International Journal of Occupational Safety and Health

ISSN: 2091-0878 (Online) ISSN: 2738-9707

Original Article

Low back pain among nursing assistants at Mansoura University hospitals: prevalence and risk

Faisal S[1], Abdel Rahman S[2], Abou-Elwafa H[1], Al-Wehedy A[1], Kamel E[1]

[1]Industrial Medicine and Occupational Health at Public Health and Community Medicine Department, Faculty of Medicine, Mansoura University, Mansoura, Dakahlia Governorate, Egypt

[2]Rheumatology and Rehabilitation Department, Faculty of Medicine, Mansoura University, Mansoura, Dakahlia Governorate, Egypt

Corresponding author:

Sarah Faisal, MSc,
Industrial Medicine and Occupational Health at Public Health and Community Medicine Department, Faculty of Medicine, Mansoura University. El Gomhouria Street, Mansoura, Dakahlia Governorate, Egypt. Postal Code:35516.
E-mail: sarahfaisal@mans.edu.eg
ORCID ID: https://orcid.org/0000-0002-1931-7249

Date of submission: 17.07.2024
Date of acceptance: 26.11.2024
Date of publication: 01.01.2025

Conflicts of interest: None
Supporting agencies: None
DOI:https://doi.org/10.3126/ijosh.v15i1.66893

ABSTRACT

Introduction: Low back pain is one of the most debilitating and prevalent disorders. It is a leading contributor to disability worldwide. Lifting heavy loads is a key duty of many healthcare workers, but among nursing assistants, patient handling is the most prevalent duty and has been reported as the main cause of back pain among them. Many studies reported a higher prevalence of back pain for nursing assistants compared with nurses and other occupational groups. This study aimed to determine the prevalence of low back pain during the past 6 months among nursing assistants.

Methods: A cross-sectional study with an analytic component was carried out on all nursing assistants working at three Mansoura University hospitals during the period from November 1st, 2022, to February 30th, 2023. An interviewer-administrated questionnaire was used to collect data regarding socio-demographics, ergonomics, having back pain in the past 6 months, pain characteristics, and disability evaluation.

Results: The prevalence of back pain in the past 6 months was 71.1% with 50.7% of them having a clinically significant disability and 6.5% having severe disability. The prevalence of back pain with neurological symptoms was more than 50.0%, while 34.8% of them were taking regular medications for the pain. Female gender, obesity, and most ergonomic factors were significantly higher among nursing assistants with back pain.

Conclusion: It is evident that back pain is prevalent among nursing assistants. Personal and ergonomic risk factors contribute to its occurrence. Health and safety programs to build ergonomically safe working conditions, training of nursing assistants, and encouraging regular physical exercise are needed.

Keywords: Back pain; disability; ergonomics; nursing assistants; pain intensity.

Introduction

Nursing assistants (NAs) or nursing aides work under the supervision of nurses to deliver high-quality care to patients.[1] They provide basic care and help patients with activities of daily living. They perform duties such as feeding, bathing, dressing, lifting, transferring, or repositioning patients and changing linens.[2] NAs had higher injury rates than nurses and the risk of an injury due to lifting was greater among NAs compared to nurses.[3] A previous study in 2015 stated that about 80% of work injuries occur among NAs compared with 20% among nurses.[4]

Anatomically, Low back pain (LBP) refers to pain in the L1–L5 vertebrae and the sacroiliac area,

which continues from the bottom edge of the 12th rib to the iliac crest area,[5] while Alnaami et al.[6] defined LBP as "pain, muscle tension, or stiffness localized below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica)".

Many cases of LBP in the general population are idiopathic and the mechanism of LBP has not yet been elucidated.[7] In the majority (85–90%) of people with LBP, the pain is classified as non-specific chronic low back pain (NSCLBP).[8] NSCLBP is the most prevalent type of low back pain and is a leading cause of pain and disability worldwide.[9]

The causes of LBP are multifactorial. However, work-related factors are considered to be among the main causes. Work-related low back pain (WRLBP) is influenced directly by work-related factors.[10] These factors particularly involve high physical workload (lifting, bending, or twisting back) and work-related psychosocial factors (e.g., stress, social support, and job control).[11]

LBP is the most prevalent and greatest cause of disability among all musculoskeletal disorders.[12] In 2020, LBP affected 619 million people globally and it is estimated that the number of cases will increase to 843 million by 2050, driven largely by population expansion and ageing.[13] It is estimated to cause 21% of the total years lived with disability.[14]

In Egypt, chronic LBP (from occupations involving lifting heavy weights, awkward postures, and high frequency/repetitions) has been added to the table of occupational diseases in Social Insurance and Pension Law (no. 148 of 2019).[15]

