Magnitude of Low Back Pain and Associated Factors Among Nurses Working at Intensive Care Unit in Amhara Region Public Hospitals, Ethiopia

Bitew Tefera (bitewtefera1@gmail.com)  
Wolkite University

Haymanot Zeleke  
Debre Markos University

Abebe Abate  
Debre Markos University

Haimanot Abebe  
Wolkite University

Zebene Mekonnen  
Wolkite University

Yihenew Sewale  
Debre Birihan University

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Abstract

Background

Low back pain is a common public health problem throughout the world with the global prevalence from 28–86%. Nurses working in intensive care units are handling people who are critically ill and helpless, which requires more assistance for transferring and handling activities. This possesses a risk for low back pain but little is known about it in Ethiopia. The aim of this study was to assess the magnitude of low back pain and associated factors among nurses who work at an intensive care units in Amhara region public hospitals, North Ethiopia.

Methods

A multi-centered institution-based cross-sectional study was conducted at Amhara region public hospitals from March 1–30/2020. Simple random sampling technique after proportional allocation was used to select the study participants. Data were collected using a standard modified Nordic musculoskeletal assessment tool. After data were checked for completeness and consistency, it was entered into Epidata version 3.1 and exported to Statistical Package for Social Science software version 26 for analysis. Descriptive statistics were computed. A binary logistic regression model was used to identify factors associated with low back pain. Finally, those variables with a p-value of < 0.05 in multivariable analysis were considered statistically significant.

Result

-The study was conducted among 412 intensive care unit nurses giving a response rate of 97.6%. The magnitude of low back pain was 313 (76 %) [95% CI: (71.6%-79.9%)]. Being female [AOR = 2.674 (1.404, 5.076)], unavailability of assistive device for patient handling [AOR = 2.139 (1.035, 4.410)], lack of training on intensive care [AOR = 2.017 (1.092,3.943)], lack of regular exercise [AOR = 2.164 (1.164 ,4.108)] and job stress [AOR = 3.66 (1.955, 6.498)] were factors significantly associated with low back pain.

Conclusions

In this study the magnitude of low back pain was high. Being female, unavailability of assistive device for patient handling, lack of training on intensive care, lack of regular exercise and job stress were factors associated with low back pain. Policy makers and concerned bodies should give emphasis on accessibility of assistive devices for patient care, provision of training on intensive care and adaptive working environment for intensive care unit nurses.
Low back pain (LBP) is pain or discomfort in the spinal area localized between the 12th rib and the inferior gluteal folds with or without radiation to the lower extremities[1]. It is a condition commonly encountered in clinical areas affecting gluteal folds and lower rib cage [2]. It is neither a disease nor a diagnostic entity, but it is a pain of variable duration in the lower back area in response to internal and external stimulus [3]. Nurses are usually affected by low back pain due to their working condition which involves lifting and transporting patients or equipments in a difficult environment, especially in developing countries where assistive devices are not available [4]. The intensive care unit (ICU) is a special hospital ward in which critically ill patients are provided with comprehensive, accurate, and ongoing care. Nurses working in this ward play a crucial role in caring for critically ill patients [5].

Low back pain was the most commonly reported Work-Related Musculoskeletal Disorder among Intensive Care Unit (ICU) Nurses in China (80.1%) [6] and Korea (90.3%) [7]. Similarly, in Turkey, the prevalence of musculoskeletal disorder symptoms among nurses were 79% [8]. The prevalence of LBP among nurses in Africa was found to be 44.1%-82.7% [9] and 45.8–70.9 % in Ethiopia [10].

Previous studies identified that being female, married, older age, smoking, lack of regular exercise, being overweight, involving on works requiring frequent twisting and bending, prolonged standing at work place, inadequate staff and heavy weight lifting were factors associated with the experience of low back pain[4, 11]. Low back pain has numerous impacts on nurses, which includes time off work, increased risk of chronicity, as well as increased personal and medical cost [12]. It also leads to impaired professional function and decreased quality of care provided to the patient, negatively affecting health of the client [13].

