



Association between the Increase in Body Mass Index and Medical Absenteeism in a Peruvian Mining Population

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Abstract

Background: Obesity and overweight are associated with work absenteeism of medical cause. However, there is little knowledge on the relationship between incremental body mass index (BMI) and absenteeism.

Objective: To assess the effect of annual increase in BMI on amount of prolonged absenteeism.

Methods: Data from a longitudinal historical cohort of workers of a mining camp in Peru between 2006 and 2014 were used for the analysis. Prolonged absenteeism of 30 days or more in one year was chosen as the dependent variable; annual increase in BMI was considered as the explanatory variable. Regression analysis with generalized estimating equation was used to determine the relative risk adjusted for age, sex and type of work.

Results: There were 1347 cases of medical leave reported with a median of 6 days. Of all cases of medical leave, 11% of those who had an annual increase in BMI and 6% of those who maintained their BMI were cases of prolonged absenteeism. Prolonged absenteeism significantly increased in workers who had an annual increment in BMI (adj RR 1.16, 95% CI 1.05 to 1.29).

Conclusion: The annual increase in BMI was marginally associated with prolonged absenteeism. Temporal increment in BMI, regardless of the baseline BMI, may be an independent determinant of the work absenteeism of medical cause.

Keywords: Body mass index; Absenteeism; Obesity; Sick leave

Introduction

The World Health Organization (WHO) considers the workplace as a priority for health promotion given the opportunity to decrease the frequency of not only occupational medical conditions, but also chronic preventable diseases.¹ Health promotion at workplace has

involved programs to address overweight and obesity to improve workers' health and ameliorate the economic cost of obesity.^{2,3} Worldwide, in the past decades, there has been an increase in the prevalence of obesity in the economically active adult population,⁴ with a corresponding increase in the incidence of associated conditions such as diabetes, heart disease, cancer,

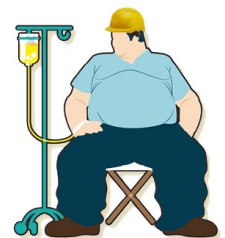
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and other diseases.^{5,6} Obesity and the associated medical conditions impose an economic burden that include not only direct medical expenditures but also the cost of decreased work productivity.^{7,8} Different epidemiological studies from various regions and in different industrial settings have shown that obese employees have a higher rate of absence due to illness and a longer duration of absence from work when ill.^{9,10}

In the occupational health context, absenteeism can be defined as the days of absence from work because of illness. The impact of obesity on the frequency and severity of absenteeism has been assessed in several studies that have shown a positive relationship between obesity and increased absenteeism of medical cause.¹¹ Obese workers, compared to non-obese workers, have on average more days of medical leave of absence due to illness and accidents, affecting their attendance to work.¹² It has also been suggested that reducing obesity and overweight in the workplace can improve the health status of the workers with chronic diseases and reduce absenteeism.^{13,14} Even though longer duration of absenteeism in obese workers has been reported previously, and several studies have addressed the question of the relationship between body mass index

(BMI) and work productivity, the impact of changes in BMI on absenteeism remains unclear.¹⁵⁻¹⁷ Increases in BMI, independently of the BMI status, may be a risk factor for absenteeism. We conducted this study to examine the association between annual increase in BMI and prolonged absenteeism of medical origin in a cohort of workers in a mining camp in Peru.

Materials and Methods

Data Source

This retrospective cohort study used secondary data from a database of a historical cohort of workers from the medical center of a mining camp located in the region of La Libertad, Peru. As part of the occupational health protocol in the mining camp, workers had occupational medical assessments as annual checkups and information was registered on electronic medical records of the medical center (SisMedic software Omnia Medica, Peru). The information from annual occupational medical assessments between 2006 and 2014 was used as the data source for this study. The extracted analytical data for this study included BMI, time of medical leave, and other variables of interest that were contained in the electronic database to be considered possible confounding or intervening variables, *eg*, age, sex, education, type of work, and whether a worker had night shifts. All personal information was excluded. Included were the data from workers who had BMI determinations in two consecutive years so that we could calculate the change in BMI—that in the current year minus that in the last year. To obtain information on absenteeism, information registered on the time of medical leaves was used. Cases of medical leaves were used as units of analysis and all cases were included in the analysis. Records with incomplete data on BMI and medical leaves

TAKE-HOME MESSAGE

- Obesity and overweight are associated with work absenteeism of medical cause.
- Although increased BMI has positive correlation with work absenteeism, the potential effect of the increment in BMI, regardless of the baseline BMI, as a predictor of work absenteeism has not been studied.
- Annual increase in BMI, regardless of baseline BMI, was found to be associated with prolonged absenteeism and might be an independent determinant of work absenteeism.

were excluded from the study.

