


ORIGINAL ARTICLE

Association of low back pain with presenteeism in hospital nursing staff

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Abstract

Objectives: Chronic low back pain (LBP) is known to cause various disorders compared with acute LBP. However, there was no study evaluating presenteeism due to LBP divided into subcategories by the duration of LBP. Therefore, this study aims to investigate the relationship between acute or chronic LBP and presenteeism in hospital nursing staff.

Methods: Overall, 1100 nurses filled in a questionnaire on basic attributes, LBP symptoms, depression symptoms, and work productivity. The subjects were divided into three groups based on the period of LBP and the compared work productivity. Work Limitation Questionnaire Japanese version (WLQ-J) was used for the assessment of work productivity. The effects of acute and chronic LBP on presenteeism were evaluated through multiple regression analysis models.

Results: In total, 765 subjects, without missing values, were included. The overall prevalence of LBP was 64.6% (acute LBP 47.5%, chronic LBP 17.1%). On multiple regression analysis, acute pain and presenteeism were not associated. Conversely, chronic LBP was associated with time management (adjusted $\beta = -2.3$, 95% CI: -4.5 to -1.1), mental-interpersonal relationship (adjusted $\beta = -2.8$, 95% CI: -5.1 to -0.6), and output (adjusted $\beta = -2.7$, 95% CI: -5.4 to 0.0) after adjustment for sex and career years. When depression was included in the adjustment factors, chronic LBP and WLQ subscales were not associated.

Conclusions: It became obvious that Chronic LBP in nurses was significantly related to time management, mental-interpersonal relationship, and output. The importance of preventing a decline in work productivity by taking precautions to prevent chronic LBP and depression was suggested.

KEYWORDS

acute low back pain, chronic low back pain, depression, nurses, presenteeism

1 | INTRODUCTION

Low back pain (LBP) is one of the diseases with a high number of complaints worldwide. It is said that 80% of the population experience LBP at least once in their lifetime.¹ A systematic review of the prevalence of LBP reported point prevalence ranged from 12% to 33%, one-year prevalence ranged from 22% to 65% and lifetime prevalence ranged from 11% to 86%.² In the industrial health department, LBP accounts for the majority of occupational diseases, especially, showing a high prevalence among the nursing staff.^{3,4} An epidemiological study on the occupational factor of the onset of LBP in nurses concluded that their work has significantly more frequent handling of heavy objects represented by unnatural work postures and embracing of patients as compared to office work, and the nurses' workplace has a high risk of developing musculoskeletal disorders including LBP.⁵

In recent years, presenteeism has been paid attention. Presenteeism is defined by the phenomenon of people, despite complaints and ill health that should prompt rest and absence from work, still turning up at their jobs.⁶ There are economic costs from sickness and health-related problems. The resulting hidden economic losses in work productivity due to the disease are greater than the medical expenses directly incurred by the illness. Moreover, the impact of presenteeism on such losses is twice or thrice more than absenteeism.⁷ In fact, a recent survey indicates that 69 million workers reported taking days off because of illness, resulting in a total of 407 million working time lost. In addition, 55 million workers were unable to concentrate on their jobs because of their own sickness or that of family members accounting for another 478 million lost days. Furthermore, the time lost from work due to health-related problems was estimated to represent an economic loss of total \$260 billion per year.⁸ Some health conditions, such as pain including LBP and migraine, allergies, irritable bowel syndrome, gastroesophageal reflux disease, and mental health problems are said to increase the risk of presenteeism.⁹ In particular, the estimated work-related economic losses caused by LBP, depression, and fatigue were about \$4 billion, which is larger than that of other health problems.¹⁰

