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The Prevalence, Severity and Occupational Risk Factors of Low Back Pain among ICU Nurses

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Background: Low back pain (LBP) is a common disorder that causes disability and absence from work. Healthcare professionals are in the first place of health problems related to LBP. The aim was to investigate the prevalence, severity and occupational risk factors of LBP among Intensive Care Units (ICU) nurses.

Method: The sample of this descriptive study was a total of 76 Intensive Care Units (ICU) nurses of a training and research hospital in the West of Turkey. A total of 1174 nursing care procedures was observed. After the completion of nurses' socio-demographic data collection, it was determined whether the nurses had LBP each time before and after providing care to patients and if they did, the severity of LBP were measured according to Numeric Pain Rating Scale.

Results: 88.2% of nurses had LBP and the mean severity of LBP was 2.84±1.44. Emergency and general surgery ICU nurses had the highest severity of LBP. The nursing care procedures were as follows in decreasing order of severity of LBP: making the bed (6.2±2.5), patient's mobilization (6,04±2,6), changing position/checking of pressure ulcer (5.9±2,3), make passive exercises (5.1±2,3), admission/discharge procedures (4.7±2,8), vascular access (4,5±2,4), checking drain(s) (4,5±2,3), measurement of vital signs (4,3±2,3), aspiration (4,3±2,3), and monitoring intake-output (4,1±2,1).

Conclusion: The prevalence of LBP among nurses was high and the mean severity of LBP was mild. According to the results of this study it is recommended that ICUs nurses receive in-service training on occupational risks, use of body mechanics during nursing care procedures requiring physical strength, incorporate their knowledge into their behaviors and regularly health checks can be helpful in prevention or decrease of LBP.

Keywords: Low back pain, intensive care unit, nursing care procedures

Introduction

Labor back pain has been highly prevalent and it is a musculoskeletal disorder that directly interferes in the quality of life at work and overloads the health system due to the high index of absenteeism and removals attributed to it. The main related reason as triggering factor for low back pain (LBP) is the unbalance between the needed effort to perform an activity and the potential to conduct it, that is, an unbalance between the functional load and the functional capacity. National and international researchers reveal that due to the profession characteristics, as well as the work conditions, the nursing team presents a high probability to develop LBP and consequently it negatively impacts the quality of assistance offered to the population. Borges

et al (2014) study showed that 71.5% of nurses have LBP (1). LBP is a common disorder that causes disability and absence from work (2). LBP is defined as pain of the dorsal region between the last rib and gluteal fold (3). Samedly et al (1995) demonstrated that 80% of active populations has experienced LBP for a period in their lives.

LBP constitutes an important problem in terms of both public health and loss of work power, causing serious economic and psychological problems due to it's chronic nature (4). It affects about 60-80% of adults at some point in their lives, and it is mostly seen between the age of 25 and 44 (5,6). It often occurs as a result of lower-back strain or injury (5,6). Previous studies established a strong relationship between LBP and performance of physically demanding repetitive tasks, rotation and flexion of the upper part of the torso, exposure of the whole body to vibration and manual lifting of items (6, 7, 8, 9). LBP, which is the most common cause of decreased productivity in people under the age of 45, causes problems including loss of working day and labor loss, reduced production and financial losses (8, 10, 11).

Previous studies demonstrated that daily lives of people with LBP are negatively affected and they encounter psychological and sexual problems (6, 8). Although LBP is common in many professions, it is more common in certain occupational groups. Healthcare professionals are in the first place of risk for health problems from work environment (3, 5). The most common problems in healthcare professionals are related to lower back and dorsal regions (6, 8). Work-related LBP is more common among nurses, compared to other occupations (5). In a study by Derek et al (2003) LBP was the most common individual musculoskeletal disorders, affecting 59% of all

