Original

Regional Difference in Mental Stress of Workers with Coronary Artery Disease: Importance of Area-Based Medicine

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Abstract

Objective: Mental or occupational stresses play a pivotal role in the pathogenesis of coronary artery disease (CAD). The intensity of stress on each individual can be greatly affected by the living environment in the surrounding residential area. Therefore, stress responses might differ between individuals in urban and rural areas. This study aimed to assess the differences in mental stress of workers with CAD between those treated in Kobe Rosai Hospital, which is located in the center of the Kobe metropolitan area, and Kumamoto Rosai Hospital, which is located in a rural area of Yatsushiro city.

Methods: Workers treated for CAD (Kobe, n=111; Kumamoto, n=37) were enrolled. Occupational stress was measured using the job content questionnaire (JCQ). The job strain index (JSI), a ratio of job demands to job control estimated from the JCQ, was used as an indicator of the occupational stress. Depression was evaluated using the Self-Rating Depression Scale (SDS).

Results: The evaluation of occupational stress demonstrated that 36.9% of and 37.8% of patients in Kumamoto Rosai Hospital had a JSI of 0.5 or higher in Kobe Rosai Hospital, respectively; these patients were categorized as having job stress-related CAD (JS-CAD). SDS was 40 or higher in 39.6% of CAD patients in Kobe Rosai Hospital compared to 18.9% of patients in Kumamoto Rosai Hospital.

Conclusion: There was a significant regional difference in the prevalence of depression in CAD patients. It is necessary to provide medical services according to the regional situation. The results of our investigation highlight the importance of area-based medicine.

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—Key words—

occupational stress, stress response, karoshi

Introduction

The pathogeneses of atherosclerosis-based coronary artery diseases (CADs) are complicated, and a wide variety of factors are involved[1]. Stress is thought to be a pivotal factor. Several types of stress are involved in the pathogenesis of cardiovascular diseases, including oxidative stress, mental stress, occupational stress, and social stress. There are several reports indicating that social stress, such as living alone or lacking social support exerts adverse effects on the prognosis of coronary artery disease[2)–4)]. Furthermore, previous clinical investigations have provided evidences that mental stress is closely associated with atherosclerotic cardiovascular disease. Wulsin et al also performed a meta-analysis to examine the onset of CAD and the relative risk of depression for the onset of CAD[5]. According to their results, the combined overall relative risk of depression associated with the onset of coronary disease was 1.64 (95% confidence interval [CI] =1.41–1.90). Thus, various

stressors are involved in the pathogenesis of cardiovascular diseases.

The quality and intensity of stress on each individual can be greatly affected by the living environment and the social infrastructure and lifestyle in the surrounding residential area. Therefore, there is a possibility that stress responses might differ between individuals in urban and rural areas. Kobe Rosai Hospital is located in the center of the Kobe metropolitan area. In contrast, Kumamoto Rosai Hospital is located in Yatsushiro city, a rural industrial city of the Kumagawa River Estuary in Yatsushiro Plain. The population and the population density of Kobe city are 1,534,000 and 2,750/km^2, respectively, and those of Yatsuhiro city are 126,000 and 185 people/km^2, respectively. The scale of operation of both hospitals is almost the same, and they play a central role in cardiovascular care in their respective areas. In the present study, the occupational and psychological stresses were evaluated in workers with CAD who were treated at Kumamoto Rosai Hospital or Kobe Rosai Hospital, and the regional differences with respect to stress responses were evaluated.

Method

Patients

Consecutive patients with CAD were recruited for the present study from Kobe Rosai Hospital and Kumamoto Rosai Hospital between May 2016 and December 2017. The profiles of the patients are shown in Table 1. Survey questionnaires, which were comprised of the Job Content Questionnaire (JCQ) and the Self-Rating Depression scale (SDS) were conducted just before discharge, and are described below. The purpose of the present study was explained to each participant in the documents. Written informed consent was obtained from all participants. The present study was approved by the Ethics Committee of Kobe Rosai Hospital and Kumamoto Rosai Hospital.