Regular exercise to enhance the strength of abdominal and lower back muscles, using proper body mechanics while lifting patient, having rest intervals in occupational duties that require bending for long hours, and maintaining healthy living conditions by avoiding smoking and reducing excessive body weight are crucial for reducing the incidence of low back pain [14]. A multi-dimensional approach like training on intensive care, providing a manual for health care workers, encouraging and sensitizing nurses about safe handling of patients are also vital to prevent low back pain [15].

Even if the problem is huge, there are limited evidences on its magnitude and contributing factors in intensive care unit nurses in Ethiopia. Some previous studies conducted in Ethiopia by including all health care professionals, working in all units may undermine the real prevalence of low back pain among ICU nurses. Nurses who work in intensive care unit frequently complained low back pain and asked to have sick leave that needed to be identified with evidence.

The finding of this study revealed data on the magnitude and associated factors of low back pain among intensive care unit nurses in Amhara region public hospitals. Identifying factors associated with low back pain is an important input for policy makers and hospital administrative bodies to plan and implement preventive measures aimed at reducing the problem and associated decreased quality of nursing care. It also helps nurses to modify their behaviors that predispose to low back pain to avoid unnecessary
personal and medical cost. Therefore, this study was aimed to assess the prevalence and associated factors of low back pain in intensive care unit nurses in Amhara region public hospitals.

**Methods**

**Study design, setting and sample size**

Institutional based cross-sectional study was conducted from March 1–30/2020 in Amhara region public hospitals. Amhara region is one of the ten regional sates of Ethiopia with the capital city of Bahirdar, located 565 km away from Addis Ababa, the capital city of Ethiopia with a total population of 22,000,000. There are a total of 82 public hospitals in the region, of which 73 were primary, 3 were general and 6 were referral hospitals. Only general and referral hospitals provide intensive care services for the cathement population.

The required sample size (n) for the first objective was calculated by using single population proportion formula, assuming the prevalence (p) of low back pain as 50% since there were no previous similar study in Ethiopia context, 95% confidence interval, 5% margin of error (d) and 10% for possible non-response rate as follows;

\[
 n = \frac{z^2 \times (p \times q)}{d^2} = \frac{1.96^2 \times (0.5 \times 0.5)}{0.05^2} = 384
\]

and by adding 10% for possible non-response rate it becomes 422.

The minimum required sample size for the second objective was also calculated using epi-info software by considering factors associated with low back pain in other studies, 80% power, 1:1 ratio of exposed and non exposed, 95% confidence interval, 5% margin of error and adding 10% for possible non-response rate. Finally by taking the maximum value, the final required sample size for this study was 422.

**Sampling procedure**

There was a total of 82 public hospitals in Amhara region; of those, 73 were primary, 3 were general and 6 were referral hospitals. All general and referral hospitals having intensive care units were included in the study. The nine included public hospitals with there respective number of nurses currently working in intensive care units were:- Debre Markos referral hospital (53), Felege Hiwot comprehensive specialized hospital (65), Tibebe Gion comprehensive hospital (57), University Of Gonder comprehensive specialized hospital (60), Dessie referral hospital (58), Debre Birihan referral hospital (58), Enjibara general hospital (49), Debre Tabor general hospital (30) and Wollo general hospital (52).

Simple random sampling technique with lottery method after proportional allocation were used to select the study participants (n = 422) from each hospital.

**Data collection tool and procedure**

Data were collected using a self-administered structured questionnaire adapted from Standard Nordic Questionnaire to assess Musculoskeletal Disorders (MSDs) [16]. The questionnaire had five sections;
socio-demographic characteristics, low back pain status assessing questions, organizational related factors, work-related assessing questions and individual factors. Data were collected by nine nurses and three supervisors after one day training was given. One nurse for each selected hospital was assigned to collect data.

