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Research Article

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Prevalence and Related Risk Factors of Low Back Pain among Nurses Working in Intensive Care Units

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Abstract

Studies have shown that low back pain is a common health problem among hospital nurses especially those working in Intensive Care Units. However, prevalence and the related risk factors in intensive care units needs to be widely investigated.

The aims: *of this study were to identify prevalence of low back pain and determine its related risk factors among nurses working in Intensive Care Units.*

Subjects: *A purposive sample of all nurses who worked in intensive care units and meet the inclusion criteria.*

Setting: *The study was conducted at four intensive care units of Menoufia University hospital.*

Tools of the study: *Two tools were utilized for data collection as follow; Tool I: Interviewing questionnaire and Tool II: Observational checklist.*

Results: *The prevalence of low back pain among studied nurses was 85%. The most important and preventable risk factors for low back pain among studied nurses were higher body mass index, more average working hours/day, not enough working space, lower compliance of nurses with proper body mechanics and range of motion exercises during work.*

Conclusion: *prevalence of low back pain among nurses working in intensive care units was high. There were multi interrlatrelatede risk factors for low back pain among studied nurses: work, patients and personnel related factors.*

Recommendations: *Periodic and continuous in-services training for nurses working in intensive care units on preventing and coping strategies for low back pain should be implemented.*

Keywords: Intensive care units, Low back pain, Nurses, Prevalence and Risk factors

Introduction

Low back pain (LBP) is defined as unpleasant sensation in the spinal area between costal margins and gluteal folds that may occur at least once a month with or without radiation to leg [1]. Moreover it is a non specific condition of acute or chronic pain in or near the lumbosacral spine that can be caused by inflammatory, degenerative, neoplastic, gynecological, traumatic, metabolic or other disorders [2].

It is considered to be a common disorder of back's muscles and bones and it is the most prevalent related problems across different countries. Epidemiological studies reported that low back pain prevalence is 70- 85% of lifetime, while the annual prevalence range from 15- 45%. The higher prevalence of LBP has often shown among health care workers compared to other professionals. Many studies showed that the highest incidence of work related low back pain was among nurses because they occupied by heavy emotional and physical work [3-4]. Moreover nurses working in intensive care units (ICU) are especially exposed to LBP more frequently than nurses working in other working setting [5].

Low back pain is not a specific disease but rather is a complaint that may be caused by a large number of underlying problems of varying levels of seriousness [6]. It was stated that the prevalence of low back pain among Chinese nurses working in intensive care unit (ICU) is 87% [7]. The high prevalence of low back pain among ICU nurses could be caused by characteristics of ICU patients such as their severe illness and the need to ensure that multiple IV lines, mechanical ventilators, cardiac monitors and other equipment are connected safely. These factors require nurses to do many patients' handling activities such as lifting and frequent change of patient's position. These activities could be done by bending waists in an

uncomfortable posture [1,8].

Also the structure of ICU environment could be an etiology for low back pain as the small available working space, trouble reaching things, easily slipping, falling and not having enough room to perform work without bending. Moreover organizational factors in ICU may play a role in developing LBP among nurses such as decreasing staff's number and increasing working hours [9]. Pinar (2007) added that low back pain in ICU may be caused by providing patients' care through false bending especially for long period, over forcing some body parts while repositioning patients. The over workload in ICU and reporting some body movement such as reaching up forward and clasping- hugging may be a role [5].

Other high risk activities include heavy work load which require rapid movement combined with poor posture especially when nurses perform their duties under time pressure. Time pressure activities include emergency nursing care, operating room, or unplanned work within hospital units [3].

All people with low back pain may suffer from disturbance of physical function because of interference of back pain with quality of life, deterioration of general health, decreased participation in social activities, insomnia and anxiety which could affect their occupation. But nurse's health not only affects their lives but also their quality of patient's care and patient's safety. Moreover nurse's health can affect their job satisfaction, quality of life and desire to change their career [10].

