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ORIGINAL ARTICLE

PREVALENCE AND RISK FACTORS FOR LOW BACK PAIN AMONG NURSES WORKING AT TWO REFERRAL HOSPITALS IN ADDIS ABABA, ETHIOPIA

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ABSTRACT

Introduction: *Low back pain (LBP) is a common cause of morbidity in the general public as well as the healthcare professionals. The lifetime prevalence of LBP among nurses is high. There is limited information about the problem among nurses working in hospitals in Ethiopia. The aim of this study was to assess the prevalence and risk factors of LBP among nurses working at Zewditu Memorial (ZMH) and Tikur Anbessa Specialized hospitals (TASH), Addis Ababa, Ethiopia.*

Methods: *A cross-sectional study including randomly selected nurses currently working in the above two hospitals was conducted using a structured self-administered questionnaire.*

Results: *Among 316 nurses, 123 (38.9%) males and 193 (61.1%) females), the 12-month prevalence of LBP was 46.5% with a slightly higher prevalence among female nurses (50.3%). The significant risk factors were long working hours [AOR=.001, 95%CI: 3.353 (1.632-6.887)], poor body posturing [AOR = .000, 95%CI: 4.080 (2.191-7.601)], direct patient contact [AOR = 0.004, 95%CI: 4.168 (1.566-11.097)] and history of trauma [AOR= .001, 95%CI: 15.783 (3.038-82.007)]. These significant risk factors also happened to independently predict the prevalence of LBP [direct patient contact [AOR 2.542 (95% CI 1.135– 5.695)]; bad body posture [AOR 4.404 (95% CI 2.593– 7.480)]; previous history of trauma [AOR 11.542 (95% CI 2.382– 55.931)] and long working hours [AOR 0.972 (95% CI 0.972– 0.992)]. Only 13 (8.8%) nurses reported severe LBP. Chronic LBP accounted for 83.7% of cases. Only 63 (42.9%) nurses sought medical treatment. Forty-nine (27.1%) nurses had been on medical leave at one time or another in the past one year and the total workdays lost were 427.*

Conclusion: *Nearly half of the study population reported low back pain that started after they commence nursing job. Longer working hours, poor body posturing, direct patient contact and history of trauma were found to have a significant association with low back pain prevalence and each of them happen to be an independent predictor of low back pain among nurses.*

Keywords*: back-pain, nursing, occupational hazard, lost workdays.*

INTRODUCTION

Low back pain (lumbago or lumbosacral pain) is localized to a region below the 12th rib and above the gluteal folds. LBP is a common cause of morbidity in the general as well as the working population. The prevalence of LBP in general population is 60-85%, making it a significant medical problem throughout the world with a predilection for female gender and persons between the ages of 40–80 years (3- 5). It occurs in similar proportions in all cultures, interferes with quality of life and work performance, and is the most common reason for medical consultations (6). There is a higher lifetime prevalence of LBP among nurses, ranging from 56% and 90% (7, 8). The most common risk factors for LBP among nurses seem to be heavy lifting, often with a bent or twisted posture while caring for a hospitalized patient. Biomechanical investigations confirm that such tasks generate high spinal stresses (9).

Different studies have reported a higher 12-month prevalence of LBP among nurses (10, 12,14,15, 22). Work related factors such as working in departments with a high work overload, long work experience, prolonged standing, poor body posturing, and performing lifting and transferring have been reported as major risk factors(10,11,13,22). Female nurses are susceptible to LBP due to factors like parity and a higher number than male nurses (14,15). Obesity is also a common predisposing factor (10). Most nurses report new symptoms of LBP occurring at least once a week, after they started practicing nursing (11,12). While some groups have reported high prevalence of mild chronic LBP (11,13), others have found a higher proportion of nurses to suffer from an acute lasting severe LBP (13,14,21).

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The treatment seeking behavior of nurses suffering from LBP is reported to be poor. Those who seek treatment also tend to prefer traditional remedies (12). Only few nurses with LBP request for leave of absence. Most applied sick leaves are denied due to technical or administrative reasons. The duration of granted sick leaves is also very short.

Number of lost work days is not significant as well (12-15). Though knowledge of back-care hygiene is important in preventing LBP, only few nurses know how to take care of their backs (14,15).

