Work-Related Factors Associated with Visiting a Doctor for a Medical Diagnosis after a Worksite Screening for Diabetes Mellitus in Japanese Male Employees

Kaho TSUDA, Akizumi TSUTSUMI and Norito KAWAKAMI

Department of Hygiene and Preventive Medicine, Okayama University Graduate School of Medicine and Dentistry, Japan

Abstract: Work-Related Factors Associated with Visiting a Doctor for a Medical diagnosis after a Worksite Screening for Diabetes Mellitus in Japanese Male Employees: Kaho TSUDA, et al.
Department of Hygiene and Preventive Medicine, Okayama University Graduate School of Medicine and Dentistry—This paper aims to investigate the work-related factors that affect whether Japanese male employees will seek a medical diagnosis after being screened for diabetes mellitus. Participants in this study received a questionnaire two months after receiving the results of their physical checkup. The analysis focused on 213 regular employees of small and medium-sized companies who were aged 35–64 and who had tested positive for diabetes in a screening. Only 42% of the subjects visited a doctor for medical diagnosis during an average follow-up period of 47.5 d. Cox’s proportional hazard regression was used to analyze the length of time between the employees’ receipt of the results and their first visit to a doctor’s office. The employees who could comfortably take a day off, compared to those who found it difficult to do so, were more likely to visit a doctor (hazard ratio (HR) 1.94; 95% confidence interval (CI) 0.85, 4.42; p for trend 0.05). In addition, employees with a high level of psychological job control, compared to those with low level of job control, were more likely to visit a doctor (HR 1.80; 95% CI 0.94, 3.45; p for trend 0.08). Employees who worked the longest (61 h per week or more) were less likely to visit a doctor than those working from 41 to 60 h weekly (HR 0.41; 95% CI 0.17, 0.98). The findings suggest that a flexible work schedule, autonomy at work, and no excessive working hours tend to improve the chance of visiting a doctor after screening for diabetes mellitus. (J Occup Health 2004; 46: 374–381)

Key words: Work-related factors, Doctor’s visit, Worksite screening, Diabetes mellitus

The prevalence of diabetes mellitus has been increasing in Japan1), and, as a result, the prevention and treatment of diabetes mellitus are major concerns. Screening for diabetes mellitus results in the detection of the disease and medical care in the early stages, which can slow the progression of the disease and prevent its complications.

While there is no doubt that the appropriate treatment of diabetes is important, it is also important to visit a doctor for a medical diagnosis without delay after the screening. According to the Industrial Safety and Health Law and its related regulations2) in Japan, Japanese companies conduct an annual health check-up of employees, including a screening for diabetes. Employees with high blood glucose levels are encouraged to visit a doctor to confirm the diagnosis of diabetes. If the medical diagnosis is glucose intolerance or diabetes, the employee receives medical advice regarding lifestyle modification or drug treatment. Employers are required by the Law3) to make an effort to provide advice from a doctor or a public health nurse to their employees with a positive result, including facilitating a visit to a doctor for a medical diagnosis, in order to secure the health and safety of employees. Nevertheless, fewer than 50% of those who had positive results during a worksite screening for diabetes visited a doctor for a medical diagnosis4). This may be partly attributable to non-work-related factors, such as the characteristics of workers and the access to a medical service. However work-related factors, such as worksite policy and working conditions, may prevent an earlier visit to a doctor after a positive result of a screening for diabetes.

A number of studies have investigated factors
associated with treatment adherence among diabetes patients. These factors include (1) demographic characteristics of patients (age, gender, ethnicity, education, income, marital status)\(^4\), (2) severity of the disease (duration of symptoms, length of time since diagnosis, etc.)\(^4, 6\), (3) accessibility of treatment (cost, transportation, etc.)\(^7\), and (4) psychosocial characteristics of patients (health beliefs, locus of control, self-efficacy, perceived social support)\(^8, 6, 8–10\), although some of the research findings are inconsistent\(^6\). Some studies have addressed the effects of work-related factors on treatment adherence among diabetes patients\(^8\). An inflexible work schedule\(^9\), restrictive worksite policy, great work pressure, and low control over work pace\(^10\) have been pointed out as factors associated with poor treatment adherence among workers with diabetes. A survey in Japan also found that long working hours and a limited number of paid vacation days were predictive of dropping out of treatment among employed diabetic men\(^12\), whereas working a rotating shift was not associated with dropping out\(^12\).

