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Prevalence and Occupational Risk Factors of Low Back Pain among Health Care Workers in Operating Rooms at Mansoura University Main Hospital

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A B S T R A C T

Background: Low back pain (LBP) is a public health concern worldwide and is a common cause of work-related disorder particularly in health-care workers (HCWs) including doctors, nurses and technicians. **Objective:** The objective of the current study is to estimate the prevalence, risk factors, and characteristics of LBP among HCWs in operation rooms. **Method:** A cross-sectional design was used at Mansoura University Main Hospital, Egypt, between December 2021 and February 2022. A self-administered questionnaire was used to collect personal data, job characteristics, and low back in the past year. Roland-Morris LBP and Disability Questionnaire was used to diagnose LBP. **Results:** A total 311 HCWs were included in the analysis; 128 physicians, 139 nursing staff, and 44 other HCWs. Approximately 51% were above the age of 30 years and 57% were females. Approximately 37% were obese, 15% were smokers, 56% were physically inactive, and 34% had comorbidities. The prevalence of LBP in the studied group was 62.4%. Sick leaves due to LBP are reported by 18.6% of HCWs; 38.1% of them consulted a specialist and 57.2% took medications. The independent predictors of LBP were; working in the obstetrics & gynecology department (OR=13.7), working in the surgery departments (OR=12.4), obesity (OR=7.3), associated co-morbidities (OR=6.3), being a physician (OR=4.7), being females HCWs (OR=3.14) and being a nursing staff (OR=1.3). **Conclusions:** LBP is still a common problem among HCWs. Several preventable risk factors have been recognized, including high BMI and physical inactivity. Educational programs on prevention and workplace interventions are necessary in order to decrease LBP.

INTRODUCTION

The global burden of disease study 2017 indicated that LBP is a leading cause of disability all over the world.[1] LBP is widespread and is the most disabling factor in the workplace.[2] With a rapid transition to an industrial lifestyle, LBP imposes a substantial economic burden on governments, especially in terms of health system costs, lost working days, low productivity, and increased disability.[3,4] Work-related LBP was found to cause 818,000 disability-adjusted life years lost (DALYs) every year .[5]Health care workers (HCWs) present high rates of work-related diseases and injuries LBP during performing duties. The mechanical hazards in hospitals include manual lifting of patients, objects and equipment that can cause the healthcare workers to be regularly affected by LBP.[3] High physical workload and work stress have recently been added to this list of LBP causes.[6] In addition, demographic variables including age, sex, physical state, smoking, and workplace stress can also threaten the HCWs to progress into LBP.[7] Also, the main ergonomic factors are awkward postures, carrying

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Table (1): Association between LBP and personal characteristics

Personal characteristics	Total group* (n=311)	Low back pain ≠ group (n=194)	p value	COR (95%CI)
Age (years)				
≤30 y (r)	153 (49.2%)	76 (49.7%)	≤0.001	1
>30 y	158 (50.8%)	118 (74.7%)		2.9 (1.9-4.8)
Sex				
Male (r)	134 (43.1%)	64 (47.8%)	≤0.001	1
Female	177 (56.9%)	130 (73.4%)		3.02 (1.9-4.87)
Marital status				
Single (r)	61 (19.6%)	32 (52.5%)	0.074	1
Married	250 (80.4%)	162 (64.8%)		1.7 (0.8-2.9)
BMI				
Non obese (r)	196 (63.0%)	107 (54.6%)	≤0.001	1
Obese	115 (37.0%)	87 (75.7%)		2.6 (1.6-4.3)
Current smoking				
Smokers	46 (14.8%)	25 (54.3%)	0.223	0.67 (0.4-1.3)
Nonsmokers (r)	265 (85.2%)	169 (63.8%)		1
Physical activity				
no (r)	175 (56.3%)	117 (66.9%)	0.064	1
yes	136 (43.7%)	77 (56.6%)		1.5 (0.9-2.5)
Co-morbidities				
Yes	105 (33.8%)	84 (80.0%)	≤0.001	3.5 (2-6.1)
No (r)	206 (66.2%)	110 (53.4%)		1

** column %, ≠ row %, r: reference group, COR: crude odds ratio, CI: confidence interval. Co-morbidities included hypertension, diabetes, hepatic disease and others*

and repositioning patients, prolonged standing, and working without sufficient breaks can significantly lead to LBP.[8]

LBP remains the most common reason for early retirement, sickness absence, and job changes among the workers.[9] Moreover, the HCWs in developing countries, often lift and transport patients, objects and equipment in awkward situations and, lifting aids are not always offered or feasible.[10] Thus, LBP is still the main concern disturbing life quality and work productivity.[11] Also, risk of work - related LBP is associated with working in operating room, where the highest LBP prevalence was in the surgical departments compared to other departments in hospitals.[12, 13]

The objective of the current study was to determine the prevalence and risk factors for LBP among HCWs who are working in operating rooms at Mansoura University Main Hospital and to explore related risk factors. Additionally, to describe LBP characteristics.

