IgMin RESEARCH Focusing on Biology, Medicine and Engineering disciplines
A BioMed & Engineering Journal
MEDICINE GROUP
Clinical Medicine
ISSN 2995-8067

Article Information

Submitted: October 21, 2024
Approved: October 29, 2024
Published: October 30, 2024

How to cite this article: Alshorman J, Altahla R, Alkhatatbeh A, Li W, Prabowo F. Prevalence of Non-specific Low Back Pain Among Chinese Healthcare Workers (Surgeons and Surgical Nurses): A Multi-Center Survey Study. IgMin Res. October 30, 2024; 2(10): 880-888. IgMin ID: igmin264; DOI: 10.61927/igmin264; Available at: igmin.link/p264

Keywords: Low back pain; Healthcare professionals; Surgeons; Surgical nurses; China

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Research Article

Prevalence of Non-specific Low Back Pain Among Chinese Healthcare Workers (Surgeons and Surgical Nurses): A Multi-Center Survey Study

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Abstract

Background: Low Back Pain (LBP) is one of the most common diseases affecting many persons including Healthcare Professionals (HCPs). LBP affects the quality of work and daily activities in HCPs. However, many factors contribute to LBP including age, Body Mass Index (BMI) and working experience.

Purpose: The objective of this study was to assess the prevalence of LBP and examine the potential risk factors associated with LBP in Chinese HCPs (surgeons and surgical nurses).

Method: A cross-sectional survey performed from October 2023 to January 2024. Quebec Back Pain Disability Scale (QBPDS) was used to assess the rating of LBP impairment. As well as Ovako Working Posture Assessment System (OWAS) is used to assess the working postures of HCPs. In addition to five more questions with yes/no answers.

Results: A total of 250 surgeons and surgical nurses were collected from six hospitals with a mean age of 45.8 ± 11.0 years old, 47 females and 203 males. The BMI was 25.07 ± 1.49 kg, and working experience was 20.30 ± 10.0 years. Working hours in a week range from < 50 to > 55 hours. However, the OWAS action category was 1 in 109, 2 in 107, 3 in 30, and 4 in 4 participants. The majority of participants with mild LBP (90.4%), half of them had neck pain, and 26% with knee pain. The QBPDS scores of HCPs with LBP were 10.88 ± 4.78. Moreover, the risk factors associated with LBP include long working hours and incorrect postures of the trunk and lower extremities. As well as notice the orthopedic surgeon was the highest risk among HCPs (p = 0.046, 0.005).

Conclusion: LBP is a common disorder in surgeons and surgical nurses and is associated with different factors including age, work experience, BMI, and abnormal working posture.

Introduction

Low Back Pain (LBP) remains a common musculoskeletal disorder affecting all age groups with an adverse effect on the societal community [1]. Worldwide, LBP is a common and a key contributor of disablement causing many social and economic burdens [2-4]. LBP is characterized as a pain with muscle weakness with reduced physical activity [5]. LBP can arise for reasons ranging from improper posture to a compression fracture. Pain gives people very unpleasant feelings that increase worldwide hospitals visit. The economic consequences of LBP are substantial [6]. However, it is the second most common reason for hospital visits and is responsible for high medical costs annually [7]. The LBP ranges from mild to severe grades, affecting daily activities such as eating, sleeping, and others in addition to the quality

of work [8,9]. However, LBP is the second most common musculoskeletal condition in Healthcare Professionals (HCPs). Several factors are connected with LBP especially previous work injury and flexibility [10]. Moreover, the prevalence of LBP among doctors is high and can be prevented through increasing physical exercise, decreasing working hours, and improving working posture from abnormal to neutral posture [3]. Moreover, the prevalence of LBP in China in 1 year showed over 20,000 doctors (65.5%). The HCPs are susceptible to the varied workloads that influence their daily life and health. However, LBP can affect the HCP's mode that influences their career [3] Moreover, the work conditions and organization as well as psychosocial and ergonomic factors are associated with LBP [11]. The neuromuscular exercise once a week for six months with back pain counseling is an effective process to reduce LBP [7]. In addition, LBP is associated with substantial indirect costs, in large part due to its detrimental effect on productivity. The LBP often presented as a temporary condition, and 25-58% of cases spontaneously resolved. However, can resolve the LBP through a structured or unstructured setting that can reduce the LBP severity, including non-surgical therapies, such as exercises, physical therapy, education, acupuncture, or spinal manipulation can reduce the severity of LBP [12,13]. However, LBP can resolve spontaneously in the acute phase, but with a heavy workload and the same life habits can return with a high grade. However, quitting smoking, stopping taking alcohol, increasing daily physical activity, and decreasing weight can improve the symptoms faster and relive the LBP [14,15]. Moreover, it's essential to perform relaxation and stretching exercise between work schedules to reduce the LBP in HCPs [16].

