ORIGINAL RESEARCH

Relation between body mechanics performance and nurses' exposure of work place risk factors on the low back pain prevalence

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ABSTRACT

Background and objective: Low back pain (LBP) is a serious medical problem and considered as the most common leading causes of disability. Aim of the study: To measure the relation between body mechanics performance and nurses' exposure of work place risk factors on the low back pain prevalence.
Methods: Subject and method: Correlation design was used. A convenient sample of one hundred (n = 100) nurses both male and female working in Minia university hospital were approached to participate. Setting: The current study was performed at Minia university Hospital in Intensive Care Unit, Coronary Care Unit, Medical Care Unit, Stroke Care Unit, operation room and surgical department.
Results: The majority of nurses don't use body mechanics when turning, moving, lifting, and transferring the patients and 88% of them had pain in lumber region.
Conclusions and recommendation: The nurses' working in Minia university hospital suffering from high prevalence of LBP. The LBP complication is mainly related to exposure to many risk factors such as obesity, lack of knowledge and practice regard to body mechanics. Educational programs among nurses about body mechanics when handling and lifting the patient have important role in decrease exposure to LBP.

Key Words: Body mechanics, Nurses, Low back pain prevalence

1. INTRODUCTION

Lumbago or lumbosacral pain is accurate description of low back pain (LBP), which causes tension, discomfort, or even stiffness above the inferior gluteal folds and below the costal margin.[1]

LBP is one of the most common occupational health problems in nurses.[2] The prevalence of LBP in nurses ranges between 40% and 97.9% and occurs more frequently in nurses when compared with other society individuals.[3] The nurses performed many physically tasks in her job exposed them to LBP complication.[2]

The prevalence of musculoskeletal problems (MSP) among nurses is high (7%-85%). The most common being in the lower back (56%-57%) and neck (52%-56%) regions. 60%-61% of nurses experienced MSP in two or more body regions. The most significant risk factors for developing MSP were

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carrying weights and working in a forced position. The most important psychosocial risk factors were attributed to the fast pace and emotional demands of the work. Dissatisfaction with work and e.g. imbalance between work-family life conflicts also raised pain risk.[4]

Risk factors for LBP are multi factorial, including lack of exercise, obesity, smoking, higher age, and gender which all can be grouped together as individual risk factors.[5] Other work-related lifestyle factors such as alcohol consumption and smoking may be considered as contributing factors to LBP.[6]

Nursing is well known to be one of the professions with the highest risk of LBP and there were also significant correlations between LBP and factors such as age, working hours per week, work experience, body mass index (BMI), gender and shift-work.[7, 8]

Patient handling is considered as the most important risk factor for work-related LBP in nursing.[7] Nursing students have extensive courses about safe patient handling in nursing schools through both clinical and theoretical basis. Nursing schools' responsibility is to adopt and apply proper body mechanics and effective patients' handling techniques which must be evidence-based protocol and manuals in everyday clinical practice.[9]

Understanding of proper body mechanics principles can be one reasonable way to prevent chronic back pain and to learn how to maintain correct ergonomics and vertebral posture during daily activities. In developed countries, significant improvements in staff behaviors and in creating supportive work facilities that have help them to prevent back pain. The prevalence of work-related musculoskeletal disorders among nurses can be reduced by ergonomics training of nurses about adequate body posture during nursing care.[10]

Significance of the study

The nurse is at risk every day to low back injuries while providing patient care, as nursing care may contain strenuous physical effort such as patient transferring in and out of bed during daily care. LBP is costly for both the nurse and the hospital costly, for the nurse as it results in pain, disability and hinder effective nursing performance, and costly for the hospital because the injured nurse is not able to provide the required level of nursing care and because treatment is costly.

In Egypt, low back pain affects nearly 60% of the country's population and nursing profession presents the highest prevalence of back work-related injuries compared with any other occupation.[11]

2. SUBJECTS AND METHODS

2.1 Aims of the study
To measure the relation between body mechanics performance and nurses' exposure of work place risk factors on the low back pain prevalence.

