Remittances Review
January, 2024
Volume: 9, No: 1, pp. 3011-3025
ISSN: 2059-6588(Print) | ISSN 2059-6596(Online)

Received: 10 January 2024, Accepted: 15 February 2024

DOI: https://doi.org/10.33282/rr.vx9il.130

Work-Related Low Back Pain and the Effect of Teaching on its Prevention and Management Among Nursing Professionals of a Tertiary Care Hospital Karachi

Alic William[1], Shehla Naeem Zafar[2], Haider Ali*[3], Gloria Noble Khan[4], Anila Jabeen[5], Faryal Victoria Albert[6]

[1]Naz Nursing Institute of Health Sciences, Pakistan,

[2,3] Iqra University North Campus, Pakistan,

[4]Shed Foundation, Pakistan,

[5] Sobhraj Maternity Hospital, Pakistan

[6]Jamshoro College of Nursing, Jamshoro, Pakistan

***Corresponding author's email address:** haider.ali@iqra.edu.pk*

Abstract:

Low back pain in nurses is a very serious problem worldwide. Prevention and treatment depend on knowledge and awareness that could be improved through educational sessions. This study was conducted at Dr. Ruth Pfau Civil Hospital. Over 140 qualified nursing professionals were enrolled in the study. The data collecting tools contain demographic data, questions regarding occupational health in nursing practice, severity of the pain, and coping strategies for reducing it. SPSS version 21.0 was used for data analysis. Overall, there were 140 nurses based on inclusion criteria. Their mean age was 35.85±7.87 years, with a mean BMI of less than 30. Most (77.9%) of nurses had ever experienced work-related low back pain. Amongst them, 43.1% have had it in the last 12 months. The onset of such work-related low back pain in 55.3% was all of sudden. After the teaching session, the situation changed, and the majority, 71.5% to 87.8%, had a perception with no problem in doing all such activities. The results of all such activities were statistically significant ($p<0.000$). Similarly, techniques to be adopted to reduce the strain on their body also became well after the teaching session. According to our study findings, teaching has changed the perception of job risk factors, and techniques adopted to reduce strain on their body difference between before and after teaching was found statistically significant at $p<0.000$.

Keywords: Low back pain, Prevention, Nursing professional, Intervention, Management, Rehabilitation, Occupational risk,

Introduction

Low back pain (LBP) is a widespread problem involving muscles, backbones, and nerves. The LBP may be a slow pain that remains constant or goes to a sudden sharp feeling. It can be divided by its duration as acute (less than six weeks), sub-chronic (6-12 weeks) duration, and for more than six months considered as chronic1. Its prevalence varies in different countries due to other measurements used to determine the LBP. It is also directly related to work-related factors 2. As medical professionals, nurses have a greater incidence of LBP because of factors related to their job. It is a very usual practice for nurses to handle patients and equipment when shifting or lifting for their procedures with or without helping aid equipment due to their non-availability, especially in developing countries. Ergonomic factors were associated with back pain 3,4,5,6. According to physical activities, this profession is ranked second after industrial workers. On one side, nurses are to be considered the backbone of the medical treatment regime, but on the other hand, musculoskeletal disorders, mainly LBP are very high in this profession. Due to this medical sick leave based on LBP is very common7, 8.

It is evident to nurses that LBP is ubiquitous and needs frequent educational sessions to reduce its incidences. According to a study, Low back pain (LBP) is the most common musculoskeletal condition affecting the adult population, with a prevalence of up to 84%. The lifetime incidence of LBP was higher in orthopaedic nurses, 65%, compared to intensive care nurses, 58%. The significant difficulties in performing their daily activities due to LBP were stair climbing, standing up, sleeping, standing up from bed, and cloth-wearing 9. According to a study conducted in Taiwan, LBP prevalence was 70.87% in the last 12-month history. It was also noted that LBP was found much more in females than in male nurses (67.5% and 32.5%, respectively) 10. In another study, Back pain was the highest issue among nurses. At a minimum of one day in the last year, 54.3%, whereas 34.3% received treatment for LBP, and chronic LBP was found in 26.8% of nurses 11. In another study12, its prevalence at any time in a year was as high as 85.9%. The nurses working in the ICU have a 95% prevalence of LBP, which is the highest where, whereas it was lowest working in the OPDs (64.0%).9 For LBP, ergonomic factors

constitute a significant influence factor on nurses. Working-place violence has also been defined in the development of LBP in study 13. The same was concluded in a study conducted on Nigerian nurses.14 In another study conducted in Saudi Arabia on hospital staff, it was concluded that LBP was almost a major problem, and the main factor was the risky activities of the staff. The study recommends that education intervention can better prevent this LBP problem in the staff 15.