A great deal of effort has been devoted to prevent low back pain and injuries among nurses through identifying low back pain and its related risk factors and trying to avoid these factors as well as performing physical exercises, provision of equipment, lumber support and stress management [11]. So the aims of the present study was to identify prevalence of low back pain among nurses working in Intensive Care Units and determine its related risk factors.

The aims of the present study were to:

1. Identify prevalence of low back pain among nurses working in Intensive Care Units.
2. Determine the related risk factors of low back pain among nurses working in Intensive Care Units.

Research questions

The following research questions were asked in an attempt to achieve the aims of the study:

1. What is the prevalence of low back pain among nurses working in Intensive Care Units?
2. What are the related risk factors of low back pain among nurses working in Intensive Care Units?

Subjects and Method

Subjects

Design: A descriptive research design was utilized in this study.

Setting: The study was conducted at four Intensive Care Unites of Menoufia University Hospital. These units are Surgical, General Medical, Nurological and Pediatric ICUs.

Subjects: A purposive sample of all nurses who worked in the previously mentioned settings.

They were selected according to the following criteria: nurses who were working in Intensive Care Unit for more than one year, not pregnant and didnt have any health problems that may cause low back pain such as disc prolapse.

The total number of nurses in those units was seventy two nurses, however only sixty nurses were eligible for the study because there were three nurses had one or more of the exclusion criteria, five were on different vacations and four were not willing to participate in the study.

Tools: In order to acheive the aims of the study, two tools were utilized for data collection. These tools are as follow:

Tool I : An interviewing questionnaire: It was developed by the researchers except part three that was developed by Bain etal. (2005) [12]. It was constructed to assess presence or absense of low back pain among studied nurses and determine its related risk factors if present. It included four parts as follow:

Part one : Biodemographic Data. It included information about nurse's age, sex, education, position ,marital status, duration of working hours in ICU, presence of chronic disease, regularity of menstrual cycle, using contraceptive pills and their body mass index(BMI).

Part two: Related risk factors of low back pain. It included information to assess presence of risk factors for low back pain among studied nurses. It consisted of two sections as follow

Section A: Assessment of working condition such as ICU specialty, enough working space, trouble reaching things, average working hours/day, work needs specific movement from nurses, adequacy of nursing staff and frequency of night shift/month.

Section B: Assessment of patient's condition as severity of patient's illness, using multiple lines that frequently need to be ensured and using mechanical ventilators or cardiac monitors that need to be connected safely.

Part three : 10 point horizontal visual analouge pain scale. It was developed by Bain et al. (2005) [12] to rate nurse's level of pain intensity. The scale was from zero to ten, in which zero means no pain, while a score from 1 to 3 denoted mild pain, a score from 4 to 6 denoted moderate pain and a score from 7 to 10 indicated sever pain. The reliability of the scale was demonstrated with high internal consistency (alpha= 0.936) and strong test retest agreement (intra class correlation coefficient= (0.93)) were observed [13].

Part four : Assessment of low back pain: it consisted of information about duration, frequency of pain , effect of low back pain and mehod used by thenurses to mange their pain.

Tool II : Observational check list: It was develped by the researchers to assess the personnel related factors of low back pain among the studied nurses. It include nurse's assessment about complying with proper body mechanics during their work, wearing high heeled shoes and practicing range of motion exercises(ROM) during their work.

Method

1. A written permission was obtained from the hospital's director and the head nurses of all included ICUs after explanation of the aims of the study.
2. After extensive literature review, the study tools were developed by the researchers except part three of tool I that was developed by Bain et al., (2005) [12]. These tools were tested for its content validity by five experts in Medical Surgical Nursing to ascertain relevance and completeness.
3. Reliability of the tools were done by test- retest method and Pearson correlation coefficient formula to ascertain relevance and consistency of the tools and measure its items. It was 0.89 for the first tool and 0.93 for the second tool.
4. Prior to actual study, a pilot study was conducted on 10 % of the subjects (6 nurses) to evaluate the constructed tool for clarity, feasibility and applicability and estimate the timeneeded to collect data, then necessary modifications were done accordingly.
5. A written nurse's consent to participate in the study was obtained from all participants after explanation of the aims of the study. Each nurse was reassured that any obtained information would be confidential and would only be used for the study's' aims. The researcher emphasized that participation in the study was entirely voluntary and anonymity of the nurses was assured through coding data.