2.2 Research question
Q1: What are the major contributing factors for LBP among nurses?
Q2: What is the nurses' knowledge about contributing risk factor for LBP?
Q3: What is the nurses' performance about body mechanics and its relation with LBP?

2.3 Research design
Correlation design was applied to accomplish this study.

The preparatory phase included: The researchers made extensive review of both national and international literature through using various resources as books, articles, periodicals and journals. Necessary changes were carried out after completing the pilot study.

Panel of experts reviewed the tools for clarity, relevance, comprehensive understanding and applicability; a few modifications were made according to their opinion.

2.4 Pilot study
The researchers applied pilot study to test for clarity, completeness, validity, and practicability, the tools were completed by 10 nurses. Needed adjustemnts were made accordingly by the researchers. Nurses included in the pilot study were excluded from the actual study sample.

2.5 Implementation phase
The researchers started data collection from May 2017 to end of October 2017 after obtaining the permission to apply this study. The researchers visited the hospital to explain the aim of the study to nurses and to obtain their written consent to participate in this study. The tool was filled by researchers through face to face interview with each participant. The researcher met nurses at time convenient to them during their working schedule. Weight, height and body mass index were measured and calculate according to World Health Organization (WHO) requirements for all study nurses. The assessment of body mechanics observation checklist was carried out while the nurses were on duty during morning and afternoon shift. Each nurse was observed by the researchers one times at different duties. Nurses were observed two hours for each nurse, while they were performing nursing intervention for their patients during this period. Each nurse suffer from LBP assessed the level of pain by scale.

2.6 Setting

The current study was conducted at different departments [Intensive Care Unit (ICU), Coronary Care Unit (CCU), Medical Care Unit (MCU), stroke Care Unit, operation room, and surgical department] at Minia university hospital in Egypt.

2.7 Sample

A purposive sample of nurses was taken from the previously mentioned study settings. The total number was one hundred nurses, both male and female who were working at the time of data collection were divided into 66 nurses from intensive care unit as ICU, CCU, MCU, stroke Care Unit, 6 nurses from operation room, 4 nurses from outpatient clinic and 24 nurses from different department as medical and surgical ward.

2.8 Tools of data collection

Data collection was done with the following tools:

Tools I: Interview questionnaires sheet

After reviewing the relevant literature, the researchers developed a construcetd questionnaire sheet and pilot tested before the study to assess nurse's knowledge regarding LBP risk factors and principles of body machanics to control back pain.

This questionnaire was used to assess nurses' knowledge about risk factors of LBP and principles of body machanics to control LBP. It also contained questions about socio-demographic data.

A-Socio demographic and health status data involved age, gender, qualification, years of experience, marital status, current and past history of LBP.

B-Assessment sheet for measuring weight and height and calculate the BMI according to the WHO (2003) classification: normal BMI = 18.5-24.9 kg/M^2, overweight BMI = 25.0-29.9 kg/M^2, obesity BMI = 30.0-39.9 kg/M^2 and the extreme obesity BMI = 40.0 kg/M^2.

The part about nurses' knowledge regarding LBP contained information about nurses' knowledge about the contributing risk factors for LBP (8 questions) and nurses' knowledge about principles that reduce risk for development of LBP (10 questions).

The scores of each item ranged from "0" (= incorrect answer) to "1" (= correct answer). The total knowledge score was calculated by summation of all knowledge items with total score equal to 18. Therefore the participants who would get 70% or more correct answers would be considered as having satisfactory level of knowledge, and if the participants would get less than 70% correct answers would be considered as having unsatisfactory level of knowledge.

The part about nurses' performance regarding body mechanics assessed through observational checklist was developed by researchers to assess malpractice during lifting and turning of the patients from bed.