On the other hand, far fewer studies have investigated factors associated with visiting a doctor for a medical diagnosis after having a positive result in a screening for diabetes\(^13\). A case-control study showed that older age, female gender and unemployment were associated with visiting a doctor for a medical diagnosis after a community-based screening program for several chronic conditions, including diabetes, in Japan\(^13\). A study in the U.S. found that medical insurance coverage was associated with visiting a doctor after receiving positive results in a screening for diabetes mellitus\(^14\). Another factor which is consistently associated with visiting a doctor after a screening for diabetes is having a recommendation from community public health or occupational health nurses\(^13, 15\).

To date, there has been no epidemiological study that has examined work-related factors associated with employees’ visiting a doctor after receiving positive diagnoses for diabetes at worksite screenings. In the worksite setting, one of the most common reasons for not visiting a doctor after a positive screening result was insufficient time, although the finding was not specific to a screening for diabetes\(^5\). Long working hours may directly result in a lack of time to visit a doctor after a diabetes screening, just as this factor is associated with diabetes patients’ dropping out of treatment\(^2\). Long working hours have also been associated with poor health-related attitudes and behaviors in general\(^6\). In addition, it might be reasonable to hypothesize that an inflexible work schedule, such as difficulty in taking a day off, prevents workers from visiting a doctor after a diabetes screening, which also has been pointed out as a possible factor for poor treatment adherence among diabetes patients\(^9\). Furthermore, previous studies have shown that psychosocial job characteristics, such as greater job demands and lack of job control, are also associated with poor treatment adherence among diabetes patients\(^13\) and with poor health-related behaviors in general\(^17, 18\). These psychosocial job stressors may interfere with an employee’s decision to visit a doctor after he/she receives a positive result from a screening for diabetes mellitus. The effects of these work-related variables should be investigated in order to facilitate a quicker visit to a doctor after a positive result from a screening for diabetes in the worksite setting.

From the methodological view, most previous studies have examined the association of relevant factors with a dichotomized outcome indicator, i.e., whether or not an individual visited a doctor in a certain time period. Only one study has considered the time from the receipt of the positive screening result to a visit to a doctor in the analysis, e.g., by employing a life-table analysis\(^13\). The use of such an analysis might provide more statistical power to detect the association between the time of notification and the time of the doctor’s appointment.

The objective of this study was to investigate work-related factors that determine whether a Japanese male employee will visit a doctor after receiving positive results from a screening for diabetes. The hypothesis of the present study is that employees who have an inflexible work schedule or work longer hours and those who have greater job stressors according to the job demands-control model\(^19\) are less likely to visit a doctor for a medical diagnosis after receiving a positive screening result for diabetes at the workplace. In this study, we employed a life-table analysis considering the time from the day of receipt of a screening result to the day of visiting a doctor for a medical diagnosis.

**Subjects and Methods**

Small and medium-sized companies, mainly in the manufacturing industry, with 2 to 630 employees were invited to participate in the study. The workplace physical checkups were conducted at the Chugoku Occupational Health Association from May through July 2003. Before the physical examinations were conducted, consent was obtained at 2,295 companies. A total of 25,871 employees (19,742 males and 6,129 females) were given physical examinations at their workplace. Screenings for diabetes mellitus were conducted with reference to the plasma glucose level or \(\text{HbA}_1c\), according to standard criteria. The criteria for the plasma glucose level with consideration of the last meal were as follows: more than 126 mg/dl at fasting, more than 200 mg/dl until 3 h after a meal, and more than 160 mg/dl from 3 to 4 h after a meal; more than 4 h was considered the same as fasting. The cut-off point for \(\text{HbA}_1c\) was 6.0%. A total of 898 employees (780 males and 118 females) were suspected of having diabetes mellitus. The results of the physical examination
were sent to each employee about three weeks (average 20 d with a standard deviation of 5.7 d) after the physical examination; the results included a referral letter for the individuals to visit a doctor for a medical diagnosis if they were suspected of having diabetes and were not yet receiving medical care. The date when the results of the physical examination were delivered to each workplace was recorded by a nurse. Approximately 2 months later, the 898 individuals received a self-administered questionnaire at the address of their workplace. We decided the time interval based on the fact that Japanese employers should encourage their employees to visit a doctor within three months of the physical examination\(^2\). The purpose and procedure of the study were explained to all the potential subjects at the beginning of the questionnaire. They were asked about work-related factors and whether they had received a recommendation to visit a doctor from an occupational health nurse or physician. A total of 564 employees (62.8\%) returned the questionnaire in the stamped and self-addressed envelope. Written consent was obtained from 476 (53.0\%) of the employees. With the prior consent of the participants, their sex, age and occupational classification at the company were obtained from the records of the physical checkup. Because only 9.6\% of the subjects were female (n=50), they were excluded from the study. A total of 387 active employees aged 35 to 64 were selected because the law does not require that the blood glucose level of employees aged 34 and younger (n=20) be measured in a screening for diabetes, and employees aged 65 and above (n=19) might have secondary diabetes mellitus due to other diseases. Furthermore, the following employees were excluded: 21 who had died, retired, or were on a long-term business trip at the time of follow-up; 46 contingent employees; 15 who had visited a doctor for a medical diagnosis before they received the results of the physical examination; four who had been under medical treatment; and 88 with missing data. Thus, 213 subjects were analyzed. Of those, 137 employees (64.3\%) worked at companies with less than 50 employees.

