Manual handling as risk factor of low back pain among workers

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ABSTRACT

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Disorders of the musculoskeletal system constitute a considerable health problem in industrialized societies. Low back pain (LBP) remains a common and costly problem among the workers. Workplace injuries, primarily musculoskeletal disorders, are a persistent problem for nursing. A cross-sectional study was conducted to investigate prevalence of LBP as well as the potential risk factors associated with LBP. These potential risk factors include individual characteristics, job duration, type of work, and manual handling knowledge and practice. Seventy-six subjects consisting of 30 nurses and 46 administrative workers were recruited into the study. Symptoms of LBP cases were assessed by means of a simple questionnaire, and the diagnosis of LBP was confirmed by clinical examination. The study showed that the overall point prevalence rate of LBP was 42.1%, while the overall 12-month prevalence rate was 69.7%. Occupational group and manual handling practice were independent predictors for point prevalence of LBP. Nursing occupation significantly increased the risk of point prevalence rate of LBP by 2.703 (95% C.I. OR 1.046 – 6.984) compared to administrative workers. Nurses with frequent manual handling practice had a 2.917-fold higher risk of developing a point prevalence of LBP, although this risk was statistically not significant (OR=2.917;95% C.I. 0.094-3.003). The study indicates that an association exists between manual handling practice and LBP prevalence.

Keywords: Low back pain, manual material handling, working pattern

INTRODUCTION

Low back pain (LBP) is a problem frequently complained of by every individual, particularly workers. The frequency of LBP approaches that of flu,[1] as more than 85% of persons has at one time in his or her lifetime ever suffered from LBP.[1,2] In an American study

50% of workers suffered yearly from LBP.[2] Another study stated that LBP in the United States was responsible for the loss of 149 million work-days per year, with 102 million work-days lost due to occupational LBP. It was estimated that the cost of lost work time reached an amount of $3000 for each insurance compensation claim.[3]

LBP is a sharp or dull pain or muscular stiffness occurring in the back, i.e. the region between the lower costal margins and gluteal folds, the pain being either localized or radiating into the lower extremities (ischialgia).[4,5] Koes et al.[5] in the Netherlands stated that among all patients with LBP 4% was identified with compression fractures, 3% with spondylolisthesis, 0.7% due to tumors or tumor metastases, 0.3% due to ancylosing spondylitis, and 0.01% caused by infection, while among the remaining cases more than 90% had no identifiable cause and was classified as non specific LBP.[2]

LBP is designated as acute LBP if it disappears in less than 6 weeks, as subacute LBP if it persists for 6 weeks to 3 months and as chronic LBP if it persists for more than 3 months. Chronic LBP frequently leads to invalidity, such that the individual concerned is unfit for work.[4] The recurrence rate of LBP is also high (80%), where the 12-month recurrence rate is around 20-44%.[1]

The point prevalence rate in the general population was reported by several studies to be around 14-30%,[6] whilst the point prevalence rate in workers was 15-30%.[7] The study by Omokhodion and Sanya[8] among office workers in Nigeria revealed an annual/12-month LBP prevalence of 38%, while the point prevalence was 20%. The annual prevalence rates in industrial workers[7] and construction workers[9] are 21% and 30.9%, respectively, whilst the point prevalence rate in workers packing detergent powder is 36.8%.[10] Back pain is also a very prevalent condition among health care workers. For health care workers in different specialities the 12-month prevalence for pain in the lumbar spine has been reported as being as high as 76%.[11,12] A number of studies on nursing occupations yielded 12-month prevalences of 30%,[6] 69%[13] and 73-76%[14] while the point prevalence was 54.7%.[14]

Studies investigating occupational risk factors for LBP have tended to focus on work-related mechanical risk factors with many using job title as a proxy measure of physical load. A study reported increased associations between mechanical factors, such as manual handling, handling heavy loads and frequent bending and twisting, and the risk of LBP.[15]

This work pattern, termed manual material handling (MMH), is frequently encountered in nursing occupations, such as lifting and transferring of patients, walking or moving, abnormal postures of the trunk (bowing, lateral bending, torsion of the trunk) and pushing, pulling trolleys and manipulating heavy equipment.[16,17] More recently, work-related psychosocial factors have also been considered as risk factors for LBP.[18,19] There is evidence that individuals who physically transfer or lift objects (manual material handling) on a regular basis increase the strain on their backs and the risk of developing back pain. In many occupations, it is difficult to avoid this. The present study aims to measure the prevalence rate of LBP among nurses as compared to administrative workers and its association with work-related patient handling activities.