Lifting of heavy loads is a key duty of many HCWs, but among NAs patient handling is the most prevalent duty and has been reported as the main cause of WRLBP.[16] The Na's efforts in manual lifting, change of patient position in bed, and patient transfer from bed to wheelchair are major risks for developing LBP.[17] The higher occurrence of LBP among NAs is responsible for reduced productivity increased medical expenditures and ultimately, they are not able to contribute to developing nation economy.[18]

The prevalence of reported LBP among NAs was 41.4% in China,[19] 80% in Portugal [20] and 57.3% in Bangladesh.[21] In Egypt, Samaei et al.[22] found that the prevalence of LBP among nursing personnel was 69.5% in the previous 12 months, and the prevalence was (79.3%) in the Abou El-Soud et al. study.[23] Most NAs are not properly educated about the potential occupational hazard of LBP or about how to control or prevent it.[10]

Rationale: Considering the high prevalence of LBP among NAs and to the best of the authors' knowledge, there are no studies that have assessed its prevalence and related risk factors among NAs in Mansoura University Hospitals due to the absence of formal occupational health services program in Mansoura University Hospitals.

Aim of the study: The present study aimed to measure the prevalence of low back pain during the past 6 months and characterize work situations associated with LBP among NAs in Mansoura University hospitals.

Methods

An observational descriptive cross-sectional study with an analytic component was carried out on all NAs working at three Mansoura University hospitals (Specialized Medical Hospital, Mansoura University Main Hospital, and Emergency Hospital) during the period from November 1st, 2022, to February 28th, 2023. All nursing assistants in the three hospitals were included in the study. The total number of NAs was 203, 194 out of them accepted to participate in the study with a response rate of 96%.

Job description of nursing assistants: NAs work in three shifts; morning shift from 8 am to 2 pm, afternoon shift from 2 pm to 8 pm, and night shift from 8 pm to 8 am. Working schedule was fixed shifts in 54.6% of them, while 45.4% worked in rotating shifts. They help patients with activities of daily living (ADLs), serve meals and help patients to eat, lift and move patients, perform various assigned treatments such as enemas and

throat irrigations and maintain a clean and sanitized environment by cleaning up spills, change soiled sheets, linens and ensure proper disposal of medical waste.

An interviewer-administrated structured questionnaire fulfilling the requirements of the study which included socio-demographic characteristics such as age, gender, education, residence, and smoking habit., and also:

a. Occupational profile such as contract type, duration of employment, working hours per day, and other current or previous jobs.

b. Past medical history including history of spine surgery and chronic diseases such as DM, HTN, and GIT disorders.

c. Ergonomic and work characteristics which contained 30 questions about specific features of work such as carrying and lifting loads, bending, sitting, standing, and kneeling. The questions were retrieved from the Dutch Musculoskeletal Questionnaire (DMQ).[24] To evaluate the overall reported performance levels of ergonomics among NAs, the researcher suggested an arbitrary score by analyzing the responses to the questions as categorical variables (correct or incorrect practice). A score of 1 was given to correct practice and 0 to incorrect practice with a total score of ergonomics between (0 – 30). The total score of ergonomics was converted to percentages and was used to describe them as: total score ⩽ 50% considered unsatisfactory or poor, from 50% to < 75% considered satisfactory & ⩾ 75 considered good performance levels of ergonomics.

d. Presence or absence of LBP in the past 6 months.

e. LBP characteristics and their impact e.g., onset, duration, sickness leave, medications, and intensity of pain which was measured by Visual Analogue Scale (VAS). In VAS, LBP is scored independently while the patient is engaged in three different postural situations: motion, standing, and sitting. Each postural situation was evaluated by a horizontal bar of 0 (no pain) to 10 cm "100 mm" (maximum pain), and the patient marks the point that corresponds to the severity of his pain. A higher score indicates greater pain intensity.[25]

f. Disability evaluation by Roland Morris Disability Questionnaire (RMDQ) which consists of 24 questions, and focuses on self-care activities, and daily life, such as walking, sitting, lying down, sleeping, and getting dressed.11 The total RMDQ score is obtained by adding the number of checked responses which ranges from 0 (no disability) to 24 (maximum disability). The minimum clinically significant change is 5 points and severe disability is ⩾ 14 points. [26]

At first, a pilot study was performed on ten NAs, that weren't included in the full-scale study, for test questions' clarity, estimating time needed for the completion of the questionnaire and having sufficient training, and discovering difficulties related to the study. So, after the pilot testing, work was organized accordingly.

Study workflow: The study was carried out in all departments of the three hospitals at break times of NAs after arrangement with respect to their schedule. Each questionnaire took about 15-25 minutes to be completed. Interviews were conducted twice weekly, with the participation of an average of 8-10 nursing assistants/ setting.