Physicians and nurses are exposed to long-term work duties and an abnormal body posture, which is a high-risk factor for LBP and/or neuromuscular discomfort [4,17]. Moreover, the LBP is associated with many factors including a female gender, married, with > 10 years of work experience, long working hours, psychological stress, and overweight [18,19]. However, LBP varies between HCPs, which depends on the working position, career, working hours, Body Mass Index (BMI), and patient-related factors; pain ranges from under-scapula pain to the upper gluteal region with or without leg pain [20,21]. However, LBP in many persons is classified as a non-specific LBP that is not connected to pathological or anatomical changes, which mostly resolve within six weeks after physical exercise [4,22]. Working >7 hours a day can cause LBP, especially in nurses [23]. Therefore, public health professionals should set up LBP preventive educational programs and working recommendations that aim at increasing awareness of preventing vulnerable factors of LBP and decreasing the recurrence rate [12,24,25]. Globally, LBP affects approximately 568.4 million people, representing a substantial increase of 182.4 million since 1990. It is estimated that LBP is responsible for 9.4% of all disability-adjusted life years lost globally, making it a major public health concern [6]. Moreover, China has the highest number of individuals suffering from LBP globally, with approximately 91.3 million people affected as of 2019. The age-standardized prevalence of LBP in China was reported at 7.25% in 1990, decreasing to 5.13% by 2019 [26,27].

The LBP influences the quality of life of various careers including HCPs. The purpose of this study is to assess the prevalence of LBP and examine the potential risk factors such as age, working hours, and abnormal postures associated with LBP in Chinese HCPs (surgeons and surgical nurses).

Methods

Study design and participants

Multi-hospitals were contributed to this study across China from October 2023 to January 2024. A total of 6 hospitals (Wuhan Union Hospital, Wuhan Tongji Medical College, Affiliated Hospital of Fujian Medical University, Affiliated Hospital of Shantou University, Xiangning Zhongxin Hospital, The Second Affiliated Hospital of Hubei University). The presentation of selected participants in this study followed the guidelines provided by the STROBE checklist (Figure 1). The collected data included age, gender, education, career, working years, working hours per week, operating hours per week, height, weight, and associated diseases. However, working hours were divided into three groups: A (< 50 hours), B (50-55 hours), and C (> 55 hours), and Operating hours per week were divided into groups A (< 20 hours), B (20-30 hours), C (> 30). The research project was approved by the ethics committees of Hubei University of Science and Technology, with ethical approval granted under number HBUST-IRB20230224.

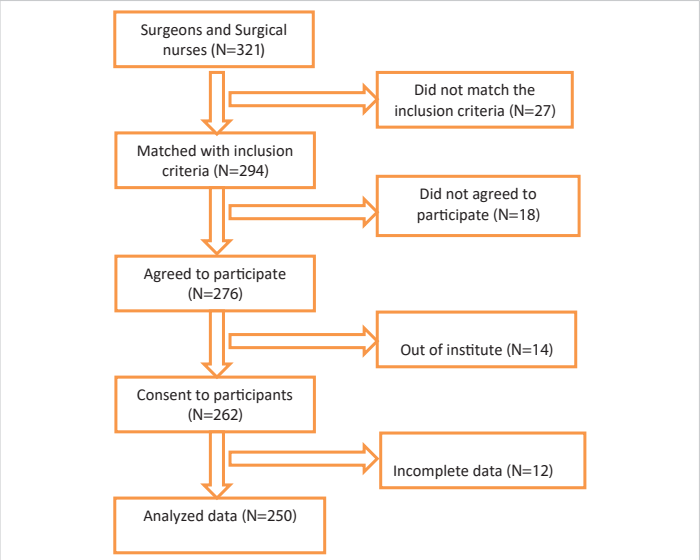

Figure 1: STROBE diagram of participants with LBP.

Inclusion and exclusion criteria

A total number of 321 participants were collected. According to the inclusion and exclusion criteria, 250 HCPs were involved including HCPs (surgeons and surgical nurses). Inclusion criteria: with LBP, surgeons, surgical nurses, working hours > 40 hours weekly, joining operation of > 15 hours weekly. However, excluded surgeons out of the hospital, working hours < 40 hours weekly, operating < 15 hours weekly. Informed consent was collected from each participant. Each participant should complete the questionnaire with no logical errors; otherwise, will be excluded from the study.

Study scales

Firstly, the Visual Analog Scale (VAS) was performed followed by the Quebec Back Pain Disability Scale (QBPDS) and Ovako Working Posture Assessment System (OWAS). Moreover, approve the written informed consent from all participants. The OWAS Action Category (AC) was confirmed according to trunk posture, arm posture, leg posture, and load bearing. After collecting the VAS scores and confirming the presence of LBP then OWAS was checked to confirm the working posture during the work and operation times. However, QBPDS was collected and analyzed. However, five more questions were asked to the participants and the answer was yes or no: 1) Do you have neck pain? 2) Do you have knee pain? 3) Do you take medicine to adjust the pain? 4) Do you smoke? 5) Do you take alcohol?

