ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 12 | December - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

STUDY OF LOW BACK PAIN AMONG NURSES WORKING IN A TERTIARY CARE HOSPITAL

Community Medicine

Sudesh V. Gandham Associate Professor, Dept. of Community Medicine, RCSM GMC Kolhapur.

Anurag Gupta* Assistant Professor, Dept. of Community Medicine, RCSM GMC Kolhapur. *Corresponding Author

ABSTRACT

Background: Possibility of healthcare personnel to encounter occupational risks varies according to their profession, job and the department in which they work. Nursing is accepted as a stressful profession with work overload due to several negative factors (overwork, overtime and long working hours, role conflict and ambiguity, problems with shift work etc.) arising from work circumstances. Healthcare workers are at a higher risk of developing low back pain due to a variety of factors. This problem is associated with major consequences in terms of disability and frequent absence. LBP might lead to activity limitation and sick leaves for more than 50 % of the nurses. This study aims to assess the prevalence and risk factors of LBP among nurses in a tertiary care center. **Objectives:** 1. To determine the frequency of low back pain and associated factors among nurses working in a tertiary care hospital 2. To assess the level of functional disability due to low back pain. **Methodology:** A cross-sectional study was conducted on 125 nurses, aged between 25 and 60 years, who had been working for at least 1 year at CPR Hospital Kolhapur (Maharashtra). Both male and female staff nurses were included in the study. Those who were pregnant and who were not willing to participate were excluded from the study. A self-administered Oswestry Low Back Pain Disability questionnaire which was applied to obtain data from the respondents. Both descriptive and inferential statistics was used. The baseline characteristics were presented as mean with standard deviation or frequencies and percentages whichever appropriate. The determinants of low back pain and knowledge on body mechanics were found using Chi-square. P value <0.05 is considered significant at 95% confidence interval. **Results:** In the present study, out of 125 participants, 56% were aged 31 to 40 years. Mean age was 32.68±7.32 years. There was female preponderance with 82.4. 71.2% had LBP. Based on Oswestry LBP Disability (OLBPD) Score, 28.8% were found to be free from any disability, 50.4% had minimal, 18.4%) had moderate and only 3 nurses had severe disability. Association was significant between higher age groups, history of caesarian (44.9%), no history of exercise (53.9%), designation of staff nurse (91.0%), physical exertion during work (92.1%), > 10 years of work experience (43.8%), attending >50 patients per day (22.5%), standing time > 5 hours in duty hours (82.0%) were found to be significantly associated with LBP (all p values <0.05).

KEYWORDS

Low back pain, nurses, prevalence

INTRODUCTION:

Possibility of healthcare personnel to encounter occupational risks varies according to their profession, job, and the department they work at[1]. Nursing is accepted as a stressful profession with work overload due to several negative factors (overwork, overtime and long working hours, role conflict and ambiguity, problems with shift work etc.) arising from work circumstances[2].

"Musculoskeletal disorders" (MSD) include a wide range of inflammatory and degenerative conditions affecting the muscles, tendons, ligaments, joints, peripheral nerves, and supporting blood vessels[3]. The most commonly reported biomechanical risk factors for MSD include awkward postures and heavy lifting[4]. Nurses often conduct patient handling by bending their waist and maintaining an uncomfortable posture towards the opposite side of the bed or chair, increasing the risk of back pain.[5]

Low Back Pain (LBP) is one of the most common complaints and most common form of musculoskeletal disorders[6]. It is estimated that over half of the general population will seek medical care for back pain at some point in their lives[7]. Usually, females complain more than males from LBP[8]. Occupational LBP is a common health problem worldwide.

Healthcare workers are at a higher risk of developing LBP due to a variety of factors. This problem is associated with major consequences in terms of disability and frequent absence[9]. LBP might lead to activity limitation and sick leaves for more than 50 % of the nurses[10]. This study aims to assess the prevalence and risk factors of LBP among nurses in a tertiary care center.

