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Risk factors for absenteeism due to sick leave in the petroleum industry

ABSTRACT

OBJECTIVE: To identify risk factors for absenteeism among workers with sick leave in an oil company.

METHODS: A case-control study (120 cases and 656 controls) nested in a retrospective cohort study following up all employees of an oil company in the North-Northeast of Brazil from 2007 to 2009. The response variable used to represent absenteeism with sick leave was the average incidence of sick leave, defined as the ratio between total sick days and potential working days in the period. Logistic regression techniques were used to investigate the association between average incidence of sick leave > 5.0% over the period and the variables sex, position, age, time at work, shift work, smoking, arterial hypertension, body mass index, physical activity, coronary risk, sleep, glycemia, non-managed diabetes, cardiovascular, digestive, musculoskeletal, neurological and neoplastic diseases, straining body positioning during work, satisfaction at work, relationship with management, and concentrated attention at work.

RESULTS: Average incidence of sick leave higher than 5.0% in the cohort period was 15.5%. The logistic model revealed that workers with average incidence of sick leave higher than 5.0% were 2.6 times more likely to be female; 2.0 time more likely to be smokers; 1.8 time more likely to be former smokers; 2.2 times more likely to report abnormal sleep and 10.5 times more likely to report dissatisfaction with their than workers with average incidence of sick leave ≤ 5.0% in the period.

CONCLUSIONS: In this population, female gender, being a smoker or a former smoker, reporting dissatisfaction with the job and reporting abnormal sleep are good predictors of occupational absenteeism with sick leave.

DESCRIPTORS: Absenteeism; Sick Leave. Workers. Petroleum Industry. Occupational Health. Occupational Health Services. Epidemiologic Surveillance Services. Case-Control Studies.

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INTRODUCTION

Absence from work due to illness leads to lost productivity, which creates significant economic impact. Absenteeism due to inability to work caused by illness, accident or injury costs the European Union an estimated 1.5% to 4.0% of Gross Domestic Product (GDP).[a] For this reason, the issue has caught the interest of employers, health care professionals and economists.

For the International Labor Organization, absenteeism is the employee missing work and absenteeism due to illness is the period of absence from work attributed to the incapacity of the individual, accounted for as the length of the sick leave.[19] Absenteeism due to illness includes missing work because of illness, accident or because of undergoing a justified medical procedure. Other types of absenteeism are: voluntary absenteeism (absence from work for non-justified personal reasons); legal absenteeism (for pregnancy, illness, gala, donating blood and military service) and compulsory absenteeism (prevented from working due to suspension imposed by the employer, because of being imprisoned or some other impediment to the employee reaching the workplace).[21]

Absenteeism due to illness has a complex causality and can be associated with, among others, demographic variables (age, sex and level of occupation), job satisfaction (level of remuneration, feeling of self-actualization), organizational characteristics (organizations and units of work) and to the work content (levels of autonomy and responsibility).[15] Despite the large amount of scientific output on absenteeism due to illness, little is known of predictors among workers in the petroleum industry in Brazil. Descriptive studies are useful in characterizing absenteeism, but they alone do not characterize the causes of such absences.[18] In Brazil in 2013, the most lucrative (US$ 7.9 billion) and third largest (61,878 employees) company was in the petroleum sector.[b] The petroleum industry in Brazil has undergone sharp growth in the last ten years and has a good prognosis after the discovery of the pre-salt layer. Against this promising background, studies on absenteeism of the workforce of this sector of the economy become increasingly relevant.

This study aimed to identify risk factors for absenteeism with sick leave among workers in a petroleum company.

METHODS

This was a case-control study, nested in a wider retrospective cohort study of all the company's workers, in the period January 1, 2007 to December 31, 2009. The study was conducted in a regional service center of a Brazilian petroleum company, in the area named shared services. This area performs support activities to achieve the company's goals: acquiring goods and services, health care, environment and security assessment, managing supplementary health care, logistics, human resources and training, administration of buildings, property security, clearing customs and setting up offices, among others. The data were obtained from electronic records of workers in the occupational health service, where sick notes are recorded after approval from the company doctor.

