ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

Low Back Pain and Patients Lifting Behaviors Among Nurses Working In Prince Abdel Rahman Al Sadairy Hospital. Saudi Arabia

Fatma Abdel Moneim Al tawil
College of Applied Medical Sciences, Aljouf University, Saudi Arabia,
Medical - Surgical Nursing Department, Faculty of Nursing, Alexandria University, Egypt.

Manuscript Info

Manuscript History:

Received: 15 September 2015
Final Accepted: 26 October 2015
Published Online: November 2015

Key words:
****Corresponding Author***

Fatma Abdel Moneim Al tawil

Abstract

Background: Nurses are among the occupational groups within the health service that are vulnerable to low back pain (LBP). It has been shown that 60–80% of the general population suffers from LBP at some time during their lives. Among nurses the lifetime prevalence was found to be slightly higher, varying between 56% and 90%.LBP can lead to persistent medical problems, disability, productivity losses, and job changes. Nurses work in a dynamic environment. They need to determine the most appropriate methods for performing patient care tasks, taking into consideration task and patient characteristics while reducing LBP. Nurses frequently have to lift or transfer patients who may move suddenly and carry out repetitive procedures with incorrect or poor body posture, which subsequently cause LBP..Low back pain (LBP) among nurses has been the subject of research studies worldwide. However, evidence of the influence of patients lifting behaviors and LBP among nurses in Saudi Arabia remains scarce. The purpose of this study was to investigate the relationship between LBP and patients lifting behaviors.

Subjects and methods: LBP questionnaire was distributed to 100 nurses working in Al sadairy Hospital distributed as Emergency unit(9),Coronary Care unit (9), Intensive Care Unit (7), Dialysis unit (30), Burn unit (5), surgical unit (11) , Medical (14) and , X-ray unit (15). The questionnaire included demographic data, attitude scale, Team work scale, Back pain history and Knowledge scale.

Results: Regarding to emergency unit, there is appositive significant relation between teamwork scale and Knowledge as r = (0.807) and *P* =0.05. Regarding to ICU unit, there is a positive significant relation between teamwork scale and attitude scale as r= (0.781) and *P* =0.05. Regarding to Dialysis unit, there is a positive significant relation between attitude scale and teamwork scale as r = (0.443) and *P* =0.05.

Conclusion: The findings suggest enhanced awareness of occupational safety with safe patient handling practices among nursing students must be emphasized and integrated into their educational curriculum. Moreover, back pain prevention program should incorporate the promotion of an active lifestyle and fitness training the implementation of institutional patient handling policies.

INTRODUCTION

Low back pain (LBP) has been a major occupational health problem in nursing. LBP is a common cause of morbidity in health care workers. Nurses are among the occupational groups within the health service that are vulnerable to LBP [1, 2]. It has been shown that 60–80% of the general population suffers from LBP at some time during their lives. Among nurses the lifetime prevalence was found to be slightly higher, varying between 56% and 90%.2 3 [3, 4, 5].LBP can lead to persistent medical problems, disability, productivity losses, and job changes [6]. In the United States, the direct cost of work-related back pain is estimated at $14 billion annually [7]. Nurses work in a dynamic environment. They need to determine the most appropriate methods for performing patient care tasks, taking into consideration task and patient characteristics while reducing LBP[8]. Among LBP interventions, the use of lifting devices has been identified as contributing to LBP reduction. However, studies show that the actual use of lifting devices among nurses is quite limited. [9, 10] Nurses frequently have to lift or transfer patients who may move suddenly and carry out repetitive procedures with incorrect or poor body posture, which subsequently cause LBP[6].However, body mechanics were used incorrectly among many nurses while lifting (57.1%), sitting (53.6%), and moving patients to the side of the bed (52.4%)[11] . Moreover, patient handling tasks, including moving patients in bed or transferring patients from bed to chair, were found to be the most common causes of occupational back injuries in nurses [1]. Despite numerous efforts and significant resources being allocated to developing strategies to reduce back pain in the workplace, no strong evidence for the efficacy of any specific intervention has been documented [13]. Previous studies have focused mainly on the relationship between occupational back problems and physical work demands [1].The influence of nurses' awareness and knowledge of safe patient handling practices and compliance with standard guidelines on low back pain is unclear [14]. Recently, the number of nurses entering the work force in Saudi Arabia has increased substantially with the expansion of the health care sector. Although the nursing work force in Saudi Arabia largely depends on expatriates, it is believed that national culture moderates nurses'performance in Saudi Arabia [15]. Yet, no scientific publications exist on the occupational risk, particularly among nurses and heavily involved in lifting and handling patients. Local information is needed to quantify the problem of low back pain among nurses and optimize prevention strategies. This study aims to explore the self-reported nature of occupational back problems in relation to organizational factors among nurses involved in patient handling in Saudi Arabia. The primary focus of this study was the association between the development of back pain among nurses and their knowledge and awareness of back care and safe patient handling practices.