Several studies reported the relationship between LBP among nurses and presenteeism.^{11,12} However, these studies observed the relationship between overall LBP and work productivity. The factors and extent of LBP are various, and the treatment for LBP differs depending on the duration and the factors.¹³ Chronic LBP is likely to lead to complications and various disorders.¹⁴ Classification of clinically diagnosed LBP is important to prescribe better treatment.¹⁵ Therefore, in terms of work productivity, it is necessary to classify LBP into sub-categories and clarify which type of LBP should be dealt with to prevent the declining work productivity. Few studies take different sub-categories of LBP into account^{16,17}

but there is no study reported the relationship between LBP divided into different categories and presenteeism among nurses. Thus, we conducted a cross-sectional survey directed toward hospital nursing staff. We hypothesize that there is a difference between the influence of acute LBP and chronic LBP for presenteeism in nursing staffs. The major aim of this study was to reveal the relationship between subcategories of LBP based on the duration (acute or chronic LBP) and presenteeism among hospital nursing personnel.

2 | SUBJECTS AND METHODS

2.1 | Subjects

This cross-sectional study was conducted in a large university hospital in 2016. Questionnaires and consent forms were distributed to the entire nursing staff (n = 1100) in each department. Nurses who did not agree were excluded from subject group to carry out research based on the will of the individuals. This study was approved by Ethic Review Committee in this facility (approve number R0131).

2.2 | Questionnaire

A questionnaire was chosen for the method in this study. All subjects filled in their workplace a structured questionnaire designed into four categories (basic attributes, information about LBP, assessment of presenteeism, and depression).

Basic attributes included individual factors concerning their personal lives, such as years of service, birth or pregnancy experience, history of smoking, regular exercise habits in addition to physical factors such as age and sex.

Regarding LBP, the subjects were asked whether they experienced LBP during the last 12 months. Nurses with LBP were further requested to provide information on the severity, the symptomatic period and the presence of measures or actions taken for LBP. The definition of LBP, for anatomic location, included pain or discomfort in posterior aspect of the body from the lower margin of the twelfth ribs to the lower gluteal folds¹⁸ and for duration, acute LBP was defined as LBP for less than 3 months and chronic LBP was defined as continuous LBP at least 3 months. The definition of duration was based on the nearly established view that LBP for 3 months or more is considered chronic LBP, but acute and subacute LBP has no precise definition.¹⁹ Based on this definition, the subjects were classified into three groups: without LBP, acute LBP, and chronic LBP. The severity of LBP was assessed by a numerical rating scale (NRS) which asked to rate pain on an 11-point scale, where 0 indicates no pain and 10 indicates the worst imaginable pain. The NRS is considered a valid and reliable pain assessment tool.²⁰

The Work Limitation Questionnaire Japanese version (WLQ-J) was used to evaluate work productivity

(presenteeism). The WLQ is a self-administered questionnaire measuring the degree to which health problems affect job performance (work disability) and the work productivity impact of these work limitations in the previous two weeks. The WLQ consists of the following four subscales, each addressing the influence of physical and emotional health problems on performance of a specific category of work tasks: physical demands (six items), which covers the ability to perform tasks involving bodily strength, movement, endurance, coordination and flexibility; time management (five items), which addresses difficulty in handling a job's time and scheduling demands; mental-interpersonal demands (nine items), which addresses cognitively demanding tasks and on-the-job social interactions; and output demands (five items), which concerns reduced work quantity, quality and timeliness. The WLQ inquire about the level of difficulty in performing specific job demands. The time, mental-interpersonal, and output scale items address the amount of time that physical or emotional health problems made the performance of specific demands difficult. The physical scale refers to the amount of time the employee was able to perform a demand without difficulty due to health problems. Scale response options are as follows: "all of the time (100%)"; "a great deal of the time"; "some of the time (approximately 50%)"; "a slight bit of the time"; "none of the time (0%)"; and "does not apply to my job." Each of the four scale scores is computed as the mean of the existing responses and converted to 0 (not limited) to 100 (limited all of the time). Using this subscale score, the algorithm calculated the rate of decrease in work performance.²¹ WLQ-J was translated by Ida with permission from the original author of WLQ.²² Test reliability and construct validity of the WLQ-J have been validated.²²