**Operational definitions**

**Low back pain**: Any pain felt in the low back region (localized between the 12th rib and the inferior gluteal folds) for at least one-day duration in the last twelve months [10, 17].

**Mild LBP**: Pain intensity on numeric scale score of 1–3 [10].

**Moderate LBP**: Pain intensity on numeric scale score of 4–6 [10].

**Severe LBP**: Pain intensity on numeric scale score of 7–10 [10].

**Job stress**: A nurse who scores the workplace stress scale of 21 or above [18].

**Regular exercise**: Performing physical activity three days/week for 20–30 minutes duration [19].

**Data quality control**

A pre-test was done on 5% (21) of the sample to check the reliability of the questionnaire. One day of training was given for the data collectors and supervisors before the actual data collection. Emphasis was given on the significance and the appropriate meanings of each question as well as how to explain it to the participants in an understandable manner. Daily basis review and checkups were done on each questionnaire for completeness, accuracy, and consistency of the collected data. The reliability of the tool was checked by Cronbach’s alpha, and the overall Cronbach’s alpha value of the tool was 0.86.

**Data processing and analysis**

After data was checked for completeness and consistency, it was entered using Epi-data software version 3.1 and exported to SPSS software version 26 for analysis. Descriptive statistics were computed and presented using text, tables and graphs. Binary logistic regression analysis was used to identify factors associated with low back pain. Variance inflation factor were used to check for the presence of multicollinearity. Model goodness of fit was tested by using Hosmer-Lemeshow statistic. All variables with P < 0.25 in the bivariate analysis were included in the final model of multivariable analysis to control all possible confounders. The degree of association between dependent and each independent variable was assessed using an adjusted odds ratio with 95% CI and variables that have a p-value of < 0.05 were considered statistically significant.

**Results**

**Socio-demographic characteristics of the participants**
From 422 total sample size, 412 intensive care unit nurses were participated in the study giving a response rate of 97.6%. The mean age of participants was 30 years with a standard deviation of ± 3.56. The majority of study participants were between 30–39 years old (89.3%) and married 233 (56.6%). (Table 1)

Table 1
Socio-demographic characteristics of intensive care unit nurses in Amhara Region public hospitals, Amhara, Ethiopia, 2020 (N = 412)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>20–29</td>
<td>10</td>
<td>2.4%</td>
</tr>
<tr>
<td></td>
<td>30–39</td>
<td>368</td>
<td>89.3%</td>
</tr>
<tr>
<td></td>
<td>&gt;=40</td>
<td>34</td>
<td>8.3%</td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
<td>217</td>
<td>52.7%</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>195</td>
<td>47.3%</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Amhara</td>
<td>349</td>
<td>84.7%</td>
</tr>
<tr>
<td></td>
<td>Tigre</td>
<td>22</td>
<td>5.3%</td>
</tr>
<tr>
<td></td>
<td>Oromo</td>
<td>41</td>
<td>10.0%</td>
</tr>
<tr>
<td>Religion</td>
<td>Orthodox</td>
<td>297</td>
<td>72.1%</td>
</tr>
<tr>
<td></td>
<td>Muslim</td>
<td>57</td>
<td>13.8%</td>
</tr>
<tr>
<td></td>
<td>Protestant</td>
<td>53</td>
<td>12.9%</td>
</tr>
<tr>
<td></td>
<td>Others (catholic)</td>
<td>5</td>
<td>1.2%</td>
</tr>
<tr>
<td>Educational status</td>
<td>Diploma</td>
<td>54</td>
<td>13.2%</td>
</tr>
<tr>
<td></td>
<td>Degree</td>
<td>328</td>
<td>79.6%</td>
</tr>
<tr>
<td></td>
<td>Masters and above</td>
<td>30</td>
<td>7.2%</td>
</tr>
</tbody>
</table>

Organizational related factors

Almost half of the respondents (49.8%) were from referral hospitals. Out of 412 study participants, 341 (82.8%) of them were working in shift (day and night alternatively) and fifty-five percent of the respondents work in different units with year based shifting schedule. Regarding staff adequacy, 294 (71.4%) of the respondents reported that there was no adequate staff for assistance during patient transferring and handling activities. Two-thirds (66%) of participants reported that there were assistive devices in their working unit like wheelchair, transferring bed, etc. for patient handling activities. The majority 343 (83.3%) of the study participants reported that there was no special training center in their working hospital.

