<th>MAP (ml/kg/min)</th>
<th>Ht (cm)</th>
<th>Wt (kg)</th>
<th>%Fat (%)</th>
<th>MAP (ml/kg/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29</td>
<td>163.4</td>
<td>53.6</td>
<td>12.0</td>
<td>51.2</td>
<td>152.7</td>
<td>50.8</td>
<td>20.6</td>
<td>35.1</td>
</tr>
<tr>
<td>±7.3</td>
<td>±6.8</td>
<td>±2.6</td>
<td>±9.8</td>
<td></td>
<td>±5.1</td>
<td>±7.6</td>
<td>±5.9</td>
<td>±9.6</td>
</tr>
<tr>
<td>30-39</td>
<td>163.6</td>
<td>56.8</td>
<td>14.1</td>
<td>45.0</td>
<td>152.0</td>
<td>50.7</td>
<td>19.6</td>
<td>34.3</td>
</tr>
<tr>
<td>±7.3</td>
<td>±8.5</td>
<td>±4.7</td>
<td>±12.5</td>
<td></td>
<td>±5.3</td>
<td>±8.6</td>
<td>±6.0</td>
<td>±10.3</td>
</tr>
<tr>
<td>40-49</td>
<td>163.6</td>
<td>58.0</td>
<td>14.9</td>
<td>41.5</td>
<td>153.0</td>
<td>51.4</td>
<td>21.1</td>
<td>35.4</td>
</tr>
<tr>
<td>±7.7</td>
<td>±9.6</td>
<td>±5.8</td>
<td>±10.2</td>
<td></td>
<td>±6.3</td>
<td>±8.8</td>
<td>±6.6</td>
<td>±5.6</td>
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<tr>
<td>50-59</td>
<td>159.9</td>
<td>58.9</td>
<td>15.8</td>
<td>36.5</td>
<td>152.9</td>
<td>52.0</td>
<td>21.2</td>
<td>35.1</td>
</tr>
<tr>
<td>±6.0</td>
<td>±7.6</td>
<td>±5.6</td>
<td>±7.2</td>
<td></td>
<td>±5.3</td>
<td>±9.5</td>
<td>±6.7</td>
<td>±7.4</td>
</tr>
<tr>
<td>60-69</td>
<td>161.5</td>
<td>55.4</td>
<td>14.3</td>
<td>32.2</td>
<td>150.6</td>
<td>49.5</td>
<td>19.0</td>
<td>30.9</td>
</tr>
<tr>
<td>±6.4</td>
<td>±7.1</td>
<td>±5.5</td>
<td>±5.8</td>
<td></td>
<td>±5.3</td>
<td>±7.6</td>
<td>±5.1</td>
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<tr>
<td>70+</td>
<td>164.8</td>
<td>58.5</td>
<td>14.6</td>
<td>30.0</td>
<td>151.2</td>
<td>53.6</td>
<td>24.4</td>
<td></td>
</tr>
<tr>
<td>±5.0</td>
<td>±10.1</td>
<td>±5.9</td>
<td>±5.4</td>
<td></td>
<td>±5.8</td>
<td>±11.6</td>
<td>±8.1</td>
<td></td>
</tr>
</tbody>
</table>

Ht: body height, Wt: body weight, %Fat: percent of the body fat.

MAP: maximal aerobic power
### Appendix III

#### Japan-Nepal Health Scientific Expedition, 1982

**Country**
- *Head* [JHS] 41
- *Foot* [JHS] 2

**Family**
- *Head* [JHS] 41
- *Foot* [JHS] 2

#### [Family History]

<table>
<thead>
<tr>
<th>Health</th>
<th>Risk</th>
<th>Drug</th>
<th>Whether</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fever</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2. Headache</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3. Heart disease</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4. Hypertension</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5. Diabetes</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6. Liver disease</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7. Kidney disease</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8. Cancer</td>
<td>1</td>
<td>1</td>
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</tbody>
</table>

#### [Life History]

<table>
<thead>
<tr>
<th>Activity</th>
<th>1992</th>
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<tbody>
<tr>
<td>Breakfast</td>
<td>Yes</td>
</tr>
<tr>
<td>Lunch</td>
<td>No</td>
</tr>
<tr>
<td>Dinner</td>
<td>Yes</td>
</tr>
<tr>
<td>Snack</td>
<td>No</td>
</tr>
</tbody>
</table>