Statistical analysis

Data was analyzed using SPSS version 21. Data normal distribution was assessed using the Kolmogorov smirnov test. Descriptive statistics such as mean along with SD and median with range or IQR based on the distribution of the data for numerical variables. Moreover, numbers and percentages were calculated for categorical variables. Association between categorical variables was determined using chi-square statistics and medina differences were calculated using nonparametric statistics Kruskal-Waillis H test for numerical variables. Various correlations in individual HCPs were determined using Spearman rank correlation. Significance at 5% was considered for all statistical tests.

Results

Participants

A total of 250 HCPs included in this study, with a mean age of 48.5 ± 11.0 years old, 47 participants (18.8%) were female, and 203 were male (81.2). This study included 45 cardiovascular (18%), 60 general (24%), 48 neurology (19.2%), 59 orthopedic surgeons (23.6%), and 38 surgical nurses (15.2). Smokers were 76 participants (30.4%) and 195 taking alcohol (78%). The BMI was 25.07 ± 1.49 kg. However, 126 were healthy range and 124 were overweight. Regarding comorbidities, diabetes was in 16 participants (6.4%), Hypertension (HTN) in 16 (6.4%), and both were in 11 participants (4.4%) (Table 1).

Factors and LBP

Working hours per week were 62 in group A (24.8%), 107 in group B (42.8%), and 81 participants (32.4%) in group C. However, operation hours per week in Group A were 65 participants (26%), 135 in Group B (54%), and 50 in Group C (20%). Moreover, working years were 20.3 ± 10 years (Table 2). While 169 participants (67.6%) not doing sports and 81 (32.4%) doing sports with a mean of 2.4 ± 3.7 hours every week. Among all participants, the BMI was lower in general surgeons and higher in cardiac surgeons (Table 3). Regarding the working hours in a week, general surgeons were higher in group A (n = 24, 38.71%) and the neurosurgeons were the lowest (n = 4, 6.45%).While orthopedics in group B (n = 25, 23.36%) and cardiac surgeons were the lowest

Table 1: Demographic and anthropometric characteristics of the study sample (n = 250).

Characteristics		Mean	SD	Median	Range	n	%
Age		45.8	11.0	45.0	43.0		
Gender	Female					47	18.80
	Male					203	81.20
Department	Cardiovascular surgery					45	18.00
	General surgery					60	24.00
	Neurosurgery					48	19.20
	Orthopedics					59	23.60
	Nursing					38	15.20
Marital Status	Divorced					14	5.60
	Married					214	85.60
	Unmarried					22	8.80
Education	Bachelor					32	12.80
	Doctorate					131	52.40
	Master					87	34.80
Institute	Fujian hospital					46	18.40
	Second Affiliated of Hubei University of Science and Technology					39	15.60
	Shantou University Hospital					38	15.20
	Wuhan Tongji Hospital					44	17.60
	Wuhan Union Hospital					37	14.80
	Zhongxin Hospital					46	18.40
Smoker	No					174	69.60
	Yes					76	30.40
Alcohol	No					55	22.00
	Yes					195	78.00
Co-morbids	Diabetes					16	6.40
	Hypertension					16	6.40
	Hypertension & Diabetes					11	4.40
	None					207	82.80
Weight (kg)		70.0	7.40	69.0	43.0		
Height(cm)		166.9	6.30	167.0	36.0		
BMI		25.07	1.49	24.98	8.24		
BMI category	Healthy range					126	50.40
	Overweight					124	49.60

BMI: Body Mass Index (kg/m^2)

ISSN 2995-8067 DOI: 10.61927/igmin264

Table 2: Operational activities and pain-related characteristics.

		n	%	Mean	SD	Median	Range
Working hours per week	A	62	24.80				
	B	107	42.80				
	C	81	32.40				
Operation hours per week	A	65	26.00				
	B	135	54.00				
	C	50	20.00				
Working (years)				20.30	10.0	19.0	40.0
Sport	No	169	67.60				
	Yes	81	32.40				
Sport hours week				2.40	3.7	0.0	13.0
VAS Score				26	9	26	43
Low Back Pain	Mild	226	90.40				
	Moderate	16	6.40				
	Severe	8	3.20				
Neck pain	No	135	54.00				
	Yes	115	46.00				
Knee pain	No	185	74.00				
	Yes	65	26.00				

VAS: Visual Analogue Scale

(*n* = 16, 14.95%). In group C, the neurosurgeons were the highest (*n* = 23, 28.4%) and surgical nurses were the lowest (*n* = 8, 9.88%). Moreover, group A operation hours in a week were highest in general surgeons (*n* = 20, 30.77%) and lowest in neurosurgeons (*n* = 3, 4.62%). In group B, orthopedic surgeons were the highest (*n* = 37, 27.41%), and the lowest were surgical nurses (*n* = 16, 11.85%). However, in group C the highest was cardiac surgeons (*n* = 18, 36%), and the lowest was surgical nurses (*n* = 3, 6%) (Table 4). The LBP was mild in 226 (90.4%), and moderate in 16 (6.4%). And severe in 8 participants (3.2%). Moreover, 115 (46%) complained of neck pain and 65 (26%) with knee pain (Table 5).