**Study variables**

**Outcome measures**

The employees were asked whether they had visited a doctor for a medical diagnosis for diabetes. If they had already visited a doctor, they were asked about the date when they visited the doctor for a closer examination.

**Demographic variables**

Age was classified into three categories: 35–44 (n=40), 45–54 (n=92), and 55–64 yr (n=81). Occupation was categorized into three groups based on the self-report: managers (n=45), white-collar workers (17 professionals/technicians, 13 office workers, 14 salespersons, and one service provider), blue collar workers (92 factory workers, 28 transportation workers, two security workers, and one miner).

**Work-related factors**

The number of work hours was categorized into two groups according to whether the participants worked overtime. The number of work hours was 40 or less weekly (one each for 30, 32, 33 and 36 h, two for 38 h, and 42 for 40 h) (n=48) and 41 or more weekly (n=165). The ease with which an employee could take a day off to visit a doctor was measured by the following four items: 1) Can easily take a day off, 2) Can take time off with pay, 3) Can schedule a day off, and 4) Can take sick leave without notification. The items were scored 1 (no) or 2 (yes), and the total scores were calculated and classified into the following three categories: 4 (difficult), 5–6 (moderate), and 7–8 (easy).

We used the Japanese version of the Job Content Questionnaire\(^{20}\), which assesses environmental job stress based on the job demands-control model\(^{19}\). The questionnaire consisted of 5 items of job demands and 9 items of job control, and all items were scored on the Likert scale of 1 to 4. Internal consistency was examined: \(\alpha=0.69\) for job demands and \(\alpha=0.76\) for job control. The subjects were divided into three groups by using the total score distribution of job demands and job control: high, moderate, and low levels. Job strain, defined as the ratio of demand to control, was similarly categorized into three groups.

**Characteristics of the screening program**

Participants were asked whether the meaning of receiving a positive result from the physical examination had been explained to them and whether a recommendation to see a doctor had been made by an occupational health nurse or doctor at the worksite. Other characteristics, including the presence of an occupational health care staff member, differ according to each company’s health care system, policy, or size. For example, companies with less than 50 employees are not required to have health care staff members within the company. Some participating companies had a contract with the Chugoku Occupational Health Association, whose members offered health advice after a physical examination. Nevertheless, even if a company had occupational health staff workers, these workers did not necessarily meet all the employees after the physical examination. We therefore selected the face-to-face recommendation by an occupational health staff member as the most sensitive predictor\(^{14, 15}\). Because all regular Japanese workers have comparable health insurance, the issue of health insurance was not included as a variable.

The study design and procedure were reviewed and approved by the Okayama University Graduate School of Medicine and Dentistry Committee on Ethics for

Statistical analysis
A chi-square test was used to test the statistical significance of the studied work-related factors and visiting a doctor for a medical diagnosis of diabetes. The Kaplan-Meyer life table was used to analyze the ratio of participants who visited a doctor within 2 months of receiving the results. The period from the day the results of the physical examination were received until a doctor was visited was calculated. Cox’s proportional hazards regression analyses were performed to estimate the effect of study variables on the time that elapsed before the employee visited a doctor for a medical diagnosis. Two models were employed for multivariate analyses. The effects of job demand and job control were simultaneously estimated with the other studied variables in Model 1. In Model 2, job strain, rather than demand and control, was entered. It should be noted that, in this study, a higher hazard ratio indicates that there is a stronger tendency to visit a doctor. A test for trend was performed. Statistical analyses were performed with the SPSS 11.0J.

