Trauma Mon. 2014 November; 19(4): e17926. DOI: 10.5812/traumamon.17926

Published online 2014 September 17. **Research Article**

# Prevalence of Low Back Pain Among Nurses: Predisposing Factors and Role of Work Place Violence

Maryam Rezaee [1]; Mohammad Ghasemi [2,*]

[1]Trauma Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran
[2]Health Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran

*Corresponding author: Mohammad Ghasemi, Health Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran. Tel/Fax: +98-2188600062, E-mail: mghmed@yahoo.com

**Received:** January 29, 2014; **Revised:** February 19, 2014; **Accepted:** May 3, 2014

**Background:** Ergonomic factors predispose nurses to low back pain (LBP). Few studies have clarified the role of workplace violence in LBP occurrence.
**Objectives:** The present study was designed to investigate acute and chronic LBP in Iranian nurses and its association with exposure to physical violence as well as its personal and ergonomic risk factors.
**Materials and Methods:** In this analytical cross sectional study, the rate of acute and chronic LBP and contributing factors were investigated among 1246 nurses using a validated questionnaire. Statistical analysis was performed by chi square, student t-test, and logistic regression, to determine the association between independent variables and LBP.
**Results:** In total, 1246 nurses, consisting of 576 (46.23%) males and 670 (53.77%) females, were included. The mean age and the mean years of employment were 31.23 ± 5.33 and 16.18 ± 7.05, respectively. Both acute low back pain and chronic low back pain were associated with physical violence experience. Moreover, acute and chronic LBP were predicted by positive past history of LBP as well as two ergonomic factors, frequent bending and frequent carrying of patients.
**Conclusions:** Besides a history of low back pain and ergonomic factors, physical violence may be considered a contributing factor for acute low back injuries. Special attention to all personal, occupational, and psychological risk factors is recommended.

*Keywords:* Low Back Pain; Nurses; Workplace Violence; Risk Factors

## 1. Background

Healthcare settings represent high rates of work-related illnesses and injuries (1). Based on previous studies, four main health concerns facing healthcare workers (HCWs) include musculoskeletal injuries, mainly low back pain (LBP), workplace violence, shift work, and needle stick injuries (2); although, recently high physical work load and job stress have been added to this list (3). LBP is the main issue affecting the quality of life and work productivity as well as absenteeism pattern and disabilities in nursing (4). Data collected on occupational disorders indicate a high rate of LBP among HCWs. The 12-month prevalence of LBP has been estimated from 15% to 64% in developed countries (5-8) and more than 79% in developing countries (4, 9-12). Data on low back injuries in Iran are sparse. Prevalence of low back injuries among Iranian nursing staff has been estimated over 50% (13), while as a comparison, 37.3% of office workers employed in a hospital developed LBP during one year (14).

In addition to individual and psychosocial variables such as age, gender, physical status, smoking and workplace stress (15, 16), main ergonomic factors that endanger nurses to develop LBP include awkward postures, carrying and repositioning patients, prolonged standing, and working without sufficient breaks (9, 17).

Most popular strategies in management and prevention of LBP in healthcare facilities focus on work-related interventions, often including ergonomic interventions and also exercise, while the role of psychosocial factors, including exposure to violence, has not been fully highlighted in preventive measures (18). Nurses who work in developed countries often participate in periodic regular health surveillance, to assess occupational safety and health. Nevertheless, access to these services in developing countries is often overlooked probably due to low economic resources (19, 20).

Healthcare workplace violence is underestimated (20, 21). According to the National Institute of Occupational Safety and Health (NIOSH), hospitals are a main place of violent events against employees (22). In hospitals, nurses feel intimidated in their worksites more than other employees (23, 24). In Iran, 21.3% of nurses were assaulted during one year (25). In another study, 69% of Iranian nurses were exposed to psychological violence (26). As noted by other authors (27), few studies clarifying the association between LBP and violence exposure. In Iran, a number of studies were conducted regarding

common injuries in the nursing environment, including needle stick injuries, musculoskeletal problems, and violent assault.

## 2. Objectives

The present study was designed to investigate acute and chronic LBP in Iranian nurses and its association with exposure to physical violence in addition to other well-known personal and ergonomic risk factors.