Japanese staff. Work conditions have an important place among the main causes of nurses commonly having LBP (12). LBP contributory factors usually include workplace activities such as strenuous actions, manual handling, repetitive tasks and job strain. Furthermore, demographic characteristics such as age, smoking and sex are also known to be important predictive variables (12). Ando et al. (2000) reported that some nursing tasks had higher musculoskeletal disorders risk ratios than others among Japanese nurses (5). LBP is associated with many reasons such as that an individual lifts things which exceed the power of the individual, lack of appropriate handling equipment, increased physical load depending on the lack of staff, high workload and lack of education (13,14). Actions to prevent LBP include exercise, proper use of body mechanics, getting people adopt the habit of proper posture, ergonomic design of the work environment, remedying situations that may pose a risk such as smo-king, stress and obesity (3). Numerous studies were conducted on the prevalence of LBP among nurses working in healthcare insti-tutions (1,3,5,6,8), however a few studies were published on the relationship between the severity of LBP and nursing care procedures. Additionally, nature of the professional activity and especially the physical load is questioned during common LBP in about 75% of the cases (10). The aim of this study was to investigate the correlations between the pre-valence and the severity of LBP, nursing care procedures and LBP.

Study design

This descriptive study was conducted in a training and research hospital (Clinics bed capacity:485, ICU bed capacity:102, Total Bed capacity:587) in Aydın province (census: 1,006, 541) in the West of Turkey between January 20 and April 25, 2014.

Setting and collecting samples

The population of the study was comprised of all nurses (n:121) working in Emergency (n:21), General Surgery (n:24), Burn (n:14), Internal Medicine (n:18), Neurology (n:16), Anesthesia-Reanimation (n:27) and Coronary (n:18) ICUs . In this study the inclusion criteria were as follows:

- Voluntary participation,
- Didn't have cervical disc hernia
- Didn't have lumbar disc hernia

From all ICU nurses, a total of 76 of them were eligible in this study and selected.

Ethical considerations

Written consents of Non-Interventional Research Ethics Committee of Medical School, and Hospital Chief Physician's Office were obtained. After necessary explanations were made to the nurses, their verbal and written consents were obtained.

Measurement/Instruments

Socio-demographic data collection form (14 items) which was developed by the researchers in line with the literature, and data collection form for the relationship between nursing care procedures and LBP (29 items) which was developed by the researchers in line with the literature and nurses observation during shifts, were used to collect data. In these forms, Numeric Pain Rating Scale (NRS) was used to measure the severity of LBP. This scale is a 11-point horizontal line divided into intervals of "0" no pain, "1-3" mild pain, "4-6" moderate pain and "7-10" severe pain.

Data collection/Procedure

A total of 1174 nursing care procedures was observed. Nurses' socio-demographic data collection form consisted of 14 items, including age, sex, marital status, educational back-

ground, smoking/alcohol consumption, socio-economic level, sports activity, whether s/he had any health problem (other than lower back/neck pain) before starting the job at ICU, experience in the field (in years), weekly workload, whether s/he works night shift, whether she/he has LBP and if s/he does, the severity of LBP.

After the researchers completed nurses' socio-demographic data collection form, it was determined whether the nurses had LBP each time before and after providing care to patients and if they did, the severity of LBP according to NRS, and the answers were entered into the respective form. Hence, the prevalence of LBP among nurses, the severity of LBP and the severity of LBP specific to each type of nursing care procedures were identified.

Statistical analysis

Statistical Package for the Social Sciences (SPSS) for Windows 16.0 software package was used to analyze the data obtained from the study. Numbers-percentages and average were used to assess socio-demographic characteristics of the nurses.

Mean value was considered in assessing LBP in nursing care procedures. Independent t-test, pearson chi-square, kruskal-wallis and correlation pearson analysis test were used to assess the correlation between age, workload and the prevalence of LBP, the correlation between sex, marital status, smoking/alcohol consumption, sports activity, whether s/he works night shift and the prevalence of LBP, the correlation between whether s/he works night shifts and severity of LBP and the correlation between age, workload and severity of LBP, respectively. Statistical signifi-cance was set at $p < 0.05$, as appropriate.

Results

According to the study data, it was established that the mean age of nurses was 25.7±6.31 years, 84.2% of nurses were female, 63.2% were single, 71.1% were registered nurses (28.9% were high health school graduate working in nurse position and MSN/PhD), 50% don't smoke and 59.2% don't consume alcohol, 81.6% were from middle-class and 52.6% don't do sports. Moreover, it was identified that nurses' mean weekly workload was 45.6±4.7 hrs and 88.2% worked night shifts and 77.6% had no health problems before (before starting the job at ICU), 88.2% had LBP and 88.2% didn't receive treatment for LBP (Table-1).