OBJECTIVES:

1. To determine the frequency of low back pain
2. To study the associated factors with low back pain
3. To assess the level of functional disability due to low back pain
4. To asses their quality of life

METHODOLOGY:

A cross-sectional study was conducted on 125 nurses, aged between 25 and 60 years, who had been working for at least 1 year at CPR Hospital Kolhapur (Maharashtra). The study was conducted from December 2020 to January 2021. Both male and female staff nurses were included in the study. Those who were pregnant and who were not willing to participate were excluded from the study.

Research Tools:

Section A consisted of Socio demographic variables of the staff nurses which include age, sex, weight, height, BMI, exercise pattern, educational qualification, marital status in pre-structured and preformed questionnaire. Section B consisted of work-related variables of staff nurses which include their activities, whether the working environment was stressful or not, number of years of work experience, over all standing time in duty and area of posting. Section C consisted of self-administered Oswestry Low Back Pain Disability questionnaire which was applied to obtain data from the respondents. All the respondents were divided into small groups and called to attend the data collection session according to their allocated time. They were briefed about the study before providing their written consent to participate.

The nurses in our hospital are subjected to work either in rotating shifts or during the day (non-shift). Those who work in a rotating shift schedule are considered shift workers. Work schedule that is practiced by nurses in public hospitals involves a fast-forward rotating shift of 2 days of morning shift, followed by 2 days of evening shift and 2 days of night shift. Then, they get 2 days off from work. The work starts at 8:00am for the morning shift, 14:00 for the evening shift, and 20:00 for the night shift. Hence, the maximum number of hours that nurses work per day is 10 hours, which is during the night shift.

Data Collection And Statistical Analysis:

Both descriptive and inferential statistics was used. The baseline characteristics were presented as mean with standard deviation or frequencies and percentages whichever appropriate. The determinants of low back pain and knowledge on body mechanics were found using Chi-square. P value <0.05 is considered significant at 95% confidence interval.

RESULTS:

Demographic Variables:

In the present study, out of 125 participants, majority, 56% were belonging to age group 31 to 40 years. Mean age was 32.68±7.32

years. There was female preponderance with 82.4% female participants. 91.2% were married and majority, 66.4% belonging to upper-middle class. More than half (55.2%) belonging to joint family and 80.8% were residing in urban areas. (Table 1)

46.4% nurses had BMI (Body Mass Index) between 18.5 to 24.9 g/m^2 followed by 30.4% had between 25 to 29.9 Kg/m^2. 19.2% participants had BMI ≥30 Kg/m^2. 88% participants reported physical exertion during hospital work, 52.8% participants gave history of regular exercise. 39.2% had previous caesarean section and only 7.2% participants had history of RTA (road traffic accidents) related injuries. (Table 1)

Table 1: Demographic Variables:

Demographic Variables		Frequency	Percent
Age (Years)	≤30	28	22.4
	31 to 40	70	56.0
	41 to 50	19	15.2
	51 to 60	8	6.4
Sex	Male	22	17.6
	Female	103	82.4
Marital status	Married	114	91.2
	Unmarried	11	8.8
Socio-economic Status	Upper Class	42	33.6
	Upper Middle	83	66.4
Type of Family	Joint	69	55.2
	Nuclear	56	44.8
Residence	Urban	101	80.8
	Rural	24	19.2
BMI (Kg/m^2)	≤18.4	5	4.0
	18.5 to 24.9	58	46.4
	25 to 29.9	38	30.4
	≥30	24	19.2
Relevant Past History	RTA Injuries	9	7.2
	Caesarean Section	49	39.2
	Exercise	66	52.8
	Physical exertion during hospital work	110	88.0

Details of the Workplace:

Details of work-place are shown in table 2. 86.4% participants were staff-nurse and 13.6% were in-charge nurse. Almost half of the participants (49.6%) had experience ≤10 years and 38.4% working since 11 to 20 years. Mean work experience was 12.46±3.32 years.