Materials and Methods

Research design:

A descriptive research design used for this study. This study conducted in prince Abdurrahman Al-Sadairy Hospital. A convenient sample of 100 nurses used for this study distributed as Emergency unit (9nurse),CCU unit (9nurse), ICU unit (7nurse), Dialysis unit (30 nurse), Burn unit (5nurse), surgical unit (11 nurse) , Medical (14 nurse), X-ray (15 nurse) . Questionnaire sheet was developed by the researcher under the supervision of the supervisor after reviewing the literature about low back pain in nurse .the questionnaire sheet consists of 2 parts:

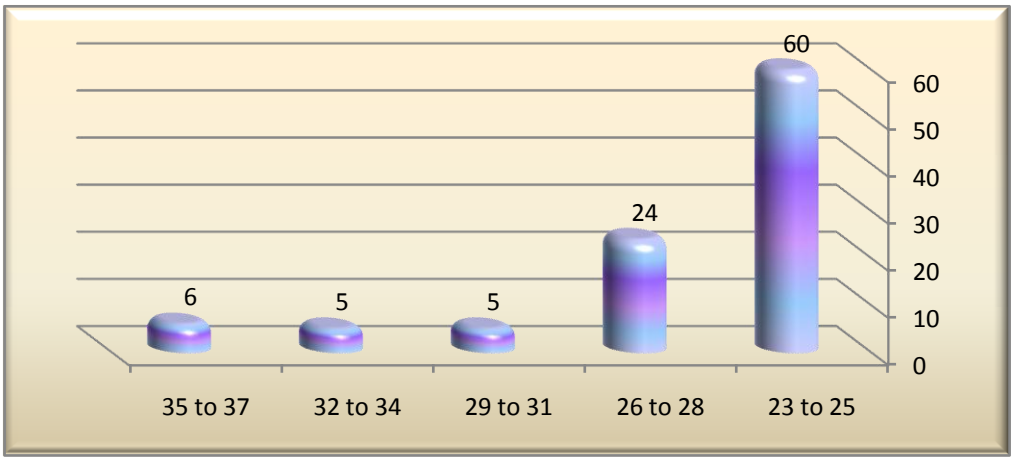
First Part: Socio-demographic characteristics of nurse, Age, year of work \unit. *Second Part:* Include sheet to assess knowledge and correct body mechanics which nurses use when they move patients, attitude scale, back pain history this section is composed of questions dealing with occupational and non-occupational back pain.

Methods:

An official letter was sent to the dean of the Faculty of Applied Medical Science to get the agreement of the Manager of the hospital and Head of each department to conduct the study. In addition, a verbal consent that was obtained from each nurse in the study. A pilot study has been carried out on 10%of the total sample to test clarity and applicability of sheet the necessary modifications in the sheet was done. Data collected by interviewing each nurse individually. The interview took 15-20minutes each. Nurse knowledge about low back pain was assessed using a questionnaire sheet

RESULTS

1-Demographic information



1-Age:

Figure above shows frequencies and percentages of age variable, most these age are between (23 to 25) years with (60%), (26 to 28) years with (24%), (35 to 37) years with (6%), and (32 to 34) and (29 to 31) years with (5%).

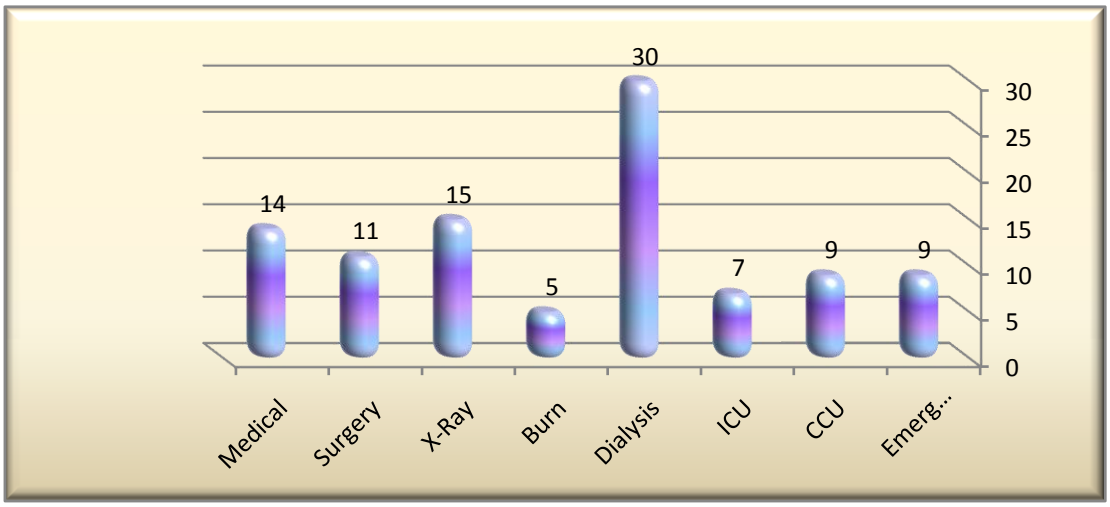


Figure above shows frequencies and percent of Units / Ward variable, most of them are (Dialysis) with (30%), (X- Ray) with (15%), (Medical) with (14%), (Surgery) with (11%), (Emergency and CCU) with (9%), (ICU) with (7%), finally (5%).

2-Attitude scale :

Table no (6) Descriptive statistics of attitude scale.