Ethiopia suffers from an acute shortage of health care workers at every level. Federal Ministry of Health (FMoH) statistics showed that the total number of nurses with BSc and diploma in the 2nd and 3rd phases of Health Sector Development Program (HSDP) were 17,300 (1:4,222) and 18,146 (1:4, 250). Respectively. (16,17). This increases the exposure of nurses to work overload related musculoskeletal disorders. Despite the growing literature on LBP among the nursing staffs, very little is known about the state of the problem in Ethiopia. The main objective of this study was to determine the prevalence and risk factors of LBP among nurses working in TASH and ZMH.

METHODS

Study area

TASH is the largest referral public hospital in Ethiopia and serves as the main teaching hospital for both clinical and pre-clinical education of most of the disciplines. It was transferred over to Addis Ababa University, College of Health Sciences in the year 1998. It is also an institution where specialized clinical services are rendered to the whole nation. It has around 700 beds. By the time this study was conducted, the hospital had a total of 836 nurses.

Zewditu Memorial Hospital is one of the hospitals being operated by the Ministry of Health. It is Ethiopia's leading hospital in the treatment of HIV patients. At the time of the study, the hospital had 264 nurses working in different departments.

Study design and period

An institution based cross-sectional study was conducted among nurses working at TASH and ZMH, Addis Ababa, Ethiopia from August 01, 2016 to December 30, 2016.

Sample size and sampling technique

Among nurses employed by TASH and ZMH, those who had one year or more work experience were included in the study.

Nurses who were pregnant or had delivered in the past three months, nurses in training and those who had a history of LBP before commencing nursing were excluded from this study. The sample size was determined using the formula for single population proportion by considering 50% prevalence (since there has not been a published study done regarding the prevalence and risks of LBP in nurses of both TASH and ZMH before), 95% level of confidence and 5% margin of error. The final sample size was 384 nurses. Convenience sampling technique was used due to financial constraints.

Data collection material and process

The Nordic Musculoskeletal Questionnaire was developed from a project funded by the Nordic Council of Ministers with the aim of developing and testing a standardized questionnaire methodology allowing comparison of low back, neck, shoulder and general complaints to be used in epidemiological studies (9). A self-administered modified Standardized Nordic questionnaire for the analysis of LBP was prepared and distributed to be filled by all participating nurses. The questionnaire consisted of 33-item questions. Questionnaires were distributed to be filled by participating nurses and later were collected back by lead nurses assigned by the principal investigator.

Data processing analysis

Data were uploaded to IBM SPSS statistics version 21. Descriptive statistics of the collected data was performed for most variables in the study using statistical measurements. Frequency tables, percentages, means, and standard deviations were used. A bi variate analysis was done to identify a significant association between the dependent variables and prevalence of low back pain on the basis of OR, with 95% CI and p-values < 0.05. A multivariate analysis was done using a binary logistic regression to see if those variables which happened to have a significant association on bivariate analysis were an independent predictors of low back pain prevalence.

Data quality assurance

Each questionnaire was checked for completeness and those that were found to be incomplete were eliminated from the research. Based on this requirement, 68 questionnaires were excluded.

Ethics approval and consent to participate

The protocol approval was obtained from the Ethical Review Committee of the Department of Neurology and the Institutional Review Board (IRB) and Research and Publication Committee of the School of Medicine of Addis Ababa University.

Before questionnaires were filled, study subjects were given details of the study aim and were provided with clear informed written consent at the beginning of the questionnaire. No names were required and confidentiality was guaranteed. Participants were informed that they can withdraw at any time and guaranteed that data was only to be used for research purpose. The research was performed in accordance with the Declaration of Helsinki.

RESULTS

Of the total 316 study participants, 123 (38.9%) were males and 193 (61.1%) were females. Out of the total respondents, 147 (46.5%) suffered from LBP.