During their duty time, 82.4% participants attend < 50 patients and 12.8% attend 50 to 100 patients. 76.8% participants remain stand for > 5 hours during duty time and remaining stand for ≤ 5 hours a day. 40% staff work in general ward, 32% in ICU, 18.4% in Operation Theatre . 6 (4.8%) nurses each work in OPD and Casualty. (Table 2)

Table 2: Details Of The Workplace:

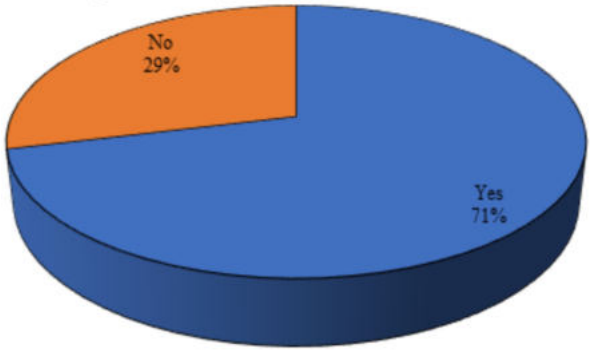
Details of the Workplace		Frequency	Percent
Designation	Staff Nurse	108	86.4
	In Charge Nurse	17	13.6
Work Experience (Years)	≤10 Years	62	49.6
	11 to 20 Years	48	38.4
	21 to 30 Years	10	8.0
	≥31 Years	5	4.0
Patients attended / day	< 50	103	82.4
	50 to 100	16	12.8
	> 100	6	4.8
Standing time in duty (Hours)	≤ 5 hours	29	23.2
	> 5 hours	96	76.8
Area of posting:	General Ward	50	40.0
	ICU	40	32.0
	Operation Theatre	23	18.4
	OPD	6	4.8
	Casualty	6	4.8

Frequency of Low Back Pain (LBP):

In the present study, out of 125 participants, majority 89 (71.2%) were found to have LBP and 36 (28.9%) were free from it.(Graph 1)

Based on Oswestry Low Back Pain Disability (OLBPD) Score, severity of LBP was categorized. 36 (28.8%) were found to be free from any disability, 63 (50.4%) had minimal disability, 23 (18.4%) had moderate disability and only 3 nurses had severe disability.

Graph 1: Frequency of Low Back Pain:



Graph 2: Oswestry Low Back Pain Disability (OLBPD) Score:

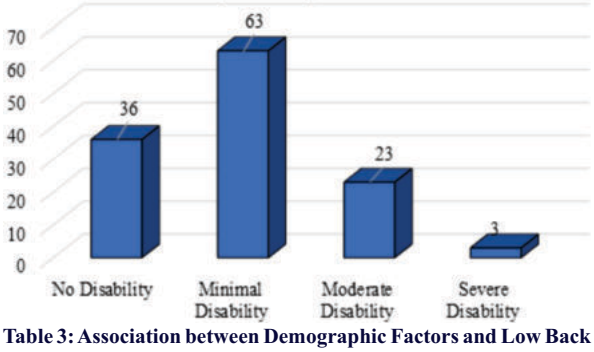


Table 3: Association between Demographic Factors and Low Back Pain:

Demographic Variables		Low Back Pain		Total	Chi Square, p value
		Yes	No		
Age Group	≤ 40 Years	65(73%)	33(91.7%)	98 (78.4%)	5.26, 0.022
	>40 Years	24(27%)	3(8.3%)	27 (21.6%)	
Sex	Male	10(11.2%)	12(33.3%)	22 (17.6%)	8.63, 0.003
	Female	79(88.8%)	24(66.7%)	103(82.4%)	
Marital status	Married	82(92.1%)	32(88.9%)	114 (91.2%)	0.337, 0.562
	Unmarried	7(7.9%)	4(11.1%)	11 (8.8%)	
Body Mass Index	≤ 24.9 kg/m^2	39(43.8%)	24(66.7%)	63 (50.4%)	5.35, 0.020
	> 25 kg/m^2	50(56.2%)	12(33.3%)	62 (49.6%)	
Socio-economic Status	Upper Class	30(33.7%)	12(33.3%)	42 (33.6%)	0.002, 0.968
	Upper Middle	59(66.3%)	24(66.7%)	83 (66.4%)	
Type of Family	Joint	47(52.8%)	22(61.1%)	69 (55.2%)	0.714, 0.398
	Nuclear	42(47.2%)	14(38.9%)	56 (44.8%)	
Residence	Rural	20(22.5%)	4(11.1%)	24 (19.2%)	2.132, 0.144
	Urban	69(77.5%)	32(88.9%)	101 (80.8%)	
Total		89 (100%)	36(100%)	125(100%)	