Data collections

a. Data collection was extended over a period of two months from beginning of April 2016 to beginning of June 2016.
b. The researchers asked the head nurse of each included Intensive Care Unit to inform them about nurses who were in vacations. Then all nurses who agreed to participate and fulfilled the inclusion criteria were included in the study.
c. The researchers initiated data collection by interviewing each nurse individually in the nursing room during the morning shift for assessing biodemographic data by using part one of tool I.
d. Body mass index was calculated by dividing weight/kilogram by square of height/ meter. Then it was classified according to Green (2009) as

- Less than 20 is classified as underweight
- 20- is normal weight.
- 25- is class i obesity.
- 30- is class ii obesity.
- 35-40 is class iii obesity.
- More than 40 is class iv obesity [14].

e. Each participant nurse was asked about work and patients' conditions using part two of tool I to assess presence of work and/or patient's related factors of LBP.
f. All participant nurses were asked about presence of low back pain and if present they were assessed for pain intensity using the visual analogue pain scale (part three of tool I).
g. Each nurse who had low back pain was assessed for duration and frequency of pain and its effect as well as how did they manage it using part four of tool I
h. The interview took about from 30 to 45 minutes for each participant nurse.
i. The researchers observed each studied nurse during his /her work in the morning shift for complying with body mechanics, practicing range of motion exercises and also the researchers observed each female nurse for wearing high heel shoes. These observations were done using the second tool (Observational checklist).
j. All obtained data were analyzed to identify the prevalence of low back pain among nurses working in Intensive care units and determine its related risk factors.

Statistical analysis

The collected data were organized, tabulated and statistically analyzed using SPSS software (Statistical Package for the Social Sciences, version 16, SPSS Inc. Chicago, IL, USA). For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, which describe a categorical set of data, it was done by frequency, percentage or proportion of each category, comparison between two groups and more was done using Chi-square test ($\chi 2$). To predict the presence or absence of an outcome (low back pain) based on a set of predictor variables, logistic Regression was done. Logistic regression coefficients (B) were used to estimate Odds ratios (EXP (B)) for each of the independent variables. Binary regression analysis was done, where Logistic regression coefficients (B) are calculated and used to estimate Odds ratios (EXP (B)) for each of the independent variables as risk factors for low back pain. Significance was adopted at $p<0.05$ for interpretation of results of tests of significance [15].

Results

Table (1) shows that all studied nursing male (100%) and majority of studied female (83.6%) had low back pain. The mean age of all studied nurses was 31.45±4.15 years. About two thirds of all studied nurses (66.7%) had baccalaureate degree of nursing, while majority of them (91.7%) were bedside nurses. Regarding marital status, 84.4% of married nurses had low back pain. Also majority of nurses who had children (82.6%) had low back pain. More than half of studied nurses who had low back pain (57.9%) had two children. Moreover, less than three fourths of nurses who had low back pain (70.6%) worked at ICU for five years or more.

Table (2) reveals that all studied nurses (100%) didn't have chronic diseases. Majority of nurses without low back pain (88.9%) and more than half of nurses with back pain (58.7%) had regular menstrual cycle. About three fourths of studied nurses (78.3%) didn't use contraceptive pills. Regarding categories of body mass index, less than half of studied nurses without back pain (44.4%) had normal body weight, while about three fourths of nurses with back pain (73.5 %) were obese either class I, ii or iii.

Figure (1) presents that the prevalence of low back pain among studied nurses was 85%.

Table (3) illustrates that, regarding work related factors, more than half of nurses with low back pain didn't have enough working space had trouble reaching things, had inadequate nursing staff as well as had six or more night shift/month(62.7%, 54.9%, 56.9% and 68.5% respectively). As regard patient's related factors, using multiple lines and mechanical ventilator or cardiac monitor were reported as a predicted risk factors by about three fourths of nurses with back pain (76.5% for both factors) compared to 22.2% and 11.1% respectively of nurses without low back pain. Regarding personnel related factors, 66.7% and 92.2% of nurses with low back pain did not comply with body mechanics and didn't practice range of motion exercises during their work respectively as compared to 22.2% and 55.6% respectively of nurses without low back pain.

