Assessment of Acute Myocardial Infarction in Japan by the Japanese Coronary Intervention Study (JCIS) Group

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Background Until now, large-scale nationwide surveys of acute myocardial infarction (AMI), such as those performed in Europe and America, have not been performed in Japan. Therefore, in 2000 the Japanese Coronary Intervention Study (JCIS) group conducted a nationwide survey on the incidence of AMI in Japan.

Methods and Results Questionnaires were collected from 8,268 facilities throughout Japan. The total annual number of patients with AMI was 66,459 (52.4 patients/10^5 population), and the AMI incidence rate in Japan was approximately 25% of that in the United States. Most facilities with AMI patients treated less than 50 AMI patients annually, and that number was 45.0% of total AMI patients. The incidence of AMI patients was highest in Kochi, Kumamoto, and Wakayama prefectures, and lowest in Yamanashi, Saitama and Shiga prefectures. The ratio of the highest incidence to the lowest incidence was 2.0. A significant correlation was observed between the mean age of the prefectural population, as a coronary risk factor, and the incidence of AMI.

Conclusions The incidence of AMI in Japan is approximately 25% that in the United States and it varies considerably among the prefectures, one of the causes being the difference in the mean age. This provides important information for assessing the guidelines for Japanese patients with AMI. (Circ J 2004; 68: 515–519)

Key Words: Acute myocardial infarction; Annual incidence; Japan

Until now, large-scale nationwide surveys of the incidence of acute myocardial infarction (AMI), such as those performed in Europe and America, have not been performed in Japan. Only a few small-scale, regional and institutional survey investigations have been performed1 and so the precise annual number of cases of AMI in Japan is unknown. According to the statistics for 1993 from the Ministry of Health and Welfare, 58,000 people died of ischemic heart diseases during that year, and the number of deaths from AMI was estimated to be 40,0002 In the statistics for 1995, the number of deaths from ischemic heart diseases increased to approximately 80,0003 Assuming that the fatality rate of AMI is 30%, the annual incidence in Japan was estimated to be approximately 250,000.

On this basis, we initiated a study titled ‘Prognosis and cost of medical therapy and coronary intervention therapy for coronary artery diseases (CAD) in Japan’, which is a 3-year project funded by the Japanese Ministry of Health, Labour, and a Welfare Grant-in-Aid for Scientific Research, starting in 2001 to investigate the situation of CAD in Japan, establish evidence related to therapeutic strategies, and revise the therapeutic guidelines for ischemic heart diseases. This study is part of that project, and we report the first survey on the incidence of AMI in Japan.

Methods
A questionnaire was dispatched by letter or fax to the departments of internal medicine, cardiology and cardiovascular surgery of 8,274 hospitals. The basic data such as the names and addresses etc of hospitals throughout Japan were obtained from the Japanese hospital database of Japan Medical Press Inc (Tokyo, Japan).

We narrowed the questionnaire down to the following 3 questions as a minimum in order to increase the collection rate and to investigate the performance of percutaneous coronary angioplasty (PCI), physicians’ systems, and number of AMI patients in each facility: (1) the total number of patients who underwent PCI between January 1 and December 31 in 2000, (2) the total number of AMI patients admitted between January 1 and December 31 in 2000, and (3) the number of physicians specializing in cardiovascular internal medicine.

AMI was defined by the conventional criteria of an increase in the serum creatine kinase concentration to at least twice the normal value or ever-changing ST-T changes on electrocardiograms.

These data were collected by the Second Department of Internal Medicine, Gifu University Graduate School of Medicine, and were analyzed by a host computer at the Japan Clinical Research Assist Center (JCRAC, Tokyo, Japan).

This study was approved by the Local Ethics Committee on Human Research of Gifu University, Japan.

Results
The questionnaire returned by 8,268 facilities (99.93%), which included all the training facilities certified by the
The present study showed that the number of AMI facilities to which AMI patients were transported in 2000 was 2,906, and the total number of AMI patients was 66,459 (23 patients per facility, and 52.4 patients per 10^5 population). Most AMI facilities (86.3%) treated less than 50

Japanese Circulation Society.

Annual Incidence of AMI in Japan
The present study showed that the number of AMI facilities to which AMI patients were transported in 2000 was 2,906, and the total number of AMI patients was 66,459 (23 patients per facility, and 52.4 patients per 10^5 population). Most AMI facilities (86.3%) treated less than 50
AMI patients annually and the number of AMI patients was 29,912 (45.0% of AMI patients) (Fig 1A, B). The number of facilities treating more than 100 AMI patients annually was 122 (4.2% of AMI facilities) and the number of AMI patients was 17,857 (26.9% of AMI patients).