The cohort was made up of employees in the shared services/North-Northeast Region who were on the payroll as of 1/1/2007 (time zero). At this time there were 787 workers.

Over the period of the study, 701 workers remained for the whole period, while 86 dropped out at some point. In 2007, there were 30 losses; in 2008, 31 and, in 2009, 25. The losses were due to death (4), retirement (21), firing (3) or transfer (58) of workers.

Of the 787 workers, there were five individuals on sick leave for the entire period of the study, with no record of periodic exams, nor information on potential days worked. These five were excluded from the study.

Of the remaining 782 individuals, six were excluded so as to perform analysis in the logistic regression model: for four, there were no data on the variable concerning sleep for the period (of these, one was a case and three were control); one worker (control) had no data on physical activity; and on (in the case group) had no data on cardiovascular disease or non-managed diabetes. In the end, 776 individuals participated in the study.

The workers consisted of 189 women and 587 men, with a mean age of 43.6 years old (SD = 8.5), minimum of 21 and maximum of 77, of which 53.0% of the population were between 40 and 50 years old. Of the total, 56.3% worked in administration and the rest did shift work. The majority (65.7%) had been with the company for between ten and 30 years, and 536 of the individuals had had at least one episode of sick leave during the study.

The response variable used to represent absenteeism with sick leave was the average incidence of sick leave in the period (AIabsence), defined as: ratio between total sick leave days (SLDtotal) and potential working days

[a] European Foundation for the Improvement of Living and Working Conditions Preventing. Absenteeism at the workplace Research Summary. Luxembourg: Office for Official Publications of the European Communities; 1997.
[b] Revista Exame. As 100 maiores empresas do Brasil – 2013 [cited 2014 Feb 6]. Available from: http://exame.abril.com.br/negocios/empresas/melhores-e-maiores/ranking/2013/

(PWD) for the cohort in the period, calculated for each participant. The response variable obtained is, primarily, a percentage, measured on a continuous scale.

PWD is a discrete quantitative variable, defined by summing working days, excluding permitted leave (weddings, family death among others) and holidays for the cohort over the period. To perform the analysis, the AIabsence variable was transformed into binary, with workers classified as having missed work (cases) or not (control). Controls were individuals with AIabsence ≤ 0.05, in other words, with sick leave representing less than 5.0% of their time available to work. Cases were defined as workers with AIabsence greater than 0.05. This cutoff point was used to produce reasonable numbers of cases and controls for the subsequent statistical analyses.

Some variables were considered when classifying each worker at point zero of the cohort: sex, position, age, length of time with the company and work regime. The latter was defined by classifying the work regime in shared services (administrative of eight and six hours, standby, eight-hour shifts and 12-hour shifts). This variable was reclassified dichotomously as administrative regime (administrative of eight and six hours – worker who worked during the working day) and shift work regime (eight-hour and 12-hour shifts – workers on shifts alternating between day and night shifts). Data were collected on this variable for the three years covered by the study, but during this time, only one individual moved from shift work to administrative work. For this reason, the work regime recorded as of 1/1/2007 was used.

The individual's position was defined by the title of their post corresponding to the hierarchy of the company, without mentioning level (junior or senior), at the beginning of the cohort. No workers changed their post during the period of the study. After data had been collected, the variable was re-categorized, as only two posts represented more than 64.5% of the population, the categories being administration and control technician, internal safety inspector and others.

As regards the variables related to health and work, the workers were classified so as to represent their evolution over the period: smoking, arterial hypertension, body mass index (BMI), physical activity, coronary risk according to the Framingham criteria, sleep, glycaemia, non-managed diabetes, cardiovascular, digestive, musculoskeletal, neurological and neoplastic diseases, straining body positioning during work, satisfaction at work, relationship with management, concentrated attention at work.