The prevalence of depression was assessed by the Center for Epidemiologic Studies Depression Scale (CES-D). The CES-D consists of 20 items designed to measure depressive symptoms during the past week in adults and adolescents. Scores for each item range from 0 to 3 [0 = rarely or none of the time (<1 day); 1 = some or a little of the time (1-2 days); 2 = occasionally or a moderate amount of time (3-4 days); and 3 = most or all of the time (5-7 days)]. Higher scores indicate more depressive symptoms.²³ As a cutoff point, over 16 points has been used to define clinically meaningful depression symptoms.²⁴ The validity, reliability, sensitivity, and responsiveness of this scale were reported.²⁵

2.3 | Data analyses

In a univariate analysis, for continuous variables (age, comprehensive evaluation of WLQ and subscales of WLQ; time management demand, physical demand, mental-interpersonal demand, and output demand), the differences among three groups (without LBP, acute LBP, and chronic LBP) were tested by Kruskal-Wallis statistics

and for categorical variables (sex, years of service and the presence of depression), these were compared using the chi-squared test. Multiple comparison was conducted by Steel-Dwass test to evaluate the differences between each group. Wilcoxon rank-sum test was used to assess the difference in the severity between acute LBP and chronic LBP.

In a multivariate linear regression, the score of WLQ was assigned to dependent variables, and the presence or absence of acute or chronic LBP was an independent variable. Sex and career years or the prevalence of depression were considered as the confounding variables to investigate the relationship between the work productivity and acute or chronic LBP.

The statistical significance level was set at 0.05. All statistical analyses were conducted using Statistical Package for Social Sciences (SPSS) version 20.0 software package (IBM Corp, Armonk, New York).

3 | RESULTS

Among 1100 subjects, the number of responders of the questionnaire was 915. In addition, 20 persons were excluded, and eventually 765 subjects, without any missing response data, were analyzed. The subjects were on average 33.0 years of age, 688 (90.9%) of them were female and 494 (64.6%) had LBP during last 12 month. Nurses with LBP further divided into acute LBP group and chronic LBP group, consequently, the number of acute LBP group were 363 (47.5%), chronic LBP group were 131 (17.1%) and without LBP group were 271 (36.4%).

3.1 | Univariate analysis.

The characteristics of the subjects (age, sex, and career years), the severity of LBP, work productivity, and depression tendency among the three groups are shown in Table 1. In Kruskal-Wallis test, a significant difference was observed between the groups with respect to age ($P < 0.0001$), WLQ comprehensive evaluation ($P = 0.019$), time management demands ($P = 0.018$), physical demands ($P = 0.017$), and mental-interpersonal demands ($P = 0.002$). In the multiple comparison, LBP group was significantly older than the group without LBP, and the WLQ comprehensive evaluation and WLQ subscales in time management demands, physical demands, and mental-interpersonal demands showed significantly lower scores. In Wilcoxon test, the severity of LBP in chronic LBP group was significantly stronger than acute pain group ($P = 0.001$). In the chi-square test, chronic LBP group had higher career years of nursing ($P < 0.01$) and stronger depression tendency ($P < 0.05$) than the other group.

TABLE 1 Comparison of subject's characteristics, the severity of LBP, work productivity, and depressive tendency