Evaluation of Occupational Stress by the Job Content Questionnaire

Occupational stress evaluated using the demands-control-support model was measured with the JCQ, which was developed by Karasek[6]. The JCQ includes scales for job demands, job control, and worksite social support with four-point response options from 1 (strongly disagree) to 4 (strongly agree). The job strain index (JSI), which is calculated as job demands divided by job control, has been used as an indicator for occupational stress, with higher scores indicating greater strain. The JSI was interpreted to be an indicator for excessive occupational stress when the participant scored of 0.5 or more[7].

Evaluation of Depression by the Self-Rating Depression Scale

The SDS designed by Zung is used to quantify the level of depression in patients experiencing depressive symptoms[8]. The SDS includes 10 positively worded items and 10 negatively worded items that assess depressive symptoms. The item responses are ranked from 1 to 4, and higher scores correspond to more frequent symptoms. Therefore, patients scored each item according to whether the item has occurred: 1 = never/very rarely/rarely; 2 = once in a while/some of the time/occasionally; 3 = relatively often/very often/often; 4 = most of the time/always/almost always. The SDS scores were used to define four categories of depression severity: within the normal range (below 40 points); presence of minimal to mild depression (40–47 points); presence of moderate to marked depression (48–55 points); and presence of severe to extreme depression (56 points and above)[9]. Subjects having scores over 40 points were defined as suffering from depression in the present study.

Statistical analysis

Continuous variables are expressed as medians and inter-quartile ranges or percentage. Patient characteristics and distribution of job category of patients among the groups were compared by Chi-square test. Statistical comparison of age between Kumamoto and Kobe was carried out using the Mann-Whitney U test. p values <0.05 were considered statistically significant. Statistical analysis was performed using Prism for Mac version 5.

Results

We enrolled 111 and 37 workers with CAD in the Kobe Rosai Hospital and Kumamoto Rosai Hospital, respectively. The age of participants of Kumamoto Rosai Hospital was higher than that of Kobe Rosai Hospital.

Table 1 Profile of Patients

	Kobe (n = 111)	Kumamoto (n = 37)	p value
Age (years old)	59.0 (52.0, 66.0)	63.0 (58.5, 69.5)	$p<0.005$
Male sex (%)	91.9	75.6	ns
Hypertension (%)	37.8	72.9	$p<0.005$
Diabetes (%)	29.7	45.9	ns
Dyslipidemia (%)	56.8	45.9	ns
AMI (%)	27.0	35.1	ns
Job category			
Managers (n, %)	20, 8.0	6, 16.2	ns
Drivers (n, %)	9, 8.1	3, 8.1	ns
Engineers (n, %)	11, 9.9	4, 10.8	ns
Sales workers (n, %)	19, 17.1	1, 2.7	$p<0.05$
Service workers (n, %)	14, 12.6	6, 16.2	ns
Clerical workers (n, %)	11, 9.9	4, 10.8	ns
Constructors (n, %)	14, 12.6	2, 5.4	ns
Agriculture (n, %)	0, 0	8, 21.6	$p<0.001$
Others (n, %)	13, 11.7	3, 8.1	ns

AMI, acute myocardial infarction

There were no differences in sex, prevalence of diabetes, dyslipidemia, and the acute myocardial infarction between the two hospitals. However, the prevalence of hypertension in Kumamoto Rosai Hospital was higher than that in Kobe Rosai Hospital (Table 1).

The distribution of job category of patients was examined with Chi-square test. Regarding with the distribution of job category, there was a significant difference between Kobe and Kumamoto. The proportion of sale workers admitted to Kobe Rosai Hospital were higher compared to Kumamoto Rosai Hospital. There were no agriculture workers admitted to Kobe Rosai Hospital.

The evaluation of occupational stress with JCQ demonstrated that 36.9% of and 37.8% of patients in Kumamoto Rosai Hospital had a JSI of 0.5 or higher in Kobe Rosai Hospital, respectively (Fig. 1A). These patients with JSI 0.5 or higher were categorized as having job stress-related CAD (JS-CAD). The prevalence of JS-CAD did not differ between the two groups, indicating that there was no difference in the prevalence of JS-CAD between the two regions, regardless of job categories. The number of patients in Kobe Rosai Hospital who were living alone was significantly higher than in Kumamoto Rosai Hospital (Fig. 1B).