Results
Ninety (42.3%) of 213 employees visited a doctor for a medical diagnosis during an average follow-up period of 47.5 d. Of those, 57 had more than once received positive results during a worksite screening for diabetes, and 33 were the employees who received a positive result for the first time. There was no statistically significant difference in the visiting rates between the two employee groups (40.4% and 45.8%, respectively, \( p=0.45 \)).

Table 1 shows the characteristics of the individuals who visited a doctor and those who did not. Older age and a recommendation by an occupational nurse or physician were significantly associated with visiting a doctor. Occupation, work hours, ease of taking a day off, and psychological job characteristics were not significantly associated with visiting a doctor for a medical diagnosis.

Table 2 shows the result of the Kaplan-Meyer life table analysis and the estimated crude hazard ratio of the work-related factors in visiting a doctor for a medical diagnosis. Employees who were older, worked longer hours, or could

<table>
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<tr>
<th>Variables</th>
<th>Visit a doctor</th>
<th></th>
<th></th>
<th>( X^2 )</th>
<th>( p )</th>
</tr>
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<td></td>
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<td>10</td>
<td>25.0</td>
<td>30</td>
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<td></td>
<td>45–54</td>
<td>92</td>
<td>36</td>
<td>39.1</td>
<td>56</td>
</tr>
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<td></td>
<td>55–64</td>
<td>81</td>
<td>44</td>
<td>54.3</td>
<td>37</td>
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<td>Occupation</td>
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<td>White collar</td>
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<tr>
<td></td>
<td>Blue collar</td>
<td>123</td>
<td>52</td>
<td>42.3</td>
<td>71</td>
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<td></td>
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<td>40 or less</td>
<td>48</td>
<td>19</td>
<td>39.6</td>
<td>29</td>
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<td>41 or more</td>
<td>165</td>
<td>71</td>
<td>43.0</td>
<td>94</td>
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<td>Take day off or time off (score)</td>
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<td></td>
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<td></td>
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<td>7</td>
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<td>15</td>
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<tr>
<td></td>
<td>Moderate (5–6)</td>
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<td>37.5</td>
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<tr>
<td></td>
<td>Easy (7–8)</td>
<td>127</td>
<td>59</td>
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<td>68</td>
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<tr>
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<td>79</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
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<td>44</td>
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<td>Job demand (score)</td>
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<td>Low (18–28)</td>
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<td>30</td>
<td>45.5</td>
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<td>Job control (score)</td>
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<td>Moderate (58–66)</td>
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<td>High (70–96)</td>
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<td>Job strain (index)</td>
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<td>36.6</td>
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<td>Moderate (0.45–0.53)</td>
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<td>43.1</td>
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<td></td>
<td>Low (0.27–0.44)</td>
<td>70</td>
<td>33</td>
<td>47.1</td>
<td>37</td>
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</table>
easily take a day off were more likely to visit a doctor for a medical diagnosis. As in the chi-square analyses, the associations of age or recommendation with visiting a doctor achieved statistical significance in these unadjusted analyses.

Table 3 shows the results of the Cox’s proportional hazard regression analyses after controlling for each study variable. Employees who could easily take a day off were nearly two times more likely to visit a doctor than those who found it difficult to take a day off, and this trend was statistically significant. Employees with the most job control were 80% more likely to visit a doctor than those with the least job control. The trend was marginally statistically significant ($p=0.08$). The recommendation was significantly associated with visiting a doctor. As for age, the fact that older employees visited doctors was significant. Those working 41 h weekly or more were marginally more likely to visit a doctor than those working 40 h or less. Although a trend was expected, job strain was not significantly associated with visiting doctors (see Model 2).

When the work hours were categorized into three groups, 40 h or less, 41 to 60 h, and 61 h or more, employees who worked the most hours (61 and more) were less likely to visit a doctor than those who worked 41 to 60 h weekly (adjusted HR=0.41; 95%CI 0.17 to 0.98). The adjusted HR of the employees who worked 40 h each week or less compared to those who worked 41 to 60 h was 0.58 (95%CI 0.33 to 1.03).

Even after adjusting for the size of the companies (less than 50 employees vs. 50 or more) and the number of times the employees had received high blood glucose test results (first time vs. more than once), the results were not altered substantially.

**Discussion**

The effect of several relevant work-related factors on a Japanese male employee’s decision to visit a doctor after a worksite screening for diabetes across several small and medium-sized companies was investigated with a life table analysis. Employees who could easily take a day off were more likely to visit a doctor for a medical diagnosis. 