**Relationship Between the Annual Number of AMI Cases and PCI Performed in the Facilities**

A total 13,058 patients with AMI (19.6% of AMI patients) were transported to 1,695 non-PCI facilities in which PCI was not performed (58.3% of AMI facilities). Note that, in the present study, we did not investigate whether thrombolytic therapy was chosen for those patients. On the other hand, 16,138 AMI patients (24.3% of AMI patients) were transported to AMI facilities that performed less than 100 PCI annually (Fig 2A, B). A significant positive correlation was observed between the annual numbers of AMI patients and PCI performed (y = 0.23x + 11.7, r = 0.782, p < 0.001) (Fig 2C).

**Annual Number of AMI Cases by Prefecture**

The annual number of AMI patients per 10^5 population in each prefecture (Table 1) was calculated from the national census for the 2000 Population [total and Japanese population], by age [single years] and sex, percentage by age, average age and median age, see Internet Web Site: http://www.stat.go.jp/data/kokusei/2000/kihon1/00/zuhyou. The annual numbers of AMI patients per 10^5 population per prefecture were divided into 5 groups: <40, 40–50, 50–60, 60–70 and >70, and the AMI incidence map of Japan is shown in Fig 3. The lowest annual number was 37.0 in Yamanashi prefecture, and the 2nd and 3rd lowest numbers were 37.7 and 37.8 in Saitama and Shiga prefectures, respectively. The highest number was 72.5 in Kochi prefecture.
ture, and the 2nd to 4th highest numbers were 70.6, 69.4, 68.8, and 65.6 in Kumamoto, Wakayama, Gifu, and Nagasaki prefectures, respectively. The ratio of the highest prefecture incidence to the lowest incidence was 2.0. Moreover, 13 prefectures (28% of all prefectures in Japan) did not have facilities that treated more than 100 AMI patients annually (Table 1).

We investigated whether the mean age of the prefectural population is associated with the difference in annual number of AMI patients per prefecture. A significant linear correlation was observed between the annual number of AMI patients in each prefecture and the mean age of the prefectural population or the population composition ratio of people aged 65 years and over \((y = 0.069x + 38.4, r = 0.423, p < 0.01; y = 0.14x + 11.8, r = 0.428, p < 0.01)\) (Fig 4A, B).
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Discussion

Incidence of AMI in Japan

The results of the present study show that approximately 66,500 AMI patients were transported to facilities in Japan in 2000 compared with approximately 540,000 patients transported to facilities in 2000 in the United States. After correction for the populations of the 2 countries, the AMI incidence rate in Japan in the present study was approximately 25% that in the United States (incidence per 10^5 population: 52 in Japan and 192 in US). Therefore, the incidence of AMI in Japan is dramatically lower than in the United States.

Recent data on major risk factors such as serum lipids, smoking, hypertension and diabetes mellitus have not shown such large differences between Japanese in Japan and people in the United States. Therefore, the low incidence of AMI in Japan may be associated with a high intake of fish, genetic factors etc.

AMI Facilities and Optimal Care

This survey clarified the following for AMI facilities in Japan.

(1) Approximately half of all AMI patients were treated in facilities that treat less than 50 AMI patients annually and approximately one-quarter of AMI patients were treated in facilities that perform less than 100 PCI annually.

(2) Most AMI facilities treat less than 50 AMI patients annually (86% of AMI facilities), and 25% less than 100 annually; 58% of AMI facilities did not perform PCI.

It has been established that for the improvement of prognosis and post-AMI cardiac function in patients with AMI, it is necessary to perform reliable reperfusion therapy as early as possible including combination therapy such as pre-hospital thrombolysis therapy using tissue plasminogen activator followed by direct PCI. Thus, it is important to establish an emergency medical system, including pre-hospital care, that transports AMI patients as quickly as possible to specialized facilities equipped for coronary arteriography.

Regional Differences in the Incidence of AMI

This survey clarified that the incidence of AMI varied considerably among prefectures. The difference between the highest and lowest prefectures was approximately double. One possible explanation is differences in the mean age and the population of those over 65 years of age in each prefecture because the AMI incidence correlated positively with these factors. However, it is unreasonable to explain the variability only by age. Further investigation on other risk factors such as hypertension, diabetes mellitus, smoking etc. is warranted.

Study Limitations

The present study was a questionnaire survey of the number of AMI patients in facilities throughout Japan, but the diagnosis of AMI in individual patients was not investigated. AMI patients who died before reaching hospital were not included nor did the questionnaire include whether coronary thrombolysis, such as tissue plasminogen activator etc., was performed.

Conclusions

The incidence of AMI in Japan is approximately 25% that in the United States and there were considerable differences in incidence among prefectures, which may be related to the mean age. This study provides important information for the guidelines for Japanese patients with AMI.

Acknowledgments

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References


Appendix 1

The members of the Japanese Coronary Intervention Study (JCIS) Investigators

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