## 3. Materials and Methods

In this analytical cross-sectional study, rates of acute and chronic LBP, exposure to physical violence, and potential risk factors for LBP among nurses were investigated in 2013. There were 1246 licensed nurses working in an academic hospital in northern Tehran, Iran. The hospital provides general and special medical services for urban and rural populations of the country. All nurses with different types of employment including registered, contractual, part-time, and students were included in the study; census method was used for data collection.

The inclusion criteria included fulltime nursing work (more than 36 hours per week) for at least two years and no experience of LBP at least three months prior to the beginning of the one-year period to assess the prevalence of LBP. Coexisting rheumatologic diseases, history of car accident-related injuries, and long-term sick leaves or any other types of absenteeism were considered as exclusion criteria; 1246 participated in the study.

### 3.1. Data Collection

The questionnaire consisted of two sections. Section one was specified for personal and demographic characteristics. Section two contained questions about LBP and its risk factors. The latter section was adopted from previous validated questionnaires about work-related musculoskeletal disorders (13).

### 3.2. Dependent Variables

Outcome measures included the rate of acute low back pain (ALBP) and chronic low back pain (CLBP) during the previous year. ALBP was defined as a pain clinically lasting one to seven days with or without radiculation to lower extremities, originated from lumbar paraspinal area, resulting in sick leave or marked limitation of job productivity. CLBP was defined similar to ALBP, but with at least three months of pain. LBP incidents were extracted from reports of nurses to the occupational physician while filling the questionnaires and the data were recorded in the Occupational Health Office.

### 3.3. Independent Variables

Baseline demographic characteristics, medical history, lifestyle habits, ergonomic factors, exposure to physical violence, and some characteristics of working environment, were defined as independent factors. Age, sex, marital status, smoking, history of LBP, and engaging in a regular exercise program (more than four days weekly), were considered as demographic and medical variables. Job-related factors were years of employment, weekly working period, and type of ward. Potential ergonomic factors (bending, carrying patients, torso twisting, and prolong standing) were rated as not at all, a little, some, rather much and very much in the questionnaire. In the statistical analysis, the three first rankings and the remaining two were separately merged to form low and high, respectively.

The practical definition of physical violence against nurses as a contributing factor for LBP was as follows: exposure of nurses to physical violence by patients, relatives of patients and/or colleagues in the form of beating, whipping, slapping, stabbing, shooting, pushing, biting, at least once during the past year (25).

### 3.4. Statistics

Statistical analysis was performed using SPSS v. 18 (SPSS Inc., USA). Chi square, student t-test, and logistic regression were used to determine the association between independent variables and LBP. In logistic regression, as a traditional rule, scientifically-accepted potential risk factors for LBP (acute and chronic) were considered for univariate analysis and those with a P value lower than 0.05 were assessed via a stepwise multivariate logistic regression model.

## 4. Results

In total, 1246 nurses, 576 (46.23%) males and 670 (53.77%) females, were included. The mean age of participants was 31.23 ± 5.33 years (20 to 61). The mean year of employment was 16.18 ± 7.05 years (2 to 30). The mean working time was 37.49 ± 2.33 hours a week. During the previous year, 374 (30.01%) nurses experienced at least one episode of physical violence by patients (27.65%), their fellows (60.29%), and coworkers (12.06%). In addition, there was no significant difference between the mean age of males and females ($P > 0.05$).

### 4.1. Low Back Pain Prevalence

One-year prevalence of ALBP and CLBP were 576 (46.23%) and 364 (29.21%), respectively. The mean ages of ALBP and CLBP groups were 30.37 ± 4.10 and 34.78 ± 2.04 years, respectively ($P < 0.05$). Night shift schedule did not affect ALBP or CLBP occurrence ($P > 0.05$) (Table 1). The type of ward was not associated with LBP ($P > 0.05$).

### 4.2. Factors Related to Acute Low Back Pain and Chronic Low Back Pain

A series of work-related and personal factors were entered in the univariate analysis. It was shown that exposure to physical violence, frequent bending, carrying

patients, torso twisting, and standing, as well as having positive history of LBP and male sex increased the susceptibility to ALBP ($P < 0.05$). Being married, regular exercise, smoking, and increased age had no significant association with ALBP ($P > 0.05$). Results for CLBP were nearly the same as ALBP. Ergonomic factors (bending, carrying patients, torso twisting and standing), being married, experience of physical violence, male sex, and history of LBP, created susceptibility to CLBP ($P < 0.05$), but increased age, smoking, and regular exercise had no association ($P > 0.05$).