Multiple risk factors of LBP amongst nurses may be physical, mental, or psychological. It may be multi-factorial due to their job requirement. The significance of the present study is that on one hand, we can find out the prevalence of LBP amongst nursing professionals in our area and on the other hand if education effects prove to remain helpful in reducing it, the recommendation could be made to health managers to promote it in nursing professional and other paramedical staff to reduce the chances of development of LBP. There is always a need to teach nursing professionals to prevent low back pain, and if they have, then its management for reducing the sickness of these critical health personnel. Therefore, this study was developed to help nursing professionals by preventing them from low back pain and performing their duties regularly without any absenteeism from LBP. As a result, it will also improve patient care. Low back pain in health care professionals, primarily in the nursing group is expected due to which they cannot perform their duties smoothly and the main reason is that most of them did not get proper education training for the prevention of job-related risk factors and preventive techniques to be adopted by them to reduce the strain on their body.

Low back pain is the most common problem people face at least once. However, it is not a specific disease, but a symptom that may occur due to different processes. Around 85% of patients with LBP have no particular cause of it, regardless of a detailed medical examination. Doctors usually diagnose it acute if its duration is<3 months and chronic for an extended period.17 The primary symptoms of it are that a patient faces pain in the lower part of the back. It radiates from the legs down front, side, or back. It became worse with activities. The patient may feel unresponsiveness or weakness in their legs and receive blood supply from a compressed nerve. Significant causes of LBP are injury or disease of muscles, bones, or spine nerves. Musculoskeletal pain syndromes included myofascial pain syndromes and fibromyalgia. Medical history, physical examination, review of images, and nerve and blood tests are the primary

treatment procedures of the LBP. Spinal manipulation, acupuncture, transcutaneous electric nerve stimulation, exercises, and preventive techniques remain helpful in managing low back pain.

LBP is increasing day by day due to changes in the working scenario. Most people do their work sitting without knowing the exact position required to save them from the LBP18. The nursing profession, which is the backbone of health care, is mostly affected by the LBP. Nurses are ranked second in physical activities after industrial professionals for this issue. This profession has a very high prevalence of musculoskeletal disorders in which low back pain is at the top. It is the most common symptom of absenteeism from work in nursing professionals. According to studies, in the United States, 12% of health employees suffer from injuries in which back pain and shoulder pain are most common18, 19, 20. Other studies concluded that its prevalence is higher in the nursing group than in different occupational groups, 73% to 90%18, 21, 22. A study documented that around 1/5th of the nurses were exposed to occupational hazards, especially low back pain during the internship period. Nursing students, however, rarely face occupational exposure except for insomnia or back musculoskeletal pains23. A study concluded that as an education strategy, the Back School program is a better one in reducing disability or LBP in nurses. It is suitable for pain prevention and reduction of functional disability in nurses who work in hospital settings24. According to studies conducted on nurses working in Iranian health professionals, low back pain prevalence ranges from 59.6%25 to 78.3%26.

The primary causes, determined through different studies and doctors' experiences, are incorrect body position during physical activities, especially lifting something, heavy loads, performing the same activities multiple times, weak abdominal muscles, and shortening muscles. Nursing has to move the patient from one place to another to carry out different tests, x-rays, ultrasounds, operation procedures, and others. They have to move types of equipment and medicines for the whole ward in which they are working. Similarly, working condition and environmental factors also play their role in developing LBP26, 27. A study concluded that without any intervention, the back pain intensity, disability, and transversus abdominal muscle strength do not improve with the usual way of treatment.28

Material and Methods

The study design was Quasi-experimental, pre-post assessment of intervention study design, and the study participants were selected from Dr. Ruth Pfau Civil Hospital Karachi. Nurses working in the ICU and emergency department of Dr. Ruth Pfau Civil Hospital Karachi were chosen for the study. Qualified nursing professionals working inwards, in ICUs, and in emergency departments have work-related lower back pain at any time in life. 95% Confidence Level and with 5% Confidence limits. A non-probability consecutive sampling technique was selected for enrolling participants. Data was collected after getting permission from the scientific committee and Institutional Review Board (IRB) of Dow University of Health Science Karachi.