Ethical approval from Mansoura Faculty of Medicine Institutional Research Board (MFM-IRB) (Code Number: MD.21.01.401). Approval of the managers of the hospitals, in which the study was conducted, was obtained. Informed written consent was obtained from each study subject to participate voluntarily in the study. Confidentiality and anonymity with the freedom to withdraw were respected at all levels of the study.

Data analysis was done using IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp. Qualitative data were expressed as numbers and percentages. The chi-square test (χ^2), Fisher's exact test, and Monte Carlo test were utilized to

compare between groups, as appropriate. Quantitative data were expressed as mean (SD) or medians (minimum-maximum), as appropriate. They were tested for normality using the Kolmogorov-Smirnov test. In the normally distributed variables, independent samples-t-test was used; while in the non-normally distributed variables, Mann Whitney test was used for comparison between groups. ''p value < 0.05'' was considered to be statistically significant.

Results

In this study, the prevalence of LBP during the past 6 months among nursing assistants was 71.1% (138 out of 194). Table 1 showed that NAs with LBP were matched with those without LBP in most of the socio-demographic characteristics except for gender, physical activity, and BMI. The majority of females 100 (90.1%) have LBP. Physical activity was seen among 4 (40%) of NAs with LBP compared to 6 (60%) in NAs without LBP. Obesity was seen among 88 (81.5%) of NAs with LBP, while it was only 20 (18.5%) among those without LBP with higher mean ± SD (32.2 ± 6.4) BMI among NAs with LBP than those without, mean ± SD (28.8 ± 5.7). (Table1)

Table 1: Socio-demographic characteristics of the study groups (n=194)

Variable	Total (n=194)	LBP (n=138) N (%)	No LBP (n=56) N (%)	Significance value
Age *(year)*				
< 40	89	60 (67.4)	29 (32.6)	p= 0.29
≥ 40	105	78 (74.3)	27 (25.7)	
(Mean ± SD)	40.5 ± 9.1	40.9 ± 8.9	39.7 ± 9.7	p= 0.40
Gender				
Male	83	38 (45.8)	45 (54.2)	p ≤ 0.001
Female	111	100 (90.1)	11 (9.9)	
Education				
Basic or less	119	81 (68.1)	38 (31.9)	p = 0.24
Secondary and higher	75	57 (76.0)	18 (24.0)	
Residence				
Rural	147	100 (68.0)	47 (32.0)	p= 0.09
Urban	47	38 (80.9)	9 (19.1)	
Income				
Just enough	80	53 (66.3)	27 (33.8)	p= 0.21
Not enough &in debt	114	85 (74.6)	29 (25.4)	
Physical exercise	10	4 (40.0)	6 (60.0)	p= 0.04
BMI *(kg/m^2)*				
Non-obese	86	50 (58.1)	36 (41.9)	p= 0.001
Obese	108	88 (81.5)	20 (18.5)	
(Mean ± SD)	31.3 ± 6.4	32.2 ± 6.4	28.8 ± 5.7	p= 0.001

Table 2 showed that NAs with LBP were matched with those without in most of the occupational profile items except for being advised to change jobs because of health problems or injuries, which was reported by 27 (90%) among NAs with LBP.

Table 3 showed that most ergonomic risk factors were significantly higher among NAs with LBP than those without. The mean total ergonomic score was lower among NAs with LBP (14 ± 3.6) than those without (17.5± 2.6). The percentage of poor ergonomic performance levels was 97 (84.3%) in NAs with LBP compared to 18 (15.7%) in those without (p< 0.001). No one in either group had a good ergonomic performance level.

Table 2: Occupational profile of the study groups (n=194)

Variable	Total (n=194)	LBP (n=138) N (%)	No LBP (n=56) N (%)	Significance value
Contract type				
Temporary	116	83 (71.6)	23 (28.4)	p= 0.88
Permanent	78	55 (70.5)	23 (29.5)	
Duration of employment (year)				
Median (min – max)	8 (0.1 – 35)	8 (1 – 30)	7 (0.1 – 35)	p= 0.13
Work shift				
Rotating	106	71 (67.0)	35 (33.0)	p= 0.16
Fixed	88	67 (76.1)	21 (23.9)	
Working hours				
< 60 h/ week	42	26 (61.9)	16 (38.1)	p= 0.14
≥ 60 h/ week	152	112 (73.7)	40 (26.3)	
Pre-employment examination	188	135 (71.8)	53 (28.2)	p= 0.36
Pre-employment training	99	66 (66.7)	33 (33.3)	p= 0.16
Periodic examination	57	35 (25.5)	21 (36.8)	p= 0.11
Advised to change jobs because of health problems or injuries	30	27 (90.0)	3 (10)	p= 0.01