Among all, 50 (40.7%) males and 97 (50.3%) female participants reported having LBP. There was no significant association (P>0.05) between gender (sex) and prevalence of LBP among nurses. **(**Table 1 and Table 2**).** The average age of responders was 31.6+/-8.4 yrs. Two-thirds of participants were between the ages of 18-30 years. There was no significant association between LBP, age or marital status of the participants (P >0.05)**.**

Table 1: Monovariate analysis of variables affecting LBP in nurses in the year 2016

Variables	Category	Frequency	Percentage
Age (year)			
	<30	188	59.5
	31-40	86	27.2
	>40	42	13.3
Gender	Male	123	38.9
	Female	193	61.1
Marital status	Single	136	42.9
	Married	167	53.0
	Divorced	13	4.1
Number of children	0	164	51.9
	1-3	124	39.2
	≥4	28	8.9
Cigarette smoking	Current	15	4.7
	Quitted	292	92.4
	Never	9	2.8
BMI	<18.5	26	8.2
	18.5 – 24.9	220	69.6
	≥ 25	70	22.2
Working department	OR	42	13.3
	Emergency	47	14.9
	Medical ward	15	4.7
	Surgical ward	32	10.1
	Orthopedic ward	20	6.3
	GYN/OBS	33	10.4
	Pediatric ward	16	5.0
	ICU	37	11.7
	Office work	5	1.6
	OPD	69	21.8
Direct patient contact	Yes	275	87.0
	No	41	13.0
Perform lifting patient or objects	Yes	217	68.7
	No	99	31.3
Number of lift or transfer per day	1-5	148	68.2
	6+	69	31.8
Working hour (per week)	< 50 hours	246	77.8
	≥ 50 hours	70	22.2
Poor body posture	Yes	195	61.7
	No	121	38.3
Knowledge about back care	Yes	190	60.1
	No	126	39.9
Job satisfaction	Poor	95	30.1
	Neutral	141	44.6
	High	80	25.3
Nursing experience	≤ 5years	195	61.7
	> 5 years	121	38.3
Current participation in regular exercise	Yes	103	32.6
	No	213	67.4
	Yes	18	5.7
Previous history of trauma	No	298	94.3

Two hundred twenty (69.6%) nurses had a normal BMI and only five were obese. Only 95 (43.2%) nurses with a normal BMI reported of having LBP **(**Table 2**).** Of the 15 nurses working in Medical wards, 11 (73.3%) reported having LBP and of 16 Pediatric and 32 Surgical ward nurses, 12 (75.0%) and 19 (59.4%) complained of LBP, respectively **(**Table 2**)**.

Nursing experience above 5 years, working hour greater or more than 50 hours per week and having direct patient contact were found to have a significant association with the risk of having lower back pain. But, there was no significant association between the prevalence of LBP and job satisfaction, performing patient or object lifting and the number of lifts or transfers done per day **(**Table 2**)**.

One hundred ninety respondents (60.1%) had previous knowledge of back care hygiene of whom 99 (51.1%) had LBP. 48 (38.1%) LBP respondents had no knowledge of back care hygiene **(**Table 1 and Table 2**)**. Among non-occupational risk factors studied, only previous history of trauma to the back showed a significant association with LBP. Of the 316 participants, 18 (5.7%) reported a previous history of trauma to their back and 16 (88.9%) of them complained of having LBP (P=0.00, COR=10.2) A previous history of trauma, poor body posturing, direct patient contact and prolonged working hour happened to increase the risk of LBP **(**Table 2**)**.

Table 2: Association of variables with prevalence of LBP in nurses in the year 2016

Variables		**Number**	**With LBP**	**%**	**P Value**	**AOR (95% CI)**
	<30	188	39	42.9		
Age (years)	31-40	86	38	44.2	.712	.830(.309-2.231)
	>40	42	13	43.3		
	Male	123	50	40.7	.175	.667 (.371-1.197)
Gender	Female	193	97	50.3		
	Single	136	62	45.6		
Marital status	Married	167	81	48.5	.272	1.490(.732-3.035)
	Divorced	13	4	30.8		
Number of children	0	164	75	45.7		
	1-3	124	56	45.2	.136	.587(.291-1.182)
	>= 4	28	16	57.1		
Cigarette smoking	Current	15	4	26.7		
	Never	292	137	46.7	.089	.404(.142-1.150)
	Quitted	9	6	66.6		
BMI	<18.5	26	10	38.5		
	18.5 – 24.9	220	95	43.2	.185	1.590(.801-3.158)
	≥ 25	70	42	60		
	OR	42	14	33.3		
	Emergency	47	18	38.3		
Working department	Medical ward	15	11	73.3		
	Surgical ward	32	19	59.4		
	Orthopedic ward	20	6	30.0	.058	2.922(.963-8.872)
	GYN/OBS	33	16	48.5		
	Pediatric ward	16	12	75.0		
	ICU	37	14	39.5		
	Office work	5	4	80.0		
	OPD	69	33	47.8		