Variables	Without LBP (n = 271)	Acute LBP (n = 363)	Chronic LBP (n = 131)	Total (N = 765)	P [†]
Age, mean (SD)	31.1 (8.8)	33.9 (9.7) [‡]	33.0 (9.4) [‡]	33.0 (9.4)	<0.001 [¶]
Female, n (%)	251 (92.0)	321 (89.6)	116 (89.9)	688 (90.9)	0.334
Carrier years, n (%)					<0.01 [¶]
Year 1-3	107 (14.0)	98 (12.8)	29 (3.8)	234 (30.6)	
Year 4-11	87 (11.4)	118 (15.4)	42 (5.5)	247 (32.3)	
Year 1 lover	77 (10.1)	147 (19.2)	60 (7.8)	284 (37.1)	
The severity of LBP, mean(SD)		3.5 (1.8)	4.2 (2.0)		0.001 [¶]
Work productivity, mean(SD)					
WLQ comprehensive evaluation	92.4 (17.8)	91.0 (20.0)	91.6 (17.0) [‡]	91.6 (18.7)	0.019 [¶]
Time management demands	88.5 (21.2)	87.4 (20.8)	85.4 (20.6) [‡]	87.4 (20.9)	0.018 [¶]
Physical demands	73.8 (30.8)	76.2 (25.3)	69.7 (26.1) [§]	74.2 (27.6)	0.017 [¶]
Mental-interpersonal demands	83.6 (21.6)	81.5 (19.4) [‡]	79.0 (20.4) [‡]	81.8 (20.4)	0.002 [¶]
Output demands	81.8 (25.3)	80.2 (22.1)	75.6 (25.2)	80.5 (23.8)	0.068
The presence of depression, n (%)	65 (24.1)	113 (31.4)	49 (38.0)	227 (29.9)	<0.05 [¶]

*Variables are mean (SD) or the number (percentage) WLQ=Work Limitation Questionnaire.

[†]Based on unadjusted analysis among without LBP, acute LBP and chronic LBP groups (Kruskal-Wallis test or chi-square test).

[‡]Significantly different from without LBP at multiple comparison (Steel-Dwass test).

[§]Significantly different from without LBP and with acute LBP at multiple comparison (Steel-Dwass test).

[¶]p<0.05.

[¶]p<0.01.

3.2 | Multivariate analysis

Association between acute LBP or chronic LBP and work productivity is presented in Tables 2 and 3. There was no relationship between acute LBP and work productivity. The multiple regression analysis showed that the relationship between chronic LBP and mental-interpersonal demands was observed without adjustment ($\beta = -2.3$, 95% CI: -4.5 to 0.0 , $P = 0.04$). Conversely, chronic LBP and time management ($\beta = -2.3$, 95% CI: -4.5 to -0.1 , $P = 0.01$), mental-interpersonal relationship ($\beta = -2.8$, 95% CI: -5.1 to -0.6) and output ($\beta = -2.7$, 95% CI: -5.4 to 0.0 , $P = 0.05$) were not significantly associated after adjustment for career years and sex. In case of an adjustment for career years, sex, and the presence of depression, a significant association between chronic LBP and work productivity was not confirmed.

4 | DISCUSSION

We performed this study with the hypothesis that there is a difference between the influence of acute LBP and chronic LBP for presenteeism in nursing staffs. From the results obtained, it became obvious that only chronic LBP has the relationship with presenteeism.

In this study, the prevalence of LBP of all subjects in the previous 12 months was 64.6% which is almost the same as

a previous study that reported the annual occurrence rate of LBP was about 60%.^{11,26} In addition, 47.5% of the subjects had acute LBP (defined as pain lasting less than 3 months) and 17.1% had chronic LBP (defined as pain lasting at least 3 months or more), respectively. It is difficult to compare the observed prevalence of acute LBP with other reports because of the different definitions, whereas chronic LBP has an established definition and the observed prevalence of chronic LBP in our study was consistent with other reports.¹⁷

The results of this study revealed that there was no relationship between acute LBP and work productivity. While chronic LBP was associated with WLQ subscales used for evaluating work productivity, when depression was included in the adjustment factors, there was no relationship between them. Acute pain can be caused by nociceptive pain, which is generated by activations of nociceptors due to tissue damage, and acute pain is easier to relax as time passes. Chronic pain is a complex sensory and emotional experience that varies widely depending on the mental state of an individual; its onset and cause are often unknown, and the pain prolongs in many cases.^{27,28} Many studies demonstrate that patients with chronic LBP have alternations in the brain networks involved in cognitive and emotional regulation of pain.²⁹ The study assessed longitudinal changes in back pain-related brain activity accompanying the transition to chronic pain and reported that the transition from acute to chronic pain may be accompanied by a shift from the sensory to affective-emotional