Work-related factors
Majority 349 (84.7%), of the study participants performed repetitive tasks requiring frequent bending and twisting in their working unit. About 314 (76.2%) of respondents lift heavy weight (>10kg) manually in their unit and position patients frequently. About 70% of participants were standing long (>1 hour) while performing nursing procedures and 281 (68.2%) of them worked while physically fatigue.

**Individual and psychosocial factors**

More than half 215 (52.2%) of study participants have 2 to 5 years of working experience in nursing (Fig. 1). The majority of the respondents, 348 (84.5%) had a normal body mass index and above half (56.3%) of them had no habit of doing regular exercise. (Table 2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current ICU working unit</td>
<td>Adult ICU</td>
<td>193</td>
<td>46.8%</td>
</tr>
<tr>
<td></td>
<td>Neonatal ICU</td>
<td>219</td>
<td>53.2%</td>
</tr>
<tr>
<td>Training on ICU</td>
<td>Yes</td>
<td>215</td>
<td>52.2%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>197</td>
<td>47.8%</td>
</tr>
<tr>
<td>Body mass index (BMI)</td>
<td>&lt;18.5</td>
<td>61</td>
<td>14.8%</td>
</tr>
<tr>
<td></td>
<td>18.5–24.9</td>
<td>348</td>
<td>84.5%</td>
</tr>
<tr>
<td></td>
<td>&gt;25</td>
<td>3</td>
<td>0.7%</td>
</tr>
<tr>
<td>How long do you sleep per day</td>
<td>&lt;8hrs</td>
<td>287</td>
<td>69.7%</td>
</tr>
<tr>
<td></td>
<td>≥8hrs</td>
<td>125</td>
<td>30.3%</td>
</tr>
<tr>
<td>Job stress</td>
<td>Yes</td>
<td>257</td>
<td>62.4%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>155</td>
<td>37.6%</td>
</tr>
</tbody>
</table>

**Prevalence of low back pain and related characteristics**

Among the total study participants 313 (76%) of them experienced low back pain for at least one day duration in the last 12 months. Majority of them had experienced low back pain level of moderate intensity (Fig. 2). From those participants who experienced LBP 87 (27.8%) of them experienced pain radiated to the lower extremities and 183 (58.5%) of them used antipain medications. Almost one-fourth (24.3%) of study participants with low back pain thought to change their job and 111 (35.5%) of them were absent from work due to low back pain.

**Factors associated with low back pain**
In bivariable logistic regression analysis factors such as; sex, age, marital status, work shift, presence of adequate staff, availability of assistive devices, training on intensive care, frequent bending or twisting, manual heavy weight lifting, frequent positioning and transferring of patients, working when physically fatigue, performing repetitive tasks, long standing (> 1hr), regular exercise, alcohol use, year of experience and job stress were associated with low back pain at p-value < 0.25. In multivariable logistic regression analysis; sex, availability of assistive device, special training on intensive care, regular exercise and stress were significantly associated with low back pain.