Items	Strongly disagree	Disagree	Agree	Strongly agree	Weighted Mean	Std. Deviation	Overall Response (in Mean)	Priority
	%	%	%	%				
-Being a nurse makes me more susceptible to back injury than people in other occupations.	2.0	1.0	27.0	70.0	3.65	.61	Strongly Agree	1
-there is little that can be done to prevent most back injuries among nurses.	16.0	9.0	57.0	18.0	2.77	.93	Agree	4
-nurses can learn specific techniques which will substantially decrease their incidence of back injury.	12.0	27.0	48.0	13.0	2.62	.86	Agree	5
-back injuries occur even if one tries to prevent them .	2.0	9.0	46.0	43.0	3.30	.72	Strongly Agree	2
-most back injuries are caused by the carelessness of nurses themselves.	31.0	33.0	20.0	16.0	2.21	1.07	Disagree	7
-I am less likely to suffer a back injury when I'm moving patients as I`ve been taught rather than when I'm using some other technique.	31.0	35.0	21.0	13.0	2.16	1.01	Disagree	9
-I worry about suffering a back injury due to my work.	10.0	4.0	33.0	53.0	3.29	.95	Strongly Agree	3
-most back injuries among nurses can be prevented.	21.0	48.0	24.0	7.0	2.17	.84	Agree	8
-I am particularly careful of my back whenever I move a patient.	17.0	27.0	43.0	13.0	2.52	93	Agree	6
					2.74		Agree	

Table above shoes Descriptive statistics of Attitude scale, from general which equal (2.74) according to Four - Likert scale which correspond to the answer "Agree" that means "respondents agree with the terms of this axis"

3-Team work scale:

Table no (7) Descriptive statistics of teamwork scale.

Items	Strongly disagree	Disagree	Agree	Strongly agree	Weighted Mean	Std. Deviation	Overall Response (in Mean)	Priority
	%	%	%	%				
-I can move the majority of patients on our unit alone without any difficulty.	**39.0**	**19.0**	**29.0**	**13.0**	**3.24**	**0.71**	**Agree**	2
-Often I just do not have the time to find another nurse to help me move a patient in bed	**3.0**	**7.0**	**53.0**	**37.0**	**2.95**	**.89**	**Agree**	3
-It is difficult to find coworkers to help me move patient when I need assistance.	**7.0**	**21.0**	**42.0**	**30.0**	**3.40**	**.74**	**Agree**	1

-When patients on our unit need assistance moving in bed , usually more than one nurse is required.	**4.0**	**3.0**	**42.0**	**51.0**	**2.17**	**1.09**	**Disagree**	4
					2.94		**Agree**	

Table above shoes Descriptive statistics of Team work scale, from general which equal (2.94) according to Four - Likert scale which correspond to the answer "Agree" that means "respondents agree with the terms of this axis ".

4-Back pain history:

Table no (8) Descriptive statistics of back pain history scale

Items	One day	2-3 day	5 & more	Months	Weighted Mean	Std. Deviation	Overall Response (in Mean)	Priority
	%	%	%	%				
1- Have back pain lasting more than thirty minutes?	32.0	41.0	18.0	9.0	2.04	.93	2-3 day	3
2- Have back pain lasting more than thirty minutes which was duo to work?	38.0	24.0	31.0	7.0	2.07	0.99	2-3 day	2
3-Have any severe back pain(no matter how brief) while working , which made you stop what you were doing ?	36.0	37.0	24.0	3.0	1.94	.85	2-3 day	6
4-Take medication (including aspirin) for back dis-comfort?	37.0	33.0	27.0	3.0	1.96	.88	2-3 day	5
5-Miss work due to back pain?	34.0	47.0	16.0	3.0	1.88	.78	2-3 day	7
6-Change your non-work plans because of back pain?	29.0	45.0	22.0	4.0	2.01	.82	2-3 day	4
7-Have to remain in your house because of back pain (including work and non-work days?	40.0	39.0	19.0	2.0	1.83	.80	2-3 day	8
8- Develop back pain because of work?	14.0	15.0	43.0	28.0	2.85	0.99	5 & more	1
					2.07		2-3 day	

Table above shoes Descriptive statistics of Team work scale, from general which equal (2.07) according to Four - Likert scale which correspond to the answer "2-3 day" that means "respondents agree with the terms of this axis ".

5- Knowledge scale.

1-Which of the following behaviors will maintain proper spinal alignment for the nurse?.