Association between Demographic Factors and Low Back Pain:

Table no 3. shows relation between demographic factors and LBP. Out of 89 patients with LBP, 27% were from age group >40 years while out of 36 patients without LBP only 8.3% were from age group >40 years. Association was significant between higher age groups and LBP. Similarly, female gender and higher BMI (> 25 kg/m^2) were also found to be significantly associated with LBP (p values 0.003 and 0.020 respectively).

Despite LBP was slightly higher in married participants, participants from nuclear family and rural areas, but the association lacks statistical significance (all p values >0.05). Socio-economic Status didn't show any association.

Association between Relevant Past History, Work-place factors and Low Back Pain:

In table no 4. relation between relevant past history, work-place factors

and LBP was shown. Out of 89 participants with LBP 44.9% had history of caesarian section while out of 36 patients without LBP only 25% had history of caesarian section. Association was significant between history of caesarian section and LBP. Similarly, among LBP participants, majority had no history of exercise (53.9% vs 30.6%), physical exertion during work (92.1% vs 77.8%), designation of staff nurse (91.0% vs 75.0%), > 10 years of work experience (43.8% vs 63.9%), attending >50 patients per day (22.5% vs 5.6%) and standing time > 5 hours in duty hours (82.0% vs 63.9%), and all these factors were found to be significantly associated with LBP (all p values <0.05).

Among 89 participants with LBP, 42.7% were working in General Ward, 37.1% in ICU and 5.6% in Casuality in contrast, out of 36 participants without LBP, 33.3%, 19.4% and 2.8% were working in General Ward, ICU, Causality respectively. The difference between two groups was statistically significant (p value 0.0008). History of road traffic accidental (RTA) injuries didn't show any association with LBP.

Table 4: Association Between Relevant History, Work-place Factors And Low Back Pain:

Relevant Past History and Work-place factors		Low Back Pain		Total	Chi Square, p value
		Yes	No		
RTA Injuries	Yes	7(7.9%)	2(5.6%)	9(7.2%)	0.205, 0.651
	No	82(92.1%)	34(94.4%)	116(92.8%)	
Caesarean Section	Yes	40(44.9%)	9(25.0%)	49(39.2%)	4.28, 0.038
	No	49(55.1%)	27(75.0%)	76(60.8%)	
Exercise	Yes	41(46.1%)	25(69.4%)	66(52.8%)	4.72, 0.029
	No	48(53.9%)	11(30.6%)	59(47.2%)	
Physical exertion during Work	Yes	82(92.1%)	28(77.8%)	110(88.0%)	5.00, 0.025
	No	7(7.9%)	8(22.2%)	15(12.0%)	
Designation	Staff Nurse	81(91.0%)	27(75.0%)	108(86.4%)	5.59, 0.037
	In-Charge Nurse	8(9.0%)	9(25.0%)	17(13.6%)	
Work Experience	≤ 10 Years	39(43.8%)	23(63.9%)	62(49.6%)	4.13 0.042
	> 10 Years	50(56.2%)	13(36.1%)	63(50.4%)	
Patient attended Per day	≤ 50	69(77.5%)	34(94.4%)	103(82.4%)	3.96, 0.047
	> 50	20(22.5%)	2(5.6%)	22(17.6%)	
Standing Time	≤ 5 Hours	16(18.0%)	13(36.1%)	29(23.2%)	4.73, 0.029
	> 5 hours	73(82.0%)	23(63.9%)	96(76.8%)	
Area of posting	General Ward	38(42.7%)	12(33.3%)	50(40.0%)	13.8, 0.0008
	ICU	33(37.1%)	7(19.4%)	40(32.0%)	
	Operation Theatre	11(12.4%)	12(33.3%)	23(18.4%)	
	Casualty	5(5.6%)	1(2.8%)	6(4.8%)	
	OPD	2 (2.2%)	4 (11.1%)	6 (4.8%)	
Total		89 (100%)	36 (100%)	125 (100%)	