OWAS action category

The OWAS AC was 1 in 109 (43.6%), 2 in 107 (42.8%), 3 in 30 (12%), and AC 4 was in 4 participants (1.6%) (Table 6). The AC in cardiac surgeons was 1 in 16 (35.56%), 2 in 23 (51.11%), and 3 in 6 participants (13.33%). While, in general surgeons were 1 in 37 (61.67%), 2 in 21 (35%), and 3 in 2 participants (3.33%). However, the AC in neurosurgeons were 1 in 16 (33.33%), 2 in 19 (39.58%), 3 in 11 (22.92%), and 4 in 2 participants (4.17%) (Table 7). In orthopedic surgeons, the

Table 3: Descriptive statistics of age, anthropometric characteristics, working years, and sports activity duration per week.

Designation	Age	Weight(kg)	Height(cm)	BMI	Working years	Sport hours/week
	Median(IQR)	Median(IQR)	Median(IQR)	Median(IQR)	Median(IQR)	Median(IQR)
Cardiac surgeons	51.0(17.0)	70.0(6.0)	167.0(7.0)	25.391(24.45)	25.0(17.0)	0.0(6.0)
General surgeons	46.0(11.5)	68.5(12.5)	168.5(7.0	24.415(2.19)	19.5(10.0)	0.0(3.50)
Neurosurgeons	51.5(19.0)	70.0(10.0)	167.0(4.50)	25.038(1.91)	24.0(18.5)	0.0(5.0)
Orthopedic surgeons	48.0(15.0)	70.0(9.0)	167.0(7.0)	24.911(1.41)	22.0(16)	0.0(6.0)
Surgical Nurses	32.0(7.0)	66.0(7.0)	160.0(9.0)	25.353(2.08)	9.0(5.0)	0.0(7.0)

BMI: Body Mass Index; bold means significant, $p < 0.001$

Table 4: Descriptive statistics of working and operation hours and sports activity.

	Working hours per week						Operation hours per week						Sport			
	A		B		C		A		B		C		No		Yes	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Cardiac surgeons	7	11.29	16	14.95	22	27.16	9	13.85	18	13.33	18	36.00	29	17.16	16	19.75
General surgeons	24	38.71	24	22.43	12	14.81	20	30.77	34	25.19	6	12.00	44	26.04	16	19.75
Neurosurgeons	4	6.45	21	19.63	23	28.40	3	4.62	30	22.22	15	30.00	30	17.75	18	22.22
Orthopedic surgeons	18	29.03	25	23.36	16	19.75	14	21.54	37	27.41	8	16.00	39	23.08	20	24.69
Surgical Nurses	9	14.52	21	19.63	8	9.88	19	29.23	16	11.85	3	6.00	27	15.98	11	13.58
p - value	0.001						< 0.001						0.746			

p - value set at < 0.05

Table 5: VAS score, level of LBP, neck and knee pain based on designation.

	VAS Score	Low Back Pain						Neck pain				Knee pain			
	Median (IQR)	Mild		Moderate		Severe		No		Yes		No		Yes	
		n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Cardiac surgeon	26(11)	38	16.81	6	37.50	1	12.50	19	14.07	26	22.61	34	18.38	11	16.92
General surgeons	26(9)	57	25.22	3	18.75	0	.00	39	28.89	21	18.26	51	27.57	9	13.85
Neurosurgeons	32(11)	37	16.37	4	25.00	7	87.50	18	13.33	30	26.09	25	13.51	23	35.38
Orthopedic surgeons	26(11)	56	24.78	3	18.75	0	.00	31	22.96	28	24.35	38	20.54	21	32.31
Surgical Nurses	17(9)	38	16.81	0	.00	0	.00	28	20.74	10	8.70	37	20.00	1	1.54
p - value	< 0.001	< 0.001						0.002				< 0.001			

VAS: Visual Analogue Scale, Where is significant here *p* - value set at < 0.05, bold mean significant.