The procedure for classifying the worker according to their evolution over the period can be shown using the example of smoking, the evolution of which was defined using responses to questions on this habit (smoker, ex-smoker and non-smoker) in three regular examinations over the period of the cohort. To classify each individual, the response which was repeated two or more times over the period was used. When this was impractical, the datum from cohort entry was compared with that of 2006 and, when only response was given in the four years of observation, this was considered the criterion for classification.

Arterial hypertension was categorized as: non-hypertensive (normal arterial pressure (DBP < 85 and SBP < 130) and borderline normal pressure (DBP 85-89 and SBP 130-139)); mild hypertension (mild hypertension (DBP 90-99 and SBP 140-159)); and hypertension (moderate hypertension (DBP 100-109 and SBP 100-179), severe hypertension (DBP $\geq$ 100 and SBP $\geq$ 180) and isolated systolic hypertension (DBP < 90 and SBP $\geq$ 140)).

The variable coronary risk of a cardiovascular event in the next ten years was defined by the Framingham score,[12] taking into account sex, and classified in bands: < 10% = low risk; 10.0%-20.0% = moderate risk; and > 20.0% = high risk.

Physical activity was obtained using the International Physical Activity Questionnaire (IPAQ)[14] – short form, to which the participants responded at the time of the regular examination and it was categorized dichotomously: active individual (very active and regularly active) and non-active individual (irregularly active, inactive and sedentary).

The sleep variable was obtained by responding to the question: "Do you consider your sleeping patterns to be normal or abnormal?" which was posed in the regular clinical exam. The responses were categorized as normal and abnormal, considering the years 2006, 2007, 2008 and 2009. Some limitations to this variable should be considered, as the record did not allow quality or disturbance of sleep to be assessed, only the worker's own perception of it.

The variables regarding job satisfaction and relationship with management were obtained based on dichotomous responses to the following questions, respectively: "Are you satisfied with your job?" and "Do you have a good relationship with management?", considering the years 2006, 2007, 2008 and 2009.

The sources of information for the variables were the SD2000 plus and SAP software, used in managing businesses.

The descriptive stage consisted of calculating mean and standard deviation and minimum and maximum values for continuous independent variables and frequencies for qualitative variables. Later, unadjusted

OR were calculated between the response variable and the independent variables, with their respective 95% confidence intervals.

To identify the importance of the factor associated with absenteeism with sick leave, an unconditional logistic regression analysis (non-paired) was conducted using R software. The initial model contained the co-variables: age (in years), sex (0 = male and 1 = female), position (0 = others, 1 = internal safety inspector and 2 = administration and control technician), work regime (0= administration and 1 = shift work), length of time in the company (in years), smoking (0 = non-smoker, 1 = smoker and 2 = ex-smoker), BMI (in kg/m^2), physical activity (0 = very active, active and regularly active and 1 = irregularly active, physically inactive, inactive and sedentary), arterial hypertension (0 = normal and borderline normal, 1 = mild hypertension and 2 = hypertension), coronary risk (Framingham score), sleep (0 = normal and 1 = abnormal), glycaemia (0 = ≤ 100 and 1 = > 100), job satisfaction (0 = yes and 1 = no), good relationship with management (0 = yes and 1 = no), concentrated attention at work (0 = no and 1 = yes), straining body positioning during work (0 = no and 1 = yes), non-managed diabetes (0 = no and 1 = yes and 1 = no), cardiovascular disease (0 = no and 1 = yes), disease of the digestive apparatus (0 = no and 1 = yes), musculoskeletal disease (0 = no and 1 = yes), neurological disease (0 = no and 1 = yes) and neoplasia (0 = no and 1 = yes).

The procedure for adjusting the logistic model followed, using the backward method of selecting variables, with a 10.0% level of significance to exclude the variables. The final model was obtained based on the test of likelihood ratio and the Wald test, using a 5% level of significance.

Interaction between the co-variables in the model was also investigated considering the terms of first order interactions with a 5% level of significance. However, none of the interactions was significant. To analyze whether the final model was adequate, the residues of the model were examined and the Le Cessie and Houwelingen test was performed, which indicate a good fit.