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**Table 2. The rates of a doctor’s visit for medical diagnosis in Kaplan-Meyer life table analysis**

<table>
<thead>
<tr>
<th>Variables</th>
<th>n=213</th>
<th>Observed 1,000 Person-days</th>
<th>Average Person-days</th>
<th>Doctor Visit n</th>
<th>Visit Rate $\times 1,000$</th>
<th>Relative Risk</th>
<th>$p^*$</th>
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<td>92</td>
<td>4.36</td>
<td>47.38</td>
<td>36</td>
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<td>1.89</td>
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<td>9.14</td>
<td>1.26</td>
<td>0.39</td>
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<td>Job strain</td>
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<tr>
<td>High</td>
<td>71</td>
<td>3.39</td>
<td>47.72</td>
<td>26</td>
<td>7.67</td>
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<tr>
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<td>3.41</td>
<td>47.32</td>
<td>31</td>
<td>9.10</td>
<td>1.19</td>
<td>0.69</td>
</tr>
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<td>70</td>
<td>3.33</td>
<td>47.56</td>
<td>33</td>
<td>9.91</td>
<td>1.29</td>
<td>0.45</td>
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</table>

*The $p$-value for each variable was calculated in Cox’s proportional hazard model.
Table 3. Hazard ratio of a doctor’s visit for medical diagnosis by Cox’s proportional hazard model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1 Hazard Ratio</th>
<th>95%CI</th>
<th>Model 1 p</th>
<th>p for Trend</th>
<th>Model 2 Hazard Ratio</th>
<th>95%CI</th>
<th>Model 2 p</th>
<th>p for Trend</th>
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<tr>
<td>Age (yr)</td>
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<tr>
<td>35–44</td>
<td>1.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
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<tr>
<td>45–54</td>
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<td>1.02</td>
<td>5.11</td>
<td>0.05</td>
<td>2.29</td>
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<td>5.14</td>
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<td>55–64</td>
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<td>White collar</td>
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<td>0.69</td>
<td>2.83</td>
<td>0.35</td>
<td>1.38</td>
<td>0.70</td>
<td>2.72</td>
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<td>1.40</td>
<td>0.76</td>
<td>2.57</td>
<td>0.28</td>
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<td>Work hours (hours a week)</td>
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<td>40 or less</td>
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<tr>
<td>41 or more</td>
<td>1.63</td>
<td>0.92</td>
<td>2.88</td>
<td>0.09</td>
<td>1.58</td>
<td>0.90</td>
<td>2.76</td>
<td>0.11</td>
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<tr>
<td>Take day off or time off</td>
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<td>Difficult</td>
<td>1.00</td>
<td>0.05</td>
<td>1.00</td>
<td>0.09</td>
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<tr>
<td>Moderate</td>
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<td>0.53</td>
<td>3.03</td>
<td>0.60</td>
<td>1.31</td>
<td>0.54</td>
<td>3.15</td>
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<td>Easy</td>
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<td>4.42</td>
<td>0.12</td>
<td>1.84</td>
<td>0.80</td>
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<td>1.00</td>
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<td>Yes</td>
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<td>1.43</td>
<td>3.56</td>
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<td>2.16</td>
<td>1.37</td>
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<td>2.24</td>
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<tr>
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<td>2.06</td>
<td>0.58</td>
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<td>Job control</td>
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<tr>
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<td>Moderate</td>
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<td>0.86</td>
<td>2.79</td>
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<tr>
<td>High</td>
<td>1.80</td>
<td>0.94</td>
<td>3.45</td>
<td>0.08</td>
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<td>Job strain</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>1.00</td>
<td></td>
<td>0.28</td>
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<tr>
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<td>0.48</td>
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<td>Low</td>
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<td>2.61</td>
<td>0.29</td>
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</table>

diagnosis. Although the result had marginal statistical significance, employees with a high degree of job control were more likely to visit a doctor than those without such control. Long working hours of 61 h or more per week and a program without post-screening professional advice precluded employees from visiting a doctor. These findings imply that adverse working conditions may decrease the effectiveness of diabetes screening.