The scores of each item ranged from "1" (= correct done) "0" (= not done) to or according to the complexity needed for intervention measures. Total score of observational checklist 71 steps.

Tool II: McCaffrey initial pain assessment tool

It was used to initial pain assessment regarding LBP it included description of pain characteristics (when pain start, quality, location, onset, frequency, duration, time of worse pain, difference in intensity with time, rhythm, tolerance, factors aggravating pain, pain management strategies)it was adopted from McCaffery et al. (1999).[12]

2.9 Scoring systems

LBP was assessed by Pain Intensity Scale. This scale is often displayed as a line numbered from zero to ten asking the nurse in pain to assign a number, from zero to ten according.

2.10 Ethical consideration

Oral consent obtained from each participant after explaining the nature & objectives of the study to gain their cooperation. Each assessment sheet was coded and subjects' name was not appearing on the sheets for the purpose of anonymity and confidentiality. Subjects were free to end their participation from the study at any time.

2.11 Administrative design

An official letter was issued from the Dean of the Faculty of Nursing to the Directory of the Mina university hospital. Nurses' written informed consent for participation was obtained by the researchers' after explaining the aim of the study. Clarification of the nature and purpose of the study was done on initial interview with each nurse. The researcher emphasized that the participation was absolutely voluntary and that confidentiality as well as anonymity would be absolutely assured throughout the study.

2.12 Statistical analysis

Statistical analysis of data was done by using SPSS-21. The researchers analyzed, categorized and coded each tool. Qualitative and quantitative variables were represented in the form of frequencies and percentages and using means and standard deviations. Correlation statistical was done for assessing the inter-relationships among quantitative variables p value < .05 was considered as statistically significant.

3. RESULT

Table 1 shows that, 52% of the study sample was females and 56% their age ranged from 21 to 30 years. Their educational level revealed that, around half had bachelor, 66% work at intensive care unit and 96% work as staff nurses and 90% are overweight.

Table 1. Demographic characteristics of the study sample (n = 100)

Items	No. (n = 100)	%
Age		
21 - < 30 years	56	56.0
30 - < 40 years	44	44.0
Mean ± SD: 28.82 ± 4.9		
Gender		
Male	48	48.0
Female	52	52.0
Educational level		
Diploma	44	44.0
Bachelor	50	50.0
Master	6	6.0
Work place		
Intensive Care Unit	66	66.0
Inpatients unit	24	24.0
Operating theater	6	6.0
Outpatient clinic	4	4.0
Job description		
Head nurse	4	4.0
Staff nurse	96	96.0
Smoking		
Smoker	28	28.0
None smoker	72	72.0
Body Mass Index		
Normal BMI = 18.5-24.9 kg/M^2	4	4.0
Overweight BMI = 25.0-29.9 kg/M^2	90	90.0
Obesity BMI = 30.0-39.9 kg/M^2	6	6.0
Mean ± SD: 24.25 ± 3.1		

Table 2 reveled that 58% of the study sample doesn't have a history of back pain before work. Forty four percent are working more than 56 hours per week and majority of sample reports have back pain related to work and work at night.

Table 3 illustrated the characteristics of pain the results revealed that 88% of them had pain in lumber region. 90% of them had gradual onset of LBP. More than two third of them 62% had aching pain. While 62% of studied nurses the pain worse in the evening. In relation to factors increase pain, the study revealed that majority of nurses 90% had LPB due to patient turning and positioning and 10% of them had LPB related to cold. In relation to factors decrease pain 40% of them reported medication relieved pain, while 20% of them mentioned support the back relieved LPB.