Result:

As per our sample size, we have selected 140 nursing participants who fulfil the study's inclusion criteria. According to demographic statistics, most (52.1%) were between the age group 26-30 years, with a mean age of 35.85 ± 7.87 years. The BMI of almost all of them was below 30 levels. Their mean working hours was 36.04 ± 0.51 hours per week whereas their mean working experience was 12.97 ±7.15 years. According to their occupational health status regarding low back pain 109. 77.9 % ever had experienced work-related low back pain whereas 43.1% had it for more than three days in the last year. Data showed that the onset of such work-related problems was sudden (55.3%), whereas 23.4% developed LBP gradually. Out of 109 faced LBP, only 35.8% have gotten self-treatment or treatment from consultant physicians. Only 23, i.e., 16.4%, have proper ergonomics training on how to prevent themselves from occupational hazards. Regarding using techniques to minimize strain, 40.7% of nurses said their first preference would be sliding boards.

Occupational health status regarding low back pain in nursing practice

S.No	Health status	n (%)
1.	**Describe if you ever had experienced LBP related to your work** **1. Yes** **2. No**	 **109 (77.9%)** **31 (22.1%)**
2.	**Describe if you have it during last one year for more than three days?** **1. Yes** **2. No**	**(out of 109 Participants)** **47 (43.1%)** **62 (56.9%)**
3.	**How such onset was happened?** **a. Gradual** **b. Sudden**	**(Out of 47 participants)** **11(23.4%)** **26 (55.3%)**

	c. As a result of an accident	**10 (21.3%)**
4.	**In result of LBP problem, have ever you got treatment as self-treatment or get treatment by consultant physicians?** **a. Yes** **b. No**	**(Out of 109 participants)** **39 (35.8%)** **70 (64.2%)**
5.	**Have you got ergonomics training to prevent from occupational hazards?** **a. Yes** **b. No**	 **023 (16.4%)** **117 (83.6%)**
6.	**Mention how you minimize strain on body during your routine duties.** **a. Through use of adjustable bed/plinth** **b. Through use of sliding board** **c. Through use of lifting belt** **d. Through use of splints** **e. Others (indicate)** **f. None of the above**	 **45 (32.1%)** **57 (40.7%)** **25(17.9%)** **01 (00.7%)** **06 (04.3%)** **06 (04.3%)**

Before the teaching session, data regarding their perception of risk factors contributing to developing work-related low back pain was collected. According to problem severity, only 33(23.6%) have no problem performing the same task repeatedly. Regarding handling many more patients daily, only 20.7 % perceive it may be fine for them. With minimum rest breaks during duties, only 22.9% have no problem. When forced to work in awkward and cramped positions, most (55%) said it might create middle to high-level low-back pain. 48.7% said it may cause a moderate to severe problem when working longer in one position. Of their perception of low back pain as a factor due to lifting or transferring dependent patients, 50% said it may create a moderate to severe problem.

Regarding the patient's unanticipated sudden movement or fall, 49.9% said it may create an LBP problem for them. Overtime, irregular work shifts, and length of working day may also be job risk factors; the perception of 77.9% was mild to severe problems. The majority believed that all of them should receive adequate preventive training to reduce the incidence of LBP.

After the teaching session, we again collected the data from all participants regarding their perception of risk factors related to jobs contributing to the development of work-related low back pain. Regarding problem severity, the majority, 87.8%, have no problem performing the same task repeatedly. In contrast, in handling many more patients in one day, 76.3% perceive that it may not be a problem for them. On minimum rest breaks during duty, 73.5% said it does

not make any problem for them. After the teaching session, the majority of the participants' perceptions regarding being forced to work in awkward and cramped positions, forced to work more extended periods in one position, lifting or transferring dependent patients, handling agitated or confused patients, lifting or moving heavy material or equipment, unanticipated sudden movement or fall by the patient, overtime and irregular work shifts and length of working day does not make them any problem. Similarly, the majority (71.5%) believe there is no problem with LBP due to proper training. It is noted that after the teaching session, no participant was aware that all these job risk factors would not affect them for a severe problem regarding work-related lower back pain.

