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Risk factors of chronic low back pain among Syrian patients: across- sectional study

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Abstract

Background Chronic low back pain is a global health issue that leads to disability and significant economic costs. However, it has received limited attention in low- and middle-income countries. This study aimed to determine the prevalence of chronic low back pain and identify its associated risk factors among the Syrian population.

Method This cross-sectional study included adults aged 18 years and above who visited neurology outpatient clinics in seven centers across four provinces (Damascus, Aleppo, Homs, and Latakia) between November 2021 and January 2022. A self-administered questionnaire was utilized to collect data on socio-demographic factors, work-related characteristics, and information about chronic low back pain. Descriptive statistics were employed to summarize the demographic characteristics of the participants. Multivariate logistic regression analysis was conducted to assess the risk factors for chronic low back pain.

Results A total of 830 adults participated in the study. The overall prevalence of chronic low back pain was estimated to be 16.7% (95% CI: 13.6–25.5), with females having a higher prevalence 17.8%, (95% CI: 14.8–27.5) compared to males 15.4%, (95% CI: 14.8–23.1). Multivariate regression analysis revealed several risk factors associated with chronic low back pain. These included being overweight (aOR: 5.2, 95% CI: 1.9–8.4, $p=0.041$), having no formal education (aOR: 4.6, 95% CI: 1.6–8.4, $p=0.001$), lack of regular physical exercise (aOR: 3.7, 95% CI: 1.8–6.3, $p=0.003$), smoking more than 11 cigarettes per day (aOR: 4.8, 95% CI: 2.4–12.6, $p=0.003$), leading a sedentary lifestyle (aOR: 8.3, 95% CI: 3.5–18.9, $p=0.002$), manual work (aOR: 7.9, 95% CI: 5.9–16.7, $p=0.003$), and adopting a stooped sitting posture (aOR: 3.5, 95% CI: 0.9–8.2, $p=0.039$).

Conclusion This study demonstrates that the prevalence of chronic low back pain in Syria is higher compared to other regions, and it is associated with several risk factors. These risk factors include a lack of formal education, being overweight, insufficient regular physical exercise, smoking, leading a sedentary lifestyle, manual work, and adopting a stooped sitting posture. These findings underscore the importance of addressing these modifiable risk factors to prevent and manage chronic low back pain in the Syrian population.

Keywords Chronic low back pain, Prevalence, Risk factors, Syria

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Introduction

Chronic low back pain (CLBP) is a prevalent condition worldwide, causing significant disability and imposing a substantial economic burden across all age groups [1, 2]. Among adults, CLBP is particularly impactful, as it is one of the leading causes of years lived with disability (YLDs) globally. Adults with CLBP often experience reduced mobility, diminished quality of life, and increased risk of comorbid mental health conditions, such as depression and anxiety, which further exacerbate their suffering. The economic burden of CLBP is profound, with direct costs related to healthcare utilization, including frequent outpatient visits, diagnostic tests, and long-term treatments, as well as indirect costs due to lost productivity, absenteeism, and early retirement. In low- and middle-income countries (LMICs) like Syria, where healthcare resources are limited and economic instability prevails, the burden of CLBP is even more pronounced. Adults in these settings face additional challenges, such as limited access to specialized care, inadequate pain management options, and socioeconomic stressors, which amplify the physical and psychological toll of CLBP. Notably, low back pain (LBP) is an almost universal experience, accounting for one-third of all daily outpatient visits and ranking second only to the common cold [3]. However, the development of CLBP from acute LBP episodes occurs only in a limited proportion of individuals, estimated to be approximately 10 to 20% [4]. Despite its relatively low prevalence, CLBP has a considerable economic impact, especially among adults. For instance, a population-based study by Linton et al. [5] revealed that 6% of CLBP cases accounted for 41% of all healthcare visits.

According to a systematic survey conducted on the global adult population, the prevalence rates of non-specific chronic low back pain (NCLBP) were found to be as follows: the point prevalence (at a specific point in time) was 12%, the 1-month prevalence was 23%, the annual prevalence was 38%, and the lifetime prevalence was 40% [6–9] Over time, there has been an observed increase in the prevalence of CLBP. Anderson et al. [10] reported increased CLBP prevalence from 3.9% in 1992 to 10.2% in 2006. Similarly, Freburger et al. found a CLBP prevalence of 10.2% among adults in California [11]. In Germany, Klauber et al. [12] reported an annual prevalence of NCLBP of 26% in 2010, which was higher than the findings of Anderson et al. in 2006 and Freburger et al. in 2009. Noormohammadpour et al. [13] reported a CLBP prevalence of 27.18% among Iranian adults aged 30 to 70 years. Hartvigsen et al. [14] found that in 2015, the global point prevalence of chronic disabling back pain was 7.3%. Specific prevalence rates of CLBP were reported as 15.4% in the general adult population of Japan [15] and 13.4% in Wales [16].