Table 2. Nurses job characteristics (n = 100)

Items	No	%
Past history of lower back pain before working		
Yes	42	42.0
No	58	58.0
Current diseases causing back pain		
Yes	60	60.0
No	40	40.0
Years of work experience as a nurse		
1 - < 10 years	72	72.0
11< 20 years	24	24.0
21< 30 years	4	4.0
Mean ± SD: 6.69 ± 5.4		
Working hours/week		
36 - < 46 hours	32	32.0
46 - < 56 hours	24	24.0
> 56 hours	44	44.0
Mean ± SD: 28.82 ± 4.9		
Have night shifts		
Yes	88	88.0
No	12	12.0
Back pain related to work		
Yes	84	84.0
No	16	16.0

Table 4 shows that more than half of study subjects have unsatisfactory level of knowledge about risk factors and principle of body mechanic (57% and 68%) respectively.

Table 5 shows the majority of study subjects don't use body mechanic as turning, moving, lifting, positioning, moving and transferring the patients when caring for patients.

Table 6 shows that there is a positive significant correlation between back pain related to work and stress of work among the study subjects with a total score $r = .400$, at $p = .000$.

Table 7 shows that there is a positive significant correlation between back pain related to work and body mass index among the study subjects with a total score $r = -.282$, at $p = .004$.

Table 8 describes that there is a positive significant correlation between back pain related to work and duration of work among the study subjects with a total score $r = -.368$, at $p = .000$.

Table 9 shows that there is a positive significant correlation between knowledge and practices regarding LBP with a total score $r = .849$, at $p = .000$.

Table 10 shows that there is a positive significant correlation between LBP prevalence and body mechanics practice among the study subjects with a total score $r = .364$, at $p = .000$.

Table 3. Pain assessment of LBP (n = 100)

Items	No. (n = 100)	%
Location of pain		
Cervical	0	0
Lumber	88	88.0
Sacral	12	12.0
Onset of back pain		
No	0	00.0
Sudden	10	10.0
Gradual	90	90.0
Intensity of pain		
No	0	00.0
Mild	50	50.0
Moderate	38	38.0
Sever	12	12.0
Duration of pain		
Weeks	50	50.0
Months	38	38.0
Years	12	12.0
Quality of pain		
No	0	00.0
Sharp	18	18.0
Aching	62	62.0
Shooting	12	12.0
Sharp and aching	8	8.00
Rhythmicity of back pain		
Intermittent	5	5.0
Nearly constant	18	18.0
Constant	48	48.0
After shifts	29	29.0
Time of worse the pain		
In the morning	38	38.0
In the evening	62	62.0
In the night	0	00.0
Factors increase back pain		
Cold	10	10.0
Standing for long time	24	24.0
Setting for long time	28	28.0
Turning or lifting the patients	38	38.0
Factors increase back pain		
Warm compress	10	10.0
Support the back	20	20.0
Relaxation	15	15.0
Message	15	15.0
Medication	40	40.0
Signs and symptoms		
Nothing	85	85.0
Nausea	10	10.0
Dizziness	5	5.0

Figure 1 indicates that there is a positive significant relation between back pain and specialty among the study subjects with a total score chi = .018, at $p = 004$.

Table 4. Knowledge regarding the risk factors of LBP and principles of body mechanics (n = 100)

Items	N	%
Nurse knowledge about risk factors that predisposing back pain		
Satisfactory	43	43.0
Un satisfactory	57	57.0
Nurse knowledge about principles of body mechanics to control pain		
Satisfactory	32	32.0
Un satisfactory	68	68.0
Mean ± SD	3.25 ± 2.4	

Table 5. Practices of study subjects regarding body mechanic (n = 100)

Items	No	%
Lifting an object from a shelf above shoulder level		
Done	0	00.0
Not done	100	100.0
Turning the patient toward you		
Done	2	2.0
Not done	98	98.0
Turning the patient away from you		
Done	0	00.0
Not done	100	100.0
Moving a patient up in bed		
Done	0	00.0
Not done	100	100.0
Transferring a patient to stretcher		
Done	3	3.0
Not done	97	97.0
Transferring a patient from bed to chair		
Done	10	10.0
Not done	90	90.0

Table 6. Correlation between back pain related to work and work stress of the study subjects