Female were 2.674 times [AOR = 2.674 (1.404, 5.076)] more likely to experience low back pain than males and those nurses working in intensive care units without assistive device for patient handling in their hospital were 2 times[AOR = 2.139 (1.035, 4.410)] more likely to develop low back pain than those who had assistive devices. The odds of experiencing low back pain were almost two times [AOR = 2.017 (1.092,3.943)] higher among nurses who didn't take special training on intensive care than the counter part. Intensive care unit nurses who didn't perform regular exercise were nearly 2 times [AOR = 2.164 (1.164,4.108)] at risk for experiencing low back pain than those with habit of regular exercise. Job stress were increased the likelihood of experiencing low back pain by 3.6 times [AOR = 3.66 (1.955, 6.498)] as compared to those who didn't have job stress. (Table 3)

Table 3
Multivariable logistic regression analysis of factors associated with LBP among ICU nurses working at Amhara region public referral and general hospitals, 2020 (N = 382)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Categories</th>
<th>LBP</th>
<th>95% confidence interval</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
<td>COR</td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
<td>183</td>
<td>34</td>
<td>2.691(1.679,4.314)</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>130</td>
<td>65</td>
<td>1</td>
</tr>
<tr>
<td>Regular exercise</td>
<td>No</td>
<td>200</td>
<td>32</td>
<td>3.706(2.293,5.990)</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>113</td>
<td>67</td>
<td>1</td>
</tr>
<tr>
<td>Job stress</td>
<td>Yes</td>
<td>223</td>
<td>34</td>
<td>4.737(2.926,7.668)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>90</td>
<td>65</td>
<td>1</td>
</tr>
<tr>
<td>Assistive devices availability</td>
<td>No</td>
<td>124</td>
<td>16</td>
<td>3.403(1.903,6.085)</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>189</td>
<td>83</td>
<td>1</td>
</tr>
<tr>
<td>Training on ICU</td>
<td>No</td>
<td>169</td>
<td>28</td>
<td>2.976(1.822,4.861)</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>144</td>
<td>71</td>
<td>1</td>
</tr>
</tbody>
</table>
Discussion

Low back pain is a major cause of disability that affects the quality of life as well as work performance. The high prevalence of low back pain in intensive care unit nurses negatively affect the quality of care in nursing, since patients in the ICU needs nurses's assistance every minute of their life.

In this study, the magnitude of low back pain was 76 % [95% CI: (71.6%-79.9%)]. This is in line with a studies conducted in Nigeria (73.5%) [4], Egypt (79%)[11] and Rwanda 78% [20]. This might be due to similar operational definition of low back pain, study design and setting.

However, the prevalence of low back pain in this study was lower than different studies conducted in china (80%) [6] and Taiwan (82%) [21]. The discrepancy might be due to differences in pain reporting culture, lifestyle and socio-demographic characteristics of study participants.

On the other hand, it was higher than a study conducted in Saudi Arabia (51.2%) [22], Malaysia (63.1%), Brazil (67%), Bahirdar, Ethiopia (64.07%) [9], Wollega (63.3%)[18] and Addis Ababa, Ethiopia (45.8%)[10]. The difference might be due to, previous studies include all nurses working in all units, which results in a difference in the assigned task in which they are responsible; where ICU nurses are assigned with critically ill patients needing close follow-up that increase the prevalence of low back pain in the current study.

In this study, females were 2.67 times more likely to develop low back pain than male. This finding is supported by studies conducted in Uganda [23], South Africa [24] and Nigeria [25]. This is due to physiologically low disk space in females that predispose to low back pain and hormonal effects (especially in postmenopausal women, estrogen level decreases and collagen wasting occurs, as a result females might experience low back pain more than males). The physical stress of child-rearing and perimenopausal abdominal weight gain may also contributes to the occurrence of low back pain in females [26].

In this study, ICU nurses who didn't perform regular exercise were 2.16 times more likely to experience low back pain when compared with those nurses who perform regular exercise. This is in line with studies conducted at Adama hospital medical college staff and turkey Istanbul ICU nurses [17, 27]. The possible justification could be regular exercise improves physical fitness, which prevents easily fatigability of back muscles that reduces the incidence of low back pain[28]. The other possible reason is, those nurses who perform regular exercise can acquire normal body weight, which indirectly prevents low back pain by reducing their weight; since most studies suggested that overweight nurses are more at risk for low back pain when compared with nurses who have normal body weight[11].