The following risk factors were found to independently predict the prevalence of LBP among nurses: direct patient contact [AOR 2.542 (95% CI 1.135– 5.695)]; bad body posture [AOR 4.404 (95% CI 2.593 – 7.480)]; previous history of trauma [AOR 11.542 (95% CI 2.382– 55.931)] and long working hours [AOR 0.972 (95% CI 0.972– 0.992)] (Table 3).

Table 3: Independent predictors of LBP prevalence in nurses in the year 2016

Variables	P value	AOR	95% CI for AOR	
			Lower	Upper
Direct patient contact	0.023	2.542	1.135	5.695
Bad body posture	0.000	4.404	2.593	7.480
Previous history of trauma	0.002	11.542	2.382	55.931
Long Working hours	0.007	0.972	0.972	0.992

Regarding LBP frequency, of the 147 nurses with LBP, 3.4% complained of having a daily LBP, 37.4% had LBP once a week and 27.2% had LBP a few times a year. 50.3% and 8.8% complained of mild and severe LBP, respectively. 94 (63.9%) reported having LBP in the last seven days. 123 (83.7%) nurses reported LBP that lasted more than three months **(**Table 4**)**. Forty-nine (33.3%) respondents with LBP had been off duty at one time or the other in the past one year.

Out of this, the duration of sick leave was 1–10 days among 28.6% of nurses. Only one reported 3 months of off-duty. The total working days for all respondents were 115,340 days (316 X 365) and total off-duty days were 427 (0.37%). Of those with LBP, 63 (42.9%) sought treatment. 50 (34.1%) and 22 (14.9%) sought relief from painkillers and physiotherapy, respectively. 19 (12.9%) had bed rest. One (0.6%) had undergone surgery. About 40 (27.1%) who reported LBP had to change working department or duty.

Table 4: Frequency, severity, chronicity, lost work days and type of treatment sought due to LBP in the year 2016

	Category	Number of nurses	%
Frequency of LBP	Daily	5	3.4
	Once a week	55	37.4
	Once a month	29	19.7
	Few times a year	40	27.2
	Less than once a year	18	12.3
	Those with LBP within the past 1 week	94	63.9
Severity of LBP	Mild	74	50.3
	Moderate	60	40.8
	Severe	13	8.8
Chronicity of LBP	≤ 3 months	24	16.3
	>3 months	123	83.7
Number of lost workdays due to LBP	1-5	20	13.6
	6-10	22	15.0
	11- 15	3	2.0
	>15	4	2.7
	Total work days lost	427	0.37
Treatment sought	Painkillers	50	34.1
	Muscle relaxant	0.0	0.0
	Use of back belt	3	2.0
	Physical exercise	9	6.1
	Physiotherapy	22	14.9
	Surgery	1	0.6
	Bed rest	19	12.9
	Traditional	2	1.4
	Changed working department or duty	40	27.1
	Others	1	0.6
	No treatment sought	84	57.1

DISCUSSION

This study found that half of the participating nurses had back pain. LBP was significantly associated with work hours, poor body posture, direct patient contact and history of trauma. The 12-month prevalence of LBP was 46.5%, with a female preponderance (50.3%), and majority of participants reported chronic LBP (83.7%). Surprisingly only 63 (42.9%) nurses with LBP sought medical treatment. Forty-nine (27.1%) nurses had been off duty in one time or another in the past one year, and the total workdays lost were 427 days.

The high 12-month prevalence is closer to results reported by other groups (12, 15, 21, and 22). This could be due to the critical shortage of staff nurses, and higher workload in all patient care setups. Females were found to have a higher prevalence of LBP. This might be due to the fact that they slightly outnumber male nurses. Other studies have also reported a higher LBP prevalence in females (14,15,22).

Age was not found to increase the risk of LBP. This could be explained by the fact that more than half of the nurses who participated in the study were below the age of 30 years and these age groups are not expected to have a long experience that can predispose them to LBP. Our result concurs with that reported by others (12).