#### [Personal Information]

- Name
- Age
- Gender
- Occupation
- Marital status
- Religion
- Education
- Natural family
- Sexual activity
- Menses
- Menstrual irregularity
- Menopause
- Pregnancy
- Abortion
- Children

#### [Health Check]

- Blood pressure
- Blood sugar
- Blood cholesterol
- Blood urea nitrogen
- Blood total bilirubin
- Blood eosinophils
- Blood neutrophils
- Blood lymphocytes
- Blood monocytes
- Blood platelets
- Hemoglobin
- Red blood cell count
- White blood cell count
- Gonadotropin levels
- Thyroid stimulating hormone
- Insulin
- Glucose
- Cholesterol
- Triglycerides
- Total cholesterol
- Blood pressure measurement

#### [Present States]

- Headache
- Dizziness
- Nausea
- Vomiting
- Epigastralgia
- Diarrhea
- Additional pain
- Visual disturbance
- Ambiguity
- Leukemia
- Meningitis
- Dermatitis
- Others

#### [Medications]

- Antihypertensives
- Antidiabetics
- Antidepressants
- Sedatives
- Others

#### [Nutrition]

- Breakfast
- Lunch
- Dinner
- Snack

#### [Other Information]

- Name
- Gender
- Age
- Occupation
- Marital status
- Religion
- Education
- Natural family
- Sexual activity
- Menses
- Menstrual irregularity
- Menopause
- Pregnancy
- Abortion
- Children

#### [Medical History]

- Family history
- Life history
- Present state
- Medications
- Nutrition

#### [Anthropometric measurement]

- Height
- Weight
- Skinfold thickness
- Body mass index

#### [Urine analysis]

- Protein
- Sugar
- Ketones
- Bilirubin
- Urobilinogen

#### [Blood pressure]

- Systolic
- Diastolic
- Pulse
The medical chart identical to the previous one was prepared in advance, and the individual medical check was carried out according to the chart shown in Appendix III.

1) Family history, life history, present status and physical examination were checked by the Nepalese doctors.

2) The subjects usually voided in the morning after arising. The next voided urine was collected as “a second morning voided urine” into a paper cup and 8 variables (pH, protein, sugar, occult blood, urobilinogen, bacteria and keton body) were determined semiquantitatively using the strip (BMTEST 8-11, Yamanouchi Co., Ltd.) by one examiner.

3) Blood pressure (BP) and pulse rate (PR) were measured 3 times consecutively in the sitting position using the semiautomated BP measuring device (OMRON HEM 401C, Tateishi Electric Co., Ltd.) prior to the blood sampling. The room temperature at the time of the BP measurement was between 22 and 26°C in both areas. The average of 3 consecutive measurements for systolic and diastolic BP and PR were computed and were used for the analyses. The subjects were classified into 3 groups according to WHO criteria.

4) Approximately 7 ml of blood was drawn through the median vein from the subjects who agreed to blood sampling. The blood specimen was centrifuged at 3,000 rpm for 15 minutes and each separated serum was frozen by the liquid nitrogen gas. Complete blood counts were not determined in the present study.

5) Electrocardiogram (ECG) of the participants more than 30 years old was taken by standard 12 leads (CARDIMAX FX 323, Fukuda Denshi Co., Ltd.).

B) Brief Results and Comments

The prevalence rates of borderline hypertensives and hypertensives in the two areas were 9.4% and 13.4% respectively. There was no remarkable sex difference in the classification of blood pressure. The prevalence rates of hypertension in the present study were lower than those in Tarkeghyang and Sermathang (Fourth study) and higher than those in Jawalakhet (Third study).

The incidences of proteinuria and microscopic hematuria were 0% and 0.4% in men and 1.0% and 1.5% in women, and that of glucosuria was zero in both genders, respectively.

Concerning the ECG findings, the incidences of left ventricular hypertrophy were 8.2% in men and 3.5% in women over the age of 30, and those of myocardial ischemic changes were 6.3% in men and 7.7% in women, respectively.

All data including the blood chemistries will be analysed in Japan and will be sent to the counterpart in Nepal to be distributed to the individual participants.

This progress report was sent to the Research Division at Tribhuvan University on September 24, 1992, just before the Japanese team left Nepal for Japan.