Before the teaching session, nurses' techniques to minimize strain on the body during routine duties were also assessed. The majority (65.0% and 55.0%) did not call someone to handle a much-weighted patient or did not modify the patient's or their position to minimize strain on their body. Only 10.7% of the participants were stretching and warming up before their duties. However, most (57.1%) nursing participants never adjust plinth/bed height, and only 12.1% select techniques /procedures that will not aggravate or provoke their discomforts. However, most participants (48.6%) always stop treatment if it causes or aggravates their discomfort. The collected data on the perception of risk factors related to job contribution to developing work-related low back pain were also analyzed separately before the teaching session. After the teaching session, we found a significant difference between these two results. To assess this difference, we have also compared the perception of risk factors contributing to developing work-related low back pain through a paired sample t-test. According to the findings after the teaching session, all the job risk factors were found on the reduction side. The perception of the participants was found to be changed as no one complained about the severity of the problem, and all became easy for them to handle at $P<0.000$.

Comparison of perception of risk factors related to job contributing increase work related low back pain (before and after teaching session) [No problem=1, mild problem=2, moderate problem=3, severe problem=4]

S.No	Problem severity	Before teaching	After teaching	P-value

		session n (%)	session n (%)	
1	**If the same task comes over and over**			
	1.	**33(23.6%)**	**123 (87.8%)**	
	2.	**59(43.0%)**	**15 (10.7%)**	
	3.	**42(30.1%)**	**02 (01.5%)**	
	4.	**06 (04.3%)**	**00(00.0%)**	**0.000**
2	**If number of patients is excessive in a day**			
	1.	**29(20.7%)**	**107(76.3%)**	
	2.	**43(30.7%)**	**29 (20.8%)**	
	3.	**65(46.5%)**	**04 (02.9%)**	
	4.	**3(02.1%)**	**00(00.0%)**	**0.000**
3	**If there is no rest break during full duty**			
	1.	**32(22.9%)**	**103 (73.5%)**	
	2.	**35(25.0%)**	**33 (23.7%)**	
	3.	**64(45.8%)**	**04 (02.8%)**	
	4.	**09(06.3%)**	**00(00.0%)**	**0.000**
4	**If you work in awkward or cramped position**			
	1.	**28(20.0%)**	**100(71.4%)**	
	2.	**35(25.0%)**	**36(25.8%)**	
	3.	**75(53.5%)**	**04(02.8%)**	
	4.	**02(01.5%)**	**00(00.0%)**	**0.000**
5	**If you work for long time in a same positions (sitting, bend over, standing, kneeling)**			
	1.	**31(22.1%)**	**103(73.5%)**	
	2.	**41(29.2%)**	**29(20.8%)**	
	3.	**55(39.3%)**	**08(05.7%)**	
	4.	**13(09.4%)**	**00(00.0%)**	**0.000**
6	**Lifting or transferring dependent patients**			
	1.	**28(20.0%)**	**112(80.0%)**	
	2.	**42(30.0%)**	**24(17.2%)**	
	3.	**67(47.9%)**	**04(02.8%)**	
	4.	**03(02.1%)**	**00(00.0%)**	**0.000**

7	**If you work with patients which are confused or agitated.** **1.** **2.** **3.** **4.**	 **29(20.7%)** **52(37.1%)** **55(39.4%)** **04(02.8%)**	 **109(77.8%)** **29(20.8%)** **02(01.4%)** **00(00.0%)**	 **0.000**
8	**If you carrying/lifting, or moving heavy equipment** **1.** **2.** **3.** **4.**	 **36(25.7%)** **40(28.5%)** **59(42.2%)** **05(03.6%)**	 **103(73.5%)** **33(23.7%)** **04(02.8%)** **00(00.0%)**	 **0.000**
9	**If you face unexpected or fall down of a patient** **1.** **2.** **3.** **4.**	 **30(21.5%)** **40(28.6%)** **67(47.8%)** **03(02.1%)**	 **102(72.8%)** **34(24.4%)** **04(02.8%)** **00(00.0%)**	 **0.000**
10	**If you assist a patients during bearing activities** **1.** **2.** **3.** **4.**	 **33(23.5%)** **34(24.3%)** **66(47.2%)** **07(05.0%)**	 **98(70.0%)** **38(27.2%)** **04(02.8%)** **00(00.0%)**	 **0.000**
11	**If you are performing extra shift, Overtime, or lengthy working day)** **1.** **2.** **3.** **4.**	 **31(22.1%)** **34(24.3%)** **68(48.6%)** **07(05.0%)**	 **108(77.2%)** **29(20.7%)** **03(02.1%)** **00(00.0%)**	 **0.000**
12	**Inadequate training on injury prevention** **1.** **2.** **3.** **4.**	 **32(22.9%)** **37(26.4)** **67(47.9%)** **04(02.8%)**	 **100(71.5%)** **37(26.4%)** **03(02.1%)** **00(00.00%)**	 **0.000**