After calculating adjusted OR and 95% confidence intervals, estimated probability was calculated for the sets of co-variables which remained in the final model.[3]

The study was approved by the Ethics Committee of the Nursing Faculty, *Universidade Federal da Bahia*, protocol 02/2010.

RESULTS

The average incidence of sick leave (AIabsence) over 5% in the period was 15.5% (120 ÷ 776 x 100).

The bivariate analysis showed a statistically significant association at the 5% level between AIabsence > 5% and the variables: sex (female), age (> 50 years old), sleep (abnormal), smoking (smoker and ex-smoker), job satisfaction (no) and strained body posture (yes) (Table 1).

The logistic model revealed there was a significant association between absenteeism with sick leave and the variables sex, smoking, sleep and job satisfaction. Over the period, workers with average incidence of sick leave > 5.0% had a 2.6 times greater chance of being female; 2.0 times greater chance of being a smoker; 1.8 time greater chance of being an ex-smoker; 2.2 times greater chance of reporting abnormal sleep and a 10.5 times greater chance of not being satisfied with their job than workers with an average incidence of sick leave ≤ 5.0% (Table 2).

Excluding the ten cases of women on maternity leave did not significantly alter the estimated of parameters of the logistic regression model. The greatest percentage variation in the estimates was of 8.0%.

Table 3 shows the estimated probabilities according to the final logistic model, having AIabsence > 5.0% for sets of characteristics formed by the co-variables of the final model. The sets of characteristics with higher probability of having mean incidence of sick leave > 5.0% were: being female, being a smoker, reporting abnormal sleep and being dissatisfied with work (P = 0.92), and the set with the lowest probabilities were: being male, being a non-smoker, reporting normal sleep and being satisfied at work (P = 0.08).

DISCUSSION

The strong association between absenteeism with sick leave in women, controlling for the effects of other co-variables, suggests that the social context in which the female workers find themselves, with a double work day, favors absence from formal work.

A pioneering study in the 1970s[17] concludes that, in Brazil, in contrast to what has been reported in highly industrialized countries, absenteeism due to illness is only slightly higher among women than among men.

Women missing work leads to the discussion of the contribution of maternity leave, as this necessarily represents authorized absenteeism and, therefore, costs for the employer. A cohort study in Norway[4] found an increased risk of absence from work in pregnancy when no adjustments were made to the work. Excluding the ten cases of maternity leave did not affect the final conclusions of this study.

The high correlation between predicted and observed probabilities in the logistic regression models assures the reliability of the models and the analyses in this study.

Table 1. Values of unadjusted odds ratio and respective 95% confidence intervals for sick leave according to risk factors in workers in a petroleum company. North-Northeast, Brazil, 2007-2009.

Variable	Controls (N = 656)	Cases (N = 120)	OR unadjusted	95%CI	p
Sex					
Male	516	71	1	–	–
Female	140	49	2.54	1.68;3.91	0.000005
Age (years)					
Under 30	70	6	1	–	–
> 30 to 40	99	21	2.47	0.89;7.25	0.065
> 40 to 50	351	63	2.09	0.86;6.15	0.09
> 50	136	30	2.57	0.99;7.90	0.04
Smoking					
Non-smoker	504	78	1	–	–
Smoker	42	13	2.00	0.94;4.01	0.04
Ex-smoker	110	29	1.70	1.02;2.79	0.02
Job satisfaction					
Yes	655	117	1	–	–
No	1	3	16.79	1.33;882.95	0.012
Sleep					
Normal	572	89	1	–	–
Abnormal	84	31	2.37	1.43;3.86	0.0004
Strained body posture at work					
No	648	118	1	–	–
Yes	8	2	0.05()	0.0;0.23	0.00001
Position					
Other	241	36	1	–	–
Internal safety inspector	286	52	1.22	0.75;1.97	0.4
Adm and control technician	129	32	1.66	0.95;2.89	0.15
Work regime					
Administrative	369	68	1	–	–
Shift work	287	52	0.98	0.65;1.48	0.93
Time in the company (years)					
Fewer than 10	199	29	1	–	–
> 10 to 20	232	43	1.27	0.74;2.20	0.35
> 20 to 30	192	43	1.54	0.90;2.66	0.1
> 30	33	5	1.04	0.29;2.99	0.55
BMI					
Normal weight	203	33	1	–	–
Underweight	12	2	1.03	0.11;4.93	0.61
Overweight	284	57	1.23	0.76;2.03	0.37
Obese	157	28	1.10	0.61;1.96	0.73
Arterial hypertension					
Non hypertensive	537	102	1	–	–
Mild hypertensive	76	11	0.76	0.35;1.51	0.42
Hypertensive	43	7	0.86	0.32;1.99	0.71