DISCUSSION:

Nurses, as professionals, have a high incidence of occupational LBP and traumas in the lumbar area, as their profession is unique with heavy emotional and physical work, and are exposed to a combination of mechanical and psychosocial stress at work.

Present study shows, out of 125 participants, majority, 56% were belonging to age group 31 to 40 years. 82.4% were female participants. 19.2% participants had BMI ≥30 Kg/m^2 (Obese). 71.2% were suffering from LBP and 36 (28.9%) were free from it.(Graph 1) Based on Oswestry Low Back Pain Disability (OLBPD) Score, severity of LBP was categorized. 36 (28.8%) were found to be free from any disability, 63 (50.4%) had minimal disability, 23 (18.4%) had moderate disability and only 3 nurses had severe disability.

This finding is similar to the prevalence of LBP reported among nurses in Sudayr region (53.2%)[11]. A cross sectional study among 265 Thai hospital nurses over a period of one year revealed that 61.5 % of the nurses had LBP[12]. It was supported by a cross sectional study done by **Sikiru et al. (2010)** [13] in which the prevalence of low back pain was 73.53%. A prevalence rates of 62%–79% was reported among nurses in previous literature[13,14]. Since the prevalence is almost the same in different parts of the world it indicates that nurses are prone for LBP and that measures had to be taken to prevent LBP.

Several studies from China and Netherlands have reported slightly lower annual prevalence rates of LBP in nurses varying between 45% and 58%[15]. Comparing these studies might be difficult as definitions of the term LBP vary considerably. Furthermore, the heterogeneity of different nursing populations could be responsible. Literature states that people with LBP are at high risk (25%) for disability[16]. Chronic low back pain may lead to functional disability and in turn affect the standard and quality of patient care. Frequent absenteeism may result from the constantly existing problem. Periodic screening of nurses and prompt intervention should be done to avoid worsening of the condition and its effect on the work routines. Prevention of LBP should be focused through regular education on body postures, maintenance of physical fitness, and proper body mechanics.

88% participants reported physical exertion during hospital work, 52.8% participants gave history of regular exercise. 39.2% had previous caesarean section and only 7.2% participants had history of RTA (road traffic accidents) related injuries. (Table 1) 86.4% participants were staff-nurse. Almost half of the participants had experience >10 years. During their duty time, 82.4% participants attend < 50 patients and 12.8% attend 50 to 100 patients. 76.8% participants remain stand for > 5 hours during duty time and remaining stand for ≤ 5 hours a day. 40% staff work in general ward, 32% in ICU, 18.4% in Operation Theatre, 4.8% nurses each work in OPD and Casualty. (Table 2) There was as significant association between higher age groups female gender and higher BMI (> 25 kg/m^2) with LBP (all p values <0.05). Similarly, association was significant between history of caesarian section, no history of physical exercise, physical exertion during work, designation of staff nurse and > 10 years of work experience (all p values <0.05).

Despite LBP was slightly higher in married participants, participants from nuclear family and rural areas, but the association lacks statistical significance (all p values >0.05). Socio-economic Status didn't show any association. History of road traffic accidental (RTA) injuries didn't show any association with LBP.