Before the teaching session, based on scores, perception regarding job risk factors for work-related low back pain was found to be no problem in 17.1% of participants, mild in 15.0%, and

moderate in 67.9% of participants. Their mean score was 49.66±22.05. After the teaching session, such perception was changed to no problem in 22.9%, mild in 75.0%, and moderate in only 2.1% of the participating nurses. After the teaching session, their mean score was just 22.96 ±11.46. Comparison of perception for job risk factors regarding Low back pain status before and after teaching sessions among participated nurses based on the score was found statistically significant at $p<0.000$.

Discussion:

Low back pain is the most severe issue medical professionals, especially nurses, face daily. Due to this issue, the majority of the nurses are not only suffering themselves but patients also remain at risk. Therefore, proper and timely education of the nurses regarding preventive measures they can adopt in performing their duties is necessary. This study is based on the effects of education intervention regarding reducing or minimizing low back pain in the nurse's group. Different studies41-43 showed different results regarding demographic data. In a study conducted in China41, the age of nurses was ≤ 30 years in 36.9%, whereas in more than 30 years, it was 63.1 %. In Iran study 42, the majority, 87%, were <35. In another study43, the respondent's mean age was 29.1 ± 6.43 years with a mean of 5.9 ± 6.04 years of working experience43. Our study results showed that most (52.1%) were between the age group 26-30 years, with a mean age of 35.85 ± 7.87 years.

Regarding the participants' working experience, according to a study 41, only 25.5% of nurses have experience more than ten years whereas the majority have less than ten years of experience. In a Malaysian study, the mean working experience of nurses was 5.9 ± 6.04 years 43. Our study showed a higher experience as the mean working experience of the participants was 12.97 ±7.15 years. It was because our study participants were more experienced.

Different studies44-48 showed the LBP prevalence in nurses from 60.9% to 76.5%. In study 44, LBP prevalence in nurses at one year was 66.8% - 69.2%, whereas, at one point, LBP prevalence was determined to be 51.3%. Incidence of LBP was documented in a study at 61.7%46. In another study, 49 burnout cases were found in emergency and ICU nurses. Regarding the prevalence of musculoskeletal disorders, LBP was highest at 50. These are similar to this study where nurses who had work-related LBP were reported as 77.9%. Out of these 43.1% have had it for more than three days in the last one-year period. In a study, 51 researchers concluded that the

reduction of musculoskeletal disorders could be achieved through preventative ergonomic training as a part of their multidisciplinary interventions. It became more effective if it was presented through pamphlets and handouts. Our study results also showed that only 16.4% have proper ergonomic training on how to prevent themselves from occupational hazards.

According to study 41 results, most nurses were unsatisfied with their LBP self-management procedures. Similarly, in study 42, observed susceptibility, seriousness, benefits, cause to action, and preventive behaviour were found to improve after the educational intervention. Perceived barriers were significantly reduced before and after educational intervention. The overall mean regarding prevention behaviour adopted for Low Back Pain among nurses before education was 60.1 ± 14.9, which improves after education of preventive measures for low back pain to mean 80.9 ± 13.6, statistically significant at P<0.0001. In the Ethiopian study55majority of nursing students are at high risk for MSDs due to improper body mechanics or wrong posture. In Egypt study5, the prevalence of musculoskeletal disorders in any part of the body region among medicine and nursing students was 69.4%. Lower back pain was the most commonly reported body site and its prevalence increased as the year of study increased. Ergonomic interventions focusing on modifying workstations and promoting and delivering ongoing ergonomic education are critical to reducing the problem.