BMI: Body mass index

Table 2. Values of unadjusted odds ratio and respective 95% confidence intervals for sick leave according to risk factors, adjusted using multiple logistic regression model in workers in a petroleum company. North-Northeast, Brazil, 2007-2009.

Variable	Controls (N = 656)	Cases (N = 120)	OR adjusted	(95%CI)
Sex				
Male	516	71	1	–
Female	140	49	2.6	1.68;3.92
Smoking				
Non-smoker	504	78	1	–
Smoker	42	13	2.0	0.99;3.99
Ex-smoker	110	29	1.8	1.12;3.02
Sleep				
Normal	572	89	1	–
Abnormal	84	31	2.2	1.34;3.53
Job satisfaction				
Yes	655	117	1	–
No	1	3	10.5	1.02;108.29

Other studies[24,23] corroborate the finding that absenteeism is higher among women than among men. In temporary positions, women show a high incidence of being off sick, perhaps because they feel threatened by the possibility of the contract being terminated.[28]

Table 3. Estimated probabilities and respective 95% confidence intervals for sets of characteristics associated with absenteeism with sick leave in workers in a petroleum company. North-Northeast, Brazil, 2007-2009.

Sex Characteristic	Estimated probability	95%CI
Female smoker/Abnormal sleep/Dissatisfied at work	0.92	0.50;1.00
Female ex-smoker/Abnormal sleep/Dissatisfied at work	0.91	0.49;0.99
Female non smoker/Abnormal sleep/Dissatisfied at work	0.85	0.34;0.98
Female smoker/Normal sleep/Dissatisfied at work	0.84	0.32;0.98
Female ex-smoker/Normal sleep/Dissatisfied at work	0.83	0.31;0.98
Male smoker/Abnormal sleep/Dissatisfied at work	0.81	0.21;0.98
Male ex-smoker/Abnormal sleep/Dissatisfied at work	0.80	0.27;0.98
Female non smoker/Normal sleep/Dissatisfied at work	0.72	0.20;0.96
Male non smoker/Abnormal sleep/Dissatisfied at work	0.69	0.17;0.96
Male smoker/Normal sleep/Dissatisfied at work	0.67	0.16;0.96
Male ex-smoker/Normal sleep/Dissatisfied at work	0.65	0.15;0.95
Female smoker/Abnormal sleep/Satisfied at work	0.52	0.32;0.70
Female ex-smoker/Abnormal sleep/Satisfied at work	0.50	0.34;0.65
Male non smoker/Normal sleep/Dissatisfied at work	0.50	0.08;0.91
Female non smoker/Abnormal sleep/Satisfied at work	0.35	0.25;0.47
Female smoker/Normal sleep/Satisfied at work	0.33	0.19;0.51
Female ex-smoker/Normal sleep/Satisfied at work	0.31	0.21;0.43
Male smoker/Abnormal sleep/Satisfied at work	0.30	0.16;0.47
Male ex-smoker/Abnormal sleep/Satisfied at work	0.28	0.17;0.41
Female non smoker/Normal sleep/Satisfied at work	0.20	0.15;0.26
Male non smoker/Abnormal sleep/Satisfied at work	0.17	0.11;0.26
Male smoker/Normal sleep/Satisfied at work	0.16	0.08;0.27
Male ex-smoker/Normal sleep/Satisfied at work	0.15	0.10;0.22
Male non smoker/Normal sleep/Satisfied at work	0.08	0.06;0.12