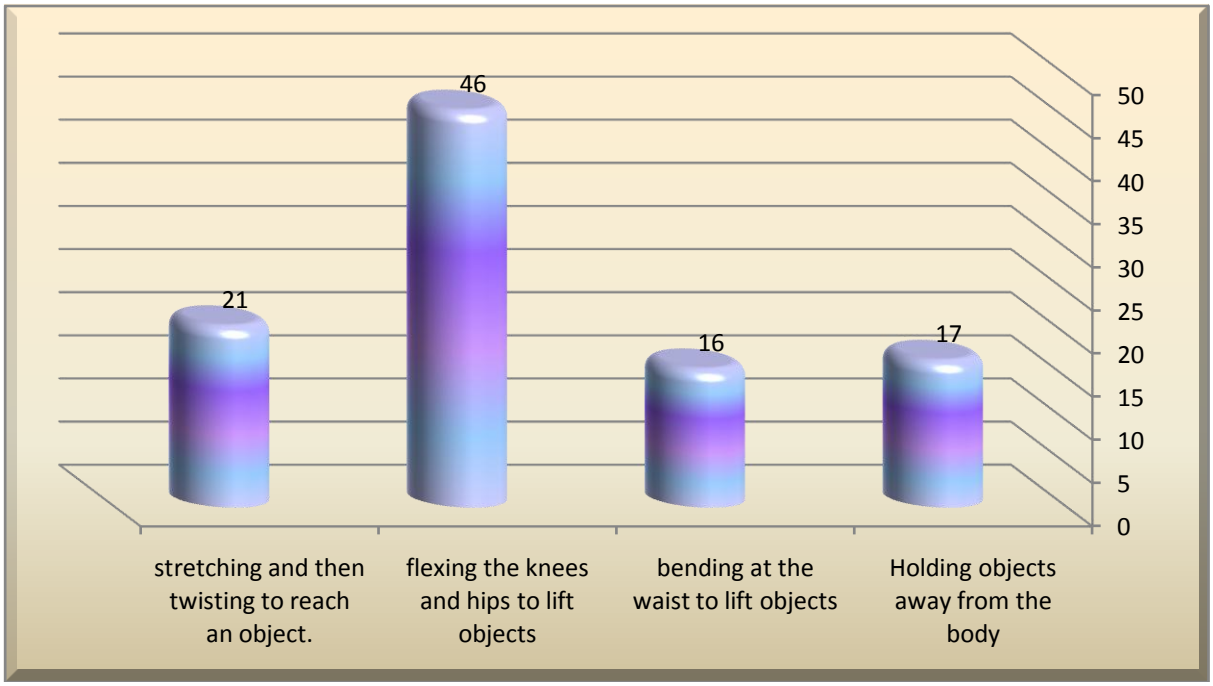


Figure above shows frequencies and percent of knowledge scale variable, most of those is (flexing the knees and hips to lift objects) with (46%) , stretching and then twisting to reach an object with (21%) , (Holding objects away from the body) with (17%),(bending at the waist to lift objects) with (16%).

Correlation studies

Correlations

		Attitude	Team	Back.1	Knowledge
attitude scale	Pearson Correlation	1	.135	.627	.336
	Sig. (2-tailed)		.750	.071	.376
	N	9	8	9	9
teamwork scale	Pearson Correlation	.135	1	.383	.807*
	Sig. (2-tailed)	.750		.349	.015
	N	8	8	8	8
back pain history	Pearson Correlation	.627	.383	1	.535
	Sig. (2-tailed)	.071	.349		.138
	N	9	8	9	9
knowledge scale	Pearson Correlation	.336	.807*	.535	1
	Sig. (2-tailed)	.376	.015	.138	
	N	9	8	9	9

*. Correlation is significant at the 0.05 level (2-tailed).

Table above shows the relationship between axis of this study according to emergency unit we find there is a positive significant relation between (teamwork scale and Knowledge) with (0.807).

Correlations

		Attitude	Team	Back.1	Knowledge
attitude scale	Pearson Correlation	1	.781*	-.006-	-.388-
	Sig. (2-tailed)		.038	.989	.390
	N	7	7	7	7
teamwork scale	Pearson Correlation	.781*	1	.126	-.598-
	Sig. (2-tailed)	.038		.787	.156
	N	7	7	7	7
back pain history	Pearson Correlation	-.006-	.126	1	-.066-
	Sig. (2-tailed)	.989	.787		.889
	N	7	7	7	7
knowledge scale	Pearson Correlation	-.388-	-.598-	-.066-	1
	Sig. (2-tailed)	.390	.156	.889	
	N	7	7	7	7

*. Correlation is significant at the 0.05 level (2-tailed).

Table above shows the relationship between axis of this study according to ICU unit we find there is a positive significant relation between (teamwork scale and attitude scale)) with (0.781).

Units\Ward = Dialysis

Correlations

		Attitude	Team	Back.1	Knowledge
attitude scale	Pearson Correlation	1	.443*	.179	.054
	Sig. (2-tailed)		.014	.344	.778
	N	30	30	30	30
teamwork scale	Pearson Correlation	.443*	1	.249	.164
	Sig. (2-tailed)	.014		.184	.386
	N	30	30	30	30
back pain history	Pearson Correlation	.179	.249	1	.433*
	Sig. (2-tailed)	.344	.184		.017
	N	30	30	30	30
knowledge scale	Pearson Correlation	.054	.164	.433*	1
	Sig. (2-tailed)	.778	.386	.017	
	N	30	30	30	30

Correlations

		Attitude	Team	Back.1	Knowledge
attitude scale	Pearson Correlation	1	.443*	.179	.054
	Sig. (2-tailed)		.014	.344	.778
	N	30	30	30	30
teamwork scale	Pearson Correlation	.443*	1	.249	.164
	Sig. (2-tailed)	.014		.184	.386
	N	30	30	30	30
back pain history	Pearson Correlation	.179	.249	1	.433*
	Sig. (2-tailed)	.344	.184		.017
	N	30	30	30	30
knowledge scale	Pearson Correlation	.054	.164	.433*	1
	Sig. (2-tailed)	.778	.386	.017	
	N	30	30	30	30

*. Correlation is significant at the 0.05 level (2-tailed).

Table above shows the relationship between axis of this study according to Dialysis unit we find there is a positive significant relation between (attitude scale and teamwork scale) with (0.443) and also we find (back pain history and knowledge scale) with (0.433).