Item	R-value	p-value
Back pain related to work	.400	.000**
Work stress		

**p < .01

Table 7. Correlation between back pains related to work and BMI of the study subjects

Item	R-value	p-value
Back pain related to work	-.282	.004**
BMI		

**p < .01

Table 8. Correlation between back pain related to work and duration of work of the study subjects

Item	R-value	p-value
Back pain related to work	-.368	.000**
Duration of work		

**p < .01

Table 9. Correlation between knowledge and practices of study subjects regarding LBP

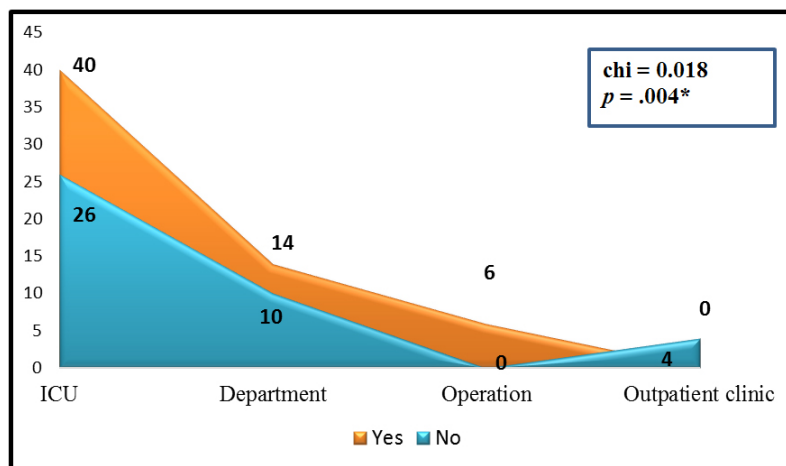| Item	R-value	p-value
Back pain related to work Practices	.849	.000**

**p < .01

Table 10. Correlation between body mechanics practices of study subjects and LBP prevalence

Item	R-value	p-value
LBP prevalence Body mechanics practice	.364	.000**

**p < .01

*p < .05

Figure 1. Relation between work area and suffering from back pain among study subjects

4. DISCUSSION

Low back pain is considered as the most important contributing factor to number of years lived disabilities. Healthcare workers have remarkable high prevalence of LBP.[13] Various nurses' responsibilities such as assisting patients' daily lives such as positioning them on the beds, carrying and lifting them also increase the risk of a low back trauma for nurses.[3]

The present study report that 90% of the nurses categorized as class I of obesity, this result of the study supported with El-Ghazaly et al. (2013)[14] that add that in Egypt according to a study among nurses, the individual factors showed significant relation with LBP, which were age, marital status, and BMI.

Also the study by Boughattas et al. (2017)[15] found high prevalence rate of LBP among Tunisian nurses. a regular physical activity and reducing nurses' overweight, as well as training them on proper patients' handling would help to reduce LBP.

The current research study showed that 50% of the nurses are suffering from mild LBP for weeks. As regarding factors increase pain 38% of study subjects feeling LBP when lifting and carrying the patient. As regard the best factor tolower the back pain, it was found that 40% of study subject uses medication.

These finding inconsistent with the result of Billis et al.

(2017)[16] who stated that the pain intensity of the nurse categorized from moderate to severe pain and lead to low of disability levels and this result agreement with the current study. Plus this author reports prevalence rate of back pain nearly over 40%.

Also, Wannes et al. (2018)[17] report the most properly consequences of LBP for nurses as work absenteeism, additional personal and economic costs, reduced nursing care efficiency, decreased quality of life, and even burnout. Unsurprisingly, several researches reported the association between work-related LBP, nurses' negative beliefs, decreased job satisfaction and nursing burnout.

In additional, Abou El-Soud et al. (2014)[2] report a strong association between LBP and the used postures in physical work as transferring patients and lifting heavy objects or equipment. Higher incidence of work-related back pain is remarkably present in developing countries due to shortage equipment and plan of work.