Table (4) demonstrates that the binary logistic regression analysis found that out of sociodemographic data, marital status presented as a significant and predictor factor for low back pain among studied nurses. While out of medical data, a high body mass index presented as a significant and predictor factor for low back pain among studied nurses.

Table (5) shows that the binary logistic regression analysis found that out of work related factors, not enough working space, increase working hours/ day and working demands presented as significant and predictor factors for low back pain among studied nurses.

Table (6) reveals that the binary logistic regression analysis found that out of patient's related factors, using multiple lines, mechanical ventilator or cardiac monitor presented as significant and predictor factors for low back pain among studied nurses. Also it was found that, out of personnel related factors, not complying with body mechanics and not practicing range of motion exercises during their work presented as significant and predictor factors for low back pain among studied nurses.

Figure (2) presents that the intensity of low back pain for more than two thirds of studied nurses with low back pain (70.6%) was sever.

Table (7) shows that about three fourths of studied nurses (72.5%) had pain from one to less than eight days/ month. Regarding frequency of low back pain, less than one fourth of them (21.6%) complained of low back pain daily. More than half of them (56.9%) restricted their activities as a result of low back pain and less than half of them (45.1%) took analgesics to relieve pain.

Table 1: Distribution of studied nurses (with and without low back pain) regarding sociodemographic characteristics (n=60)

Sociodemographic characteristics	The studied nurses (n=60)						χ^2	P
	Without low back pain (n=9)		With low back pain (n=51)		Total (n=60)			
	n	%	n	%	n	%		
Sex								
Male	0	0	5	100	5	8.3	0.963	0.327
Female	9	16.4	46	83.6	55	91.7		
Age years								
24	4	44.4	14	27.5	18	30.0	3.312	0.191
30	2	22.2	28	54.9	30	50.0		
35-41	3	33.3	9	17.6	12	20.0		
Range **Mean ±SD**	25-41 31.44±5.25		24-41 31.45±3.99		24-41 31.45±4.15		**t-test=** 0.004	0.997
Education level								
Diploma degree	1	12.5	7	87.5	8	13.3	0.065	0.968
Technical degree	2	16.7	10	83.3	12	20.0		
Baccalaureate degree	6	15.0	34	85.0	40	66.7		
Nurse's position:								
Bedside nurse	9	16.4	46	83.6	55	91.7	0.963	0.327
Head nurse	0	0	5	100	2	8.3		
Marital status:								
Single	0	0	10	100	10	16.7	7.759	0.051
Married	7	15.6	38	84.4	45	75.0		
Widowed	1	25.0	3	75.0	4	6.7		
Divorced	1	100	0	0	1	1.7		
Having children								
Yes	8	17.4	38	82.6	46	76.7	0.884	0.347
No	1	7.1	13	92.9	14	23.3		
Number of children								
One	3	37.5	10	26.3	13	28.3	3.255	0.196
Two	2	25.0	22	57.9	24	52.2		
Three	3	37.5	6	15.8	9	19.6		
duration of work in ICU								
<5	1	11.1	15	29.4	16	26.7	1.310	0.252
5 & more	8	88.9	36	70.6	44	73.3		

Table 2: Distribution of medical data of studied nurses (with and without low back pain)(n=60)

Medical characteristics	The studied nurses (n=60)						χ^2	P
	Without low back pain (n=9)		With low back pain (n=51)		Total (n=60)			
	n	%	n	%	n	%		
History of chronic disease								
No	9	100	51	100	60	100	-	-
Menstrual cycle *								
Regular	8	88.9	27	58.7	35	63.6	2.353	0.125
Irregular	1	11.1	19	41.3	20	36.4		
Using contraceptive pills								
Yes	4	44.4	9	17.6	13	21.7	3.237	0.072
No	5	55.6	42	82.4	47	78.3		
Category of body mass index								
Under weight	1	11.1	4	7.8	5	8.3	6.897	0.141
Normal weight	4	44.4	7	13.7	11	18.3		
Class i obesity	3	33.3	14	27.5	17	28.3		
Class ii obesity	1	11.1	21	41.2	22	36.7		
Class iii obesity	0	0	5	9.8	5	8.3		

*Five males were excluded from asking about regularity of menstrual cycle.