Table 3: Ergonomic factors related to low back pain (LBP) among the study groups (n=194)

Variable	Total (n=194)	LBP (n=138) N (%)	No LBP (n=56) N (%)	Significance value
I- Physical load at work				
Often Lift or carry >20 kg	187	132 (70.6)	55 (29.4)	p= 0.46
Often Pull or push >20 kg	187	132 (70.6)	55 (29.4)	p= 0.46
Often Lift with the load far away from the body	48	32 (66.7)	16 (33.3)	p= 0.43
Often Lift in an uncomfortable posture	134	103 (76.9)	31 (23.1)	p= 0.008
Often Lift with twist trunk	108	96 (88.9)	12 (11.1)	p ≤ 0.001
Often Lift with load above shoulder level	91	72 (79.1)	19 (20.9)	p= 0.02
Often Lift without help	46	32 (69.6)	14 (30.4)	p= 0.79
II- Posture adopted at work				
Trunk bent slightly	191	136 (71.2)	55 (28.8)	p=0.86
Trunk bent heavily	100	96 (96.0)	4 (4.0)	p ≤ 0.001
Trunk twist slightly	163	126 (77.3)	37 (22.7)	p ≤ 0.001
Trunk twist heavily	53	47 (88.7)	6 (11.3)	p= 0.001
Trunk bent and twisted simultaneously	109	97 (89.0)	12 (11.0)	p ≤ 0.001
Slight bent posture for long periods	143	115 (80.4)	28 (19.6)	p ≤ 0.001
Heavy bent posture for long periods	31	27 (87.1)	4 (12.9)	p= 0.03
Slight twist posture for long periods	95	81 (85.3)	14 (14.7)	p ≤ 0.001
Heavy twist posture for long periods	28	25 (89.3)	3 (10.7)	p= 0.02
Twist and bent posture for long periods	55	49 (89.1)	6 (10.9)	p= 0.001
Stand for long periods at work	182	129 (70.9)	53 (29.1)	p= 0.76
Sit for long periods at work	11	7 (63.6)	4 (36.4)	p= 0.73
Walk for long periods at work	181	128 (70.7)	53 (29.3)	p= 0.76
Work kneeled or squatted for long periods	67	47 (70.1)	20 (29.9)	p= 0.83
Work in the same posture for long periods	12	9 (75.0)	3 (25.0)	p= 0.76
Work in an uncomfortable posture	117	81 (69.2)	36 (30.8)	p= 0.47
Work with/ hold hands above shoulder level	63	46 (73.0)	17 (27.0)	p= 0.69
Work with /hold hands below knee level	117	86 (73.5)	31 (26.5)	p= 0.37
Sometimes slip or fall during work	145	116 (80.0)	29 (20.0)	p ≤ 0.001
Total score of Ergonomics (0 – 30)	15 ± 3.7	14 ± 3.6	17.5± 2.6	p ≤ 0.001
Total ergonomic performance levels				
Poor (≤ 15)	115	97 (84.3)	18 (15.7)	p ≤ 0.001
Satisfactory (15- 22.5)	79	41 (51.9)	38 (48.1)	

Table 4 showed that the majority of cases had a gradual onset of LBP 97 (70.3%) with a median duration of pain episode 12 (0.5 – 96) hours, with 44 (31.9%) of them had physician consultation and 48 (34.8%) of them were taking regular medications for the pain. Sickness absence from work for >1 day because of LBP was 67 (48.6%) with a median duration of absence spell 4 (2 – 90) days, while 52 (37.7%) of them were coming to work while feeling ill (presenteeism). Being off work for a few days or on vacation, LBP improved in 123 (89.1%) of them and on returning to work after a weekend, LBP worsened in 131 (94.9%).

Regarding associated neurological symptoms in lower limbs, 73 (52.9%) of them complained of leg numbness or tingling, and 76 (55.1%) had radiating pain to the leg or feet with only 14 (10.1%) complained of leg weakness or clumsiness. About one-fourth of them, 35 (25.4%) complained of urine incontinence or changes in bladder habits with only 2 (1.4%) complaining of changes in bowel habits, while limitation of back movement was detected in 82 (59.1%).