Correlations

		Attitude	Team	Back.1	Knowledge
attitude scale	Pearson Correlation	1	-.652-	-.423-	-.493-
	Sig. (2-tailed)		.233	.478	.399
	N	5	5	5	5
teamwork scale	Pearson Correlation	-.652-	1	.961*	.389
	Sig. (2-tailed)	.233		.009	.518
	N	5	5	5	5
back pain history	Pearson Correlation	-.423-	.961**	1	.283
	Sig. (2-tailed)	.478	.009		.645
	N	5	5	5	5
knowledge scale	Pearson Correlation	-.493-	.389	.283	1
	Sig. (2-tailed)	.399	.518	.645	
	N	5	5	5	5

Correlations

		Attitude	Team	Back.1	Knowledge
attitude scale	Pearson Correlation	1	-.652-	-.423-	-.493-
	Sig. (2-tailed)		.233	.478	.399
	N	5	5	5	5
teamwork scale	Pearson Correlation	-.652-	1	.961*	.389
	Sig. (2-tailed)	.233		.009	.518
	N	5	5	5	5
back pain history	Pearson Correlation	-.423-	.961**	1	.283
	Sig. (2-tailed)	.478	.009		.645
	N	5	5	5	5
knowledge scale	Pearson Correlation	-.493-	.389	.283	1
	Sig. (2-tailed)	.399	.518	.645	
	N	5	5	5	5

Table above shows the relationship between axis of this study according to Burn unit we find there is a positive significant relation between (teamwork scale and back pain history) with (0.961).

Discussion

Nursing is a profession with high incidence and prevalence of back pain. The nursing literature demonstrates the efforts that have been made to try to reduce the back pain problem, such as moving and handling training and the provision of handling aids. Nursing is well established as a high-risk occupation for musculoskeletal disorders and, in particular, low back pain (LBP).[43]There is variability in the prevalence rates of LBP reported in the nursing literature[44,45]and this seems to be largely due to the different data collection instruments used, varying definitions of 'nurse,' and different work environments ,i.e. hospitals and nursing homes. This makes comparisons between studies problematical. A number of prospective studies have further confirmed the high incidence, and prevalence, of back pain in the nursing profession internationally.[46,47]An early study of 1008 nurses and nursing auxiliaries found that 1.3% of nurse leavers were permanently leaving their positions because of back pain, and 12% intended to leave permanently, citing back pain as either a main or contributing factor. More recently, it is thought that up to 3.5% of nurses are leaving the profession due to back pain[48] and this represents a significant attrition rate in a profession with recruitment and retention problems globally.[49]In terms of absence from work, 16.2% of total days lost to sickness have been attributed to back pain, a loss of 764,000 working days annually. The subsequent economic consequences to the NHS are considerable not only in terms of sick leave, but also compensation benefits and treatment costs.[50]Loss of experienced staff is another indirect cost which has not been estimated.[60] While measures to reduce the risk of LBP in nursing through the banning of dangerous lifting techniques, the provision of lifting aids [61,62]and ergonomic interventions[63]are necessary and most welcome, LBP continues to be a problem in this profession. Reasons for this continuing problem cited in the literature include shortages of equipment at point of use,[64]shortages of staff and restricted work environments.[65,66] In addition, rising levels of patient obesity are also thought to put nurses' backs at risk.[67]Therefore, for a large number of nurses, health care for LBP treatment will be necessary. Information as regards nurses' choice of treatment for LBP in the literature is sparse and often presented within the context of LBP prevalence studies. In a Belgian survey of over 1000nurses, 49.9% had consulted a physician for back pain treatment and this decision was significantly Among registered nurses, it has been found that a wide variety of factors from all of the three domains are associated with musculoskeletal disorders [69,70]. Several studies that have examined factors associated with low back pain among registered nurses or female healthcare workers have focused on physical tasks such as heavy lifting, bending postures, transfer and/or poor knowledge of ergonomics [65,71,72], but also on stress [32], low social support [24], and poor work relationships with colleagues[72].

While there is an abundance of cross-sectional and epidemiological studies documenting the high prevalence and persistence of low back pain in nursing personnel [66], there are far fewer studies on neck/shoulder pain and its relation to potential influencing factors among registered nurses [73,74,75]. [74] found that the strongest predictors of pain in the neck/shoulder were previous history of the symptom, physical exposure at work (reaching, pushing and/or pulling) and low mood and stress [74,75] found that high mental pressure was a risk factor for musculoskeletal disorders of the neck and shoulder, while Hignett, S., et al. (2007)[73] found that job strain had a strong association with neck pain. Introduction Unsafe patient handling is a major risk factor for musculoskeletal injuries among nurses [76]. Each year, more than 10,000 nurses in the United States experience work-related musculoskeletal disorders resulting in lost work days and nurses rank among the top five occupations for musculoskeletal disorders [8]. Injuries from patient handling tasks account for 31–66% of all musculoskeletal injuries among healthcare workers [34, 77, 78]. Use of mechanical patient lifting equipment can reduce the risk of musculoskeletal injury from patient handling. Biomechanical and lift intervention studies have shown significant reductions in biomechanical stress, musculoskeletal discomfort, injury rates, and workers compensation costs [68,80,81,82,83] Eliminating risky manual lifting and promoting the use of adequate lifting equipment have become a key component of safe patient handling policies internationally (American Nurses Association, 2001b[9]; Australian Nursing Federation, 2012; Workers Compensation Board of British Columbia, 2006). Since 2005, 10 states in the United States have enacted safe patient handling legislation that requires provision of patient lifting equipment to prevent musculoskeletal injury among healthcare workers (American Nurses Association, 2001b)[9] . Providing lifts to nurses is the first step in ensuring safe patient handling, and having a lift readily available and having nurses actually use the lift are key to the success of lift interventions. However, lifts are not available in many healthcare settings. Even in settings where lifts are provided, actual lift availability and usage is far from optimal [6,84]. A 2011 survey by the American Nurses Association (2012a) showed that while two thirds of respondents had patient lift and transfer devices available, less than one third reported using the devices frequently. The majority of the sample scored high on the knowledge and awareness section of the questionnaire (Table 2). A high percentage of respondents reported taking precautions prior to handling, asking for help when needed, and knowing how to handle patients with disabilities as well as use assistive devices. Regarding the duration of back pain, 56% of participants reported having back pain for 5 days or less in the previous 12 months and 10.3% reported having back pain daily. More than 60% of the participants reported that back pain had at least a mild effect on their social and leisure activities. The majority of the sample (66.4%) did not seek treatment or advice from health professionals for their back pain. Only 33.6% of the participants reported taking sick leave because of their back pain. Of those, the majority reported sick leave for 7 days or less throughout the previous 12 months. The novelty of this study lies in the exploration of the role of knowledge and awareness about safe patient handling in the development of back pain. The results indicate that an association does exist between the awareness of nurses and their risk of developing low back pain. This finding supports the importance of awareness in preventing low back pain [85]. Consistent with previous reports [86][87], the current data suggest that the proper use of assistive devices decreases the risk of back pain associated with patient transfers. Previous training on proper handling did not correlate with reduced low back pain, refuting the emphasis on training in the literature [88]. However, nurses' knowledge of body mechanics had a protective effect, reducing the prevalence of low back pain. Also, the current results confirm the positive role of exercise and physical fitness in reducing the risk of low back pain [89]