In view of the severity of LBP by the units the nurses worked in, even though the severity of LBP was in the range of 1.8 to 3.5. The Mean LBP severity among ICU nurses was 2.84±1.44. Emergency and general surgery ICU nurses had the most severe LBP. Moreover, the severity of LBP was in the range of 0 to 2 and 4 to 6 for 34.3% and 31.4% of the nurses with LBP, respectively (Table-2).

According to the results of the study, LBP was more common among female single nurses who don't smoke and consume alcohol, do sports and who work night shifts, however, no statistically significant difference was found between the said factors and the prevalence of LBP according to the results of pearson chi-square test analysis.

According to the results of the study, the severity of LBP was higher among female married nurses who smoke and consume alcohol, don't do sports and who work night shifts, however, no statistically significant difference was found between the said factors and severity of LBP according to the analysis results of kruskal-wallis test (Table-3).

Table-1. Sociodemographic Characteristics and Working Status of Nurses

Characteristics	n(%)
Sex	
Female/Male	64(84.2) / 12(15.8)
Age	
18-22	25(32.9)
23-27	25(32.9)
28-32	15(19.8)
33-37	5(6.6)
≥38	6(7.8)
Mean age	25.7±6.31
Marital status	
Single/Married	48(63.2) / 28(36.8)
Educational status	
High school	20(26.3)
BSc	54(71.1)
MSc/Ph.D.	2(2.6)
Smoking status	
I've never used	38(50)
I stopped using	6(7.9)
I am using	32(42.1)
Alcohol status	
I've never used	46(60.5)
I stopped using	9(11.8)
I am using	21(27.6)
Clinical experience	
0-3 yrs	51(67.2)
3-6 yrs	6(7.8)
6-9 yrs	10(13.1)
≥10 yrs	9(11.9)
Clinical it still works	
Emergency ICU	8(10.5)
Coronary ICU	20(26.3)
Anesthesia-Reanimation ICU	9(11.8)
General surgery ICU	18(23.7)
Internal Medicine ICU	11(14.5)
Neurology ICU	5 (6.6)
Burn ICU	5(6.6)
Weekly Workload	
≤50 hrs	69(90.7)
≥50 hrs	7(9.3)
Weekly workload (hrs)	45.6±4.7
Night Duty Status	
No/Yes	9(11.8) / 67(88.2)
Exercise status	
No/Yes	52(68.4) / 24(31.6)
Socio-Economic Status	
Lower income	14(18.4)
Middle income	62(81.6)
Upper income	0(0)
Presence of LBP	
No/Yes	9(11.8) / 67(88.2)
Previous health problems	
No/Yes	60(78.9) / 16(21.1)
Total	76(100)

Table-2. Distribution of LBP Severity by NRS Among Departments

Departments	LBP severity Mean±SD
Emergency ICU	3.5±0.92
Coronary ICU	2.95±1.19
Anesthesia-Reanimation ICU	2.22±1.1
General Surgery ICU	3.11±1.74
Internal Medicine ICU	2.91±1.7
Neurology ICU	2.4±1.51
Burn ICU	1.8±1.48
Mean LBP	2.84±1.44
LBP severity	n(%)
0-2	23(34.3)
2-4	16(23.9)
4-6	21(31.4)
6-8	5(7.5)
8-10	2(2.9)
Total	67(100)

The results of the study revealed that the mean age of nurses with and without LBP were 26.2±5.7 and 25.6±6.4 years, respectively, however, no statistically significant relationship was found between LBP and age according to analysis results of independent t-test (p:0.808). Moreover, there was no significant relationship between the nurses' age and the severity of LBP according to the analysis result of pearson test (p:0,163).