TABLE 2 The association between WLQ score and the presence of acute LBP*

Variables	Without acute LBP (n = 271)	With acute LBP (n = 363)	Unadjusted β (95% CI/P-value)	Adjusted β^\dagger (95% CI/P-value)	Adjusted β^* (95% CI/P-value)
Work productivity comprehension evaluation	92.4 \pm 17.8	91.0 \pm 20.0	-1.4 (-4.4, 1.6/P = 0.4)	-1.7 (-4.7, 1.3/P = 0.3)	-1.3 (-4.3, 1.7/P = 0.4)
Time management demands	88.5 \pm 21.2	87.4 \pm 20.8	-1.0 (-4.3, 2.3/P = 0.5)	-1.2 (-4.5, 2.1/P = 0.5)	-0.4 (-3.6, 2.9/P = 0.8)
Physical demands	73.8 \pm 30.8	76.2 \pm 25.3	2.5 (-2.0, 6.8/P = 0.3)	1.9 (-2.6, 6.4/P = 0.4)	2.6 (-1.9, 7.1/P = 0.3)
Mental-interpersonal demands	83.5 \pm 21.6	81.5 \pm 19.4	-2.2 (-5.4, 1.1/P = 0.2)	-3.0 (-6.3, 0.3/P = 0.1)	-1.9 (-5.1, 1.2/P = 0.2)
Output demands	81.8 \pm 25.3	80.2 \pm 22.1	-1.6 (-5.3, 2.1/P = 0.4)	-2.3 (-6.1, 1.4/P = 0.2)	-0.9 (-4.5, 2.7/P = 0.6)

*WLQ=Work Limitation Questionnaire.

†Adjusted for sex and nurse career year.

‡Adjusted for sex, nurse career years, and the prevalence of depression.

circuitry for pain.³⁰ Notably, a previous study indicated that longer pain duration is related to depression. Von Korff et al reported that both the number of pain days in the prior 6 months and the number of pain sites were significantly associated with depression symptom levels.³¹ An international survey showed that patients with pain lasting longer than 6 months were more than four times as likely to have a depressive disorder as those without chronic pain.³² The long-term medical conditions most strongly associated with the development of depression included back pain and migraine headaches.³³ Moreover, it is also known that not only the duration of pain but also the severity of pain, the interference with daily activities and the diffuseness of pain (or number of pain sites) are associated with depression outcomes.³⁴ For example, as the severity of pain increases, depressive symptoms, and depression diagnoses become more prevalent.³⁵ Thus, it seems that acute LBP did not lead to decline in work productivity as it had little influence on depression tendency and a few abnormalities in the central pain changes in pain networks due to the short duration of onset. Chronic LBP, on the other hand, had various factors, such as central changes in pain receptor networks, the severity of pain and depression tendencies, which had multiplied the effect on presenteeism.

The relationship between chronic LBP and time management, mental-interpersonal relationship and output was revealed from our results, which are in line with a previous study reporting that chronic pain had moderate to high correlation with sub-items of WLQ except for physical demands.³⁶ Burton et al reported that the pattern of odds of LBP across the four domains of WLQ was interestingly similar to the profile seen with depression. This means that like the employees with depression, the employees identifying themselves with LBP reported that their disorder mostly impacted the mental-interpersonal aspects of their jobs.³⁷ Depression and pain comorbidity have been suggested in many studies.^{38,39} For example, it is indicated that on average, 65% of patients with depression experience one or more pain complaints, and depression is present in 5%-85% of patients with pain conditions.³⁴ Moreover, it has also been known that the chronic pain leads to the decline of cognitive function. A systematic review on working memory function in chronic pain patients consistently showed moderate effects in behavioral assessment.⁴⁰ In our results, nurses with chronic pain also have a high prevalence of depression, and the relationship between the prevalence of depression and work productivity was especially strong. It can be thought that the depressive tendency and declining cognitive function accompanying with chronic LBP may influence ability to work, including time management, interpersonal relationship, and output.