Conclusions

This study described the (nature) of low back pain among nurses in Saudi Arabia. A high percentage of the nurse had LBP in dialysis unit, coronary care unit; several risk factors were identified, consistent with emerging evidence from other countries. The study suggests that despite prior training, nurses may not comply with patient handling directives if they exist. New prevention strategies emphasizing risk assessment and control principles are needed.

Recommendations

This study recommended that:

- ✓ An educational program should be prepared to the nurse about prevention of the low back pain. Prevention program should incorporate the promotion of an active lifestyle and fitness training the implementation of institutional patient handling policies, and hands on training using biomechanical lifting principle and equipment.

- ✓ Knowledge about prevention low back pain and back care and safe patient handling practices Should be added to the educational curriculum of students in nurse department.

References:

1. Alexopoulos, E. C., Burdorf, A., &Kalokerinou, A. (2006). A comparative analysis on musculoskeletal disorders between Greek and Dutch nursing personnel. International Archives of Occupational and Environmental Health, 79(1), 82-88.
2. Sharafkhani, N., Khorsandi, M., Shamsi, M., &Ranjbaran, M. (2015). The Effect of an Educational Intervention Program on the Adoption of Low Back Pain Preventive Behaviors in Nurses: An Application of the Health Belief Model. *Organization*, *13*, 14.
3. Nahit, E. S., Hunt, I. M., Lunt, M., Dunn, G., Silman, A. J., & Macfarlane, G. J. (2003).Effects of psychosocial and individual psychological factors on the onset of musculoskeletal pain: common and site-specific effects. Annals of the Rheumatic Diseases, 62(8), 755-760.
4. Moussa, M. M. M., El-Ezaby, H. H., & El-Mowafy, R. I. (2015). Low back pain and coping strategies' among nurses in Port Said City, Egypt. *Journal of Nursing Education and Practice*, *5*(7), p55.
5. Smith, D. R., Choe, M. A., Jeon, M. Y., Chae, Y. R., An, G. J., &Jeong, J. S. (2005). Epidemiology of musculoskeletal symptoms among Korean hospital nurses.143.
6. Trinkoff, A. M., Lipscomb, J. A., Geiger-Brown, J., & Brady, B. (2002). Musculoskeletal problems of the neck, shoulder, and back and functional consequences in nurses. American Journal of Industrial Medicine, 41(3), 170-178
7. Bureau of Labor Statistics. (2002). Lost-work time injuries and illnesses: Characteristics and resulting days away from work, 2000. Retrieved October 14, 2003, from http://stats.bls.gov/iif/home.htm.
8. Bureau of Labor Statistics. (2005). Lost-work time injuries and illnesses: Characteristics and resulting days away from work, 2003. Retrieved March 30, 2007, from http://stats.bls.gov/iif/home.htm.
9. American Nurses Association (2001, September). Nursing world: Health and safety study. Retrieved June 5, 2004, from http://nursing.org
10. Baldwin, M. L. (2004). Reducing the costs of work-related musculoskeletal disorders: targeting strategies to chronic disability cases. Journal of Electromyography and Kinesiology, 14(1), 33-41.
11. Abolfotouh, S. M., Mahmoud, K., Faraj, K., Moammer, G., ElSayed, A., &Abolfotouh, M. A. (2015). Prevalence, consequences and predictors of low back pain among nurses in a tertiary care setting. *International orthopaedics*, 1-11.
12. Mont, D., Burton, J. F., Reno, V., & Thompson, C. (2001). Workers' compensation: Benefits, coverage, and costs. Washington: National Academy of Social Insurance.
13. Leigh, J. P., Markowitz, S. B., Fahs, M., Shin, C., &Landrigan, P. J. (1997). Occupational injury and illness in the United States. Estimates of costs, morbidity, and mortality. Archives of Internal Medicine, 157(14), 1557-1568.
14. Nelson, A. L. (2001). Patient care ergonomics resource guide: Safe patient handling and movement. Tempa, FL: Veterans Health Administration and Department of Defense.
15. Trinkoff, A. M., Brady, B., & Nielsen, K. (2003). Workplace prevention and musculoskeletal injuries in nurses. Journal of Nursing Administration, 33(3), 153-158-144
16. Byrns, G., Reeder, G., Jin, G., &Pachis, K. (2004). Risk factors for work-related low back pain in registered nurses, and potential obstacles in using mechanical lifting devices. Journal of Occupational and Environmental Hygiene, 1(1), 11-21.
17. Karahan, A., &Bayraktar, N. (2004). Determination of the usage of body mechanics in clinical settings and the occurrence of low back pain in nurses. International Journal of Nursing Studies, 41(1), 67-75.
18. Warming, S., Precht, D.H., Suadicani, P., Ebbehoj, N.E., 2009. Musculoskeletal complaints among nurses related to patient handling tasks and psychosocial factors e based on logbook registrations. Appl. Ergon. 40, 569e576.
19. Hartvigsen, J., Lauritzen, S., Lings, S., &Lauritzen, T. (2005). Intensive Education combined with low tech ergonomic intervention does not prevent low back pain in nurses. Occupational and Environmental Medicine, 62(1), 13-17.
20. D'Arcy, L.P., Sasai, Y., Stearns, S.C., 2012. Do assistive devices, training, and workload affect injury incidence? Prevention efforts by nursing homes and back injuries among nursing assistants. Journal of Advanced Nursing 68 (4) 836–845.