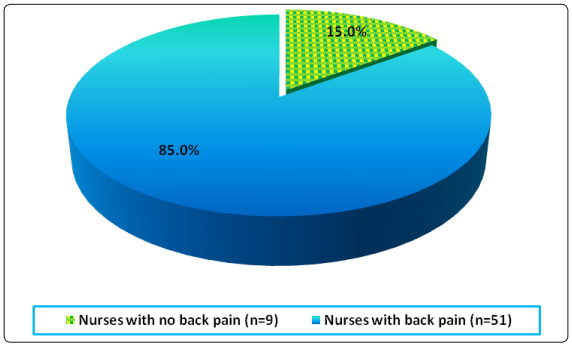

Figure 1: Prevalence of low back pain among studied nurses working in Intensive care units (n=60).

Table 3: Distribution of studied nurses (with and without low back pain) regarding possible risk factors of low back pain (n=60)

Possible risk factors	The studied nurses (n=60)						χ^2	P
	Without low back pain (n=9)		With low back pain (n=51)		Total (n=60)			
	N	%	N	%	n	%		
A-Work related factors ICU specialty								
Surgical	4	44.4	14	27.5	18	30.0	2.397	0.494
General medical	4	44.4	20	39.2	24	40.0		
Neurological	0	0	8	15.7	8	13.3		
Pediatric	1	11.1	9	17.6	10	16.7		
Enough working space								
Yes	7	77.8	19	37.3	26	43.3	5.116	0.024*
No	2	22.2	32	62.7	34	56.7		
Trouble reaching things								
Yes	7	77.8	28	54.9	35	58.3	1.647	0.199

No	2	22.2	23	45.1	25	41.7		
Average working hours / day:								
Range	8-12		7-12		7-12		**t-test=** 2.390	0.020*
Mean ±SD	10.33±1.32		9.10±1.44		9.28±1.48			
Work demands								
Twisting	2	22.2	20	39.2	22	36.7	10.936	0.053
Bending forward	0	0	8	15.7	8	13.3		
Weight lifting	0	0	5	9.8	5	8.3		
Prolonged sitting	0	0	5	9.8	5	8.3		
Walking for long distance	5	55.6	11	21.6	16	26.7		
Others	2	22.2	2	3.9	4	6.7		
Adequacy of nursing staff								
Adequate	0	0	4	7.8	4	6.7	1.740	0.419
Somewhat adequate	5	55.6	18	35.3	23	38.3		
Inadequate	4	44.4	29	56.9	33	55.0		
Frequency of night shift/month								
0-5	6	66.7	16	31.4	22	36.7	4.104	0.043*
6 & more	3	33.3	35	68.5	38	63.3		
B-Patients' related factors: **Sever illness of patients:**								
Yes	8	88.9	48	94.1	56	93.3	0.336	0.562
No	1	11.1	3	5.9	4	6.7		
Using multiple lines that need to be ensured:								
Yes	2	22.2	39	76.5	41	68.3	10.404	0.001*
No	7	77.8	12	23.5	19	31.7		
Using mechanical ventilator or cardiac monitor that need to be connected safely								
Yes	1	11.1	39	76.5	40	66.7	14.706	0.0001*
No	8	88.9	12	23.5	20	33.3		
C-Personnel related factors: **Complying with body mechanics during work:**								
Yes	7	77.8	17	33.3	24	40.0	6.296	0.012*
No	2	22.2	34	66.7	36	60.0		
Wearing high heeled shoes								
Yes	1	11.1	24	47.1	25	41.7	4.067	0.044*
No	8	88.9	27	52.9	35	58.3		
Practicing range of motionexercises during work								
Yes	4	44.4	4	7.8	8	13.3	8.869	0.003*
No	5	55.6	47	92.2	52	86.7		
*Significant (P<0.05)								