In this study, results also showed that ergonomic interventions focusing on modification of workstations and promoting and delivering ongoing ergonomic education are very important to reduce the problem. Before the teaching session, based on scores, job risk factor perception regarding low back pain was found to be no problem in 17.1% of participants, mild in 15%, and moderate in 67.9% of participants. Their mean score was 49.66±22.05. After the teaching session, their mean score was just 22.96 ±11.46 showing a significant reduction in fears of LBP. Their perception was changed as a mild issue in 75.0% of the participating nurses. Comparison of perception for job risk factors regarding Low back pain status before and after teaching sessions among participated nurses based on the score was found statistically significant at p<0.000. Similarly, our study also proved that the use of techniques by nurses to reduce strain on their bodies in different aspects possibly also improved when compared to the before and after educational sessions.

Conclusion

According to our study findings, after the teaching session, the situation changed, and the majority, 71.5%, and 87.8%, perceived no problem in doing all such activities. Before the teaching session, overall perception regarding job risk factors, the mean score was 49.66±22.05, which was reduced after the teaching session to a mean score of 22.96 ± 11.46. This difference was determined at $P<0.000$, showing statistically significant. The technique to reduce the strain on their body also became well after the teaching session. So we conclude that the teaching effect is much more substantial and the chances of developing Low Back Pain could be reduced amongst our most important health care professionals, i.e., nurses, and improve the treatment facilities through more presence of this group. This study has significant findings for the health managers who posted nurses with less experience and poor perceptions regarding job-related risk factors and techniques to be adopted to reduce the strain on their bodies in the ICUs and emergency units in the hospitals.

Recommendations:

Teaching regarding preventive measures to be adopted for job risk-related factors in nurses should be repeated from time to time so that they remain fit to serve the patients and perform their duties. Training in ergonomics should be made compulsory for each nurse before posting inwards or in emergencies. Proper guidelines should be given during their study sessions through preventive courses. Further studies should be conducted primarily comparing private and public sector hospitals where nurses' working hours are much longer.

References:

1. Low back pain -,2019, Wikipediahttps://en.wikipedia.org/wiki/Low_back_pain

2. Vieira ER, Kumar S, Coury HJ, Narayan Y, Low back problems and possible improvements in nursing jobs. J AdvNurs. 2006; 55(1):79-89

3. Hoof WV, O'Sullivan K, O'Keeffe M, Verschueren S, O'Sullivan P, Dankaerts W, The efficacy of interventions for low back pain in nurses: A systematic review, International Journal of Nursing Studies, 2018;77:222-31

4. Bento TPF, Genebra CVS, Maciel NM, Cornelio GP, Vitta A, Low back pain and some associated factors: is there any difference between genders? Brazilian Journal of Physical Therapy,2020;24(1):79-87

5. Besen E, Young AE, Shaw WS: Returning to work following low back pain: towards a model of individual psychosocial factors. *J OccupRehabil.* 2015;25(1):25–37.

6. Lorenzo A, Schildt P, Lorenzo M, et al. Acute low back pain management in primary care: a simulated patient approach. *FamPract.* 2015;32(4):436–41.

7. Sharafkhani N, Khorsandi M, Shamsi M, Ranjbaran M, Low Back Pain Preventive Behaviors Among Nurses Based on the Health Belief Model Constructs, SAGE Journals, 2014; 4(4), https://doi.org/10.1177/2158244014556726

8. Urits, I., Burshtein, A., Sharma, M. et al. Low Back Pain, a Comprehensive Review: Pathophysiology, Diagnosis, and Treatment. Curr Pain Headache Rep, 2019;**23:** 23 https://doi.org/10.1007/s11916-019-0757-1

Allegri

9. M, Montella S, Salici F, Valente A, Marchesini M, Compagnone C, et al., Mechanisms of low back pain: a guide for diagnosis and therapy, F1000RES, 2016;5(2): F1000, doi: 10.12688/f1000research.8105.1

10. Abolfotouh SM, Mahmoud K, Faraj K, Moammar G, ElSayed A, Abolfotouh MA, Prevalence, consequences and predictors of low back pain among nurses in a tertiary care setting. IntOrthop. 2015;39(12):2439-49. doi: 10.1007/s00264-015-2900-x

11. Abolfotouh SM, Mahmoud K, Faraj K, Moammar G, Elsayed A, prevalence, consequences and predictors of Low back pain among nurses in a tertiary care setting, International Orthopaedics, 2015;39(12):2439-49