**Table 1.** Individual and Occupational Risk Factors Associated With Low Back Pain Among Nurses [a,b]

| Risk factors | ALBP ( n = 576) | | CLBP (n = 364) | |
|---|---|---|---|---|
| | No. (%) | P value | No. (%) | P value |
| **Exposure to physical violence** | | < 0.001 | | < 0.001 |
| No | 355 (40.71) | | 221 (25.34) | |
| Yes | 221 (59.09) | | 143 (38.23) | |
| **Past history of low back pain** | | < 0.001 | | < 0.001 |
| No | 341 (41.23) | | 126 (15.20) | |
| Yes | 235 (56.22) | | 238 (57.07) | |
| **Age** | | 0.117 | | 0.081 |
| < 30 Years | 113 (49.56) | | 57 (25.00) | |
| 30-39 Years | 284 (42.20) | | 163 (24.22) | |
| ≥40 Years | 179 (51.88) | | 144 (41.74) | |
| **Sex** | | 0.006 | | 0.001 |
| Male | 310 (53.82) | | 217 (37.67) | |
| Female | 266 (39.70) | | 147 (21.94) | |
| **Marriage** | | 0.388 | | 0.075 |
| No | 157 (44.60) | | 99 (28.13) | |
| Yes | 419 (46.86) | | 265 (29.64) | |
| **Having night shift** | | 0.084 | | 0.072 |
| No | 129 (47.42) | | 87 (31.98) | |
| Yes | 447 (45.89) | | 277 (28.44) | |
| **Frequent bending** | | < 0.001 | | < 0.001 |
| No | 98 (28.65) | | 50 (14.62) | |
| Yes | 478 (52.88) | | 314 (34.73) | |
| **Frequent carrying patients** | | < 0.001 | | < 0.001 |
| No | 166 (33.33) | | 86 (17.27) | |
| Yes | 410 (54.81) | | 278(37.16) | |
| **Frequent torso twisting** | | 0.001 | | 0.042 |
| No | 271 (40.21) | | 173 (25.67) | |
| Yes | 305 (53.32) | | 191 (33.39) | |
| **Frequent prolong standing** | | 0.033 | | 0.017 |
| No | 93 (32.75) | | 51 (17.96) | |
| Yes | 483 (50.20) | | 313 (32.54) | |
| **Regular exercise** | | 0.067 | | 0.110 |
| No | 275 (45.15) | | 168 (27.58) | |
| Yes | 301 (47.25) | | 196 (30.77) | |
| **Smoking** | | 0.122 | | 0.082 |
| No | 521 (46.18) | | 334 (29.60) | |
| Yes | 55 (46.61) | | 30 (25.42) | |

[a] Abbreviations: ALBP; acute low back pain, CLBP; chronic low back pain.
[b] Data are presented as No. (%).

**Table 2.** Characteristics That Predicted Acute Low Back Pain Among Nurses

| | Odds Ratio | 95% Confidence Interval | P value |
|---|---|---|---|
| **Physical violence** | 1.869 | 1.296-2.696 | 0.001 |
| **Past history of low back pain** | 3.253 | 2.219-4.769 | < 0.001 |
| **Male sex** | 0.641 | 0.459-1.895 | 0.129 |
| **Frequent bending** | 1.978 | 1.188-3.293 | 0.009 |
| **Frequent carrying** | 1.685 | 1.072-2.649 | 0.024 |
| **Frequent twisting** | 1.210 | 0.809-1.811 | 0.354 |
| **Frequent prolong standing** | 1.041 | 0.623-1.741 | 0.877 |

**Table 3.** Characteristics That Predicted Chronic Low Back Pain Among Nurses

| | Odds Ratio | 95% Confidence Interval | P value |
|---|---|---|---|
| **Physical violence** | 2.736 | 1.381-3.863 | < 0.001 |
| **Past history of low back pain** | 4.233 | 3.499-6.114 | < 0.001 |
| **Male sex** | 0.435 | 0.682-1.273 | 0.101 |
| **Being married** | 1.237 | 0.778-1.095 | 0.110 |
| **Frequent bending** | 2.465 | 1.289-4.714 | 0.006 |
| **Frequent carrying** | 2.513 | 1.454-4.344 | 0.001 |
| **Frequent twisting** | 0.980 | 0.607-1.581 | 0.980 |
| **Frequent prolonged standing** | 0.851 | 0.447-1.620 | 0.851 |