ISSN 2995-8067 DOI: 10.61927/igmin264

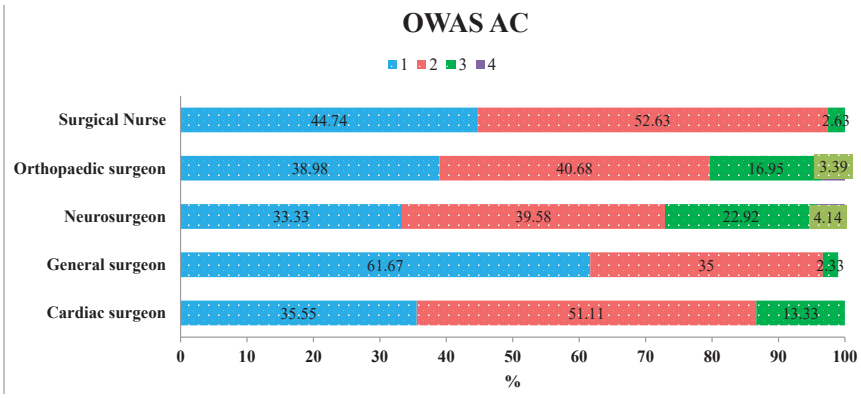

Figure 2: Percentages of OWAS AC based on designations.

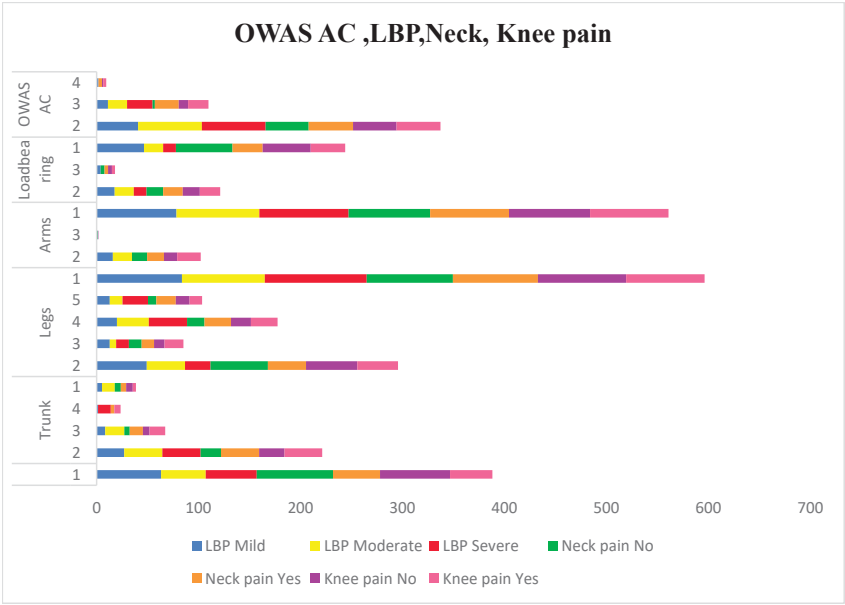

Figure 3: Working posture in HCP with the level of LBP, neck pain, and knee pain based on OWAS AC subgroups.

Table 6: OWAS and their subheadings.

		n	%
Trunk	1.0	154	61.60
	2.0	70	28.00
	3.0	22	8.80
	4.0	4	1.60
Legs	1.0	14	5.60
	2.0	119	47.60
	3.0	31	12.40
	4.0	53	21.20
	5.0	33	13.20
Arms	1.0	210	84.00
	2.0	39	15.60
	3.0	1	0.40
Load bearing	1.0	197	78.80
	2.0	44	17.60
	3.0	9	3.60
OWAS action category	1.0	109	43.60
	2.0	107	42.80
	3.0	30	12.00
	4.0	4	1.60

OWAS: Ovako Working Posture Assessment System.

AC was 1 in 23 (38.98%), 2 in 24 (40.68%), 3 in 10 (16.95%), and 4 in 2 participants (3.39%). While in nurses AC 1 was in 17 (44.74%), 2 in 20 (52.63%), and 3 in 1 participant (2.63%) (Figure 2). However, 66 (26.40%) participants take medicine to relieve the LBP. The QBPDS scores of HCPs with LBP were 10.88 ± 4.78. However, VAS ranges between HCPs between 17 to 32.

OWAS AC subgroups

No statistically significant association was observed between LBP and working posture and OWAS, $p > 0.05$. However, OWAS trunk and legs showed a statistically significant association with neck pain $p < 0.05$. The Trunk posture showed a statistically significant association with knee pain $p < 0.05$ (Figure 3). However, LBP was mild with AC 1 ($n = 105$, 46.46%) while LBP was moderate in AC 2 ($n = 10$, 62.5%), and in severe AC 2 ($n = 5$, 62.5%) (Figure 3). Cardiac surgeons mainly had mild LBP with AC 2 ($n = 18$, 47.37%), in

ISSN 2995-8067 DOI: 10.61927/igmin264

Table 7: Frequency of OWAS AC sub-groups across designations.