Study Variables

Prolonged absenteeism was considered a dichotomous outcome variable and defined as a leave of 30 days or more of the total number of workdays within the last year, vs the loss of 29 days or less, used as the comparison category. The explanatory variable was the annual increase in BMI. Change in BMI was defined as the difference in BMI measured in a given year and the BMI in the previous year for the same worker. Annual increase in BMI was considered a dichotomous variable with two categories: those who gained BMI, and those who had maintained their BMI. Those with decreased BMI in the last year were excluded from the regression analysis to account for cases of severe disease and provide a fair comparison. Possible confounding variables were chosen based on what was allowed by the database selecting those possibly associated with increase in BMI and prolonged absenteeism. Confounding variables considered included sex; age; the highest level of education, considered dichotomous (some college or higher, and secondary education or lower); type of work according to the degree of physical activity as a binary variable (operational/field work, and administrative/office work); and whether a worker had night shift work or not.

Statistical Analysis

An initial descriptive analysis of the frequencies of sick leave absences for each of the covariates was performed showing frequencies and percentages. The quantitative variables were described in medians and IQRs after evaluation of normality with the Shapiro Wilk test. Bivariate as well as multivariate analyses were performed using the statistical population-averaged generalized estimating equation (PA-GEE) of the Poisson family and log link func-

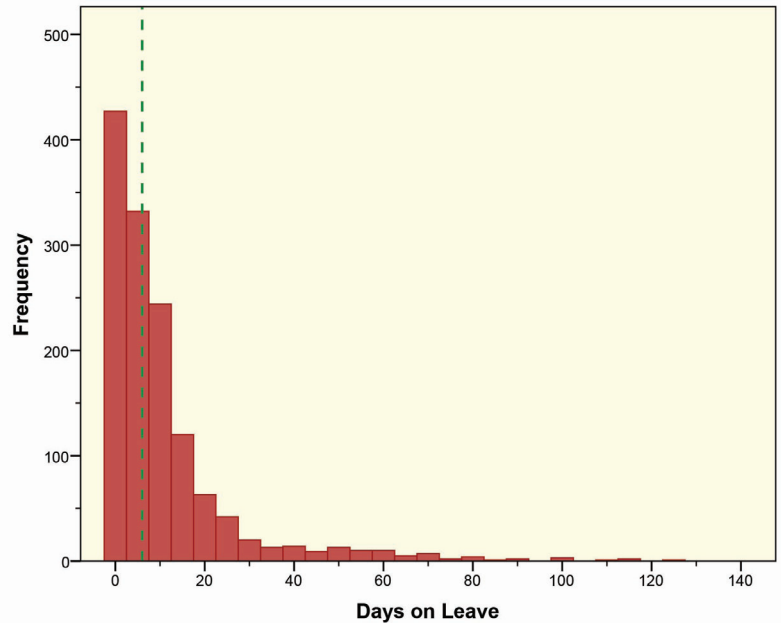


Figure 1: The distribution of workdays lost per case of sick leave. The green dashed line represents the median.

tion to examine the relationship between the independent variables with prolonged absenteeism, obtaining crude and adjusted relative risks (RR). This allowed the time adjustment of measurements made in the year in which the occupational data of each case of prolonged absenteeism were collected. Multiple regression analysis provided adjusted RRs of the associations along with their 95% confidence intervals (CI). All analyses were performed using the statistical package Stata[®] ver 11.1 (StataCorp, TX, USA).

Results

After excluding 1% of cases with incomplete information, 1347 sick leaves were obtained from the database between 2006 and 2014. The median number of workdays lost per case of sick leave was 6 (IQR 2 to 13) days (Fig 1). Eight and half percent of studied workers lost more than 30 days during the last year (Fig 2). Musculoskeletal, respiratory, and intestinal