### *4.3. Logistic Regression*

Factors associated with ALBP and CLBP in the first step of analysis were entered in the logistic regression analysis. In this way, the associations between ALBP and bending, carrying patients, torso twisting, standing, gender, history of LBP, and violence exposure, were assessed. For CLBP, the same variables considered for ALBP plus being married were included. Results showed that both ALBP and CLBP were associated with physical violence (odds ratios were 1.869 and 2.736, respectively). Moreover, acute and chronic LBP were predicted by positive past history of LBP and two ergonomic factors, frequent bending (odds ratios of 1.978 and 2.465, respectively) and frequent carrying of patients (odds ratios of 1.685 and 2.513, respectively). Past history of low back pain had the highest odds ratio, followed by exposure to physical violence (3.253 and 4.233 for ALBP and CLBP, respectively) (Tables 2 and 3).

## 5. Discussion

We demonstrated that along with a past history of LBP and some ergonomic factors, physical violence may be considered a contributing factor for acute low back injuries. Role of physical violence in logistic regression was as high as some ergonomic factors, but a past history of LBP had the most prominent association with both types of LBP. Prior investigations focused on work place conditions and somewhat personal characteristics as important risk factors for LBP in medical staff (16, 28). We also considered these factors in addition to physical violence as an important psychological and somewhat mechanical hazard. Predicting violence as a psychological hazard, one expects great improvement of LBP occurrence by appropriate actions against violent incidents in healthcare settings.

In healthcare, low back injuries have higher frequencies among nurses than other HCWs (10). Comparing to other studies related to developed countries, the present finding about LBP prevalence had similar results. In England, Australia, France and the United States, the 12-month prevalence of LBP was reported between 29% and 59% (4, 9, 10). Meanwhile, in Philippine as a developing country, the one-year prevalence of LBP among nurses was 80% (29). In our study, the occurrence rates of ALBP and CLBP were 46.22% and 29.21%, respectively. On the surface these findings are acceptable, but as there is fear of job loss due to illness, underestimation may mask the real prevalence of LBP (19). Strategies about reporting the symptoms as soon as possible can have great roles in prevention of LBP-related impairments and disabilities, since unfortunately nurses may continue working without adequate rest despite having LBP (19). In some cases, the prevalence of musculoskeletal pain was low in developing countries compared to developed countries. One important explanation in part can be cultural difference in perception of illness and under-reporting (30).

As mentioned, special attention in this study was toward physical violence. Compared to other workplaces various types of occupational violence occur more commonly in health care facilities (31). In Japan a developed country, the one-year prevalence of violence exposure was more

than 36% among 11000 healthcare staff (32). Meanwhile, violence in hospitals and clinics is usually under-reported and underestimated (21, 33). Among HCWs, nurses do not feel safe during working due to potential violent attacks (34). Main well-established sequels of violence in workplace are anxiety, depression and post traumatic stress disorder (PTSD), and regional musculoskeletal pains are less likely to be assessed (35). Results of a longitudinal examination showed that exposure of nurses to physical violence affects somatic pains in different areas, including upper and lower extremities, and causes LBP over a six-month period. Concluding to this findings the authors stated that reducing physical violence incidents can be beneficial for health of nurses (36). In another study, 920 nurses were asked about LBP and experience of physical violence. The results showed that the rate of LBP increased from 40% among non-assaulted nurses to 70% among those assaulted three times or more (27). Our findings showed that physical violence may have an effect on acute and chronic LBP with an odds ratio more than 3.

Generally, the nature of LBP incidents in healthcare settings represents that finding an exact cause is almost always problematic (19). Compared to personal variables such as body mass index, work factors are considered a main risk factor for LBP (37). Patient positioning in addition to multiple awkward positions including bending and torso twisting have been reported to have an association with LBP in nurses (38). The role of awkward postures may even be more than patient lifting and manual transporting (28, 39). In other studies, static position and lifting/carrying the patient were associated with LBP (29). Lifting in-bed patients is a major risk factor of LBP among nurses (9, 10). In a systematic review comprising 89 studies, patient handling had the highest risk, followed by other nursing tasks. Moreover, existence of numerous risk factors as confounders in the role of patient handling, a threshold limit below which the nursing work is considered safe, has not been established (40). One of the challengeable subjects in prevalence studies is response rate, which may affect the results by spontaneous exclusion of some cases. Our response rate was high and as we included all the nurses, the selection bias was minimized (28). In the occupational settings, unhealthy and low fit workers should avoid intense work. Due to this principle, the relationship between high prevalent hazards such as ergonomic factors and LBP may be underestimated (28). As we conducted a cross-sectional research, the results may be affected, although major ergonomic factors in nursing had meaningful associations with LBP.