		Cardiac surgeon		General Surgeon		Neurosurgeon		Orthopedic surgeon		Surgical Nurse		*p* -value
		n	%	*n*	%	*n*	%	*n*	%	*n*	%	
Trunk	1.0	27	60.00	47	78.33	24	50.00	29	49.15	27	71.05	< 0.001
	2.0	15	33.33	11	18.33	14	29.17	20	33.90	10	26.32	
	3.0	3	6.67	2	3.33	6	12.50	10	16.95	1	2.63	
	4.0	0	.00	0	.00	4	8.33	0	.00	0	.00	
Legs	1.0	1	2.22	1	1.67	3	6.25	5	8.47	4	10.53	0.242
	2.0	18	40.00	38	63.33	17	35.42	27	45.76	19	50.00	
	3.0	9	20.00	7	11.67	6	12.50	5	8.47	4	10.53	
	4.0	10	22.22	10	16.67	12	25.00	13	22.03	8	21.05	
	5.0	7	15.56	4	6.67	10	20.83	9	15.25	3	7.89	
Arms	1.0	40	88.89	58	96.67	42	87.50	33	55.93	37	97.37	<0.001
	2.0	5	11.11	2	3.33	6	12.50	25	42.37	1	2.63	
	3.0	0	.00	0	.00	0	.00	1	1.69	0	.00	
Loadbearing	1.0	43	95.56	53	88.33	42	87.50	27	45.76	32	84.21	
	2.0	2	4.44	7	11.67	5	10.42	24	40.68	6	15.79	
	3.0	0	.00	0	.00	1	2.08	8	13.56	0	.00	
OWAS Action Category	1.0	16	35.56	37	61.67	16	33.33	23	38.98	17	44.74	0.007
	2.0	23	51.11	21	35.00	19	39.58	24	40.68	20	52.63	
	3.0	6	13.33	2	3.33	11	22.92	10	16.95	1	2.63	
	4.0	0	.00	0	.00	2	4.17	2	3.39	0	.00	

OWAS: Ovako Working Posture Assessment System, *p* - value set at < 0.05.

Table 8: Stratification of the working posture of HCP with LBP.

		Cardiac surgeon						General Surgeon				Neurosurgeon						Orthopedic surgeon				Surgical Nurse	
		LBP						LBP				LBP						LBP				LBP	
		Mild		Moderate		Severe		Mild		Moderate		Mild		Moderate		Severe		Mild		Moderate		Mild	
		n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Trunk	1.0	24	63.16	2	33.33	1	100.00	44	77.19	3	100.00	19	51.35	2	50.00	3	42.86	29	51.79	0	.00	27	71.05
	2.0	12	31.58	3	50.00	0	.00	11	19.30	0	.00	9	24.32	2	50.00	3	42.86	19	33.93	1	33.33	10	26.32
	3.0	2	5.26	1	16.67	0	.00	2	3.51	0	.00	6	16.22	0	.00	0	.00	8	14.29	2	66.67	1	2.63
	4.0	0	.00	0	.00	0	.00	0	.00	0	.00	3	8.11	0	.00	1	14.29	0	.00	0	.00	0	.00
p - value		0.560						0.646				0.698						0.046					NC
Legs	1.0	1	2.63	0	.00	0	.00	1	1.75	0	.00	3	8.11	0	.00	0	.00	3	5.36	2	66.67	4	10.53
	2.0	17	44.74	1	16.67	0	.00	36	63.16	2	66.67	12	32.43	3	75.00	2	28.57	27	48.21	0	.00	19	50.00
	3.0	8	21.05	1	16.67	0	.00	7	12.28	0	.00	5	13.51	0	.00	1	14.29	5	8.93	0	.00	4	10.53
	4.0	5	13.16	4	66.67	1	100.00	10	17.54	0	.00	10	27.03	0	.00	2	28.57	12	21.43	1	33.33	8	21.05
	5.0	7	18.42	0	.00	0	.00	3	5.26	1	33.33	7	18.92	1	25.00	2	28.57	9	16.07	0	.00	3	7.89
p - value		0.126						0.364				0.780						0.005					NC
Arms	1.0	33	86.84	6	100.00	1	100.00	55	96.49	3	100.00	32	86.49	3	75.00	7	100.00	32	57.14	1	33.33	37	97.37
	2.0	5	13.16	0	.00	0	.00	2	3.51	0	.00	5	13.51	1	25.00	0	.00	23	41.07	2	66.67	1	2.63
	3.0	0	.00	0	.00	0	.00	0	.00	0	.00	0	.00	0	.00	0	.00	1	1.79	0	.00	0	.00
p - value		0.596						1.000				0.448						0.676					NC
Loadbearing	1.0	36	94.74	6	100.00	1	100.00	50	87.72	3	100.00	32	86.49	4	100.00	6	85.71	27	48.21	0	.00	32	84.21
	2.0	2	5.26	0	.00	0	.00	7	12.28	0	.00	4	10.81	0	.00	1	14.29	21	37.50	3	100.00	6	15.79
	3.0	0	.00	0	.00	0	.00	0	.00	0	.00	1	2.70	0	.00	0	.00	8	14.29	0	.00	0	.00
p - value		0.825						1.000				0.925						0.100					NC
OWAS AC	1.0	16	42.11	0	.00	0	.00	35	61.40	2	66.67	14	37.84	1	25.00	1	14.29	23	41.07	0	.00	17	44.74
	2.0	18	47.37	4	66.67	1	100.00	20	35.09	1	33.33	12	32.43	3	75.00	4	57.14	22	39.29	2	66.67	20	52.63
	3.0	4	10.53	2	33.33	0	0.00	2	3.51	0	0.00	9	24.32	0	.00	2	28.57	9	16.07	1	33.33	1	2.63
	4.0	0	0.00	0	0.00	0	0.00	0	.00	0	0.00	2	5.41	0	.00	0	0.00	2	3.57	0	0.00	0	0.00
p - value		0.202						0.941				0.544						0.500					NC