METHOD

A cross-sectional design was used at Mansoura University Main Hospital, Egypt, between December 2021 and February 2022.

Health care workers at the operating room of Mansoura University Main Hospital. Physicians, nursing staff, and other HCWs who had worked for one year or more were included. The following departments were included; obstetrics & gynecology, surgery, and ear, nose, and throat doctor (ENT) departments. Those with a history of back surgery before joining their current jobs and pregnant female workers were excluded.

The calculated sample size was estimated at 296 health care workers at the operating room of Mansoura

Table (2): Association between LBP and Work characteristics

Work characteristics	Total group (n=311)	Low back pain group (n=194)	p value	OR (95%CI)
Occupation				
Physicians	128 (41.2%)	91 (71.1%)	0.02	2.2 (1.1-4.5)
Nursing staff	139 (44.7%)	80 (57.6%)	0.53	1.2 (0.63-2.4)
Workers (r)	44 (14.1%)	23 (52.3%)	(r)	1
Departments				
Obstetrics & gynecology	91 (46.9%)	62 (68.1%)	≤0.001	9.5 (3.7-24)
Surgery	80 (41.2%)	125 (68.7%)	≤0.001	9.7 (4-23)
ENT department (r)	23 (11.9%)	7 (18.4%)	(r)	1
Years of employment				
≤5 y (r)	166 (53.4%)	92 (55.4%)	0.007	1
>5 y	145 (46.6%)	102 (70.3%)		1.9 (1.2-3.1)
Days of work/ week				
≤4 days (r)	154 (49.5%)	67 (43.5%)	≤0.001	1
>4 days	157 (50.5%)	127 (80.9%)		5.5 `(3.3-9.2)
Transportation method				
On foot (r)	42 (13.5%)	22 (52.4%)	(r)	1
Bike & Motorcycle	23 (7.4%)	13 (56.5%)	0.74	1.2 (0.4-3.3)
Car	173 (55.6%)	111 (64.2%)	0.16	1.6 (0.8-3.2)
Bus	73 (23.5%)	48 (65.8%)	0.15	1.7 (0.8-3.8)

University Main Hospital.[14] The assumptions were 95% confidence interval, 5% precision (margin of error), 74% expected prevalence of LBP among health care workers (74%).[15] The sample size was increased to 326 by 10% attrition rate for missing or incomplete data. About 96.3% of the predetermined sample completed the questionnaire (311 HCWs) for whom analysis of data was done. The number recruited from each department depended on the proportion of HCWs in each department and recruited using a cluster sampling technique.

Data were collected using a self-administered questionnaire was applied for data collection in the present study. It included (1) Personal data: Age, sex, height, weight, marital state, education level, smoking, exercise or sporting activity, and disease status. (2) Job characteristics: the place of work, job specification, duration of service, previous work experience, days worked per week and sufficiency of breaks. (3) Questions about LBP in the past year: duration, characteristics, if radiating to other sites, a physician consultation, and sick leaves due to LBP, underlying risk factors, also respondents were asked if they received treatments for their pain. LBP was defined as "pain, muscle tension, or stiffness experienced below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica)".[16] The body mass index (BMI) underwent calculation.

Roland-Morris LBP and Disability Questionnaire [17]: A valid questionnaire for only those who suffer from LBP. It is one of the most widely used validated instruments for measuring functional outcomes in LBP. It is composed of 24 questions answered by "yes/no" designed to assess LBP as experienced by the patient in the last 24 hours. "Yes" items are counted to yield a total score; 0 = no disability to 24 = maximum disability.

The questionnaire was first developed in English and then translated into Arabic by forward and backward translation method. The validity of the questionnaire was ensured by a consulting panel of experts and amended according to their comments and suggestions. Then, the Arabic version was tested on a group of 20 HCWs (not included in the full-scale

Table (3): Multivariate Logistic regression analysis of independent predictors of LBP

Independent predictors	β	P value	AOR (95% CI)
Sex			
Male (r)	1.144	≤0.001	1
Female			3.14 (1.7-5.8)
BMI			
Non obese (r)	1.995	≤0.001	1
Obese			7.3 (3.7-14.8)
Co-morbidities			
Yes	1.848	≤0.001	1
No (r)			6.34 (3.0-13.3)
Occupation			
Physicians	1.561	0.001	4.7 (1.8-12.3)
Nursing staff	0.281	0.530	1.3 (0.55-3.2)
Workers (r)	-	-	1
Departments			
Obstetrics & gynecology	2.615	≤0.001	13.7 (4.7-39)
Surgery	2.515	≤0.001	12.4 (4.6-33)
ENT department (r)	-	-	1

AOR: Adjusted odds ratio

study) to test any difficulties in the questionnaire that needed modifications. It was also to estimate the time needed to complete the questionnaire and to test the flow of work and administrative cooperation.