Self-reporting of dependent (i.e. LBP) and independent variables is another issue to be considered. Although self-reporting has been considered as an original information which makes recall bias, studies suggested that it was in agreement with clinical history and examination (41, 42). The prevalence rate of LBP did not rise with increasing age and this was not in line with other studies (29). In a number of surveys, the association between aging and LBP has been reported (43, 44). Meanwhile in some reports, LBP incidence in the first five years of employment was high (29). Spine degeneration resulted from aging primarily predisposed individuals to low back problems (12); but in our study, avoiding high risk tasks by older nurses and perhaps enhanced workload for younger respondents probably affected the results.

Our study had some limitations. First, we did not have follow-up, so those with severe pain who left their job were not considered. Moreover, we did not consider subacute (7 to 30 days) and at risk (30 to 90 days) LBPs, because we thought that their chronological aspects were less recalled by nurses; in addition, acute and chronic pains were more prominent for absenteeism and disability, respectively. Second, we did not use a tool to explore the pain severity. Third, professional consequences of LBP (e.g. sick leaves) were not measured. Fourth, we included only physical violence. In our study, verbal abuses and threats were not regarded (27, 36). All types of violence could be considered as psychological hazards and should be noted. Fifth, our results might have been influenced by uncontrolled confounding factors, among which, psychological and life style variables were more dominant (45, 46). Another important factor was inadequate staffing (47, 48), since there is nursing shortage in Iran.

The present study had some advantages. We considered both CLBP and acute episodes, as this was not performed in similar surveys (16, 28, 29, 49, 50). High response rate and considering violence as a disremembered psychological contributing factor for LBP were other advantages of this study. Our analysis although preliminary, highlighted physical violence as a possible risk factor for LBP among nurses and may exacerbate the effects of ergonomic risk factors.

## Acknowledgements

We kindly appreciate all nursing employees, managers and supervisors of Baqiyatallah Hospital for their cooperation.

## Authors' Contributions

Study design, searching, data gathering and writing the manuscript: Maryam Rezaee; study design, data gathering and writing the manuscript: Mohammad Ghasemi.

## References

1. Gropelli T, Corle K. Assessment of nurses' and therapists' occupational musculoskeletal injuries. *Medsurg Nurs*. 2011;**20**(6):297–303.
2. Aiken LH, Sloane DM, Klocinski JL. Hospital nurses' occupational exposure to blood: prospective, retrospective, and institutional reports. *Am J Public Health*. 1997;**87**(1):103–7.
3. McNeely E. The consequences of job stress for nurses' health: time for a check-up. *Nurs Outlook*. 2005;**53**(6):291–9.
4. Lipscomb J, Trinkoff A, Brady B, Geiger-Brown J. Health care system changes and reported musculoskeletal disorders among registered nurses. *Am J Public Health*. 2004;**94**(8):1431–5.
5. Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. *J Electromyogr Kinesiol*. 2004;**14**(1):13–23.