Participants who could easily take a day off were more likely to visit a doctor for a medical diagnosis. Difficulty in taking a day off seems to be a strong barrier to visiting a doctor for a medical diagnosis after a diabetes screening. In relation to this finding, employees with the highest degree of job control (defined as the uppermost tertile) were more likely to visit a doctor than those with the least job control, although the association was only marginally significant. The findings are consistent with previous ones indicating that a flexible work schedule and job control are associated with treatment adherence among diabetes patients. Workers with flexible work schedules might have a better chance to visit a doctor after receiving a positive result from a worksite screening for diabetes even though they work longer hours. In addition, greater job control may enhance a sense of autonomy and a better coping style and enable employees to consider the results of the screening and make plans to visit a doctor. Allowing a flexible work schedule or improved work autonomy may be an effective strategy to enable employees to visit a doctor for a medical diagnosis.

On the other hand, job demands and job strain were not significantly associated with visiting a doctor. Statistical power may not have been sufficient to confirm the association. Another explanation is the relatively low α coefficient of the job demand scale; the low measurement reliability may have led to associations towards the null.

Although the finding was statistically insignificant, it was paradoxical that employees who worked overtime were more likely to visit a doctor than were those who did not work overtime. However, a sub-analysis indicated that workers who worked the most overtime were the least likely to visit a doctor for a medical diagnosis. Overtime work beyond a certain amount appeared to be
an obstacle that prevented employees from visiting a doctor. Employees who worked 40 h or less were less likely to visit a doctor than those who worked 41 h and more; the former might consist of a special group of workers who are unable to work even a little overtime for some reason. For example, workers with a second job may not have enough time to visit a doctor for a medical diagnosis.

Employees who were advised by an occupational nurse or physician to visit a doctor after a physical examination were more likely to visit a doctor than their counterparts. This finding was consistent with that of an earlier study. After a physical examination, not all of the employees were advised to visit a doctor for a medical diagnosis because the health care systems and policies differ at each worksite. The findings of the current study provide evidence that the recommendation to see a doctor, when given face-to-face by an occupational nurse or physician, is a strong inducement to the employee to see a doctor after the receipt of a positive result from a screening for diabetes mellitus.

Older employees are more likely to visit a doctor than are younger employees. Older employees may be more concerned in general with their health than are younger employees. Furthermore, older employees are more likely to have diseases in addition to diabetes than are younger employees. These other factors may motivate older employees to visit a doctor for a medical diagnosis. Not all the reasons are clear since the exclusive focus of this study was diabetes, but the findings suggest that more attention should be given to the health education of younger employees.

The findings from the present study suggest that employees with a positive finding after a screening for diabetes mellitus become more likely to visit a doctor for medical diagnosis, by improving working conditions, such as flexibility of the work schedule, autonomy at work, and long working hours. These working conditions might be a reflection of the company’s policy and attitude toward their employees’ health and safety. Employers should consider to develop their policy and make necessary arrangements of these working conditions to facilitate an employee’s access to a doctor for medical diagnosis after a screening for diabetes mellitus and, as a result, to secure their employees’ health.

There were several limitations to the current study. The number of respondents was relatively small, and the number of eligible participants was also limited. Thus, the statistical power may be insufficient. The large sample attrition may also be a problem. First, as the participant pool may not be as representative as they could have been, the ability to generalize the results is limited. Second, employees who are less concerned with their own health or those who want to deny their health problem may be less likely to participate, which may result in inflation of some of the observed associations, e.g., between the recommendation from an occupational health staff person and the visit to a doctor. It is plausible that busy workers could not respond to or complete the questionnaire, which might have caused an underestimation of the associations between adverse working conditions and visiting a doctor. Furthermore, our retrospective study design may have caused recall bias in the measurements, and some employees who did not visit a doctor may have given the reason as adverse work-related factors. Psychological job demands and job control were evaluated two months after the participants received the results of the screening. Therefore, the association with visiting a doctor for a medical diagnosis may be weak, but the evidence shows that the job characteristics measured by JCQ are relatively stable over a period of time. Substantial changes in the measure were unlikely in such a short period. The referral letter given to the participant after the screening did not mention a time limit for a visit to a doctor. The observation period in our study was only two months from their receiving the result of the physical examination. The duration of two months seems to be enough to test our hypothesis and the duration after the worksite physical examination (three months) is almost compatible with the regulated time limit. However, the long-term effects of work-related factors on an individual’s decision to visit a doctor are not completely understood. Some variables that had the potential to confound the results were not investigated, including socioeconomic status, access to a doctor’s office, health beliefs, second jobs, or the severity of the diabetes.

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References
2) The industrial safety and health law and its related regulations, 1996.
4) KE Lutfey and WJ Wishner: Beyond compliance is
10) LM Tillotson and MS Smith: Locus of control, social support, and adherence to the diabetes regimen. Diabetes Educ 22, 133–139 (1996)