There are some limitations in this study. First, the cross-sectional design of our study could not determine the causal relationship between chronic pain and depression, which are

TABLE 3 The association between WLQ score and the presence of chronic LBP*

Variables	Without chronic LBP (n = 271)		With chronic LBP (n = 131)		Unadjusted β (95% CI/P-value)		Adjusted β^\dagger (95% CI/P-value)		Adjusted β^\ddagger (95% CI/P-value)	
	Work productivity comprehension evaluation	92.4 ± 17.8		91.6 ± 17.0		-0.4 (-2.2, 0.4/P = 0.65)		-0.8 (-2.6, 1.1/P = 0.41)		-0.2 (-2.0, 1.6/P = 0.80)
Time management demands	88.5 ± 21.2		85.3 ± 20.6		-1.6 (-3.8, 0.7/P = 0.17)		-2.3 (-4.5, -0.1/P = 0.04) [§]		-1.3 (-3.5, 0.9/P = 0.24)	
Physical demands	73.8 ± 30.8		69.7 ± 29.4		-2.0 (-5.1, 1.0/P = 0.19)		-2.7 (-5.9, 0.5/P = 0.09)		-1.8 (-5.0, 1.4/P = 0.27)	
Mental-interpersonal demands	83.6 ± 21.6		79.0 ± 20.4		-2.3 (-4.5, 0.0/P = 0.04)		-2.8 (-5.1, -0.6/P = 0.01) [§]		-1.7 (-3.9, 0.5/P = 0.12)	
Output demands	81.8 ± 25.3		78.6 ± 25.2		-1.6 (-4.2, 1.0/P = 0.23)		-2.7 (-5.4, 0.0/P = 0.04) [§]		-1.4 (-4.0, 1.2/P = 0.29)	

*WLQ=Work Limitation Questionnaire.

†Adjusted for sex and nurse career years.

‡Adjusted for sex, nurse career years, and the presence of the depression.

§p<0.05.

known to interact with each other.³⁶ Second, there is the possibility that the self-appraisal of those affected by depression may be biased toward the negative.⁴¹ Third, the recall bias may exist because the questionnaire asked about the complaint of LBP in the last 12 months.

In conclusion, we found that only chronic LBP among hospital nursing staffs was associated with presenteeism in the abilities of time management, mental-interpersonal relationship, and output. Therefore, in terms of work productivity, the importance of classification LBP into subcategories by characteristics including the duration and the necessity of taking measures against chronic LBP rather than acute LBP was suggested. Moreover, chronic LBP had a correlation with depression. Both chronic LBP and depression strongly affect presenteeism. Thus, it was also suggested that intervention was necessary not only for physical factors, such as chronic LBP, but also mental health factors, such as depression, to maintain work productivity. Further investigation of the casual relationship between chronic LBP and depression and similar examinations among other occupation are needed for generalizability.

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DISCLOSURES

Approval of the research protocol: This study was approved by Ethic Review Committee in this facility (approve number R0131) regarding research protocol including the voluntary participation, do not harm, confidentiality, anonymity and only assess relevant components of this study. *Informed consent:* In this study, we explained about this research sufficiently in document and oral to those who would participate beforehand, then this study targeted for only those who gained consent from the person's free will. Explained items were following: the title and outline of this research including the objective, measurement items and its duration, disadvantages arising from becoming subjects, freedom of refuse to become subjects at any time, be able to withdraw consent from as required even after subjects and their family agree, protection of privacy and no reward is paid. *Registry and the registration no. of the study/trial:* N/A. *Animal studies:* N/A.

CONFLICT OF INTEREST

The authors had no financial support or other benefits from commercial sources for the work reported in the manuscript, or any other financial interests that could create a potential conflict of interest or the appearance of a conflict of interest regarding the work.

AUTHOR CONTRIBUTIONS

JP wrote this paper. NF, KN, HY, TA conducted data collection. NF, KN, HY, MY, YT, TM, YS, IY, ST, TA designed study. NF, YS, IY, ST analyzed data. All co-authors confirmed this research.

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