6. Riihimaki H. Hands up or back to work–future challenges in epidemiologic research on musculoskeletal diseases. *Scand J Work Environ Health.* 1995;**21**(6):401–3.
7. Leijon M, Hensing G, Alexanderson K. Gender trends in sick-listing with musculoskeletal symptoms in a Swedish county during a period of rapid increase in sickness absence. *Scand J Soc Med.* 1998;**26**(3):204–13.
8. Badley EM, Rasooly I, Webster GK. Relative importance of musculoskeletal disorders as a cause of chronic health problems, disability, and health care utilization: findings from the 1990 Ontario Health Survey. *J Rheumatol.* 1994;**21**(3):505–14.
9. Smedley J, Egger P, Cooper C, Coggon D. Manual handling activities and risk of low back pain in nurses. *Occup Environ Med.* 1995;**52**(3):160–3.
10. Smith DR, Leggat PA. Musculoskeletal disorders among rural Australian nursing students. *Aust J Rural Health.* 2004;**12**(6):241–5.
11. Waddell G, Burton AK. Occupational health guidelines for the management of low back pain at work: evidence review. *Occup Med (Lond).* 2001;**51**(2):124–35.
12. Josephson M, Lagerstrom M, Hagberg M, Wigaeus Hjelm E. Musculoskeletal symptoms and job strain among nursing personnel: a study over a three year period. *Occup Environ Med.* 1997;**54**(9):681–5.
13. Mohseni-Bandpei MA, Fakhri M, Bagheri-Nesami M, Ahmad-Shirvani M, Khalilian AR, Shayesteh-Azar M. Occupational back pain in Iranian nurses: an epidemiological study. *Br J Nurs.* 2006;**15**(17):914–7.
14. Rezaee M, Ghasemi M, Jonaidi Jafari N, Izadi M. Low Back Pain and Related Factors among Iranian Office Workers. *Int J Occup Hyg.* 2011;**3**(1):23–8.
15. da Costa BR, Vieira ER. Risk factors for work-related musculoskeletal disorders: A systematic review of recent longitudinal studies. *Am J Ind Med.* 2010;**53**(3):285–323.
16. Freimann T, Coggon D, Merisalu E, Animagi L, Paasuke M. Risk factors for musculoskeletal pain amongst nurses in Estonia: a cross-sectional study. *BMC Musculoskelet Disord.* 2013;**14**:334.
17. Harber P, Billet E, Gutowski M, SooHoo K, Lew M, Roman A. Occupational low-back pain in hospital nurses. *J Occup Med.* 1985;**27**(7):518–24.
18. Pillastrini P, Bonfiglioli R, Banchelli F, Capra F, Resende Fde L, Villafane JH, et al. The effect of a multimodal group programme in hospital workers with persistent low back pain: a prospective observational study. *Med Lav.* 2013;**104**(5):380–92.
19. de Castro AB, Cabrera SL, Gee GC, Fujishiro K, Tagalog EA. Occupational health and safety issues among nurses in the Philippines. *AAOHN J.* 2009;**57**(4):149–57.
20. Kamchuchat C, Chongsuvivatwong V, Oncheunjit S, Yip TW, Sangthong R. Workplace violence directed at nursing staff at a general hospital in southern Thailand. *J Occup Health.* 2008;**50**(2):201–7.
21. May DD, Grubbs LM. The extent, nature, and precipitating factors of nurse assault among three groups of registered nurses in a regional medical center. *J Emerg Nurs.* 2002;**28**(1):11–7.
22. Chen WC, Sun YH, Lan TH, Chiu HJ. Incidence and risk factors of workplace violence on nursing staffs caring for chronic psychiatric patients in taiwan. *Int J Environ Res Public Health.* 2009;**6**(11):2812–21.
23. Fernandes CM, Bouthillette F, Raboud JM, Bullock L, Moore CF, Christenson JM, et al. Violence in the emergency department: a survey of health care workers. *CMAJ.* 1999;**161**(10):1245–8.
24. Winstanley S, Whittington R. Violence in a general hospital: comparison of assailant and other assault-related factors on accident and emergency and inpatient wards. *Acta Psychiatr Scand Suppl.* 2002(412):144–7.
25. Ghasemi M, Rezaee M, Jafari NJ, Ashtiani AF, Izadi M, Ranjbar R. Physical Violence against Nurses in Hospital. *Int J Occup Hyg.* 2009;**1**(1):41–5.
26. Teymoorzadeh E, Rashidian A, Arab M, Akbari Sari A, Ghasemi M. Exposure to psychological violence among the nursing staff in a large teaching hospital in Tehran. *J School Public Health Institute Public Health Res.* 2009;**7**(2):41–9.