Absenteeism with sick leave of 60 days or more was associated with females who smoked daily.[10] Among women, low levels of control at work was consistently linked with a greater risk of absence due to illness.[5]

Current studies on absenteeism among women need to go deeper, covering risk factors that go beyond demographic variables and those concerning the job itself. One of the limitations of this study was that it did not approach aspects of psychological suffering, which is an important factor in absenteeism due to illness.[29] Aspects connected with psycho-social health complaints, such as feelings of depression, burnout, tiredness and lack of interest in the work have been reported as strong predictors of being off sick in women.[2]

Individuals who saw their period of sleep as abnormal had a greater chance of missing work due to illness. Poor quality sleep can influence physical and psychological health, leading to problems with performance at work, with personal relationships and to accidents. Perceived stress, followed by dissatisfaction with work, is strongly associated with poor quality sleep.[1]

There are few studies relating sleep to missing work. A study in Finland reports a greater risk of the first episode of absence through illness in cases of sleep apnea in females.[26]

In Sweden, the percentage of women experiencing work-related sleep disturbance at least once a week, adjusted for age, increased from 12.3%, in 1993, to 21.7% in 1999. The OR for absence due to illness for those who reported work-related sleep disturbance every day, compared with those who responded "never/rarely, in the previous three months", varied between 3.22 (95%CI 1.88;5.50) and 4.26 (95%CI 2.56;7.19), with the strongest associations observed in 1999.[30] These OR values are similar to those found in this study: OR = 2.2 (95%CI 1.34;3.53).

The characteristics of being a smoker and ex-smoker were shown to be significantly associated with average incidence of sick leave over 5.0%. Similar associations have been found in studies in Denmark.[6] In China, in 1986, the OR for sick leave was 2.37 for smokers and 1.45 for light smokers, compared with non-smokers. The corresponding ORs for 1987 were 1.70 and 1.28 for heavy and light smokers, respectively, compared with non-smokers. Smoking was positively associated with being off work, even after adjusting for age, alcohol intake and exposure to chemical products.[22]

In an American petroleum company, increased absence due to illness was associated with smoking, high blood pressure, high cholesterol levels and obesity.[27]

The value of the OR of sick leave for ex-smokers is comparable with that of smokers. It is possible that ex-smokers are individuals in whom the harmful effects of smoking had manifested themselves more intensely in the past, which contributed to them giving up smoking.

The variable with the highest OR (10.5), and which calls for further investigation, is being dissatisfied at work. However, the wide confidence interval of this OR recommends that it be viewed with caution. The chance of those who are dissatisfied with their job having sick leave is 2.5%, and falls to 0.15% in those who are satisfied. In Finland, a survey showed that an imbalanced organizational environment, with dissatisfied workers, was associated with more reports of work-related symptoms.[20] Explaining dissatisfaction at work as a variable associated with absence becomes a complex task, but in the literature, there are association between a poor organizational climate and psychological and musculoskeletal symptoms.[20]

Health promoting actions are directly linked to decreases in absenteeism, as suffering at work may precede dissatisfaction and this may precede absenteeism.[25] It is, therefore, necessary to investigate dissatisfaction as a predictor of absenteeism.

The link between the way work is organized and absenteeism due to illness has been studied in union members in a petroleum company in Singapore, over a 12-year period.[8] Decreases in absenteeism, observed between 1981 and 1986, were attributed to organizational changes related to sick leave and better supervision of those missing work. The increased age of the workers did not affect the quantity of absences in the short term, although shift work was associated with greater absenteeism. In the 1986 to 1992 period, rates of absenteeism returned to the high level of 1981, due to relaxing sick leave control measures and supervision of those on sick leave.

