Social Science & Medicine 72 (2011) 1652–1658

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Impact of occupational stress on stroke across occupational classes and genders

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ARTICLE INFO

Article history:
Available online 5 April 2011

Keywords:
Japan
Epidemiology
Gender
Occupations
Psychological stress
Socioeconomic factors
Gender

ABSTRACT

The aims of the present study were to analyze the association between incident stroke, occupational class and stress and to examine whether the association is found in both men and women in a prospective study of Japanese male and female workers. A total of 3190 male and 3363 female Japanese community-dwelling workers aged 65 or under with no history of cardiovascular disease were followed. Occupational stress was evaluated using a demand-control questionnaire. The impact on stroke was examined in stratified analyses of occupational classes. We identified 147 incident strokes (91 in men and 56 in women) during the 11-year follow-up period. Men with high strain jobs (combination of high job demand and low job control) were nearly three times more likely to suffer from a stroke than men with low strain jobs (combination of low job demand and high job control). Among male workers in low occupational classes (blue-collar and non-managerial work), job strain was associated with a higher risk of stroke. In contrast, there was no association between job strain and incident stroke among male workers in high occupational classes (white-collar and managerial work). No statistically significant differences were found for stroke incidence among the job characteristic categories in all the female participants. However, significant, over five-fold excess risks were found among white-collar and managerial female workers exposed to high job strain, compared with their counterparts with low strain jobs. Our study of Japanese workers provided supportive evidence for vulnerability to occupational stress among lower occupational class workers in males but not in females.

Introduction

Previous studies have indicated that workers in lower occupational classes are more vulnerable to occupational stress than workers in higher occupational classes (Hallqvist, Diderichsen, Theorell, Reuterwall, & Ahlbom, 1998; Kivimäki et al., 2002; Lynch, Krause, Kaplan, Tuomilehto, & Salonen, 1997; Theorell et al., 1998; Wege et al., 2008). Only a few studies have prospectively investigated the association between occupational class and occupational stress using stroke as the outcome (Kivimaki et al., 2009; Kuper, Adami, Theorell, & Weiderpass, 2007; Toivanen, 2008; Toivanen & Hemström, 2008; Virtanen & Notkola, 2002). Of those, one study showed that female lower occupational class non-manual workers with low job control had a significantly higher risk of stroke mortality (Toivanen & Hemström, 2008). Other prospective studies did not test whether lower occupational class workers were more susceptible when exposed to occupational stress (Kivimaki et al., 2009; Kuper et al., 2007). Thus, there is no prospective study that has addressed different vulnerabilities to stress across occupational classes using incident stroke as an outcome. In addition, there may be gender differences in the health impact of socioeconomic factors as well as occupational stress (Kopp, Skrabski, Szekely, Stauder, & Williams, 2007). Nevertheless, few studies have addressed the potential interaction between gender and occupational or employment status and gender differences in work hazard exposures and the health impact. Furthermore, the prospective associations between occupational class/occupational stress and health outcomes have not been examined extensively outside Western societies. Data from the Jichi Medical School Cohort Study of a Japanese working population, a large-scale prospective cohort study, allowed an approach to this important issue. The aims of the present study were to analyze the association between incident stroke, occupational class and stress and examine whether the association is found in both men and women in a prospective study of Japanese male and female workers.

Materials and methods

Study populations

Data were acquired from routine mass screening examinations for cardiovascular diseases in the aged, which were carried out in

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doi:10.1016/j.socscimed.2011.03.026

Japan in accordance with relevant legal regulations. The regulations required municipal governments to manage the program efficiently and to make it available to all residents who wished to participate. The local government office invited all potential participants in each community to attend screenings by sending letters or using public information channels. The invitation explained that people who were visiting hospitals or clinics in relation to cardiovascular diseases were exempt from the examination. Ultimately, 12,490 Japanese individuals from 12 communities across Japan participated between 1992 and 1995. The overall response rate was 65.4% (Ishikawa, Gotoh, Nago, Kayaba, & Jichi Medical School (JMS) Cohort Study Group, 2002). Because the aim of this study was to analyze the association between incident stroke, occupational class and occupational stress, the study population was limited to 3190 male and 3363 female workers with baseline ages ≤65 years who were free from stroke or myocardial infarction and completed information regarding occupations. Compared with the general working population, the study population included larger proportions of older workers and workers engaged in pre-industrial occupations (farming/forestry/fisheries) (Tsutsumi, Kayaba, Kario, & Ishikawa, 2009). Over 99% of the participants were employed by companies with fewer than 300 employees. Japanese companies are required to conduct an annual health check-up of their employees. However, for those not offered health examinations at their workplace, such as workers with pre-industrial occupations or those who were self-employed, the mass screening examination program provided an opportunity to have their health status checked. Furthermore, many small companies (local industries) or local government offices used the opportunity to get health checkups for their employees in rural districts, such as those included in our study areas. We inferred from the analysis of repeated surveys that changes in occupation or job position were infrequent in the settings studied (Kayaba, Tsutsumi, Gotoh, Ishikawa, & Miura, 2005). Some part-time employees may have been included in the study population, but this was not ascertained.