Next, the prevalence of depression was examined using the SDS. SDS was 40 of higher in 39.6% of CAD patients in Kobe Rosai Hospital compared to 18.9% of patients in Kumamoto Rosai Hospital (Fig. 1C). Thus, there was a significant difference in the prevalence of depression in worker with CAD between the two regions.

Discussion

In the present investigation, we demonstrated that approximately 37% of workers with CAD experienced high occupational stress regardless of job categories, and there was a regional difference in terms of the prevalence of depression in workers with CAD. The living environment and the social infrastructure and lifestyle in each resident area could have caused the regional difference in stress responses. Although the numbers of cases in the present study is small, we speculate that the difference between two regions in the proportion of individuals living alone might partly explain the differences in the prevalence of depression in worker with CAD.

Occupational stress is largely involved in the pathogenesis of cardiovascular disease and stroke. *Karoshi*, or. death from overwork is an extreme outcome of these diseases[10]. Stroke and cardiovascular diseases associated with overwork are extremely rare in Europe and the US because of very strict labor regulations. However, many deaths related to excessive occupational stress still occur in Japan despite the widespread recognition of the problem since the 1980s. Occupational stress is considered as the major cause of cases of *karoshi*, al-

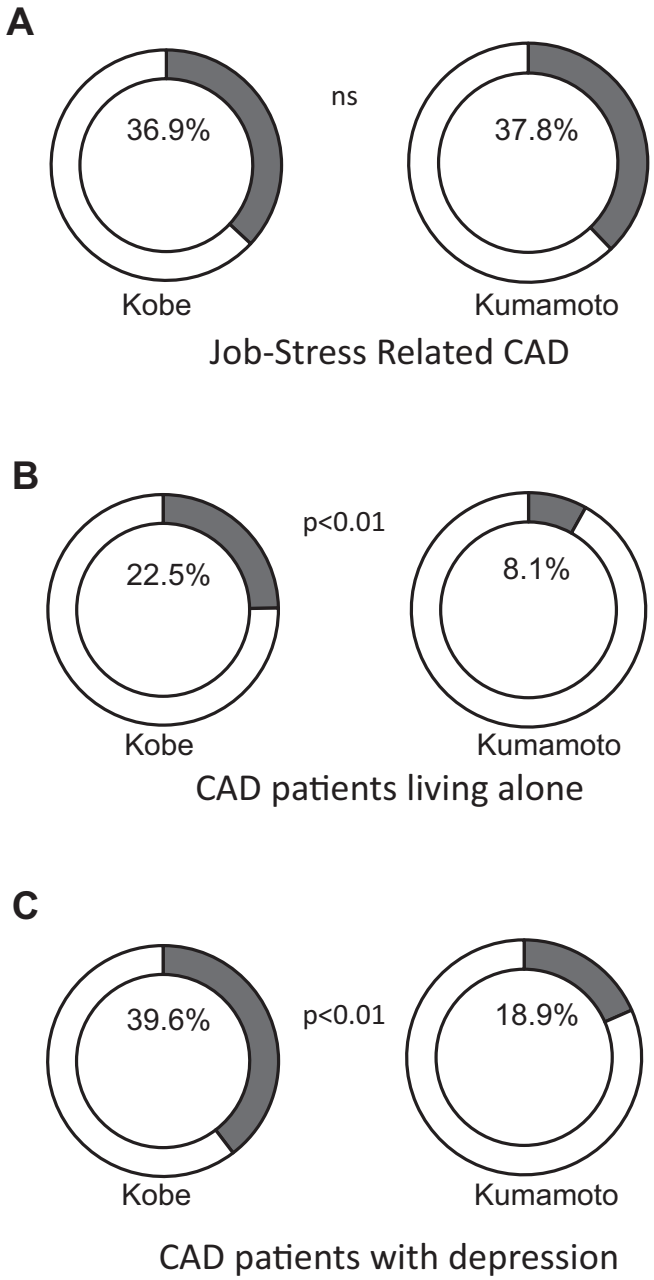

Fig. 1 A. The proportion of workers with coronary artery disease (CAD) patients having Job strain index of 0.5 or higher in Kobe Rosai Hospital and Kumamoto Rosai Hospital. These patients with JSI 0.5 or higher were categorized as having job stress-related CAD (JS-CAD). The prevalence of JS-CAD did not differ between the two hospitals.