Table 4: Binary logistic regression analysis of bio- sociodemographic data as predictors and risk factors of low back pain among the studied nurses (n=60)

Variables	B	SE	P	Exp (B)	95% confidence interval	
					Lower limit	Upper limit
Sociodemographic data						
Age/ years	1.907	1.102	0.084	6.730	0.776	58.338
Education level	0.015	0.691	0.982	1.016	0.262	3.935
Marital status	2.611	1.093	0.017*	0.073	0.009	0.626

Having children	1.007	1.108	0.364	2.737	0.312	24.022
Number of children	1.368	0.823	0.096	0.255	0.051	1.278
Years of experience as a nurse at ICU	1.204	1.104	0.276	0.300	0.034	2.613
Medical data						
Regularity of menstrual cycle	1.587	1.118	0.156	4.887	0.546	43.723
Using contraceptive pills	1.345	0.790	0.089	3.838	0.816	18.042
High body mass index	0.738	0.352	0.036*	2.092	1.049	4.174

B=Logistic Regression CoefficientSE=Standard Error of B
P=SignificanceExp (B)=Estimated Odds Ratio
***Significant (P<0.05)**

Table 5: Binary logistic regression analysis of working condition as predictors and risk factors of low back pain among studied nurses (n=60)

Work related factors	B	SE	P	Exp (B)	95% confidence interval	
					Lower limit	Upper limit
-ICU specialty	0.490	0.411	0.232	1.633	0.730	3.651
Not enough working space	1.774	0.852	0.037*	5.895	1.109	31.340
-Trouble reaching things	1.056	0.850	0.214	2.875	0.544	12.203
-Increase working hours / day	0.556	0.255	0.029*	0.573	0.348	0.944
-Work demands	0.489	0.208	0.019*	0.613	0.408	0.923
-Adequacy of nursing staff	0.117	0.574	0.838	1.124	0.365	3.461
-Frequency of night shift/month	1.476	0.769	0.055	4.375	0.970	19.742

B=Logistic Regression CoefficientSE=Standard Error of B
P=SignificanceExp (B)=Estimated Odds Ratio
***Significant (P<0.05)**

Table 6: Binary logistic regression analysis of patient and personal conditions as predictors and risk factors of low back pain among studied nurses (n=60)

Variables	B	SE	P	Exp (B)	95% confidence interval	
					Lower limit	Upper limit
Patients' related factors						
Sever illness of patients	0.693	1.216	0.569	0.500	0.046	5.423
Using multiple lines that need to be ensured	2.431	0.867	0.005*	0.088	0.016	0.481
Using mechanical ventilator or cardiac monitor that need to be connected safely	3.258	1.111	0.003*	0.038	0.004	0.339
Personnel related factors						
Not complying with body mechanics during intervention	1.946	0.855	0.023*	7.000	1.310	37.403
Wearing high heeled shoes	1.962	1.097	0.074	0.141	0.016	1.208
Not practicing range of motion exercises	2.241	0.849	0.008*	9.400	1.779	49.663

B=Logistic Regression Coefficient SE=Standard Error of B
P=Significance Exp (B)=Estimated Odds Ratio
***Significant (P<0.05)**

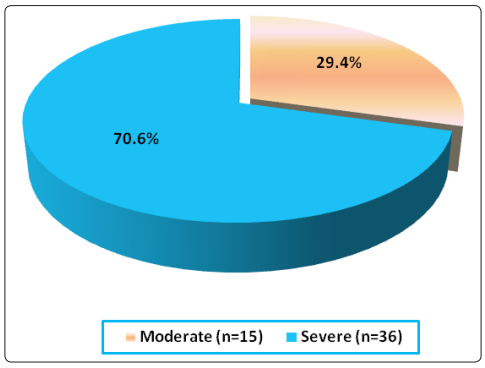

Figure 2: Severity of low back pain among studied nurses with low back pain(n=51)

Table 7: Number and percentage distribution of studied nurses (with low back pain) regarding characteristics of low back pain(n=51)