Surveillance of stroke

The established follow-up system ensured that participants were contacted annually by direct interview or telephone/letter to determine their health status. Participants were asked if they had suffered a stroke or cardiovascular disease after enrolling. They were asked which hospital they attended and when, to ascertain the incidence of these diseases. When an incident case was suspected, all the medical records were reviewed and duplicate computer tomography films or magnetic resonance imaging films for these patients were obtained. The diagnosis of stroke was based on the presence of a focal and nonconvulsive neurological deficit lasting ≥24 h, with a clear onset. Patients who had a transient ischemic attack were excluded. The diagnosis was determined independently by a diagnostic committee composed of a radiologist, a neurologist and two cardiologists. Specific causes of mortality were determined for all participants who died between the date of their health examination and the end of 2005, using the Cause-of-Death Register found at the public health center located in each community. This was done with the permission of the Agency of General Affairs and the Ministry of Health, Labor and Welfare.

Assessment of occupational class

Two categories of occupation (white-collar and blue-collar) and two categories of position (manager and non-manager) were used to reflect the occupational classes related to socioeconomic status. Participants' occupations at baseline were classified according to the National Statistics guidelines (Ministry of Internal Affairs and Communications, 1998). The following occupations were included: professional or technician (n = 196 men, 196 women); clerk (198, 342); sales worker (249, 355); service worker (250, 550); farming, forestry, or fisheries worker (1200, 1134); security worker (18, 1); transportation or communications worker (87, 4); construction worker (609, 83); craft worker or laborer (330, 657) and unclassified (53, 41). Regarding occupation, the first four job categories (from professional/technician to service worker) were classed as white-collar jobs; the remainder was classed as blue-collar jobs. If participants reported themselves to be a manager, they were classed as white-collar, regardless of their chosen job category. Positions were classed as either manager or non-manager. Subjects were categorized as managers if they reported themselves to be employers or managers at their companies. The managerial positions included relatively large numbers of employers or administrative personnel, reflecting the rural setting of our study. The majority was considered to be self-employed. In accordance with several preceding studies, we classed self-employed workers as managerial, even though they may not necessarily have had any subordinates (Fukuda, Nakamura, & Takano, 2005; Kawakami et al., 2004; Rosengren et al., 1990; Wege et al., 2008). Although our occupational classification was based on simple questions, previous analyses of this cohort found that the occupational categories showed a reasonable association with psychosocial job characteristics and lifestyle factors (Hirokawa, Tsutsumi, & Kayaba, 2006; Tsutsumi, Kayaba, Tsutsumi, & Igarashi, 2001).

Assessment of occupational stress

Occupational stress was evaluated at baseline using a Japanese version of the Demand-Control Questionnaire from the WHO-MONICA Psychosocial Study Questionnaire. The questionnaire is based on Karasek's demand-control model (Karasek & Theorell, 1990). The model states that workers who face high psychological demands and have little control over their work (i.e., job strain) are at greater risk of becoming ill. This questionnaire has the following subscales: job demands related to quantitative and qualitative workloads (5 items) and job control related to decision-making authority and skill discretion (6 items). All questions are scored on a Likert scale of 1–4. Cronbach's alpha coefficients for the job demand index and job control index were 0.69 and 0.65, respectively. The job conditions in this cohort during the follow-up period demonstrated a moderate degree of stability with 5-year-interval intraclass correlation coefficients of 0.55 (n = 378) for job demands and 0.63 (n = 377) for job control (Kayaba et al., 2005). Cross-classification of the job demand and job control scales according to their sex-specific median values produced a quadrant scheme with four psychosocial job characteristics: low job demand and high job control, representing a low strain job (reference category); high job demand and high job control, representing an active job; low job demand and low job control, representing a passive job; and high job demand and low job control, representing a high strain job.

Assessment of confounding factors

We measured the following demographic characteristics and conventional risk factors at baseline: age (18–39, 40–49, 50–59, 60–65 years); educational attainment (≤15 years: age at completion of compulsory education; 16–18 years: age at finishing senior high school; ≥19 years: age at entering college or further education); smoking status (lifetime non-smoker, ex-smoker, current smoker); alcohol consumption (non-drinker, <1 go daily (go, a traditional Japanese alcohol unit; 1 go = 28.9 g of alcohol), ≥1 go