Other co-variables considered in this study which showed no significant association with absenteeism due to illness include: heavy physical work load;[5] discomfort at work, lifting or transporting loads and the act of pushing or pulling loads;[13] arterial hypertension, in both sexes[9] and musculoskeletal system disease.[11] Physical activity was shown to be a factor reducing the risk of missing work due to illness, when individuals were vigorously active.[7] Obesity was associated with high annual incidence and long periods of sick leave.[16]

We can conclude that being female, smoker or ex-smoker, having abnormal sleep and being dissatisfied with work are good predictors of absenteeism due to illness. Changes in smoking, in sleep quality and aspects which influence job satisfaction should be considered in programs aiming to prevent absenteeism in populations with these characteristics. It is recommended that future studies investigating factors associated with sick leave include other variables not included in this study, especially those in the psycho-social sphere.

REFERENCES

1. Doi Y, Minowa M, Tango T. Impact and correlates of poor sleep quality in Japanese white-collar employees. *Sleep*. 2003;26(4):467-71.
2. Duijts SF, Kant IJ, Landeweerd JA, Swaen GM. Prediction of sickness absence: development of a screening instrument. *Occup Environ Med*. 2006;63(8):564-9. DOI:10.1136/oem.2005.024521
3. Hosmer DW, Lemeshow S. Applied logistic regression. 2. ed. New York: John Wiley & Sons; 2000. p. 85-8.
4. Kristensen P, Nordhagen R, Wergeland E, Bjerkedal T. Job adjustment and absence from work in mid-pregnancy in the Norwegian Mother and Child Cohort Study (MoBa). *Occup Environ Med*. 2008;65(8):560-6. DOI:10.1136/oem.2007.035626
5. Laaksonen M, Pitkaniemi J, Rahkonen O, Lahelma E. Work arrangements, physical working conditions, and psychosocial working conditions as risk factors for sickness absence: Bayesian analysis of prospective data. *Ann Epidemiol*. 2010;20(5):332-8. DOI:10.1016/j.annepidem.2010.02.004
6. Labriola M, Lund T, Burr H. Prospective study of physical and psychosocial risk factors for sickness absence. *Occup Med (Lond)*. 2006;56(7):469-74.
7. Lahti J, Laaksonen M, Lahelma E, Rahkonen O. The impact of physical activity on sickness absence. *Scand J Med Sci Sports*. 2010;20(2):191-9. DOI:10.1111/j.1600-0838.2009.00886.x
8. Lai CS. Sickness absence in a Singapore refinery, 1981-1992. *Ann Acad Med Singapore*. 1994;23(5):660-4.
9. Leynen F, De Backer G, Pelfrene E, Clays E, Kittel F, Moreau M, et al. Increased absenteeism from work among aware and treated hypertensive and hypercholesterolaemic patients. *Eur J Cardiovasc Prev Rehabil*. 2006;13(2):261-7. DOI:10.1097/01.hjr.0000194420.62379.de
10. Lidwall U, Bergendorff S, Voss M, Marklund S. Long-term sickness absence:changes in risk factors and the population at risk. *Int J Occup Med Environ Health*. 2009;22(2):157-68. DOI:10.2478/v10001-009-0018-3
11. Lötters F, Burdorf A. Prognostic factors for duration of sickness absence due to musculoskeletal disorders. *Clin J Pain*. 2006;22(2):212-21. DOI:10.1097/01.ajp.0000154047.30155.72
12. Lotufo PA. O escore de risco de Framingham para doenças cardiovasculares. *Rev Med (São Paulo)*. 2008;87(4):232-7.
13. Lund T, Labriola M, Christensen KB, Bultmann U, Villadsen E. Physical work environment risk factors for long term sickness absence: prospective findings among a cohort of 5357 employees in Denmark. *BMJ*. 2006;332(7539):449-52.