Statistical analysis:

The data were analyzed by Statistical Package of Social Science (SPSS) program for windows (V16) (Chicago, IL, US=). Categorical data were represented as numbers and percentages. Chi square and Fisher Exact tests were utilized to test the significance of categorical data. The significance of the results was judged at p-value ≤ 0.05. Significant variables on univariate analysis were entered into logistic regression model utilizing the forward Wald statistical technique to predict the most significant determinants and to control for possible interactions and confounding effects. Odds ratios (OR) and their 95% confidence interval (CI) were calculated.

RESULTS

Table (1) shows the distribution of the personal data of the studied group according to LBP; it shows that LBP was statistically significantly higher among HCWs more than 30 years old. 74.7% of them suffered from LBP as compared to 49.7% of those ≤30 years. LBP was significantly higher in females; 73.4% of females had LBP compared to 47.8% in males. The highest risk of LBP is found among females (OR=3.02) and age more than 30 years (OR=2.9). Approximately 75.7% of the obese (BMI >30) suffered from LBP, while 54.6% of non-obese had LBP. The risk of LBP among obese individuals was 2.6 times more than non-obese. The majority of the study group were nonsmokers (85.2%) and physically inactive (56.3%). LBP is higher among individuals suffering from different types of co-morbidities where 80% of individuals with overall comorbidities suffer from LBP. The risk of LBP in HCWs with co-morbidities is 3.5 times more than in healthy individuals.

Table (2) shows that the overall prevalence of LBP in the studied group was 62.4%, with the highest prevalence among physicians (71.1%), followed by nursing staff (57.6%) and the lowest prevalence among workers (52.3%).68.1%, 68.7%, and 18.4% of HCWs in obstetrics & gynecology, surgery, and ENT departments, respectively suffered from LBP. The study group who works more than 4 days / week suffered from LBP (about 80.9%) with OR=5.5. LBP prevalence was significantly higher among those who have been employed for more than 5 years than those who had been working for less than 5 years (70.3% vs. 55.4% respectively) with OR=1.9. There was no

Table (4): LBP characters among LBP cases

LBP characters	LBP cases group (n=194)
LBP per month	
≤once	69 (35.6%)
>once	125 (64.4%)
LBP due to accidents	10 (5.2%)
Tingling/ numbness in leg	107 (55.2%)
Sick leaves due to LBP	
None	158 (81.4%)
≤1 week	24 (12.4%)
>1 week	12 (6.2%)
Consultation for LBP	74 (38.1%)
Medications for LBP	111 (57.2%)

significant association between LBP and vehicles used to reach work. Table (3) shows that after multivariate logistic regression analysis and adjusting the confounding factors, the following were independent predictors or LBP; working in the obstetrics & gynecology department (OR=13.7), working in the surgery departments (OR=12.4), obesity (OR=7.3), associated co-morbidities (OR=6.3), occupation as physician (OR=4.7), females HCWs (OR=3.14) and occupation as nursing stuff (OR=1.3).

Table (4) shows that 64.4% of cases reported LBP episodes more than once per month, while only 5.2% of LBP is due to accidents. Also, more than half have tingling or numbness sensation in the legs due to nerve compression. Sick leaves due to LBP were reported by 18.6%; 38.1% of them consulted a specialist and 57.2% took medications.

DISCUSSION

Lower back pain is a real problem that hinders the smooth running of the medical team in the operating rooms of any health care agency.[18] Uncomfortable working positions because of restriction of movement and privacy of space inside operation rooms and theatre. This indicates that there was a critical situation regarding the workers' health.[19]

In this study, the overall prevalence of LBP in the staff of Mansoura university hospital in the operating room was 62.4%, with the highest prevalence among physicians (46.9%), followed by nursing staff (41.2%)) and the lowest prevalence among workers (11.9%). This result agreed with the outcome of another study in Libya (2016) which estimated that the prevalence rate of LBP was 55% among the HCWs in the operating room. Moreover, another study carried out by Hinmikaiye and Bamishaiye, 2012 showed that 78% of respondents had experienced lower back pain among health care providers who are working inside the theatre.[20] A higher prevalence was estimated by Mukhtad and Mohamed, 2018 who demonstrated that 87% of respondents had experienced LBP.[19]

In the current study, LBP was high among older individuals than those of younger age (74.7 % vs. 49.7%). This is in agreement with the results from Emmanuel, et al., 2015 and Al-Disoky, et al 2015 studies where there was a significant relationship between LBP and age.[21,22] Duthey , 2013 reported that the prevalence of LBP was highest in the 3rd decade, and overall prevalence increases with age with a peak at 60–65 year age group and then undergoes gradual decrease.[23] Possible explanation of these results may be that age related physical problems may significantly affect LBP. On the contrary, the results found by Kwon, et al 2006 and a study in Bangladesh which showed that low back pain occurs more between 20-40 years of age.[24, 25] such findings might be because these younger workers, less experienced staff, being allocated to more physically demanding work, and their relative inexperience in undertaking those tasks without proper techniques.