The median intensity of LBP by Visual Analogue Scale while in motion was 65 (10 – 90), in standing was 50 (0 – 85), and in sitting was 30 (0 – 80). The severity of pain was found to be higher during motion, followed by standing, and lastly sitting. The median total score of the Roland Morris Disability Questionnaire in cases was 6 (0 – 20), with 70 (50.7%) of them having clinically significant disability, while only 9 (6.5%) had severe disability. (Table 4)

Table 4: LBP characteristics and impact during the past 6 months among cases (n=138)

Variable	**LBP cases** (n=138) N (%)
Onset of LBP	
Sudden	41 (29.7)
Gradual	97 (70.3)
Duration of pain episode (hours) Median (min-max)	12 (0.5 – 96)
Physician consultation for LBP	44 (31.9)
Regular medications for the pain	48 (34.8)
Off work for >1 day because of LBP (absenteeism)	67 (48.6)
Longest spell of absence because of LBP Median (min-max)	4 (2 – 90)
Coming to work while feeling ill (presentism)	52 (37.7)
On being off work for a few days or on vacation, LBP improved	123 (89.1)
On returning to work after a weekend, LBP worsened	131 (94.9)
Leg numbness or tingling	73 (52.9)
Radiating pain to leg or feet	76 (55.1)
Leg weakness or clumsiness	14 (10.1)
Urine incontinence or changes in bladder habits	35 (25.4)
Changes in bowel habits	2 (1.4)
Total score of RMDQ Median (min-max)	6 (0 – 20)
No clinically significant disability (< 5 RMDQ score)	59 (42.8)
Clinically significant disability (5 – 13 RMDQ score) Severe disability (14 – 24 RMDQ score)	70 (50.7) 9 (6.5)
Intensity of LBP while in motion by VAS (mm) Median (min-max)	65 (10 – 90)
Intensity of LBP in standing by VAS (mm) Median (min-max)	50 (0 – 85)
Intensity of LBP in sitting by VAS (mm) Median (min-max)	30 (0 – 80)

Discussion

LBP is a major public health problem worldwide, being widespread and of considerable negative social, psychological, and economic influences.[27] Nursing assistants have one of the highest incidences of work-related back problems. They perform many physical tasks in the job exposing them to back pain and complications.[28] Work-related LBP is amongst the leading reasons for nursing assistants to leave their jobs.[19] The higher occurrence of LBP among NAs is responsible for reduced productivity, and increased medical expenditures of both individuals and their families, and ultimately, they could not be able to contribute to developing the nation's economy.[18] The current study aimed to evaluate the prevalence of LBP during the past 6 months and identify the potential associated risk factors among nursing assistants in Mansoura University hospitals. In this study, the prevalence of LBP among NAs during the past 6 months was 71.1%, which was lower than that reported among NAs in Portugal (80%) [20] and higher than that reported in NAs in Bangladesh (57.3%) [21] and India (43.8%).[29] The variability in LBP prevalence between regions and countries may be explained partly by the difference in the personal criteria, as well as the difference in working conditions and the number of NAs per shift.[30] Regarding associations between the nursing assistants' gender and LBP during the past 6 months in this study, female NAs showed higher prevalence than their male counterparts. This is in agreement with other studies in Saudi Arabia [6], Portugal,[20] Ethiopia,[31] Brazil [32,] and Bangladesh.[21] Physical exercises improve one's health and well-being.[33] The present study revealed a significant protective effect of practicing regular exercise on developing LBP during the past 6 months. Similar results have been observed in previous studies in Taiwan,[34] Turkey,[35] Saudi Arabia,[6] Pakistan[36,] and Bangladesh.[21] Lack of regular physical exercise results in weak or no back support and incorrect body mechanics.[37] In the present study, obesity was found in 81.5% of the NAs with LBP, which might behave as an aggravating factor or contribute to making this condition chronic. A similar finding was reported among NAs in Portugal.[20] However, other studies done in 2012,[38,] and 2023,[21] reported that BMI was not a significant risk factor for LBP among NAs. Several possible explanations can clarify the association between obesity and LBP. First, obesity can exaggerate the mechanical burden on the spine by causing a higher compressive force on the lumbar spine structures during various movements. Obese people may also be more prone to accidents. Second, obesity may trigger LBP through chronic inflammation. Obesity is associated with elevated cytokines and acute-phase reactants and initiation of proinflammatory pathways, which may result in pain.[6] In the current study, the main occupational risk factors for LBP among NAs included lifting in an uncomfortable posture, lifting with a twisted trunk, bending and twisting simultaneously, twisting or bending for long periods, and slipping or falling during work. In Uganda, the main occupational risk factors for LBP among healthcare workers included lifting and moving patients, frequent twisting and bending, sustained postures, and poor ergonomics in the work environment. [39] In this study, 31.9% of NAs asked for medical advice for LBP, 48.6% had missed work for >1 day as a result of LBP, and 34.8% took regular medications for the pain. In a study done in 2023, it was found that 36.8% of NAS had seen a doctor or physiotherapist for LBP, 18.1% had missed work as a result of LBP, and 70.80% of them had received medical treatment.[21] Also in Turkey, where 32.6% of NAs asked for medical advice and 84.6% received both medical care and physiotherapy.[35] In another study in Turkey, 33.3% of NAs consulted with a doctor, and 72.2% received medical care.[40] The current study showed that, the median intensity of LBP by VAS (0–100 mm) while in motion was 65 (10 – 90), while in standing was 50 (0 – 85) and in sitting was 30 (0 – 80). The severity of pain was found to be higher during motion, followed by standing, and lastly sitting. In Iran the mean intensity of LBP among NAs measured by VAS (0–10 cm) was 5.01 ± 1.97,10 while in Finland, the mean intensity of LBP measured by VAS (0–100 mm) was 36.2 ± 22.6.[8] LBP is one of the most