12. Abou El-SoudAM, El-Najjar AR, El-Fattah NA, Hassan AA. Prevalence of low back pain in working nurses in Zagazig University Hospitals: an epidemiological study. Egypt RheumatolRehabil 2014;41:109-15

13. Rezaee M, Ghasemi M. Prevalence of Low Back Pain Among Nurses: Predisposing Factors and Role of Work Place Violence, Trauma Mon. 2014; 19(4):e17926. doi: 10.5812/traumamon.17926

14. SikiruL, HanifaS, Prevalence and risk factors of low back pain among nurses in atypical Nigerian hospital, AfricanHealthSciences2010;10(1):26–30

15. Homaid MB, Abdelmoety D, Alshareef W, Alghamdi A, Alhozali F, Alfahmi N, et al., prevalence and risk factors of low back pain among operation room staff at a tertiary care centre,

Makkah, Saudi Arabia: A cross-sectional study, Annals of Occupational and environmental medicine, 2016;28(1):1-8

16. Savic BS, Pesjak K, Touzery SH, Low back pain among nurses in Slovenian hospitals: cross-sectional study, International nursing review journal, 2017;64(4):544-51, https://doi.org/10.1111/inr.12376

17. ShielJr WC, Balentine JR, Low Back Pain, medicine Health,2019

18. Malone RE, Ergonomics, policy, and the ED nurse. Journal of Emergency Nursing, 2000;26: 514-5.

19. Maul I, Läubli T, Klipstein A, Krueger H, Course of low back pain among nurses: A longitudinal study across eight years. Occupational and Environmental Medicine, 2003; 60:497-503.

20. Engels JA, Landeweerd JA, KantY, An OWAS-based analysis of nurses' working postures. Ergonomics, 1994; 37: 909-19.

21. Ajimsha MS, Daniel B, Chithra S, Effectiveness of Myofascial release in the management of chronic low back pain in nursing professionals. Journal of Bodywork and Movement Therapies, 2014; 18(20): 273-81.

22. Oren B, ZenginN, Assessing Health Threatening Problems among Nursing or Midwifery Students during the Clinical Education Course in Turkey, Iranian Journal of Public Health,2019; 48(1):85-94, DOI:10.18502/ijph.v48i1.786

23. Pakbaz M, Hosseini MA, Aemmi SZ, Gholami S, Effectiveness of the back school program on the low back pain and functional disability of Iranian nurse, Journal of Exercise Rehabilitation 2019;15(1):134-8, DOI: 10.12965/jer.1836542.271

24. Knibbe JJ, Friele RD, Prevalence of back pain and characteristics of the physical workload of community nurses. Ergonomics, 1996; 39: 186-98. (sample size determination)

25. Mohseni-Bandpei MA, Fakhri M, Ahmad-Shirvani M, Bagheri-Nessami M, Khalilian AR, Epidemiological survey of low back pain among nurses. Journal of Babol University of Medical Sciences, 2005; 7(26): 35-40.

26. Simozar I, Derakhshan A, Sadeghi H, Zare N, Incidence of low back pain in nursing staff of Namazi and Faghihi hospital and its relationship with their knowledge of predisposing factors in the workplace (Master's thesis). University of Medical Sciences, Shiraz, Iran, 1999.

27. Bernard BP, Musculoskeletal disorders and workplace factors: A critical review of epidemiologic evidence for work-related disorders of the neck, upper extremities, and low back (NASA, Document No. 19980001289),1997, Available at http://staks.cdc.gov/view/cdc/21745

28. Mohamed SPH, Alagesan S, Subbarayalu AV, management of postural low back pain among the information technology professionals: a multi-therapeutic intervention approach, Int J Physiother Res, 2015;3(6):1271-83

29. Boughattas W, Maalel O, Maoua M, Bougmiza I, Kalboussi H, Brahem A, et al, Low Back Pain among Nurses: Prevalence, and Occupational Risk Factors. *Occupational Diseases and Environmental Medicine*, 2017;5(1):26-37. doi: 10.4236/odem.2017.51003

30. Stanulewicz N, Knox E, Narayanasamy M, shivji N, Khunti K, Blake H, Effectiveness of Lifestyle Health Promotion Interventions for Nurses: A Systematic Review*Int. J. Environ. Res. Public Health* 2020, *17*(1), 17; https://doi.org/10.3390/ijerph17010017