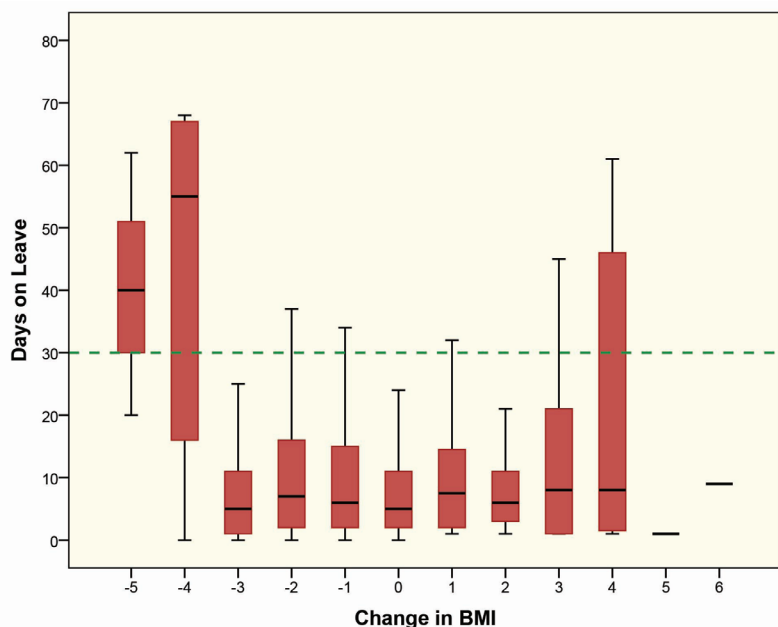


Figure 2: Box and whisker plot of days on sick leave against the change in BMI. Outliers are not shown. The green dashed line represents the cut-off of 30 days, we chose for our study.

diseases were the most frequent causes of sick leaves, accounting for 54.8% of all cases. The participants had a median BMI

Table 1: Characteristics of the cases with sick leave

Variable	n (%)
Sex	
Female	127 (9.4)
Male	1220 (90.6)
Education	
Secondary or lower	183 (23.8)
College or higher	586 (76.2)
Type of work	
Administrative/office	56 (5.1)
Operational/field	1039 (94.9)
Night shift work	
No	280 (21.3)
Yes	1033 (78.7)

of 25.5 (IQR 23.7 to 27.6) kg/m². The BMI increased in 300 (22.3%) cases in the last year; it did not change in 632 (46.9%), decreased in 415 (30.8%) cases; 11% of those with increased BMI, 6% of those who maintained their BMI, and 10.5% of cases with decreased BMI had prolonged absenteeism in the last year (mostly associated with chronic illness or cancer). The frequency of obesity in the sample decreased from 8.59% in 2006 to 6.50% in 2014.

The characteristics of the cases of medical leave of absence with respect to each of the covariates are shown in Table 1. In 90 (6.7%) cases of sick leave, the worker was male. The median age of studied workers was 34 (IQR 30 to 40) years. In the adjusted model, it was found that those with increased BMI in the last year were more likely to have a sick leave of more than one month (adj RR 1.16, 95% CI 1.05 to 1.29) (Table 2). It was also found that males, when compared to females, had a lower likelihood of prolonged absenteeism (crude RR 0.59, 95% CI 0.42 to 0.82; adj RR 0.47, 95% CI 0.42 to 0.52). Even though having a college degree or higher, and working in the operational unit, were not found significant predictors in univariate analysis, they were significantly associated with prolonged absenteeism in multivariate analysis.

Discussion

Because of the multiple organizational, medical, and socioeconomic variables involved in its genesis, the measurement of work absenteeism of medical origin has many challenges.¹⁸⁻²⁰ However, there seems to be a consistent link between increased BMI and absenteeism, even though overweight has not been found to have a strong association with absence of medical cause.¹¹ A study found that obese workers had at least 14 more days of absenteeism when compared to workers with

Table 2: Bivariate and multivariate analyses of increased BMI and work-related factors with prolonged absenteeism

Variable	Absenteeism >30 days in the last year, n (%)		Crude RR (95% CI)	Adj RR (95% CI)
	Yes	No		
BMI Increase				
No	82 (71.9)	965 (78.3)	1	1
Yes	32 (28.1)	268 (21.7)	1.30 (0.91 to 1.86)	1.16 (1.05 to 1.29)
Sex				
Female	16 (14.0)	111 (9.0)	1	1
Male	98 (86.0)	1122 (91.0)	0.59 (0.42 to 0.82)	0.47 (0.42 to 0.52)
Age, mean (range) (yrs)	36 (30 to 42)	34 (30 to 40)	1.01 (0.97 to 1.04)	0.97 (0.92 to 1.03)
Education				
Secondary or lower	20 (24.4)	163 (23.7)	1	1
College or higher	62 (75.6)	524 (76.3)	0.97 (0.66 to 1.42)	2.09 (1.06 to 4.10)
Type of work				
Administrative/office	4 (3.5)	52 (5.3)	1	1
Operational/field	109 (96.5)	930 (94.7)	1.31 (0.47 to 3.69)	2.09 (1.06 to 4.10)
Night shift work				
No	18 (15.8)	262 (21.8)	1	1
Yes	96 (84.2)	937 (78.2)	1.33 (0.92 to 1.91)	1.38 (0.75 to 2.54)

normal BMI.¹⁰ Another study with a large population data found that obese individuals were 1.7 times more likely to experience high level absenteeism (more than seven absences in the last six months) compared with non-obese individuals.²¹ In studies analyzing the association between obesity and absenteeism, reports of the association between annual increase in BMI and absenteeism were lacking.

