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Article

Differences in stroke and ischemic heart disease mortality by occupation and industry among Japanese working-aged men

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ABSTRACT

Occupation- and industry-based risks for stroke and ischemic heart disease may vary among Japanese working-aged men. We examined the differences in mortality rates between stroke and ischemic heart disease by occupation and industry among employed Japanese men aged 25–59 years. In 2010, we obtained occupation- and industry-specific vital statistics data from the Japanese Ministry of Health, Labour, and Welfare dataset. We analyzed data for Japanese men who were aged 25–59 years in 2010, grouped in 5-year age intervals. We estimated the mortality rates of stroke and ischemic heart disease in each age group for occupation and industry categories as defined in the national census. We did not have detailed individual-level variables. We used the number of employees in 2010 as the denominator and the number of events as the numerator, assuming a Poisson distribution. We conducted separate regression models to estimate the incident relative risk for stroke and ischemic heart disease for each category compared with the reference categories "sales" (occupation) and "wholesale and retail" (industry). When compared with the reference groups, we found that occupations and industries with a relatively higher risk of stroke and ischemic heart disease were: service, administrative and managerial, agriculture and fisheries, construction and mining, electricity and gas, transport, and professional and engineering. This suggests there are occupation- and industry-based mortality risk differences of stroke and ischemic heart disease for Japanese working-aged men. These differences in risk might be explained to factors associated with specific occupations or industries, such as lifestyles or work styles, which should be explored in further research. The mortality risk differences of stroke and ischemic heart disease shown in the present study may reflect an excessive risk of Karoshi (death from overwork).

1. Introduction

Long working hours may be a risk factor for stroke and ischemic heart disease (Kivimäki et al., 2015). The Japanese Ministry of Health, Labour and Welfare designated Karoshi (a Japanese word meaning death due to overwork) as part of the national compensation scheme in 2001 (Ministry of Health, Labour and Welfare, 2015b). This included stroke (e.g., cerebral hemorrhage, cerebral infarction, subarachnoid hemorrhage and hypertensive encephalopathy) and ischemic heart disease (e.g., angina pectoris, sudden cardiac arrest, and dissecting aneurysm of the aorta). To determine compensation, the compensation agency scrutinized the background of each death if the onset of disease was triggered by work; for example, high levels of stress before the onset of disease(s), and short- and long-term overload assessed by the amount of overtime. Both lethal and recovered cases were covered by this compensation (Iwasaki, Takahashi, & Nakata, 2006).

To date, about 400 cases of stroke (22% fatal events) and 250 cases of ischemic heart disease (65% fatal events) have been approved by the compensation agency each year (Ministry of Health, Labour and Welfare, 2015a). A review of the available statistics indicates that some occupations and industries have more cases approved. For example, transportation (24%) had the highest number of all approved Karoshi cases due to stroke and ischemic heart disease.

Occupation and industry is an important risk factor about stroke and ischemic heart disease (Honjo, 2014; Kunst et al., 1999; Luckhaupt & Calvert, 2014; Robinson et al., 2015). Occupational cardiovascular risk factors in farm and office environments include shift work, extreme heat, cold, noise, carbon disulfide, nitroglycerin, carbon monoxide, and stress (Robinson et al., 2015). About working hours in Japan, workers in construction and transportation industry

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worked longer than those in other industries (Statistics Bureau, 2015). Though the differences of mortality ratio between occupations and industries were confirmed in suicide and mental disorder (Eguchi, Wada, Higuchi, Yoneoka, & Smith, 2015; Wada, Eguchi, Prieto-Merino, & Smith, 2015) in Japan, the study in order to confirm the differences of moratarity ratio due to ischemic heart disease and stroke were limited.

We hypothesized that the populations at risk for stroke and ischemic heart disease may be determined by occupation and industry. Occupation- or industry-based risk differences have previously been found for suicide among Japanese working-aged males (Wada et al., 2015). We compared rates of stroke and ischemic heart disease across different occupations and industries to identify which occupations and industries had high or low rates of disease, and which might pose risk or protective factors associated with cardiovascular disease. We also looked for clues to work-related etiological factors for cardiovascular disease. Details about the risk differences of stroke and ischemic heart disease may help to identify target populations needing interventions to prevent premature death and Karoshi. These occupation- and industry-based risk differences for stroke and ischemic heart disease may reflect differences in lifestyles and work styles associated with the risks for these diseases. The Japanese Ministry of Health, Labour, and Welfare collects occupation- and industry-specific vital statistics at 5-year intervals, during the same year as the National Census. This dataset may delineate the risk of death by occupation and industry. This is the first study to examine occupation- and industry-based differences in the mortality rates for stroke and ischemic heart disease among employed Japanese men aged 25–59 years. We excluded unemployed men who had already been identified as a high-risk group for stroke and ischemic heart disease to focus on the differences between occupations and industries (Nakao, 2010).