Marital status, parity, cigarette smoking or BMI did not affect the risk of LBP. Though more than half of the nurses were married, only 28 had 4 or more kids. Among 25 (4.7%) nurses who gave a current smoking history, only 4 (26.7%) reported LBP. 42 (60%) nurses with BMI of 25 or more reported LBP. But unlike other published reports (10,13) BMI did not stand out as an independent risk factor of LBP.

A higher number of nurses with working experience of more than five years reported LBP (53.7%). However, seniority at work was not a significant risk factor of LBP. The likely explanation for lack of an association between age and LBP is the gradual reduction in time spent at bedside nursing and an increase in their administrative role. Other studies also reported a high prevalence of LBP among those who had long work experience (10,11,13).

Direct patient contact (P=0.008, AOR=3.453, CI = 1.378-8.653), hours of work per week (P=0.001, AOR = 3.319, CI = 1.654-6.659) and poor body posture (P=0.000, AOR=4.286(2.349-7.820) were found to increase the risk of LBP independently. These factors are known to predispose nurses to occupational hazards. Many studies have reported a strong association between LBP and work-related factors (7,10,12-20,22).

A higher percentage of nurses working in Medical, Surgical and Pediatric wards reported LBP but there was no significant association with LPB risk (P>0.05). When compared to OR and ICU, prolonged standing, poor body posturing and lifting and transferring of either patients or objects is lower in the wards. In other studies, the highest percentage of LBP was found among nurses working in the ICU and Surgical, Internal Medicine and Obstetrics and Gynecology departments including labor room (14,15).

Many nurses were unaware of back care ergonomics. Of those who reported knowing how to take care of their backs (190), 51.1% had LBP. So the mere presence of back care knowledge is not adequate and nurses need to practice them in their daily practice. A significant association between ergonomic risk factors and prevalence of LBP were reported by others too (15,19,22).

Except for a previous history of trauma to the back (P-value = 0.001, AOR = 14.635 (2.958-72.414)), other non-occupational risk factors did not turn out to have a significant association with LBP. Trauma is a known risk factor for LBP. The majority (50.3%) of nurses had mild LBP. This could be due to the fact that most (123 (83.7%)) of the nurses had chronic LBP and the most reported frequency of LBP was once a week (37.4%) and few times a year (27.2%). Only 13 (8.8%) nurses had severe LBP. While some groups have reported similar results regarding frequency and chronicity of LBP (11,13), others have found a higher proportion of nurses to suffer from an acute lasting severe LBP (13,14,21).

Only 63 nurses with LBP (42.9%) sought treatment. This poor treatment-seeking behavior might be a result of the fact that the majority of the nurses suffered from mild LBP or due to poor knowledge about LBP treatments or negligence. Majority sought relief from painkillers (34.1%), physiotherapy (14.9%) and bed rest (12.9%). Others have found that only 34.1% of LBP sufferers sought treatment and 60.5% preferred traditional treatments over modern treatments (27.7%) (12).
Of all nurses with LBP, only 49 (27.1%) nurses had been off duty at different occasions in the past one year and reported about 427 (0.37%) lost workdays of the total 115,340 working (316 x 365) days. Given the high prevalence of LBP, it is not associated with a significant loss of work days. Since the majority of nurses suffer from mild LBP, they may not need a longer off-duty day. Others have found that though longer sick-leaves were medically advised, only a few of the applied for sick leaves were approved (15).

Since it is a hospital-based study involving only one profession, the result might not be generalizable to the general population. Convenience sampling method may also have introduced selection bias. Even though this study tried to address some important factors, the result of the study was dependent on self-reported data of the participants which were susceptible to recall bias causing under or overestimation.

Conclusion

Though it is not associated with a significant loss of work days, nearly half of nurses reported LBP. Longer working hours, poor body posturing, direct patient contact and history of trauma were significant independent predictors of LBP. Poor treatment seeking behavior and low knowledge of back care ergonomics were noted. Increasing the number of staff nurses, creating back care hygiene training and updates, equipping hospitals with basic lifting aids, encouraging nurses to engage in regular physical exercises and motivating them to seek treatment for LBP is recommended to decrease work-related hazards as well as the prevalence of LBP among nurses.