14. Matsudo S, Timóteo A, Matsudo V, Andrade D, Andrade E, Oliveira C, et al. Questionário internacional de atividade física (IPAQ): Estudo de validade e reprodutibilidade no Brasil. *Rev Bras Ativ Fís Saude*. 2001;6:5-18.
15. Mesa MFR, Kaempffer RAM. 30 años de estudio sobre ausentismo laboral en Chile: una perspectiva por tipos de empresas. *Rev Med Chile*. 2004;132(9):1100-8. DOI:10.4067/S0034-98872004000900012
16. Moreau M, Valente F, Mak R, Pelfrene E, Smet P, De Backer G, et al. Obesity, body fat distribution and incidence of sick leave in the Belgian workforce: the Belstress study. *Int J Obes Relat Metab Disord*. 2004;28(4):574-82. DOI:10.1038/sj.ijo.0802600
17. Nogueira DP, Laurenti R. Absenteísmo por doença em mulheres. *Rev Saude Publica*. 1975;9(3):393-9. DOI:10.1590/S0034-89101975000300012
18. Oenning NSX, Carvalho FMC, Lima VMC. Indicadores de absenteísmo e diagnósticos associados às licenças médicas de trabalhadores da área de serviços de uma indústria de petróleo. *Rev Bras Saude Ocup*. 2012;37(125):150-8. DOI:10.1590/S0303-76572012000100018
19. Oficina Internacional del Trabajo. Enciclopedia de salud, seguridad e higiene en el trabajo. Madrid: Centro de Publicaciones del Ministerio de Trabajo y Seguridad Social; 1991. p.5-11.
20. Piirainen H, Räsänen K, Kivimäki M. Organizational climate, perceived work-related symptoms and sickness absence: a population-based survey. *J Occup Environ Med*. 2003;45(2):175-84. DOI:10.1097/01.jom.0000052957.59271.f4
21. Quick TC, Lapertosa, JB. Análise do absentismo em usina siderúrgica. *Rev Bras Saude Ocup*. 1982;10(40):62-7.
22. Qun WW, Dobson AJ. Cigarette smoking and sick leave in an industrial population in Shanghai, China. *Int J Epidemiol*. 1992;21(2):293-7. DOI:10.1093/ije/21.2.293
23. Saldarríaga JF, Martínez E. Factores asociados al ausentismo laboral por causa médica en una institución de educación superior. *Rev Fac Salud Publica*. 2007;25(1):32-9.
24. Silva LS, Pinheiro TMM, Sakurai E. Perfil do absenteísmo em um banco estatal em Minas Gerais: análise no período de 1998 a 2003. *Cienc Saude Coletiva*. 2008;13(Supl 2):2049-58. DOI:10.1590/S1413-81232008000900009
25. Siu OL. Predictors of job satisfaction and absenteeism in two samples of Hong Kong Nurses. *J Adv Nurs*. 2002;40(2):218-29. DOI:10.1046/j.1365-2648.2002.02364.x
26. Sjosten N, Kivimäki M, Oksanen T, Salo P, Saaresranta T, Virtanen M, et al. Obstructive sleep apnoea syndrome as a predictor of work disability. *Respir Med*. 2009;103(7):1047-55. DOI:10.1016/j.rmed.2009.01.014
27. Tsai SP, Gilstrap EL, Colangelo TA, Menard AK, Ross CE. Illness absence at an oil refinery and petrochemical plant. *J Occup Environ Med*. 1997;39(5):455-62. DOI:10.1097/00043764-199705000-00012
28. Virtanen M, Kivimäki M,, Vahtera J, Elovainio M, Sund R, Virtanen P, et al. Sickness absence as a risk factor for job termination, unemployment, and disability pension among temporary and permanent employees. *Occup Environ Med*. 2006;63(3):212-7. DOI:10.1136/oem.2005.020297

29. Virtanen M, Vahtera J, Pentti J, Honkonen T, Elovainio M, Kivimaki M. Job strain and psychologic distress influence on sickness absence among Finnish employees. *Am J Prev Med.* 2007;33(3):182-7. DOI:10.1016/j.amepre.2007.05.003

30. Westerlund H, Alexanderson K, Akerstedt T, Magnusson Hanson L, Theorell T, Kivimaki M. Work-related sleep disturbances and sickness absence in the Swedish working population, 1993-1999. *Sleep.* 2008;31(8):1169-77. DOI:10.1093/occmed/kql058

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