2. Methods

2.1. Statistical analysis

We examined data for Japanese men who were aged 25–59 years in 2010, grouped into 5-year age intervals. We estimated the mortality rates of stroke and ischemic heart disease for each age group in the occupation and industry categories defined in the national census. We used the number of employees in 2010 as the denominator and the number of events as the numerator, assuming a Poisson distribution. We conducted separate regression models to estimate the incident relative risk (IRR) for stroke and ischemic heart disease in each occupational category compared with the reference category “sales group.” We then conducted separate regression models to estimate the IRR for stroke and ischemic heart disease in each industry compared with the reference industry “wholesale and retail.” We examined whether the occupation or industry differed by age by fitting interaction terms with age classified in 5-year age interval groups (7 groups); detailed information about the statistical analysis have been published elsewhere (Wada et al., 2015). To confirm the interaction effects of age, two additional analyses were conducted. We examined the interactions with age using three age groups (25–39, 40–49, 50–59). We also examined the interactions with age by including only industries/occupations with more than 100 deaths from stroke and ischemic heart disease. We drew scatter plot of the relative risks for IHD versus those for stroke of the occupations and industries. Data were analyzed using STATA version 14 (StataCorp LP; College Station, TX, USA).

2.2. Data sources

We obtained the dataset for occupation- and industry-specific vital statistics from the Japanese Ministry of Health, Labour, and Welfare in 2010. We calculated occupation- and industry-specific death rates based on the 2010 national population census at 1 October 2010 (also implemented at 5-year intervals on 1 October).

2.3. Measurements

Death certificate data includes the underlying cause of death. This is completed by physicians based on the sequence of events leading to the death and coded according to the International Classification of Diseases, 10th Revision (World Health Organization, 1992). Ischemic heart disease includes ICD-10 codes I200–I259 and I460–I469, and stroke includes codes I600–I639, I674, I710–I719.

In the years in which occupation- and industry-specific vital statistics were collected, family members of deceased people were required to report the occupation and industry of the deceased person. The families were given occupation and industry lists, and corresponding descriptions and definitions, and asked to select one occupational and one industry category. The occupation list included 11 occupations: administrative and managerial; professional; clerical; sales; services; security; agriculture; manufacturing; transport; construction and mining; and carrying, cleaning, and packaging. The industry list comprised 19 industries: agriculture; fisheries; mining; construction; manufacturing; electricity and gas; information; transport; wholesale and retail; finance; real estate and rental; research and professional services; accommodation and dining services (e.g., hotels, and eating and eateries); amusement services; education; medical and welfare; compound services (e.g., postal services and cooperative associations); other service industries; and government.

These categories are based on Japanese Standard Classification of Occupations (Ministry of Internal Affairs and Communications, 2009). Detailed lists of occupations and industries have been published elsewhere (Wada et al., 2015).

2.4. Ethics

We requested access to the dataset from the Ministry of Health, Labour and Welfare, Japan, based on the Statistics Act of Japan. We obtained de-identified data for research purposes, and formal ethics approval and informed consent were not required.

3. Results

Table 1 presents the distribution of stroke and ischemic heart disease mortality cases by occupations and industries. Stroke accounted for 4875 deaths among Japanese men aged 25–59 years. We excluded 1633 men who were unemployed at the time of death, 944 without an occupation category, and 1045 without an industry category. The total number of stroke cases analyzed was 2298 by occupation and 2197 by industry. Ischemic heart disease accounted for 6735 deaths among Japanese men aged 25–59 years. We excluded 2648 men who were unemployed at the time of death, 1320 without an occupation category, and 1490 without an industry category. The total number of ischemic heart disease cases analyzed was 2767 by occupation and 2597 by industry. The highest mortality for stroke was for the occupation “service” and industry “mining” and for ischemic heart disease was for the occupation “administrative and managerial” and industry “mining.” The largest number of death cases for stroke and ischemic heart disease for occupation was “professional and engineering” and for industry was “manufacturing.”

Table 2 and Fig. 1 shows the relative mortality risk for stroke and ischemic heart disease by occupation among males aged 25–59 years. Compared with “sales” the “service,” “administrative and managerial,” “agriculture, construction and mining,” “transport and machine operation,” and “professional and engineering” categories had higher relative mortality risks for stroke and ischemic heart disease. No interaction was found between age and occupation.

The age-adjusted Incident Relative Risks by industry for stroke and ischemic heart disease are shown in Table 3 and Fig. 2. “mining,”