common causes of functional disability.[37] In this study, the median total score of RMDQ in LBP cases was 6 (0 – 20), with 50.7% of them having clinically significant disability, while only 6.5% had severe disability. A previous study from Italy in 2020, it was found that the mean total score of RMDQ in LBP cases was 6.4 ± 4.9.[11]

Conclusions

LBP was found among 71.1% of nursing assistants, with 50.7% of them having clinically significant disability, while 6.5% had severe disability. Gender, obesity, and ergonomic factors were associated with LBP among NAs.

Limitations

The cross-sectional design of the study makes it difficult to establish a causal association. The small sample size of the study makes its results cannot be generalized. The possibility of recall bias also could not be excluded despite the adoption of a six-month- prevalence measure.

Recommendations

We recommend that health education and training of NAs on proper posture and correct lifting techniques should be introduced in the workplace. Workplaces should be provided with ergonomically based tools e.g. adjustable-height beds and chairs together with encouragement of the use of assistive devices such as transfer belts, sliding boards, and mechanical lifts when moving or transferring patients to reduce strain on the lower back during patient care activities. Also, provision of regular breaks at work and facilitations to practice regular physical exercises.

Acknowledgments

The authors are grateful to all the nursing assistants who participated in the study and helped this research to materialize despite their very busy and rigorous work schedules.

References

1. Sorrentino SA, Remmert L. Mosby's textbook for nursing assistants-e-book, 9th ed; Elsevier Health Sciences, Canada. 2016. Available from: https://books.google.com.eg/books?id=bR6KCwAAQBAJ&lpg=PR1&hl=ar&pg=PP1#v=onepage&q&f=true.
2. Walton AL, Rogers B. Workplace hazards faced by nursing assistants in the United States: A focused literature review. Int J Environ Res Public Health. 2017;14(5):544. Available from: https://doi.org/10.3390/ijerph1405044
3. Rodriguez-Acosta R, Richardson D, Lipscomb HJ, Chen J, Dement JM, Myers DJ, et al. Occupational injuries among aides and nurses in acute care. Am J IndMed. 2009;52(12):953-64. Available from: https://doi.org/10.1002/ajim.20762.
4. Ibrahim R, Elsaay OE. The effect of body mechanics training program for intensive care nurses in reducing low back pain. IOSR JNHS. 2015;4(5):81-96. Available from: https://doi.org/10.9790/1959-04548196.
5. Knezevic NN, Candido KD, Vlaeyen JW, Van Zundert J, Cohen SP. Low back pain. Lancet. 2021;398(10294):78-92. Available from: https://doi.org/10.1016/S0140-6736(21)00733-9.
6. Alnaami I, Awadalla NJ, Alkhairy M, Alburidy S, Alqarni A, Algarni A, et al. Prevalence and factors associated with low back pain among health care workers in southwestern Saudi Arabia. BMC Musculoskelet Disord. 2019;20:1-7. Available from:https://10.1186/s12891-019-2431-5.
7. Hegmann KT, Travis R, Belcourt RM, Donelson R, Eskay-Auerbach M, Galper J, et al. Diagnostic tests for low back disorders. J Occup Environ Med. 2019; 61(4):e155-e168. Available from: https://doi.org/10.1097/JOM.0000000000001551.
8. Taulaniemi A, Kankaanpää M, Tokola K, Parkkari J, Suni JH. Neuromuscular exercise reduces low back pain intensity and improves physical functioning in nursing duties among female healthcare workers; secondary analysis

of a randomized controlled trial. BMC Musculoskelet Disord. 2019;20(1):328. Available from: https://doi.org10.1186/s12891-019-2678-x.

9. Gianola S, Bargeri S, Del Castillo G, Corbetta D, Turolla A, Andreano A, et al. Effectiveness of treatments for acute and subacute mechanical non-specific low back pain: a systematic review with network meta-analysis. Br J Sports Med. 2022; 56(1), 41-50.Available from: https://doi.org/10.1136/bjsports-2020-103596.