METHODS

Design

This was a cross-sectional study in which nurses and administrative workers were recruited.

Research location and time frame

The study was conducted at the Medical Faculty, Trisakti University from September 2006 until February 2007.

Subjects

Subjects were nurses with a job duration of several years in a private hospital in Jakarta, who were attending biomedical courses at the Medical Faculty, Trisakti University, as part of the Strata I program in Nursing Science, while administrative personnel of the Medical Faculty, Trisakti University funtioned as the control group. All participants consented to become study subjects and signed an informed consent form for this study.

Exclusion criteria were nurses without nursing jobs or administrative workers without administrative work, persons with traumatic back pain, and persons with a past history of renal disease, tuberculosis of the spine or malignancies.

The 12-month prevalence rate estimate of 70%[15] for low back pain was used to determine sample size. Assuming the 12-months prevalence rate in administrative workers to be 35%, it was estimated that 29 subjects were required to have 80% power of detecting a risk associated with LBP (95% confidence interval).[20]

Data collection

Data collection was conducted by the investigators, using a questionnaire regarding the respondents' demographic characteristics, type of work, and job duration. The diagnosis of LBP was established on the basis of past or current attacks of LBP at the present work location in the previous year, and/or tenderness of the paralumbal/gluteal/sacroiliac musculature, with or without a positive straight-leg raising test, and with or without radiation of the pain into the legs. Assessment of knowledge of MMH techniques was performed by presenting the subjects with

six illustrations of work posture in manual handling tasks, selected from "Ergonomic Checkpoints: Practical and easy-to-implement solutions for improving safety, health and working conditions".[21] This method has been used by previous investigators for their studies,[10] where the subjects were asked to choose between right or false and to give their reasons. Scoring was accomplished by evaluating aeach question according to the following criteria.

A score of 0 was given if the answer was considered completely incorrect, a score of 1 for a nearly correct answer, and a score of 2 for correct answers. The scores for all six answers were then summed and the resulting total was categorized as follows: a total score of 7–12 was considered evidence of an understanding of the MMH techniques presented in the questionnaire, whereas a total score of 0–6 denoted ignorance of the MMH techniques in question.

Measurement of height and weight of the subjects was by means of SMIC instruments made in China. Physical examination was performed by the investigators, while the diagnosis of LBP was established on the basis of the previously defined criteria.

Data analysis

Data were entered into the statistical package for the social sciences (SPSS v 15) software program. Nominal, binary and interval data were analysed using descriptive statistics. Bivariate analysis was used to examine for the associations between age, gender, job duration, manual handling, prevalence of low back pain, with occupational group. Chi-square tests were used for categorical data and independent-t tests for continuous data. Data were further analysed using multivariate logistic regression techniques to explore for independent predictors of point prevalence of LBP.

RESULTS

A total of 76 respondents were recruited into this study, comprising 30 nurses (3 male and 27 female nurses) and 46 administrative workers (26 male and 20 female workers). The youngest subject was 20 years of age and the eldest 60 years, with a mean age of 34.8 years and a standard deviation (SD) of 9.6. The majority of the subjects, viz. 44 (57,9%) had an academic educational background, 5 subjects had studied at primary school or junior high, comprising 2 with a primary school certificate and 3 with a junior high school certificate, whereas 27 subjects were educated at senior high school. The mean job duration was 10.6 years (SD = 8.6). Minimum job duration was one year and maximal job duration 37 years.

Approximately 67.1% of respondents had poor knowledge of manual handling techniques, and 71.1% rarely had manual handling practice. On the day of the examination, the point prevalence of LBP was 42.1% and the 12-month prevalence of LBP 69.7% (Table 1).