Similar finding is reported by **Sikiru L et al** and according to **Hinmikaiye and Bamishaiye (2012)** LBP is reported among nurses with increasing age[13,17]. The influence of age and experience on LBP indicates that age related physical problems may significantly affect LBP. It is the responsibility of the health care setting to ensure regular physical assessment of workers and provision of appropriate care to ensure good physical health of the individual. Gender as associated risk factor was also reported by **Sikiru L et al,** where females displayed higher percentages of LBP prevalence[13]. They reported LBP was more prevalent among female nurses (67.5%) than the male nurses (32.5%). The reason for female preponderance in this study was unclear but it may be related to the anatomical, physiological and structural difference between males and female.

LBP was reported work related in study **by Sikiru and Hanifa et al** [13] where 67% of the nurses who had LBP believed it to be due to their occupation. Association of exertion and stress at work is in agreement with the findings of **Ghilan et al**[18] **and Wong et al**[19]. A study conducted by **Mehrdad et al. (2010)**[20] on Iran concluded that Musculo-skeletal symptoms were more associated with psychological factors especially stress and exertion. These findings were consistent with the present study in which 71.9% of the sample experienced that the working environment were stressful. Another workplace characteristic that was positively associated with LBP was lifting heavy objects at work. A previous study has also demonstrated similar findings where LBP was significantly associated with lifting objects, carrying/moving patients, etc.[19] As place of work significantly influence the presence of LBP, the nurses may be rotated in their work place to provide balanced level of physical. The significant association between LBP and BMI reveal the need for nurses with ideal body weight. Provisions like gym should be made within the institution to ensure healthy weight. Incentives can be provided for nurses maintaining good health and not availing frequent leave due to medical ailments especially LBP.

In this study, it was seen that the departments in which the nurses worked showed a significant association with the occurrence of LBP. Association was significant between LBP and attending >50 patients

per day and standing time > 5 hours in duty hours (all p values <0.05). LBP was high in patients working in General Ward, ICU and Causality (p value 0.0008). Prolonged standing would cause an increased pressure on the back and can precipitate LBP. This might explain the higher proportion of those standing >2 h in a day suffering from LBP as compared to those who had a shorter duration of standing. Positioning patients in bed and washing patients were the other activities that were also regarded as high risk in a study by **(Jensen et al, 2003)**[21] who found that the frequency of positioning patients in bed also predicted the development of LBP.

The relationship of LBP with workplace functioning can be complex. Individuals may experience impairment or disability at work because of LBP whether the latter was directly caused by job-related factors or not. The degree to which ability to work is impaired is often dependent on the physical demands of the job. Furthermore, when an individual experiences a LBP, it may be a new occurrence or an exacerbation of an existing condition. Again, originally it may have been directly caused by work or by non-work-related factors. Thus, the relationship between work functioning and LBP may be direct in some cases, but not in others[22].

CONCLUSION:

Low back pain is quite common among nurses and they are at risk for complications related to LBP. Higher age group, physical exertion at work, prolonged standing, higher BMI, ICU and ward duties were significantly associated with LBP. LBP might be a significant problem among the hospital nurses and strategies need to be implemented to help reduce the prevalence of LBP and its effects. Periodic screening of nurses for LBP may help to identify nurses at risk and prevent major physical injury. Also, good life style practices and food habits are essential to maintain ideal weight which will help in preventing LBP.

IMPLICATIONS:

The present research will be useful to achieve awareness among the nurses working in a tertiary care hospital about a much ignored problem amongst them that is low back pain and how it affects their quality of life.