21. Dawson, A. P., McLennan, S. N., Schiller, S. D., Jull, G. A., Hodges, P. W., & Stewart, S. (2007). Intervention to prevent back pain and back injury in nurses: A systematic review. Occupational and Environmental Medicine, 64(10), 642-650.
22. Hignett, S. (2003). Intervention strategies to reduce musculoskeletal injuries associated with handling patients: A systematic review. Occupational and Environmental Medicine, 60(9), E6.
23. Eriksen, W., Bruusgaard, D., &Knardahl, S. (2004). Work factors as predictors of intense or disabling low back pain: A prospective studyof nurses' aides. Occupational and Environmental Medicine, 61(5),398-404.
24. Menzel, N. N., Brooks, S. M., Bernard, T. E., & Nelson, A. (2004). The physical workload of nursing personnel: Association with musculoskeletal discomfort. The International Journal of Nursing Studies,41(8), 859-867
25. Burton, A. K. (2005). How to prevent low back pain. Best Practice &Research Clinical Rheumatology, 19(4), 541-555.
26. Hartvigsen, J., Lauritzen, S., Lings, S., &Lauritzen, T. (2005). Intensive education combined with low tech ergonomic intervention does not prevent low back pain in nurses. Occupational and Environmental
27. Hignett, S. (2003). Intervention strategies to reduce musculoskeletal injuries associated with handling patients: A systematic review. Occupational and Environmental Medicine, 60(9), E6.
28. Al-Ahmadi, H. (2009). Factors affecting performance of hospital nurses in Riyadh Region, Saudi Arabia. International Journal of Health Care Quality Assurance, 22(1), 40-54
29. Dagenais, S., Caro, J., &Haldeman, S. (2008). A systematic review of low back pain cost of illness studies in the United States and internationally. The Spine Journal, 8(1), 8-20.
30. Andersson, G. B. (1999). Epidemiological features of chronic low back pain. Lancet, 354(9178), 581-585
31. vanTulder, M., Koes, B., & Bombardier, C. (2002).Low back pain. Best Practice
32. Warnakulasuriya, S. S., Peiris-John, R. J., Coggon, D., Ntani, G., Sathiakumar, N., &Wickremasinghe, A. R. (2012). Musculoskeletal pain in four occupations
33. Souza, A. C., &Alexandre, N. M. (2012). Musculoskeletal symptoms, work ability, and disability among nursing personnel. Workplace Health & Safety, 60(8), 353-360
34. Da Costa, B.R., Vieira, E.R., 2010. Risk factors for work-related musculoskeletal disorders: a systematic review of recent longitudinal studies. Am. J. Ind. Med.53, 285e323.
35. Smedley, J., Egger, P., Cooper, C., & Coggon, D. (1995). Manual handling activities and risk of low back pain in nurses. Occupational and Environmental Medicine, 52(3), 160-163.
36. Hignett, S., &Crumpton, E. (2007). Competency-based training for patient handling. Applied Ergonomics, 38(1), 7-17.
37. Dagenais, S., Caro, J., &Haldeman, S. (2008). A systematic review of low back pain cost of illness studies in the United States and internationally. The Spine Journal, 8(1), 8-20.
38. D'Arcy, L.P., Sasai, Y., Stearns, S.C., 2012. Do assistive devices, training, and workload affect injury incidence? Prevention efforts by nursing homes and back injuries among nursing assistants. Journal of Advanced Nursing 68 (4) 836–845.
39. Dawson, A. P., McLennan, S. N., Schiller, S. D., Jull, G. A., Hodges, P. W., & Stewart, S. (2007). Intervention to prevent back pain and back injury in nurses: A systematic review. Occupational and Environmental Medicine, 64(10), 642-650.
40. Hignett, S. (2003). Intervention strategies to reduce musculoskeletal injuries associated with handling patients: A systematic review. Occupational and Environmental Medicine, 60(9), E6.
41. Eriksen, W., Bruusgaard, D., &Knardahl, S. (2004). Work factors as predictors of intense or disabling low back pain: A prospective studyof nurses' aides. Occupational and Environmental Medicine, 61(5),398-404.
42. Karahan, A., Kav, S., Abbasoglu, A., &Dogan, N. (2009). Low back pain: Prevalence and associated risk factors among hospital staff. Journal of Advanced Nursing, 65(3), 516-524.
43. Menzel, N. N., Brooks, S. M., Bernard, T. E., & Nelson, A. (2004). The physical workload of nursing personnel: Association with musculoskeletal discomfort. The International Journal of Nursing Studies,41(8), 859-867
44. Burton, A. K. (2005). How to prevent low back pain. Best Practice &Research Clinical Rheumatology, 19(4), 541-555.
45. Hou, J. Y., &Shiao, J. S. (2006). Risk factors for musculoskeletal dis comfort in nurses. The Journal of Nursing Research, 14(3), 228-236
46. Smith, D. R., Wei, N., Kang, L., & Wang, R. S. (2004). Musculoskeletal disorders among professional nurses in mainland China. Journal of Professional Nursing, 20(6), 390-395.