Table 1. Profile of respondents (n=76)

Characteristics	n (%)
Gender	
Male	29 (38.2)
Female	47 (61.8)
Occupational group	
Nursing	30 (39.5)
Administration	46 (60.5)
Job duration group (yrs)	
< 10	46 (60.5)
≥ 10	30 (39.5)
Job duration (yrs, mean ± SD)	10.6±8.6
Age groups (yrs)	
< 35	44 (57.9)
≥ 35	32 (42.1)
Age (yrs, mean ± SD)	34.8±9.6
Manual handling knowledge	
Yes	25 (32.9)
No	51 (67.1)
Manual handling practice	
Yes	22 (28.9)
No	54 (71.1)
Point prevalence of LBP	
Yes	32 (42.1)
No	44 (57.9)
Annual prevalence of LBP	
Yes	53 (69.7)
No	22 (30.3)

Table 2. Profile of respondents by occupational group (n=76)

Characteristics	Occupational group		p
	Nursing (n=30)	Administration (n=46)	
Gender			
Male	3 (10.3%)	26 (89.7%)	0.0000
Female	27 (57.4%)	20 (42.8%)	
Age, yrs, mean (SD)	31.8 (8.2)	36.8 (10.1)	0.0281
Job duration, yrs, mean (SD)	7.9 (6.2)	12.4 (9.6)	0.0271
Manual handling knowledge			
Yes	16 (64.0%)	9 (36.0%)	0.002
No	14 (27.5%)	37 (72.5%	
Manual handling practice			
Yes	22 (100.0%)	0 (0.0%)	0.0000
No	8 (14.8%)	46 (85.2%)	
Point prevalence of LBP			
Yes	17 (53.1%)	15 (46.9%)	0.0380
No	13 (29.5%)	31 (70.5%)	
Annual prevalence of LBP			
Yes	24 (45.3%)	29 (55.7%)	0.1162
No	6 (21.6%)	17 (78.4%)	

Table 3. Risk factors of point prevalence of LBP in respondents (n=76)

Risk factors	Odds ratio (OR)	95% Confidence Interval OR
Gender		
Female	1.672	0.643 – 4.351
Male	Reference	
Age group (yrs)		
< 40	0.900	0.357 – 2.268
≥ 40	Reference	
Job duration group (yrs)		
< 10	1.087	0.429 – 2.756
≥ 10	Reference	
Occupational group		
Nursing	2.703	1.046 -6.984
Administration	Reference	
Manual handling knowledge		0.545 – 3.912
Poor	1.460	
Good	Reference	
Manual handling practice		
Frequent	3.501	1.241 – 9.849
Rare	Reference	

Males were significantly more frequently employed as administrative workers (89.7%) in comparison with nurses (42.8%). On average the administrative workers were older (36.8 ± 10.1) than the nurses (31.8 ± 8.2). Regarding type of occupation, the point prevalence of LBP was significantly higher among nurses (53.1%) compared with that of administrative workers (46.9%). Manual hanling knowledge and manual handling practice was significantly better in nurses than in administrative workers (Table 2). The occurrence of a significant difference in point prevalence between nurses and administrative workers requires further analysis.

A number of risk factors of point prevalence of LBP were examined, namely gender, age group (<40 and ≥40 years), job duration (<10 and ≥10 years), type of occupation, manual handling knowledge and manual handling practice. Table 3 indicates that occupational group and manual handling practice were independent predictors for point prevalence of LBP. Nursing occupation significantly increased the risk of point prevalence of LBP by 2.703 (95% C.I. OR 1.046 – 6.984) compared to administrative workers. Respondents who did frequent manual handling practice had a 3.501-fold significantly higher risk of point prevalence of LBP compared with those who had no frequent manual handling practice (95% C.I.; OR 1.241 – 9.849).

Based on the analytical results on Table 3 a stratification of the respondents should be performed by occupation (Table 4).

Nurses with frequent manual handling practice had a 2.917-fold higher risk for developing a point prevalence of LBP compared with nurses with infrequent manual handling practice, but the risk was statistically not significant (OR=2.917;95% C.I. 0.094-3.003).