10. Shojaei S, Tavafian SS, Jamshidi AR, Wagner J. A multidisciplinary workplace intervention for chronic low back pain among nursing assistants in Iran. Asian Spine J. 2017;11(3):419. Available from: https://doi.org/10.4184/asj.2017.11.3.419.

11. Bernardelli G, Vigna L, Nava C, Colonna VD, Andersen LL, Consonni D, et al. Physical activity in healthcare workers with low back pain: effects of the Back-FIT randomized trial. J Occup Environ Med. 2020;62(6):245-9. Available from: https://doi.org/10.1097/JOM.0000000000001844.

12. Safiri S, Nejadghaderi SA, Noori M, Sullman MJ, Collins GS, Kaufman JS, et al. The burden of low back pain and its association with socio-demographic variables in the Middle East and North Africa region, 1990–2019. BMC Musculoskelet Disord. 2023;24(1):1-11. Available from: https://doi.org/10.1186/s12891-023-06178-3.

13. Global Burden of Disease (GBD) 2021 Low Back Pain Collaborators. Global, regional, and national burden of low back pain, 1990-2020, its attributable risk factors, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. Lancet Rheumatol. 2023;5:e316-29. Available from: https://doi.org/10.1016/S2665-9913(23)00098-X.

14. Hoy DG, Smith E, Cross M, Sanchez-Riera L, Blyth FM, Buchbinder R, et al. Reflecting on the global burden of musculoskeletal conditions: Lessons learned from the global burden of disease 2010 study and the next steps forward. Ann Rheum Dis. 2015;74(1):4-7. Available from: https://doi.org/10.1136/annrheumdis-2014-205393.

15. The Ministry of Social Solidarity (MOSS) New social insurance and pension law (no. 148 of 2019). 2019. Available from: https://wwwmossgoveg/ar-eg/Pages/lawsaspx.

16. Verbeek JH, Martimo K-P, Kuijer P, Karppinen J, Viikari-Juntura E, Takala EP, et al. Proper manual handling techniques to prevent low back pain, a Cochrane systematic review. Work. 2012;41:2299-301. Available from: https://doi.org/10.3233/WOR-2012-0455-2299.

17. Menzel NN, Brooks SM, Bernard TE, Nelson A. The physical workload of nursing personnel: association with musculoskeletal discomfort. Int J Nurs Stud. 2004 Nov;41(8):859-67. Available from: https://doi.org/10.1016/j.ijnurstu.2004.03.012.

18. Hussain R, Ahmed T, Ali B, Maheshwari GK, Ahmed IA. Prevalence study on work-related stress and relationship with low back pain (LBP) among nursing staff in a tertiary care hospital of Karachi, Sindh. J of Peoples University of Medical & Health Sciences Nawabshah (JPUMHS). 2023;13(1):39-49. Available from: http://doi.org/10.46536/jpumhs/2023/13.01.385.

19. Cheung K, Szeto G, Lai GKB, Ching SS. Prevalence of and factors associated with work-related musculoskeletal symptoms in nursing assistants working in nursing homes. Int J Environ Res Public Health. 2018;15(2):265. Available from: https://doi.org/10.3390/ijerph15020265.

20. Henriques M, Sacadura-Leite EM, Serranheira F. Low back pain among hospital nursing assistants. Rev Bras Med Trab. 2019;17(3):370. Available from: https://doi.org/10.5327/Z1679443520190365.

21. Islam MJ, Ahmed S, Islam KM, Al Mamun MA, Roy SK, Chakraborty SR. Characteristics of low back pain and its associated factors among

healthcare providers at a tertiary hospital in Sylhet city: a cross-sectional study. Bulletin of Faculty of Physical Therapy. 2023;28(1). Available from: https://doi.org/10.1186/s43161-023-00152-9.

22. Samaei SE, Mostafaee M, Jafarpoor H, Hosseinabadi MB. Effects of patient-handling and individual factors on the prevalence of low back pain among nursing personnel. Work. 2017;56(4): 551-61. Available from: https://doiorg/10.3233/WOR-172526.

23. El-Soud AM, 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. Available from: https://doi.org/10.4103/1110-161X.140525.

24. Candan SA, Sahin UK, Akoglu S. The investigation of work-related musculoskeletal disorders among female workers in a hazelnut factory: prevalence, working posture, work-related and psychosocial factors. Int. J. Ind. Ergon. 2019;74:102838. Available from: https://doi.org/10.1016/j.ergon.2019.102838.