47. Jensen, L. D., Ryom, P. K., Christensen, M. V., & Andersen, J. H. (2012). Differences in risk factors for voluntary early retirement and disability pension: A 15-year follow-up in a cohort of nurses' aides. British Medical Journal Open, 2(6). doi:10.1136/bmjopen.2012.000991
48. Yip, Y. (2001). A study of work stress, patient handling activities and the risk of low back pain among nurses in Hong Kong. Journal of Advanced Nursing, 36(6), 794-804.
49. Hignett, S., &Crumpton, E. (2007). Competency-based training for patient handling. Applied Ergonomics, 38(1), 7-17.
50. Smedley, J., Inskip, H., Trevelyan, F., Buckle, P., Cooper, C., & Coggon, D. (2003). Risk factors for incident neck and shoulder pain in hospital nurses. Occupational and Environmental Medicine, 60(11), 864-869
51. Smith, D. R., Mihashi, M., Adachi, Y., Koga, H., &Ishitake, T. (2006). A detailed analysis of musculoskeletal disorder risk factors among Japanese nurses. Journal of Safety Research, 37(2), 195-200.
52. Wijnhoven, H. A., de Vet, H. C., &Picavet, H. S. (2007). Sex differences in consequences of musculoskeletal pain. Spine, 32(12), 1360-1367.
53. Kouvonen, A., Kivimaki, M., Vaananen, A., Heponiemi, T., Elovainio, M., Ala-Mursula, L., et al. (2007). Job strain and adverse health behaviors: The finnish public sector study. Journal of Occupational and Environmental Medicine, 49(1), 68-74.
54. Piirainen, H., Rasanen, K., &Kivimaki, M. (2003). Organizational climate, perceived work-related symptoms and sickness absence: a population-based survey. Journal of Occupational and Environmental Medicine, 45(2), 175-184.
55. Evanoff, B., Wolf, L., Aton, E., Canos, J., & Collins, J. (2003). Reduction in injury rates in nursing personnel through introduction of mechanical lifts in the workplace.
56. Lin, P. H., Tsai, Y. A., Chen, W. C., & Huang, S. F. (2012). Prevalence, characteristics and work-related risk factors of low back pain among hospital nurses in Taiwan: A cross-sectional survey.
57. International Journal of Occupational Medicine & Environmental Health, 25(1), 41-50.American Journal of Industrial Medicine, 44(5), 451-457.
58. Yassi, A., Cooper, J. E., Tate, R. B., Gerlach, S., Muir, M., Trottier, J., et al. (2001). A randomized controlled trial to prevent patient lift and transfer injuries of health care workers. Spine, 26(16), 1739-1746.
59. vanTulder, M., Koes, B., & Bombardier, C. (2002). Low back pain. Best Practice & Research Clinical Rheumatology, 16(5), 761-775.
60. Lee, Y. H., &Chiou, W. K. (1994). Risk factors for low back pain, and patient handling capacity of nursing personnel. Journal of Safety Research, 25(3), 135-145.
61. Janz, N. K., & Becker, M. H. (1984). The health belief model: A decade later. Health Education Quarterly, 11(1), 1-47.
62. Engkvist, I. L., Hjelm, E. W., Hagberg, M., Menckel, E., &Ekenvall, L. (2000). Risk indicators for reported over-exertion back injuries among female nursing personnel. Epidemiology, 11(5), 519-522.
63. Eriksen, W., Bruusgaard, D., &Knardahl, S. (2004). Work factors as predictors of intense or disabling low back pain; a prospective study of nurses' aides. Occupational and Environmental Medicine, 61(5), 398-404.
64. Burton, A. K. (2005). How to prevent low back pain. Best Practice & Research Clinical Rheumatology, 19(4), 541-555.
65. Bronfort, G., Maiers, M. J., Evans, R. L., Schulz, C. A., Bracha, Y., Svendsen, K. H., Transfeldt, E. E. (2011). Supervised exercise, spinal manipulation, and home exercise for chronic low back pain: A randomized clinical trial. The Spine Journal, 11(7), 585-598.