Table 4. Manual handling practice as risk factor of point prevalence of LBP
by occupational group (n=76)

Occupational group	Exp(β)	95% Confidence Interval Exp(β)
Nursing (n=30)		
Manual handling practice		
Frequent	2.917	0.094 – 3.003
Rare	Reference	
Administration		
Manual handling practice*	----	

*All respondent in the administrative group rarely had manual handling practice, therefore the odds ratio could not be determined

DISCUSSION

The point prevalence of LBP was 42.1% in all respondents and the annual prevalence of LBP 69.7%. These study results were similar to those of a study in Iran with an annual prevalence of LBP of 84% in industrial workers.[7] The present study showed a point prevalence rate of LBP and an annual prevalence rate of LBP in nurses of 53.1% and 46.9%, respectively. These results are consistent with a study in Hongkong nurses where of the 377 nurses interviewed, 153 (40.6%) reported having LBP within the last 12 months.[22] In comparison, Taiwanese nurses had a point prevalence rate of LBP of 66.0%.[23] However, the results obtained in our study showed a point prevalence of LBP and an annual prevalence rate of LBP that were greater than those found in Irish nurses (respectively 15.5% and 30%).[6] The higher point prevalence of LPB found in the present study is presumably due to the fact that the diagnosis was established by a combination of interviews and physical examination, as the symptoms and signs arising in mild cases that may be found on physical examination are frequently ignored by the patients. Our study showed an annual prevalence rate of LBP in nurses which was not significantly different from the rate in administrative workers

(respectively 45.3% and 55.7%). These LBP annual prevalence rates suggest that LBP prevalence among health service workers is no greater than that in the general population. This is consistent with the findings of Maui et al.[14] who found no difference in LBP prevalence between nursing and non-nursing groups despite the fact that nursing is generally regarded as a high-risk occupation for LBP. However, contrary results were obtained in a study in Hongkong indicating a high occurrence rate of LBP in nurses (40.6%).[22] Such a high occurrence rate may be accounted for by the nature of nursing work. The results of our study clearly demonstrates that the annual prevalence rate of LBP is higher than the point prevalence rate of LBP. This fact suggests that LBP is chronic and recurrent in nature.

The difference in LBP prevalences indicate a difference in assessment of LBP. Two previous studies indicated that the risk factors for LBP differ with how the LBP is defined and measured.[24,25]

The day-to-day work routines proved to be a risk factor in the development of the point prevalence of LBP. Nurses had a higher risk of suffering from LBP in comparison with administrative workers. In connection with MMH practice, the group of workers with

frequent manual handling practice had a significantly higher risk of LBP. Stratification analysis showed that in nurses with frequent manual handling practice the risk of developing LBP was higher than in those with infrequent manual handling practice, although the difference was not statistically significant. This may be because the assumption that formed the basis for the calculation of sample size was incorrect. The assumption was that the prevalence of LBP in administrative workers would be 50% lower than in nurses, whereas actually in this study the LBP prevalence in administrative workers was 20% greater than in nurses. Thus the sample size in this study was unable to demonstrate a significant difference between nurses with frequent manual handling practice and those with infrequent manual handling practice. The foregoing demonstrate that the technical knowledge of posture and work methods in occupations requiring heavy physical activity, such as lifting, lowering, pushing, pulling, throwing, supporting, transferring weights, or postures with frequent bending and/ or bowing, and sitting or standing still, may in the long term decrease the risk of LBP.

However, at the moment there is controversy rather than agreement among the existing study results. One systemic review found no evidence that training with or without lifting equipment is effective in the prevention of back pain or consequent disability. Either the advocated techniques did not reduce the risk of back injury or training did not lead to adequate change in lifting and handling techniques.[26] The study of Hignett[27] reported that intervention strategies relying exclusively on training in correct manual handling techniques did not reduce the risk of LBP. The study performed by Martimo et al.[28] revealed that training in correct manual handling techniques with or without mechanical aids was unable to prevent the

occurrence of LBP or invalidity. Other studies have stated that multiple interventions comprising MMH training accompanied by administrative interventions, such as improving work policies and procedures, and by the use of mechanical weight-lifting aids, and by ergonomical redesign of behavior, equipment and work environment may reduce the risk of LBP.[29,30]

CONCLUSIONS

A major finding in this study was the high prevalence of LBP among nurses and administrative workers. There was an association between 'manual handling paractice and occupation on the one hand, and point prevalence of low back pain on the other, especially in nurses. These findings have important implications for the prevention of occupational LBP, particularly for nurses. Good posture and correct transferring techniques in ward situations should be reinforced with hands-on practice performed on nurses' common types of clients.

ACKNOWLEDGEMENTS

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