REFERENCES:

1. Mollaoglu M, Fertelli TK, Tuncay FO (2010) Evaluation of the perceptions of nurses working in the hospital environment. Firat Health Services Magazine, 5: 17-30.
2. Kebapci A, Akyolcu N (2011) The effects of the work environment on nurse burnout in emergency department. Turkish Journal of Emergency Medicine 11: 59-67.
3. L. Punnett and D. H. Wegman, "Work-related musculoskeletal disorders: the epidemiologic evidence and the debate," Journal of Electromyography and Kinesiology, vol. 14, no. 1, pp. 13–23, 2004.
4. B. R. Da Costa and E. R. Vieira, "Risk factors for work related musculoskeletal disorders: a systematic review of recent longitudinal studies," American Journal of Industrial Medicine, vol. 53, no. 3, pp. 285–323, 2010.
5. K. J. June and S.-H. Cho, "Low back pain and work-related factors among nurses in intensive care units," Journal of Clinical Nursing, vol. 20, no. 3-4, pp. 479–487, 2011.
6. Deyo RA, Weinstein JN. Low back pain. N Engl J Med. 2001;344(5):363–70.
7. Deyo RA, Tsui-Wu YJ. Descriptive epidemiology of low-back pain and its related medical care in the United States. Spine (Phila Pa 1976). 1987;12(3): 264–8
8. Al-Arfaj AS, Al-Saleh SS, Alballa SR, Al-Dalaan AN, Bahabri SA, Al-Sekeit MA, et al. How common is back pain in Al-Qaseem region. Saudi Med J. 2003; 24(2):170–3.
9. Karahan A, Kav S, Abbasoglu A, Dogan N. Low back pain: prevalence and associated risk factors among hospital staff. J Adv Nurs. 2009;65(3):516–24.
10. Al Dajah S, Al Daghdi A. Prevalence and risk factors of low back pain among nurses in sudayr region. ESJ. 2013;9(33):198–205.
11. Yassi A, Lockhart K (2013) Work-relatedness of low back pain in nursing personnel: A systematic review. International Journal of Occupational and Environmental Health 19: 223-244.
12. Sopajareeya C, Viwatwongkasem C, Lapvongwatana P (2009) Prevalence and risk factors of low back pain among nurses in a Thai public hospital. Journal of Medical Association of Thai 92: S93-99.
13. Sikiru, L., Hanifa, S. (2010) Prevalence and risk factors of low back pain among nurses in a typical Nigerian hospital. Afr Health Sci., 10(1):26–30.
14. Sopajareeya C, Viwatwongkasem C, Lapvongwatana P, Hong O, Kalampakorn S. Prevalence and risk factors of low back pain among nurses in a Thai public hospital. J Med Assoc Thai 2009;92 Suppl 7:S93-9.
15. Comerino D, Conway PM, Van der Heijden BI, Hasselhom HM. Age-dependent relationships between work ability, thinking of quitting the job and actual leaving among Italian Nurses: a longitudinal study. Int J Nurs Stud. 2008;45(11):1645–57.
16. Hill JC, Dunn KM, Martyn L (2008) A primary care back pain screening tool: Identifying patient subgroups for initial treatment. Arthritis and Rheumatism 59: 632-641.
17. Hinmikaiye CD, Bamishaiye EI (2012) The incidence of low back pain among theatre nurses: A case study of University of Ilorin and Obafemi Awolowa University teaching hospital. International Journal of Nursing Science 2: 23-28.
18. Ghilan K, Al-Taiar A, Yousfi NA, Zubaidi RA, Awadh I, Al-Obeyed Z. Low back pain among female nurses in Yemen. Int J Occup Med Environ Health 2013;26:605-14.
19. Wong TS, Teo N, Kyaw MO. Prevalence and risk factors associated with low back pain among health care providers in a district hospital. Malays Orthop J 2010;4:23-8.
20. Mehrdad, R., Dennerlein, J.T., Haghighat, M., Aminian, O. (2010)Association between psychosocial factors and musculoskeletal symptoms among Iranian nurses. Am J Ind Med.,53(10):1032–9.
21. Jensen, Jette N., et al. "The greatest risk for low-back pain among newly educated female health care workers; body weight or physical work load?." BMC musculoskeletal disorders 13.1 (2012): 87.
22. Monteiro MS, Alexandre NMC. Work ability and low back pain among workers from a public health institution. Rev Gaúcha Enferm. 2009;30(2):297-302.