Weekly workload values of nurses with and without LBP were 46.09±4.6 hrs and 43.2 ±3.9 hrs, respectively, however, no significant relationship was found between LBP and workload according to the analysis result of independent t-test (p,0.085). There was no significant relationship between weekly work-load and the severity of LBP of the nurses according to the analysis result of Pearson test (p:0,291) (Table-4).

Table-4. The Relationship Between Independent Variables and Prevalence/Severity of LBP

Independent Variables	Mean Age±SD	Mean Weekly Workload±SD	Independet T-Test P
Nurses With LBP	26.2±5.7	46.09±4.6	0.808
Nurses Without LBP	25.6±6.4	43.2±3.9	0.085
LBP Severity	Bivariate Pearson Test P: 0.163		Bivariate Pearson Test P: 0.291

* Statistical significance p<0.05

A total of 1174 nursing care procedures applied by nurses was observed. The mean severity of LBP before and after all nursing care procedures was 2.6±0.62 and 3.9±0.96, respectively. According to the analysis result of Wilcoxon test the mean severity of LBP before and after all nursing care procedures

Table-3. The Relationship Between Independent Variables and Prevalence/Severity of LBP

Independent Variables		Nurses with LBP n(%)	Nurses without LBP n(%)	Pearson Chi-square P*	Mean Severity of LBP ± SD	Kruskal-Wallis P*
Sex	Female	58(76.4)	6(7.9)	0.125	3.22 ± 1.17	0.453
	Male	9(11.8)	3(3.9)		2.9 ± 0.73	
Marital status	Single	43(56.6)	5(6.6)	0.574	3.11 ± 1.1	0.596
	Married	24(31.6)	4(5.3)		3.3 ± 1.18	
Smoking	No	35(46)	3(3.9)	0.287	3 ± 1.05	0.203
	Yes	32(42.2)	6(7.9)		3.3 ± 1.17	
Alkohol	No	42(55.2)	4(5.3)	0.521	3.07 ± 1.13	0.143
	Yes	25(32.9)	5(6.6)		3.4 ± 1.06	
Exercise	No	42(55.2)	6(7.9)	0.11	3.23 ± 0.97	0.736
	Yes	25(32.9)	3(3.9)		3.21 ± 1.16	
Night duty	No	8(10.5)	2(2.6)	0.392	3 ± 1.19	0.613
	Yes	59(77.7)	7(9.2)		3.2 ± 1.17	

Nursing Care Procedures Given to Patients	The Number of Nursing Care procedures	Mean Severity of LBP Before Nursing care procedures±SD	Mean Severity of LBP After Nursing care procedures±SD	Wilcoxon Test P
Making the bed	63	3 ± 1.3	6.2 ± 2.5	0.0001
Patient's mobilization	63	2.3 ± 1.3	6 ± 2.6	0.0001
Changing position and pressure ulcer control	61	1.8 ± 1.2	5.9 ± 2.5	0.0001
Having the patient make passive exercises	40	1.8 ± 1.2	5.1 ± 2.3	0.0001
Admission/ Discharge procedure's	49	3.6 ± 1.9	4.7 ± 2.8	0.0001
Establishing vascular access	54	2.1 ± 1.2	4.5 ± 2.4	0.0001
Checking drain(s)	47	3.9 ± 1.8	4.5 ± 2.3	0.011
Measurement of vital signs	36	2.3 ± 1.3	4.3 ± 2.3	0.0001
Aspiration	49	2.4 ± 1.4	4.3 ± 2.3	0.0001
Monitoring patient's intake-output	42	3.8 ± 1.8	4.1 ± 2.1	0.016
Having the patient make breathing exercises	36	3.6 ± 1.6	4 ± 2.1	0.018
Maintenance of artery catheter	49	3.4 ± 1.7	4 ± 2.1	0.07
Performing an electrocardiography	38	2.1 ± 1.2	4 ± 1.8	0.0001
Perineal care/dressing	44	2.2 ± 1.3	3.8 ± 2.3	0.0001
Maintenance of peripheral catheter	44	3.2 ± 1.5	3.8 ± 2	0.011
Maintenance of urine catheter	38	2.8 ± 1.9	3.7 ± 2.2	0.001
Take blood for laboratory	44	2.6 ± 1.4	3.6 ± 1.9	0.0001
Monitoring	35	1.6 ± 1.1	3.5 ± 2.5	0.0001
Intravascular injection	31	2.9 ± 1.3	3.5 ± 2.1	0.0001
Intramuscular injection	26	2.1 ± 1.2	3.5 ± 1.9	0.02
Giving food and medicines by NGT/PEG/PEJ	27	3.1 ± 2.1	3.4 ± 2.5	0.059
Oxygen therapy	36	2.9 ± 1.9	3.3 ± 2.2	0.016
Maintenance of NG Tube	34	2.8 ± 1.5	3.3 ± 1.9	0.017
Making bed bath	41	2.6 ± 1.5	3.2 ± 1.8	0.0001
Preparation of infusion set	36	2.6 ± 1.5	3 ± 1.6	0.01
Eye care	27	2.6 ± 1.2	2.8 ± 1.4	0.046
Oral care	29	2.5 ± 1.1	2.7 ± 1.4	0.059
Maintenance of Tracheostomy	25	1.8 ± 0.9	2.6 ± 1.5	0.001
Subcutaneous Injection	30	2.2 ± 1.3	2.5 ± 1.3	0.03
Total	1174	2.6 ± 0.62	3.9 ± 0.96	0.0001