27. Miranda H, Punnett L, Gore R, Boyer J. Violence at the workplace increases the risk of musculoskeletal pain among nursing home workers. *Occup Environ Med.* 2011;**68**(1):52–7.
28. Eriksen W, Bruusgaard D, Knardahl S. Work factors as predictors of intense or disabling low back pain; a prospective study of nurses' aides. *Occup Environ Med.* 2004;**61**(5):398–404.
29. Tinubu BM, Mbada CE, Oyeyemi AL, Fabunmi AA. Work-related musculoskeletal disorders among nurses in Ibadan, Southwest Nigeria: a cross-sectional survey. *BMC Musculoskelet Disord.* 2010;**11**:12.
30. Coggon D. Occupational medicine at a turning point. *Occup Environ Med.* 2005;**62**(5):281–3.
31. Fayard GM. Work-related fatal injuries in parking lots, 1993-2002. *J Safety Res.* 2008;**39**(1):9–18.
32. Fujita S, Ito S, Seto K, Kitazawa T, Matsumoto K, Hasegawa T. Risk factors of workplace violence at hospitals in Japan. *J Hosp Med.* 2012;**7**(2):79–84.
33. Gates DM, Ross CS, McQueen L. Violence against emergency department workers. *J Emerg Med.* 2006;**31**(3):331–7.
34. Kansagra SM, Rao SR, Sullivan AF, Gordon JA, Magid DJ, Kaushal R, et al. A survey of workplace violence across 65 U.S. emergency departments. *Acad Emerg Med.* 2008;**15**(12):1268–74.
35. Alexy EM, Hutchins JA. Workplace violence: a primer for critical care nurses. *Crit Care Nurs Clin North Am.* 2006;**18**(3):305–12.
36. Yang LQ , Spector PE, Chang CH, Gallant-Roman M, Powell J. Psychosocial precursors and physical consequences of workplace violence towards nurses: a longitudinal examination with naturally occurring groups in hospital settings. *Int J Nurs Stud.* 2012;**49**(9):1091–102.
37. Jensen JN, Holtermann A, Clausen T, Mortensen OS, Carneiro IG, Andersen LL. The greatest risk for low-back pain among newly educated female health care workers; body weight or physical work load? *BMC Musculoskelet Disord.* 2012;**13**:87.
38. Hoogendoorn WE, van Poppel MN, Bongers PM, Koes BW, Bouter LM. Physical load during work and leisure time as risk factors for back pain. *Scand J Work Environ Health.* 1999;**25**(5):387–403.
39. Cato C, Olson DK, Studer M. Incidence, prevalence, and variables associated with low back pain in staff nurses. *AAOHN J.* 1989;**37**(8):321–7.
40. Yassi A, Lockhart K. Work-relatedness of low back pain in nursing personnel: a systematic review. *Int J Occup Environ Health.* 2013;**19**(3):223–44.
41. Holmstrom E, Moritz U. Low back pain--correspondence between questionnaire, interview and clinical examination. *Scand J Rehabil Med.* 1991;**23**(3):119–25.
42. Walsh K, Coggon D. Reproducibility of histories of low-back pain obtained by self-administered questionnaire. *Spine (Phila Pa 1976).* 1991;**16**(9):1075–7.
43. Adams MA, Mannion AF, Dolan P. Personal risk factors for first-time low back pain. *Spine (Phila Pa 1976).* 1999;**24**(23):2497–505.
44. Bejia I, Younes M, Jamila HB, Khalfallah T, Ben Salem K, Touzi M, et al. Prevalence and factors associated to low back pain among hospital staff. *Joint Bone Spine.* 2005;**72**(3):254–9.
45. Parkes KR. Locus of control as moderator: an explanation for additive versus interactive findings in the demand-discretion model of work stress? *Br J Psychol.* 1991;**82 ( Pt 3)**:291–312.
46. Vahtera J, Kivimaki M, Uutela A, Pentti J. Hostility and ill health: role of psychosocial resources in two contexts of working life. *J Psychosom Res.* 2000;**48**(1):89–98.
47. Stilwell B, Diallo K, Zurn P, Vujicic M, Adams O, Dal Poz M. Migration of health-care workers from developing countries: strategic approaches to its management. *Bull World Health Organ.* 2004;**82**(8):595–600.
48. Pang T, Lansang MA, Haines A. Brain drain and health professionals. *BMJ.* 2002;**324**(7336):499–500.
49. Smith DR, Mihashi M, Adachi Y, Koga H, Ishitake T. A detailed analysis of musculoskeletal disorder risk factors among Japanese nurses. *J Safety Res.* 2006;**37**(2):195–200.
50. Harcombe H, McBride D, Derrett S, Gray A. Physical and psychosocial risk factors for musculoskeletal disorders in New Zealand nurses, postal workers and office workers. *Inj Prev.* 2010; **16**(2):96–100.