Also, many studies explored that many work factors area strongly correlated with the risk of LBP such as lifting of heavy object, frequent twisting and bending, and low job satisfaction.[18]

The finding of current study is in agreement with those of SeyedEhsan et al. (2017)[19] who revealed nearly half of affected nurses receive medications in the form of Non-

Steroidal Anti-inflammatory drugs (NSAIDS) and muscle relaxants, Also about one third receive physiotherapy, less than one third of the studied sample use topical preparations, while 14.28% of them required time off work, and only 5.88% need a back belt.

Finally, in the same line the study of Markus et al. (2018)[20] reported that recent systematic review about workplace-based interventions reported that physical exercise, especially resistance training is the most effective strategy for reducing and rehabilitating neck, shoulder and lower back pain.

The result of present study showed that more than half of study subjects have unsatisfactory level of knowledge about risk factors and principle of body mechanic (57% and 68%) respectively. This result agreement with that by Sikiru et al. (2010)[21] who found that, the nurses' knowledge scores were insufficient, but can be increased when they are more experienced in nursing field, despite the lack of formal education.

Also, Sarallah et al. (2017)[10] stated that many Iranian nursing assistants are not properly educated about the potential occupational hazard of work related LBP or about how to control and prevent such musculoskeletal disorders.

In addition, the result by Khudhir et al. (2017)[22] added that the work related musculoskeletal disorders are the most contributing factors that cause occupational injury and nurses' disabilities. LBP can be reduced by certain prevention strategies and training courses with great emphasis on psychosocial risk factors and improving work environment. Finally, Boughattas et al. (2017)[15] report that LBP is widely investigated in western countries, but in Tunisia, like in other countries perhaps, there is limited information about its' prevalence and risk factors.

The current study shows that there is majority of study subjects don't perform the body mechanics correctly, especially regarding turning, moving, lifting, positioning, moving and transferring the patients. This result is supported by those of Ibrahim & Elsaay (2015)[11] that revealed a highly statistically significant difference regarding total knowledge about back pain, body mechanics knowledge and performance pre- and post- program implementation.

The result of present study showed that there is positive significant correlation between LBP and work stress factors among the study subjects, which is in contrast with that of Yilmaz et al. (2012)[23] that there reported that a LBP is positively associated with heavy physical work, frequent manual operations, repeated twisting of the trunk, whole body vibration and sitting for long time. Psychosocial factors, such as work demands, symptoms of stress and lack of social support have been reported to be important contributing factors of LBP.

The result of current research demonstrates that there is a positive significant correlation between back pain related to work and body mass index, this finding of current study agreement with Zingg and Kendalldo (2017)[24] revealed that, LBP and obesity are both epidemics problem.

The current study results showed a positive significant correlation between back pain related to work and duration of work, this result is agreement with Shwn-HueyShieh et al. (2016)[25] who reported that with the increased number of cared patients per shift and longer daily working hours, it would lead to more musculoskeletal problems as LBP.

The current study shows that there is a positive significant correlation between knowledge and practices regarding body mechanics LBP. This result is supported with that by Mc-Cauley (2015)[26] who stated that a nurse should have thorough scientific knowledge of body mechanics and its proper use in their daily practice.

Limitation of the study

Increase number of the study sample to ensure from accurate prevalence of LBP and assessment of body mechanics observational checklist were performed during morning and evening shift through heavy nursing duties.

5. CONCLUSION

The nurses' working in Minia university hospital suffering from high prevalence of LBP. The LBP complication is mainly related to exposure to many risk factors such as obesity, lack of knowledge and practice regard to body mechanics.

Recommendation

- Nurses should use the evidence-based strategy in prevention and management of LBP.
- Educational programs among nurses about body mechanics when handling and lifting the patient could be implemented to decrease exposure to LBP.
- Increase number of nursing staff in the same shift is important factor to reduce the occupational hazard.

CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

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