was significantly (p<0.0001). In view of the mean severity of LBP by nursing care procedures, mean severity of LBP before and after nursing care procedures was significant except maintenance of artery catheter, giving food and medicines by NGT/PEG/PEJ and oral care procedures (p>0.05). The mean severity of LBP during 13 nursing care procedures was found to be moderate (in the range of 4 to 6). These nursing care procedures were as follows in decreasing order of the severity of LBP: making the bed (6.2±2.5), ensuring patient's mobilization (6,04±2,6), changing position (5.9±2,3), making the patient do passive exercises (5.1±2,3), discharge procedures (4.7 ±2,8), establishing vascular access (4.5±2.4), checking drain(s)(4.5±2.3), aspiration (4,3±2,3), measurement of vital signs (4.3±2.3), monitoring patient's intake-output (4.1±2.1), maintenance of artery catheter (4.0±2.1), making the patient do respiratory exercises (4.0±2.2) and performing an electrocardiography (4.0± 1.8) (Table-5).

Discussion

LBP, which is in second place among diseases that lead to loss of labor in developed countries, it is considered as the most important factor affecting the production decline (10, 11). Occupational LBP, which develops as a result of exposure to risk factors, including lifting items, working by leaning forward, using low back and the body in wrong positions, and of inappropriate working conditions, is a common cause of injury (8). Altınel et al. (2008) reported a LBP prevalence rate in the range of 32 to 79.2% in hospital staff (14). Ando et al. (2000) found a LBP prevalence of 54.7% in hospital staff in Japan (5). Bejia et al. (2005) reported a LBP prevalence of 57.7% in hospital staff (15). In Lagerström et al. (1995), Larese et al (1994) and Stubbs et al (1983) studies LBP prevalence

among nurses working in hospitals were 56%, 48% and 45%, respectively (16,17,18). In Smith et al. study (2004) on nurses in China, 70% of them had musculoskeletal disorders and 56.7% of them developed disorders in low back and 38.9% in dorsal region (19). In Tezel's study (2006), 69% of nurses were found to suffer from LBP (20). Mendelek et al. (2013) study results indicated that about half of hospital satff were suffering from moderate to high back pain (10). Karadag et al. (2004) reported rates of LBP in nurses of 68.6% (21). In a study by Dıracoglu (2006) evaluating musculoskeletal system pain in all healthcare personnel, the complaint with the highest rate was reported to be LBP (22). In a study by Kabatas et al. (2012) of 167 healthcare workers at a Hospital in Turkey, complaints of LBP were determined in 40% of the participants at a mild level and in 3.3% at a severe level. The results of that study showed that the onset of LBP was more after starting work and it was seen more in nurses than in other healthcare workers (23).