Our study reported a median number of days of sick leaves of six days although there was a substantial variation (Fig 1). It was observed that almost half of the studied cases did not change their BMI in the last year; the BMI was increased in almost a quarter of the cases. This finding allowed to examine how influential was the in-

crease in BMI on the rate of absenteeism regardless of the baseline BMI. The exclusion of cases with decreased BMI may have introduced bias. However, inclusion of these cases could have represented even a greater source of bias as some of those cases would have been chronically ill; some of them might also intentionally be trying to reduce their weight specially because there was a general trend of weight reduction. We did find that more than one-tenth of cases with decreased BMI had prolonged absenteeism, which corresponded to chronically ill or cancer patients. We were not able to exclude these patients as the units of analysis were cases of sick leave and not workers.

In the present study, workers with

sick leaves who increased their BMI had a higher rate of prolonged absenteeism regardless of the initial BMI. The risk of prolonged absenteeism was marginally increased in workers who experienced an increase in BMI in the last year (adj RR 1.16, 95% CI 1.05 to 1.29). Our study complemented previous reports suggesting that absenteeism is associated with not only increased BMI but also with temporal increase in BMI, regardless of the initial BMI. The results of this study suggested that increases in BMI might predict the temporality of sick leaves. Therefore, controlling weight gain becomes a major goal in promoting health at work, even in non-obese workers, to potentially reduce absenteeism and improve productivity. This main finding of the present study was in line with previous reports that found a positive relationship between increased physical activity at the workplace and decrease in absenteeism.^{22,23} Also, the finding that males, when compared to females, had a lower likelihood of prolonged absenteeism was compatible with previous reports.²⁴ Higher education and working in an operational unit were significantly associated with prolonged absenteeism after adjusting for confounding variables. Although we do not have an explanation as to why higher education was associated with prolonged absenteeism, it is reasonable to expect that those workers who work in operational units are more likely to have sick leaves due to trauma, joint problems, and low-back pain.

The present study had a number of limitations that need attention. The analytical sample was extracted from a database of occupational medical records of a working population with occupational and environmental characteristics of those of a mining camp. The results are therefore only generalizable to similar populations. However, rather than studying a population of workers, the study analyzed the relationship of

annual increase in BMI and prolonged absenteeism. This relationship can be further assessed in other populations. This study defined prolonged absenteeism arbitrarily as sick leaves of 30 days or more. This was done because after 30 days, workers were not followed in the occupational medicine records of the camp and often transferred to work for mining offices outside the mining camp. Because prolonged absenteeism was defined with the cut-off of 30 days, it was not possible to assess the influence of BMI on short-term sick leaves. This study was also subjected to the information bias inherent to a historical longitudinal study, where important data may have been excluded. The data did not allow for the inclusion of other variables that could have been involved in the association of annual increase in BMI and prolonged absenteeism such as medical conditions and health risk factors other than obesity. However, possible intervening variables such as sex, age, education, and type of work were considered. In addition, night shift was included in the analysis as shift work has been associated with metabolic syndrome.²⁴ Finally, some of the employees working in the study period were participants of health promotion programs that included the identification and monitoring of metabolic diseases. This was reflected in the decreasing trend in the prevalence of obesity in the study population between 2006 and 2014. However, this finding could not affect our study, since it considered the annual increment in BMI rather than obesity or high BMI. The analysis of absenteeism of medical origin may be more substantial when the temporal trend of the observed variations was also taken into account. Finally, our study had the limitation of examining the correlation and not causation. It is likely that the increment in BMI was a factor for prolonged absenteeism. However, it is also possible that prolonged absenteeism was a factor for increment in BMI

as prolonged stay at home can predispose a worker to a sedentary lifestyle and thus increased BMI.

In conclusion, in this study, the annual increment in BMI was weakly associated with the severity of medical absenteeism. Despite its limitations, this study might offer evidence that increase in BMI was a determinant of absenteeism of medical cause. This concept requires attention from employers and policy makers. Further prospective research examining the impact of health conditions on work productivity is necessary. The implementation of programs for health promotion in the workplace is not yet widely accepted among employers in many countries,²⁶ probably due to the insufficient evidence of benefit in different working populations and the potential resources required in follow-up of workers and monitoring of indicators related to different medical conditions.²⁷ Often, resources associated with health promotion and disease prevention in the workplace are a legal obligatory expense instead of an investment aligned with productivity. The high rates of overweight and obesity in working populations warrant the study of the consequences of associated health conditions on productivity.

Conflicts of Interest: None declared.

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