B. The proportion of workers with CAD patients who were living alone in Kobe Rosai Hospital and Kumamoto Rosai Hospital. The proportion of CAD patients in Kobe Rosai Hospital who were living alone was significantly higher than in Kumamoto Rosai Hospital.

C. The proportion of workers with CAD patients having SDS scores of 40 or higher in Kobe Rosai Hospital and Kumamoto Rosai Hospital. There was a significant difference in the prevalence of depression in worker with CAD between the two regions.

though lifestyle factors are involved in the pathogenesis of these diseases. In the present study, approximately 37% of CAD workers were under high occupational stress. Such cases might be at risk for *karoshi*. Therefore, comprehensive medical and social interventions are necessary.

Societies are aging at a faster rate worldwide, and aging has been particularly rapid in Japan. The aging population is creating a burden on health care systems, which are pressured to maintain adequate levels of care for aged patients with atherosclerotic cardiovascular diseases. Many areas are suffering from depopulation, especially rural areas, where the population decline is intense. On the other hand, lack of social support is a major problem in the urban areas. Recently, a paradoxical death from "city's loneliness", defined as dying from loneliness in the city, became recognized as a social problem. Thus, the issues related to stress in urban, rural, and depopulated areas are significantly different. Therefore, it is difficult to promote the preventive medical care in a consistent manner, and it is important to consider differences in regional social backgrounds for the prevention of cardiovascular diseases. In 2025, one in four people will be over 75 years old in Japan, and it is expected that medical and nursing care needs will sharply increase. From the viewpoint of medical demand, it should be kept in mind that there are differences in the type of medical care needed depending on the area. Furthermore, it is necessary to provide medical services according to the regional medical needs. Area-based medicine, in which means regional medical care is based on the situations in the surrounding residential area, seems to be necessary. The results of our investigation highlights the importance of area-based medicine.

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冠動脈疾患症例におけるストレス応答の地域差に関する研究
―Area Based Medicine を目指して―

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―キーワード―
職業性ストレス，ストレス応答，過労死

［目的］過労死の要因となる脳心血管病の発症には，精神的ストレスや社会的ストレスが重要な役割を果たしている．また各症例に負荷されるストレスの質や強度は，その地域における社会的な基盤や生活様式に影響される．神戸労災病院は神戸都市圏中心部に位置しており，一方，熊本労災病院は球磨川河口八代平野の田園工業都市八代市に在り，人口及び人口密度は，神戸市が 153 万 4 千人，2,750 人/km^2，八代市が 12 万 6 千人，185 人/km^{2}である．今回の研究は，熊本及び神戸労災病院に入院加療を受けた冠動脈疾患症例を対象に，職業性ストレス及び精神的ストレスを評価し，その地域差を検討した．［方法］対象は，神戸及び熊本労災病院にて冠動脈疾患にて入院加療を受け，研究参加の同意を得た勤労者（神戸 111 例，熊本 37 例）．精神的ストレスは，Self-rating Depression Scale（SDS）にて評価し 40 点台以上を抑うつ傾向ありと判定した．職業性ストレスは Job Content Questionnaire（JCQ）にて評価した．JCQ の job demand 値を job control 値で除した job strain index（JSI）を職業性ストレスの目安とし，0.5 以上を職業性ストレス高度と判断した．［結果］JSI 0.5 以上の症例は，神戸 36.9%，熊本 37.8% と差は無かった．抑うつを呈していた割合は神戸 39.6%，熊本 18.9% と，神戸で有意に高率であった．独居の割合は神戸 22.5%，熊本 8.1% であった．［考察］冠動脈疾患症例で職業性ストレスが高度な症例（職業性ストレス関連冠動脈疾患）の割合は両地域で差異は無かったが，抑うつの頻度は神戸で高く地域差を認めた．生活様式や社会的基盤が，ストレス応答に影響を及ぼすことが推察された．ストレス関連疾患を検討する場合，地域による社会的背景も考慮することが重要であることが示唆された．

利益相反：利益相反基準に該当無し

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