Characteristics of low back pain	The studied nurses with low back pain	
	n=51	%
Duration		
1-days/ month	37	72.5
8-20 days/ month	6	11.8
>20 days/ month	8	15.7
Frequency		
Daily	11	21.6
Once/ week	20	39.2
Twice or more/week	20	39.2
Effect of low back pain		
Restriction of activity	29	56.9
Thinking to leave nursing profession	12	23.5
Taking many days off	6	11.8
Transferring to other nursing specialty	4	7.8
How to manage low back pain		
Intake of analgesics	23	45.1
Rest	9	17.6
Use muscle relaxant	3	5.9
Reduce movement at work	8	15.7
Nothing	8	15.7

Discussion

It was stated that one of the most prevalent occupation related problem all over the world either developed or developing countries is low back pain [3].

Biodemographic characteristics of studied nurses

The findings of the current study found that majority of studied nurses was female and majority of these female had low back pain. This may be because of females are not only have work related duties but also have home related duties.

Regarding age, it was noticed that the age of more than half of nurses with low back pain was thirty to less than thirty five years. This may be because of this age duration is an active period of life in which the person performs many activities in the same time. This result is in line with the result of Ovayolu et al. [16].

As regard educational level, about two thirds of all studied nurses had baccalaureate degree of nursing and majority of them were bedside nurses. This may be related to intensive care units need highly educated nurses with better knowledge and skill level.

In relation to marital status and having children, the current study reported that majority of married nurses who had children complained of low back pain. This may be because of marriage and having children makes person over loaded by many activities in addition to work related activities that may lead to low back pain.

Hinmikaiya and Bamishaiye (2012) reported that the majority of their studied nurses who had low back pain, worked for more than five years in ICU [3]. This supports the results of the current study which showed that about three fourth of nurses with low back pain worked for more than five years in ICU.

The finding of the current study demonstrated that about three fourths of studied nurses with low back pain were obese, while minority of them had normal body weight. However these findings contradict with the finding of Hinmikaiya and Bamishaiye (2012) who stated that majority of nurses with low back pain had normal body weight [3]. This contradiction may be due to about half of their sample were single that may decrease incidence of obesity.

Prevalence of low back pain

Abou El-Soud et al. reported that prevalence of low back pain is high among studied nurses with the highest prevalence among ICU nurses [17]. Also June and Cho (2010) demonstrated that there was a high prevalence of low back pain among nurses working in ICU [1]. These results coincide the result of the current study which showed that the prevalence of low back pain among studied nurses was high and this result answers the first research question.

Work related factors of low back pain

The findings of the current study observed that the prevalence of low back pain is greater among nurses worked in general medical ICU than others. This findings is supported by the results of Ovayolu et al., who stated that many nurses who were working in ICU experienced low back pain especially who worked in medical ICU(16). Also June and Cho(2010) reported that there was a higher low back pain prevalence rate among nurses in general medical ICU than others [1].

In relation to presence of enough working space, it was observed from the current study that about two thirds of studied nurses with low back pain didn't have enough working space in ICU settings. This may be explained by not having enough working space that may enforce nurses to make wrong movement during their work and may predispose them to low back pain.

It was stated that prevalence of low back pain among nurses can be explained by high work load that may need twisting, working for long distance and bending forward [17].This report is in accordance with the result of the present study.

Also it was found from the results of the current study that more than half of studied nurses with low back pain worked in areas with inadequate nursing staff that may increase the work load on them. This result is supported by the findings of June and Cho(2010) who summarized that inadequate staffing was associated with higher low back pain prevalence [1].

Another important finding in this study that, the more night shift the nurses had, the more prevalence of low back pain. This may be explained by decreasing the number of nursing staff during night shift may increase the work load on worked nurses causing low back pain.

Patients related factors of low back pain

The current study revealed that the majority of studied nurses who had low back pain worked with patients with severe illness. This is in agreement with Ovayolu et al.,(2014) who concluded that the more severity of patient's disease, the more prevalence of low back pain among nurses [16].

Personnel related factors of low back pain

The current study reported that about two thirds of studied nurses with low back pain didn't comply with body mechanics during their work compared to minority of nurses without low back pain. This is coincide with the result of Ovayolu et al. [16].