In Syria, the majority of studies on LBP tend to focus on work-related or occupation-based factors, examining the incidence, prevalence, risk factors, and disabilities associated with LBP concerning employment status. Unfortunately, there is a lack of comprehensive research specifically investigating CLBP, with studies often mentioning CLBP as a secondary topic within investigations of other musculoskeletal disorders. In the context of LMICs, including Syria, there is a lack of comprehensive investigation into CLBP. Non-specific chronic low back pain refers to persistent pain or discomfort in the region below the lower 12th rib and the inferior gluteal fold, lasting for at least 12 weeks, without any identifiable specific spinal disease, radiculopathy, or nerve root pain [3]. It encompasses various clinical manifestations, including sacroiliac joint pain, facet/zygapophyseal joint pain, and lumbosacral myofascitis [3]. CLBP is often associated with significant complications, including chronic disability, reduced physical function, and impaired quality of life. Many individuals with CLBP experience sleep disturbances, fatigue, and difficulty performing daily activities, which further contribute to their suffering. Additionally, CLBP is frequently accompanied by psychological complications, such as depression, anxiety, and social isolation, creating a vicious cycle of pain and emotional distress. The chronic nature of CLBP also increases the risk of opioid dependence and other medication-related complications, particularly in settings where pain management options are limited. It is worth noting that treating non-specific CLBP can be complicated and challenging, with approximately 80–90% of CLBP cases falling into this category [17]. The primary objective in managing LBP is to alleviate pain, restore or improve function, and prevent recurrence. However, the complexity of CLBP, with its multifactorial etiology and frequent comorbidities, often makes treatment outcomes unpredictable and necessitates a multidisciplinary approach involving physical therapy, psychological support, and pharmacological interventions.

The current recommendations lean towards minimally invasive conservative approaches and rehabilitation. Pharmacologic therapy is often the initial treatment option, with interventional therapy considered if conservative measures and medication fail to provide relief. It is worth noting that the majority of LBP cases, around 80%, resolve within a few weeks, with only approximately 20% progressing to chronic and disabling symptoms. However, CLBP is poorly investigated despite its association with significant disability and high economic costs. The lack of comprehensive research on CLBP hampers understanding its distribution and impact. One of the challenges in studying CLBP is the variation in its definition across the literature, with different authors using different definitions and criteria over time. This lack of a standardized definition makes it difficult to compare and generalize findings, leading to a deficiency in accurate knowledge regarding the distribution of CLBP in terms of anatomical characterization and symptom duration. Therefore, there is an urgent need for a precise assessment of the prevalence, incidence, associated risk factors, and economic burden of CLBP. This information is crucial for effectively allocating healthcare resources and addressing the growing public health issue CLBP poses. As part of a more extensive study, this research aims to determine the burden of CLBP among adults in Syria by investigating the prevalence and risk factors associated with this condition.

Methods

Study design, setting, and participant

We conducted a cross-sectional study at neurology outpatient clinics in seven centers across four provinces (Damascus, Aleppo, Homs, and Latakia) between November 2021 and January 2022. The study utilized a standardized self-administered questionnaire, and we recruited adult participants aged 18 years and above, consistent with the widely accepted definition of adulthood in epidemiological and clinical research [18]. Participants who sought healthcare services at the selected clinics during the study period were included. Participants were required to provide informed consent to be included in the study. Exclusion criteria encompassed minors, those with mental illness or physical disabilities, and individuals with congenital anomalies such as cerebral palsy, ambulatory issues, or other significant medical conditions [19].

Sample size Estimation

The sample size was calculated to estimate the prevalence of CLBP with a 95% confidence level and a 5% margin of error. Assuming a maximum variability of 50% (due to the lack of prior prevalence data), an initial sample size of 567 was determined. To account for potential nonresponse, the sample size was increased by 10%, resulting in an intermediate sample size of 624. Given the multicenter nature of the study, a design effect ($D = 1.5$) was applied to adjust for potential clustering effects, such as regional variations in CLBP prevalence or differences in healthcare access across the seven study sites. The final estimated sample size was 936 (624×1.5). Participants were recruited using a convenience sampling approach from neurology outpatient clinics in seven centers across four provinces (Damascus, Aleppo, Homs, and Latakia). While convenience sampling is not random, it was the most feasible method given the logistical challenges of conducting research in Syria, including limited resources and the ongoing humanitarian crisis. To mitigate potential biases, we ensured that the sample included a diverse range of participants in terms of age, gender, and socioeconomic status.