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Competing interests

The authors declare that this manuscript was approved by all authors in its current form and that no competing interest exists.

Authors' contribution

HA wrote the proposal and participated in data collection and analysis. She also wrote the manuscript. AT approved the proposal with some revisions and revised subsequent drafts of the manuscript. All authors have read and approved the manuscript.

REFERENCES

1. Owoeye I. The human back: physical examination and physical assessment. JNMRT. 1999;4(7):1-6.
2. Waheed A. Effect of interferential therapy on low back pain and its relevance to total lung capacity. JNMRT. 2003;8(2):6-18.
3. Biering-Sørensen F. A prospective study of low back pain in a general population. I. Occurrence, recurrence and aetiology. Scandinavian journal of rehabilitation medicine. 1983;15(2):71-9.
4. Andersson GB. Epidemiological features of chronic low-back pain. The lancet. 1999;354(9178):581-5.
5. Hoy D, Bain C, Williams G, March L, Brooks P, Blyth F, et al. A systematic review of the global prevalence of low back pain. Arthritis & Rheumatism. 2012;64(6):2028-37.
6. Ehrlich George E. Low back pain/Ehrlich George E. Bulletin of the World Health Organization. 2003;81:671-6.
7. Smedley J, Egger P, Cooper C, Coggon D. Manual handling activities and risk of low back pain in nurses. Occupational and environmental medicine. 1995;52(3):160-3.
8. Knibbe J, Friele R. Prevalence of back pain and characteristics of the physical workload of community nurses. Ergonomics. 1996;39(2):186-98.
9. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Applied ergonomics. 1987;18(3):233-7.
10. Aljeesh Y, Nawajha S. Determinants of low back pain among operating room nurses in gaza governmental hospitals. J Al Azhar Univ Gaza (Nat Sci). 2011;14:41-54.
11. Shawashi TO, Subih MM, Al Hadid LAR, Abu Adas M. Occupational-related back pain among J ordanian nurses: A descriptive study. International journal of nursing practice. 2015;21:108-14.
12. Wong T, Teo N, Kyaw M. Prevalence and Risk Factors Associated with Low Back Among Health Care Providers in a District Hospital. Malaysian Orthopaedic Journal. 2010;4(2):23-8.
13. El-Soud AMA, El-Najjar AR, El-Fattah NA, Hassan AA. Prevalence of low back pain in working nurses in Zagazig University Hospitals: an epidemiological study. Egyptian Rheumatology and Rehabilitation. 2014;41 (3):109.
14. Sikiru L, Hanifa S. Prevalence and risk factors of low back pain among nurses in a typical Nigerian hospital. African Health Sciences. 2010;10(1):26.
15. Sikiru L, Shmaila H. Prevalence and risk factors of low back pain among nurses in Africa: Nigerian and Ethiopian specialized hospitals survey study. East African journal of public health. 2009;6(1).

16. Campbell J, Dussault G, Buchan J, Pozo-Martin F, Guerra Arias M, Leone C, et al. A universal truth: no health without a workforce. Geneva: World Health Organization. 2013.
17. Federal Ministry of Health. Health Sector Strategic Plan (HSDP-III) 2005/6-2009/10. 2005. p. 24.
18. Munabi IG, Buwembo W, Kitara DL, Ochieng J, Mwaka ES. Musculoskeletal disorder risk factors among nursing professionals in low resource settings: a cross-sectional study in Uganda. BMC nursing. 2014;13 (1):7.
19. Rezaee M, Ghasemi M. Prevalence of low back pain among nurses: predisposing factors and role of work place violence. Trauma monthly. 2014;19(4).
20. bing Yip Y. A study of work stress, patient handling activities and the risk of low back pain among nurses in Hong Kong. Journal of advanced nursing. 2001;36(6):794-804.
21. Maul I, Läubli T, Klipstein A, Krueger H. Course of low back pain among nurses: a longitudinal study across eight years. Occupational and Environmental Medicine. 2003;60(7):497-503.
22. Mengestie M, et al. Epidemiology of Low Back Pain among Nurses Working in Public Hospitals of Addis Ababa, Ethiopia; East Cent. Afr. J. surg. 2016; 21(1); 113-131.