LBP was significantly more in females than males (73.4% and 47.8% respectively) and in married more than single (64.8% and 52.5%). This result was similar to a study conducted at El-Dakahlia governorate, where the prevalence of LBP was more among female patients (62.8%) than among male patients.[26] Also, the study by Sikiru and Hanifa (2010) stated that the prevalence of LBP was more in females (68%).[27] Heuch, et al., 2014 claimed that the risk for LBP was greater among women because of the stress of hormonal alterations, gynecological problems, and childbirth.[28] On the other hand, the prevalence of LBP was reported higher among males (57%) than females by Al-Disoky, et al., 2015, the difference in the results may be due to that the percentage of males in their study sample was more than females.[22]

In this study, LBP was higher among obese than non-obese (75.7% vs. 54.6%), this difference was statistically significant and similar to results from prior studies done by Heuch, et al., 2013 and Shiri, et al., 2010 which demonstrated obesity to be a risk factor for LBP. A meta-analysis in 2003 showed that obesity

was a risk factor to increased prevalence of LBP in the last year (OR = 1.33 (95% CI: 1.14-1.54).[28,29,30] Systemic metabolic processes associated with excess adipose tissue as well as biomechanical factors that increase the load on the spine may play a role in back pain and disability.[31]

This study reported no relation between smoking and LBP which was in agreement with another study by Bawab et al., 2015.[32] One possible explanation is that the majority of the study group were nonsmokers (85.2%). on the contrary, Strong associations were identified between smoking and chronic low back pain across multiple studies.[26, 33]

In the current study, low back pain was significantly lower in physically active individuals (43.7%) than in physically inactive (56.3%) which is in agreement with Alhalabi, et al., 2015 where regular physical activity appeared as a protective factor from chronic LBP.[34] On the other hand, there was a strong evidence that leisure time sports, and exercises were not associated with LBP according to a study by Bakker, et al., 2009.[35]

A significant relationship between LBP and "other" comorbidities was demonstrated (≤0.001) and the risk to develop LBP also increased with the presence of "other" co-morbidities (OR 3.5: CI 2-6.1).

Increasing the period of work inside intensive care units and operation theatre lead to an increase the chance of occurrence of LBP.[36] Tanzil, et al., 2019 demonstrate in their study that workers experience more than 5 years of recorded feeling LBP.[37] This fact comes in agreement with our study where there was a high significant association between duration of work and lower back pain (p <0.001). (46.6%) of workers more than 5yrs have LBP compared to (55.4%) in workers less than 5yrs (OR=1.9). But these results were in contrast with where years of professional experience did not influence LBP occurrence.[38]

In the present study, 55.2% complained of LBP accompanied by numbness or pain radiating to the lower extremities. This is in agreement with a study by Wong, et al., 2010 where 35.8% of LBP cases presented with numbness or pain of the leg/buttock.[39]

In our study, the reported sick leave duration was 1–7 days in 12.4% of individuals suffering from LBP, more than 1 week in another 6.2%. Sick leaves were highly significantly related to the degree of disability. LBP-related sickness absence represents a major cost to the health care facilities. LBP became the second most common cause of work absenteeism after the common cold; about 40% of sick absences from work were attributed to it. The direct and indirect costs of LBP are in terms of quality of life, productivity, and employee absenteeism.[40]

CONCLUSIONS

The problem of LBP is evident among HCWs mostly among females, obese, smoking, and aged subjects and with long working hours and long duration of employment. Some steps should be followed to combat low back pain. Scheduling rest periods to avoid long-standing work hours and incorrect postures, ergonomic interventions are suggested. Additionally, providing educational programs which enhance the ideal or proper use of body mechanics when lifting and transferring patients and heavy objects. Finally, developing health programs for managing co-morbidities, weight problems, and creating a healthier lifestyle.

Ethical Approval

The study protocol was approved by the Institutional Research Board (IRB) of Mansoura faculty of medicine with number R.22.02.1618.R1. Informed verbal consent was obtained from each participating health care worker. Confidentiality and privacy were maintained at all levels of this study. Collected data will not be utilized for any other purpose.

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