25. Aoki Y, Sugiura S, Nakagawa K, Nakajima A, Takahashi H, Ohtori S, et al. Evaluation of nonspecific low back pain using a new detailed visual analogue scale for patients in motion, standing, and sitting: characterizing nonspecific low back pain in elderly patients. Pain Res Treat. 2012:680496. Available from: https://doi.org/10.1155/2012/680496.

26. Payares K, Lugo LH, Restrepo A. Validation of the Roland Morris questionnaire in Colombia to evaluate disability in low back pain. Spine. 2015; 40(14):1108-14. Available from: https://doi.org/10.1097/BRS.0000000000000963.

27. Hartvigsen J, Hancock MJ, Kongsted A, Louw Q, Ferreira ML, Genevay S, et al. What low back pain is and why we need to pay attention. Lancet Lond Engl. 2018;391:2356–67. Available from: https://doi.org/10.1016/S0140-6736(18)30480-X.

28. Choi SD, Brings K. Work-related musculoskeletal risks associated with nurses and nursing assistants handling overweight and obese patients: A literature review. Work. 2016;53(2):439-48. Available from: https://doi.org/10.3233/WOR-152222.

29. Parikh S, Mehta J, Thakkar M, Thakkar N, Gauswami M. Prevalence of musculoskeletal disorders and its risk factors among class 4 workers of rural tertiary health-care hospitals in Western India: a cross-sectional study. Natl J Physiol Pharm Pharmacol. 2022;12(12):2131-7. Available from: https://doi.org/10.5455/njppp.2022.12.03144202212052022.

30. Anderson SP, Oakman J. Allied health professionals, and work-related musculoskeletal disorders: a systematic review. Safety and health at work. 2016;7(4):259–67. Available from: https://doi.org/10.1016/j.shaw.2016.04.001.

31. Negash NA, Tadele A, Ferede AJ. Prevalence and associated factors of low back pain among healthcare professionals at the University of Gondar Comprehensive and Specialized Hospital, northwest Ethiopia: a cross-sectional study. J Pain Res. 2022;15(May):1543–52. Available from: https://doi.org/10.2147/JPR.S351987.

32. Cezar-Vaz MR, Xavier DM, Bonow CA, Vaz JC, Cardoso LS, Sant'Anna CF, et al. Musculoskeletal Pain in the Neck and Lower Back Regions among PHC Workers: Association between Workload, Mental Disorders, and Strategies to Manage Pain. Healthcare (Basel). 2023;11(3):365. Available from: https://doi.org/10.3390/healthcare11030365.

33. Borg-Stein J, Dugan SA. Musculoskeletal disorders of pregnancy, delivery, and postpartum. Phys Med Rehabil Clin N Am. 2007;18(3):459–76. Available from: https://doi.org/10.1016/j.pmr.2007.05.005.

34. Shieh S-H, Sung F-C, Su C-H, Tsai Y, Hsieh VC-R. Increased low back pain risk in nurses

with high workload for patient care: a questionnaire survey. Taiwan J Obstet Gynecol. 2016;55(4):525–9. Available from: https://doi.org/10.1016/j.tjog.2016.06.013.

35. Şimşek Ş, Yağci N, Şenol H. Prevalence of and risk factors for low back pain among healthcare workers in Denizli. Agri. 2017;29(2):71–8. Available from: https://doi.org/10.5505/agri.2017.32549.

36. Tanzil S, Jamali T, Inam SN, Abbas A. Frequency and Severity of low back pain among healthcare providers and associated factors in tertiary care, a public hospital in Karachi. Occup Med Heal Aff. 2019;7(March):1–5. Available from: https://doi.org/10.4172/2329-6879.1000285.

37. Terzi R, Altın F. The prevalence of low back pain in hospital staff and its relationship with chronic fatigue syndrome and occupational factors. Agri: The j of the Turkish Society of Algology. 2015;27(3):149–54. Available from: https://doi.org/10.5505/agri.2015.26121.

38. Jensen JN, Holtermann A, Clausen T, Mortensen OS, Carneiro IG, Andersen LL. The greatest risk for low-back pain among newly educated female health care workers; body weight or physical workload? BMC Musculoskelet Disord. 2012;13:87. Available from: https://doi.org/10.1186/1471-2474-13-87.

39. Aleku M, Nelson K, Abio A, Wilson ML, Lule H. Lower Back Pain as an Occupational Hazard Among Ugandan Health Workers. Front Public Health. 2021; 9,761765. Available from: https://doi.org/10.3389/fpubh.2021.761765.

40. Karahan A, Kav S, Abbasoglu A, Dogan N. Low back pain: prevalence and associated risk factors among hospital staff. J Adv Nurs. Mar 2009;65(3):516-24. Available from: https://doi.org/10.1111/j.1365-2648.2008.04905.x.