LBP: Low Back Pain ; OWAS: Ovako Working Posture Assessment System. NC : No statistics are computed because LBP is a constant, the bold value in this table means significant.

ISSN 2995-8067 DOI: 10.61927/igmin264

Table 9: Factors associated with LBP score in health care professionals (surgeon and surgical nurses) with LBP.

	Cardiac surgeon		General Surgeon		Neurosurgeon		Orthopedic surgeon		Surgical Nurse	
	r	p	r	p	r	p	r	p	r	p
Age	0.263	0.081	-0.032	0.809	0.191	0.194	0.161	0.223	-0.173	0.299
BMI	-0.102	0.503	-0.242	0.063	-0.176	0.231	-0.139	0.293	0.231	0.163
Working years	0.245	0.245	-0.015	0.907	0.175	0.235	0.166	0.210	-0.175	0.293
Sports hours/week	0.185	0.224	0.149	0.256	0.290	0.045	0.243	0.064	0.067	0.688
Trunk	0.480	0.001	0.345	0.007	0.390	0.006	0.284	0.029	0.611	0.000
Legs	0.507	0.000	0.505	0.000	0.710	0.000	0.506	0.000	0.231	0.162
Arms	-0.036	0.816	-0.236	0.069	0.032	0.829	0.027	0.841	0.213	0.198
Loadbearing	-0.054	0.723	-0.155	0.237	0.165	0.261	0.194	0.142	-0.067	0.690
OWAS AC	0.892	0.000	0.869	0.000	0.926	0.000	0.931	0.000	0.833	0.000

r: Spearman Correlation ; $p < 0.05$, BMI: Body Mass Index ; OWAS: Ovako Working Posture Assessment System.

general surgeons the LBP was mild with AC 1 (n = 35, 61.4%). However, neurosurgeons mostly with AC 1 and mild LBP (n = 14, 37.84%). Moreover, in orthopedic surgeons, the most AC was 1 with a mild LBP (n = 23, 41.07%). In surgical nurses, the most AC was 2 with a mild LBP (n = 20, 52.63%) (Table 8). However, there are some factors associated with LBP such as age, BMI, and sports activities; in addition to body posture during work time (Table 9).

Discussion

Low Back Pain (LBP) is one of the most common disorders worldwide [2-4]. Pain and muscle weakness a common characteristics of LBP, which cause upsetting feelings, that affect daily life activities [5,8,9]. Various factors contribute to LBP while classified as non-specific LBP in HCPs, which can be relieved through rest and physical activities [18,19]. However, daily activities and decreasing working hours could reduce the risk of LBP [7]. Moreover, some factors help to relieve LBP faster such as quitting smoking, stopping alcohol, and decreasing weight [14,15].

This study aims to investigate the effect of work experience on the LBP in Chinese HCPs (surgeons and surgical nurses). Moreover, it shows the association between LBP with abnormal working posture and other factors that cause LBP. Moreover, a significant majority of HCPs, specifically 90%, reported experiencing mild LBP. Among the HCWs assessed, a considerable proportion of general surgeons, orthopedics, and neurosurgeons exhibited LBP, followed by an equal portion of cardiac surgeons and surgical nurses [16]. The LBP in HCPs classified as a non-specific LBP, which can be relieved with rest and physical activities [4,22]. Ibrahim, et al. 2019 concluded that working > 7 hours a day can cause LBP in nurses [23]. However, this study showed that surgeons' and surgical nurses' working hours exceed 10 hours daily with longer time in the operation room. This study showed the working years 20.30 ± 10 with about 10 hours of daily work. Moreover, different factors with long working hours and experience time can increase the risk of LBP with a high grade, our findings agreed with Sun, et al. 2020 [18]. Suliman, et al. 2018 concluded that workload is highly connected with an LBP in nurses which forces some of them to change the working unit and increase nurses' sick leaves [28]. Heavy workloads with a long experience time increase the LBP in HCPs and affect the work quality [29]. Moreover, this study showed that long working hours and working experience are associated with neck and knee pain. This study showed 81 participants doing exercises with a mean of 2.4 ± 3.7. However, 67 of them showed mild LBP with less VAS score compared to others. Additionally, it was observed that surgical nurses had a significant VAS score, indicating a higher level of pain. On the other hand, the lowest group engaged in regular sports activities. However, this study showed other factors such as age, BMI, and long working hours increasing the risk of LBP. Although it is widely recognized that older age is associated with a higher prevalence of low back pain, this particular study did not find a significant correlation between age and low back pain. The findings of this study contribute to the existing literature by suggesting that age does not influence the level of pain and disability experienced by HCPs with low back pain [30,31]. The results of the OWAS action classification revealed that both orthopedic surgeons and neurosurgeons required more corrections for their working posture compared to other professionals.