Moreover, the current study summarized that majority of studied nurses without back pain didn't wear high heeled shoes. This may be explained by decreasing the burden on the back muscle during nursing activities. Finally, majority of studied nurses of the current study who had low back pain didn't practice range of motion exercises (ROM) during their work. This is in agreement with the result of Ovayolu et al. [16]. This may be explained by ROM exercises relax muscles and relieve the greater tension of work load.

The concluded risk factors of low back pain

The results of the current study revealed that marital status (being married) was a significant predictor factor for low back pain among studied nurses. This result is in agreement with the result of Lela and Frantz (2012) who reported that there was a significant relationship between low back pain and marital status [18].

Also the current study showed that being obese was presented as a significant factor for low back pain. This is in accordance with Abou El- Soud etal., who mentioned that high BMI was significantly associated with low back pain among nurses [17]. Another study carried by Smith etal., reported that incresing body weight was associated with increasing the incidence of low back pain [19].

Moreover, the current study illustrated that the smaller available working space, increasing number of working hours/ days and work demands were presented as significant factors for low back pain. These resutls are in agreement with the study of Abou El-Soud et al. [17].

It was observed from the current study that if patients had multiple lines that need to be ensured and/or used mechanical ventilator or cardiac monitor were significantly associated with increasing incidence of low back pain. Those factors may be related to increase the need for doing mutiple activities at the same time for those patients that may increase work load on nurse's muscles especially back. Finally it was noticed from the present study that, nurses who didnt comply with body mechanics or didnt perform ROM during their work are signifocantly liable to low back pain than others.

All those results answer the second research question.

Characterestics of low back pain

Ovayolu et al.,(2014) concluded that about two thirds of their studied nurses with low back pain, had moderate pain [16]. This result is different from the result of the current study which revealed that more than two thirds of studied nurses with low back pain had sever pain. This difference may be because majority of the current studied nurses were married female that may make them more vulnerable to many risk factors of low back pain than others.

Regarding frequency of low back, the current study stated that more than one third of studied nurses with low back pain, were exposed to that pain once a week. This result is in agreement with June and Cho (2011) and Hinmikaiya and Bamishaiye (2012) who reported that more than one third of their studied nurses experienced LBP at least once a week [1,3].

In relation to negative impact of low back pain on nurses, it was noticed that more than half of studied nurses with LBP restricted their activities during pain episodes. This result is in accordance withHinmikaiya and Bamishaiye(2012) who reported that LBP made half of their sample restricting their activities [3].

Regarding how nurses manage their LBP, it was noticed from the current study that about half of studied nurses with LBP took medications to relieve pain either analgesics or muscle relaxants. This is differed from the result of Ovaylu et al.,(2014) who mentioned that minority of their sample took medications to relive pain(16). This may be explained by about two thirds of their sample had moderate pain compared to two thirds of the current studied nurses had sever LBP.

Conclusion

Based on the results of current study, it was concluded that:

1. A high prevalence rate of low back pain was found among nurses working in intensive care units and a high percentage of nurses pain was described as pain with sever intensity.
2. Many risk factors for low back pain for the studied nurses were identified: being married, increasing body mass index than 25k/m², units that didn't have enough working space, increasing average working hours/day, increasing number of patients with multiple lines, mechanical ventilators or cardiac monitors, not complying with body mechanics as well as not practicing range of motion exercises during work.

Recommendations

Based on the findings of the current study, the following recommendations can be suggested:

1. Periodic and continuous risk assessment of low back pain among nurses worked in ICU should be implemented by authorized personnel.
2. Organizational policies for preventing low back pain for nurses in ICU should be planned and implemented such as

decrease number of working hours/day and increase number of nursing staff in these units.

3. Intensive care units should have specialized equipment that help nurses to overcome specific risk factors such as electronic adjustable beds and lifts.
4. Periodic and continuous in-services training for nurses working in ICU on preventing and coping strategies for low back pain.
5. Replication of the study with large probability sample to allow for greater generalization of the results.

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