In this study, those ICU nurses who had job stress were 3.66 times more likely to experience low back pain when compared with those who didn’t have job stress. This finding is supported by a study conducted at Addis Ababa, Ethiopia among nurses [10]. The possible justification could be when ICU nurses become
stressed at work by different assigned tasks, they become physically fatigued and fatigue negatively influences pain receptors by increasing sensation, leading to low back pain.

In the current study, ICU nurses who didn’t have an assistive devices (wheelchair, lift, transfer beds, automated beds...) for patient handling were 2.3 times more likely to experience low back pain when compared with ICU nurses who had an assistive device. This finding is supported by cross-sectional studies conducted in Gaziantep Turkey [29] and Nigeria [28]. The possible justification could be, when ICU nurses use available assistive devices for patient handling activity they can easily perform their activity without fatigability and the workload on their body especially on their lower back decreased as a result the occurrence of low back pain will be reduced.

Lack of special training on intensive care was also the other factor that was significantly associated with the experience of low back pain among ICU nurses. The odds of experiencing LBP in this study were almost doubled in those ICU nurses who didn’t take training on intensive care when compared with those who have taken the training. This study was supported by a study conducted in Wollega [18]. It is also strengthened by an interventional study which was conducted in turkey, that showed health care staff who engaged in training on patient transferring and lifting perform six out of seven behaviors better than they did previously [30]. Even though the exact relationship between taking training and low back pain was not established, training increases awareness of nurses towards preventive measures of low back pain in work place that leads to behavioral change and maintenance of workplace safety cultures [18].

Conclusion

The prevalence of low back pain among intensive care unit nurses in Amhara region was found to be high. Being female, unavailability of assistive device for patient handling, lack of training on intensive care, lack of regular exercise and job stress were factors significantly associated with low back pain. Health policy makers and hospital administrative bodies should give emphasis on accessibility of assistive devices for patient care, provision of training on intensive care and adaptive working environment for intensive care unit nurses. Research evidence using prospective cohort study is also recommended to establish cause and effect relationship.

Limitation Of The Study

- Since it was a cross-sectional study it may not show cause and effect relationship and may have recall bias

List Of Abbreviations

- **AOR**: Adjusted Odds Ratio
- **BMI**: Body Mass Index
- **ICU**: Intensive Care Unit
- **LBP**: Low Back Pain
- **MSD**: Musculo - Skeletal Disorder
- **SPSS**: Statistical Package for Social Sciences
- **WRMSDs**: Work Related Musculo -
Declarations

Ethics approval and consent to participate

Ethical approval was obtained from Debre Markos University ethical review board. Informed and voluntary written consent was obtained from each study participant. Confidentiality of personal informations were assured through coding and aggregate reporting. All methods were carried out in accordance with relevant guidelines and regulations of BMC Musculoskeletal Disorders Journal. All COVID-19 preventive measures were implemented through out the data collection period.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study will be available from the corresponding author on reasonable request.

Competing of interests

Authors declared no any conflicts of interest with respect to the research, authorship or publication of this article.

Funding

The authors received no funding

Author’s contribution

**BT**: draft proposal, lead data collection and analysis process, wrote final thesis and prepare manuscript, **HZ** and **AA**: Revised and edit proposal & thesis, support data collection and analysis, revised thesis manuscript, **HA, ZM** and **YS**: Reviewed different literatures, revised proposal, thesis manuscript and participated in data collection. All authors revised, consent and approved the final version of the thesis and manuscript.

Acknowledgment

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References


Figure 1

Working experience of nurses in intensive care units of Amhara region public hospitals, Amhara, Ethiopia. 2020
Figure 2

Low back pain intensity level of intensive care unit nurses in Amhara region public hospitals, Amhara, Ethiopia, 2020