In terms of professional risk, orthopedic surgeons and neurosurgeons were found to have a higher risk, while surgical nurses had the lowest risk among the healthcare professionals assessed. Therefore, it is crucial to educate HCPs about this issue and ensure that their postures are corrected at an early stage. Moreover, the AC during working time is associated significantly with an LBP. However, this study showed a significant connection between trunk posture and knee pain. Moreover, trunk and lower extremity postures are highly associated with neck pain. The abnormal posture during working time with a long working experience is highly connected with a non-specific LBP. Consequently, the risk factors associated with LBP among HCPs include long working hours and incorrect postures of the trunk and lower extremities. As well as notice the orthopedic surgeon was the highest risk among HCPs (p = 0.046, 0.005). However, most of the participants (73.60%) did not take medicine to relieve

the LBP and it resolved after taking good rest with some exercises. The non-specific LBP accompanied by other risk factors can lead to permanent LBP with a high grade, which requires different management. It is essential to mention the risk factors of LBP in HCPs to prevent further progression through education and working recommendations that aim to increase attention towards the factors causing LBP, which affect the work quality and daily activities. The findings align with previous research indicating that prolonged working hours, specifically exceeding 7 hours a day, are associated with increased LBP among HCPs [32]. Li, et al. (2024) conducted a systematic review and meta-analysis to identify the risk factors associated with LBP in the Chinese population. The study found that factors such as age, BMI, physical activity level, and occupational hazards significantly contribute to the prevalence of LBP, highlighting the need for targeted interventions to address these risks in healthcare and community settings [27]. However, Jia, et al. (2022) reveal that LBP is highly prevalent in labor-intensive sectors, with significant risk factors including prolonged standing, heavy lifting, and poor ergonomic practices, emphasizing the need for tailored interventions to mitigate LBP in these high-risk occupations [33], which showed the agreement with Tesfaye, et al. (2023) in Africa [34]. Improving workplace design, providing proper training on posture and body mechanics, and promoting regular physical activity can significantly enhance worker comfort and reduce the incidence of LBP. Additionally, fostering a culture that prioritizes employee well-being through flexible work arrangements and rest breaks can contribute to better health outcomes and productivity. Ultimately, addressing these issues will not only improve employee health but also reduce absenteeism and healthcare costs associated with LBP.

This study includes some limitations in that it relies on self-reported data, which may be prone to recall bias and subjective interpretation by the participants, which could potentially impact the accuracy and reliability of the obtained results. Additionally, the cross-sectional design of the study prevents establishing a causal relationship between work experience and LBP, as it only provides a snapshot at a specific time without assessing changes over time. The study focuses on a specific group of Chinese HCPs (surgeons and surgical nurses) from five hospitals limits the generalizability of the findings to the HCPs in China. Lastly, the absence of a comparative group without LBP or individuals from other professions hinders direct comparisons and definitive conclusions regarding the unique impact of work experience on LBP in Chinese HCPs. Addressing these limitations, in future studies would improve the understanding of the relationship between work experience and LBP in HCPs.

Conclusion

LBP is a common disorder in HCPs and mainly presents as a non-specific LBP, which can resolve spontaneously. Surgeons and surgical nurses are highly affected by LBP because of different factors associated with LBP. Age, working experience, daily working hours, BMI, and abnormal posture are highly associated with LBP in surgeons and surgical nurses. Despite a high incidence of LBP reported, factors such as age and body mass index did not correlate significantly with pain levels, suggesting that work-related conditions play a more crucial role. The findings underscore the need for targeted interventions and education to promote better ergonomic practices and reduce the risk of LBP in this population. Addressing these issues is essential for improving the overall health and work quality of healthcare providers.

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How to cite this article: Alshorman J, Altahla R, Alkhatatbeh A, Li W, Prabowo F. Prevalence of Non-specific Low Back Pain Among Chinese Healthcare Workers (Surgeons and Surgical Nurses): A Multi-Center Survey Study. IgMin Res. October 30, 2024; 2(10): 880-888. IgMin ID: igmin264; DOI: 10.61927/igmin264; Available at: igmin.link/p264

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