At present study, the prevalence of LBP was 88.2%, and 31.4% of the nurses had moderate LBP. In addition, the severity of LBP was higher among emergency and general surgery ICU nurses, compared to other ICU nurses. At present study the prevalence of LBP was high in compare of litarature. It may be associated with higher number of nursing care procedures, long shifts and higher number of patients per nurse in these ICUs.

According to the results of Larese & Fiorito (1994) study conducted to examine the relationship of manpower to LBP, a direct link was established between patient to nurse ratio and LBP. The rate of LBP was higher among nurses who had less number of patients in the wards with a high patient to nurse ratio (17). Bejai et al. (2005) identified that LBP is more

prevalent in the elderly and women. Bejai stated that marital status, smoking and length of experience in years are among LBP risk factors, and stressed that doing sports prevent LBP (15). In Altınel's (2008) study, although LBP was more prevalent in those who smoke, no difference was identified between the level of sports/daily activities and the prevalence of LBP (14).

In Akalp & Aytac (2012) study, the mean LBP was calculated as 18.44 for the single participants and as 18.08 for the married nurses, but the difference was not statistically significant (24). In Nas et al. (2001) study rates of back pain was to be higher in married hospital staff than in single staff. The findings of the current study do not conform to those of literature in this respect (25).

In our study, mean age was found to be high among nurses with LBP, however, no significant difference was found between the prevalence of LBP and age (p:0.808). In addition, there was no significant relationship between age and severity of LBP (p:0.163). The average weekly workload of nurses with LBP was found to be high, however, there was no significant relationship between workload and LBP (p: 0.085). Furthermore, there was no significant correlation between weekly workload and the severity of LBP (p:0.291). In our study, the prevalence of LBP was higher among single female nurses who don't smoke and consume alcohol and do sports. In addition, the severity of LBP was higher among female married nurses who smoke and consume alcohol and don't do sports. The results of our study were found to be in good agreement with previous studies.

Ando et al. (2000) reported a correlation between patient transfer and LBP (5). Other studies suggested that nursing care procedures requiring physical strength, including lifting patients from bed, ensuring mobilization of patients and lifting patients from the floor onto bed, cause LBP (26,27). Harber et al., (1985) stated that lifting patients is one of the most important causes of LBP (26). In an Italian study on musculoskeletal disorders among nurses, the prevalence of LBP was found to be in the range of 40 to 50% per annum and the rate of musculoskeletal disorders was found to be higher in females than in males. In addition, musculoskeletal disorders common in women (in lumbar and thoracic regions) were found to be related to work requiring physical strength (13).

In our study, severity of LBP was moderate for nursing care procedures, including making the bed, ensuring patient's mobilization, changing position, making the patient do passive exercises, discharge procedures, establishing vascular access, checking drain(s), aspiration, measurement of vital signs, monitoring patient's intake-output, maintenance of artery catheter, making the patient do respiratory exercises and performing an electrocardiography. When results of previous studies and our study were compared, since the above mentioned nursing care procedures are in the category of nursing care procedures that require strength and remaining standing for a long time, the severity of LBP at the end of such procedures was found to be higher.

The strength of this study was comparison of LBP among ICUs nurses and relathionship between nursing care procedures and LBP. The results of this study showed that LBP had the most sever in emergency and general surgery ICUs and related on nursing care procedures which requiring physical strength.

This study investigated on registered nurses and high health school graduate (who were working in nurse position). Therefore, for actual results it was no possible to disable of

high school graduate nurses from the study. On the other hand, this study did on in a university hospital ICUs nurses. So, for generalize the results of this study it is recommended do same researchs in other hospitals.

Conclusion

In our study the prevalence of LBP among ICU nurses was high and the severity of LBP was mild. Emergency and general surgery ICU nurses had the most severe LBP. The severity of LBP was found to increase in the case of nursing care procedures requiring physical strength. According to the results of present study, the ICU nurses were established to be under serious risk in terms of LBP. According to the results of this study it is recommended that ICUs nurses receive in-service training on occupational risks, use of body mechanics during nursing care procedures requiring physical strength, incorporate their knowledge into their behaviors and regularly health checks can be helpful in prevention or decrease of LBP.

Acknowledgements

Conflict of Interest

No conflict of interest has been declared by the authors.

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