Data collection

Structured questionnaires were utilized to collect data in this study (supplementary file). The questionnaires gathered detailed baseline information on various aspects, including participant demographics (age, gender, and marital status), socioeconomic status (highest educational level and occupation), lifestyle factors (exercise frequency, smoking attitude, and alcohol consumption), postural habits (type of work, use of back support, and sitting posture), clinical parameters (BMI calculated using self-reported height and weight, presence of chronic diseases), and low back pain-related information (previous history, current status, healthcare service utilization, and social implications).

In this study, CLBP was defined as low back pain persisting for at least three months, occurring on most days during this period. This definition aligns with the widely accepted clinical criteria for chronic pain. Pain severity was assessed using self-reported measures, including a numeric rating scale (NRS) ranging from 0 (no pain) to 10 (worst imaginable pain). Although the use of a validated scale such as the Visual Analog Scale (VAS) would have provided greater precision, the NRS allowed for a practical and accessible assessment of pain intensity in our study population.

To ensure clarity and consistency in the measurement of other key variables, operational definitions were applied. Physical activity was defined as any form of exercise or movement performed for at least 30 min per day, on three or more days per week. Smoking status was classified as current smoker (regularly smokes at least one cigarette per day), former smoker (has smoked in the past but has not smoked for at least six months), or never smoker (has never smoked or has smoked fewer than 100 cigarettes in their lifetime) [20]. Postural habits were defined based on self-reported sitting posture during work or daily activities, categorized as good posture (sitting with back support and maintaining a neutral spine position) or poor posture (sitting without back support or with a slouched or hunched position). Body Mass Index (BMI) was calculated using self-reported height and weight ($BMI = \text{weight in kg} / \text{height in m}^2$) and classified as underweight (< 18.5), normal weight (18.5–24.9), overweight (25.0–29.9), or obese (≥ 30.0). Healthcare service utilization was defined as seeking medical care (e.g., visiting a doctor, physiotherapist, or specialist) for low back pain within the past 12 months.

The survey was initially written in English, then translated into Arabic by language specialists, and subsequently back-translated into English to ensure consistency in the meaning of terms and concepts. This process was completed before data collection began. A pilot study was conducted on 40 students to test the clarity and feasibility of the questionnaire. Based on the pilot results, the principal statistical team revised the questionnaire to improve its reliability and validity.

The tool's reliability in assessing acceptance was evaluated using Cronbach's Alpha, which was used to determine the "internal consistency" of the questionnaire. The Cronbach's Alpha score of 0.89 indicated acceptable internal consistency, supporting the reliability of the questionnaire for data collection.

Participation in the study was voluntary, and strict measures were implemented to ensure all participants received equal and respectful care. Participants were informed that they had the right to withdraw from the study at any point if they no longer wished to continue. Before data collection, all participants who volunteered and met the inclusion criteria were required to provide written consent after fully understanding the terms and conditions of the study.

Statistical analysis

The collected data were analyzed using IBM SPSS statistical software version 24.0 for Windows (IBM Corp., Armonk, NY, USA). Descriptive statistics were employed to analyze the demographic data, which were presented as frequencies (n) and proportions (%) with corresponding 95% confidence intervals (CI) for all variables. A multivariate logistic regression analysis was conducted to assess the association between CLBP biomechanical risk factors and the presence of CLBP. Adjustments were made for factors that showed significant associations with CLBP in the univariate analysis, with a significance cut-off of $p \leq 0.2$ [21]. This threshold was chosen to ensure that potentially important variables were not excluded prematurely, as recommended in methodological literature for exploratory studies. To address potential issues of collinearity and overfitting, we evaluated the covariates included in the model using variance inflation factors (VIFs). Variables with VIF > 5 were identified as potentially collinear and were either removed or combined to reduce redundancy. Additionally, the Hosmer-Lemeshow test was used to assess the goodness-of-fit of the logistic regression model, confirming that the model adequately fits the data without overfitting. The dependent variable in this analysis was the presence or absence of CLBP, and adjusted odds ratios (aORs) along with their 95% confidence intervals (CIs) were estimated. A separate regression model was employed to calculate the association between pregnancy and CLBP, considering only female participants in the analysis. A significance level of $p < 0.05$ was considered statistically significant after adjustment for all statistical analyses.

Results

General characteristics of the participants

Between November 2021 and September 2022, 913 questionnaires were distributed to participants. However, only 830 questionnaires were completed, resulting in a response rate of 90.9%. Table 1 provides an overview of the sociodemographic characteristics of the participants. The gender distribution showed that approximately 41.1% were males and 58.9% were females. Regarding age groups, 9.7% of the participants were classified as elderly, while only 7.6% were categorized as young adults. Most participants were middle-aged adults, constituting a significant proportion of the sample. Regarding marital status, nearly half (55.6%) of the participants were married.

Regarding body weight, approximately one-third of the participants were classified as overweight (29.6%), and 22.5% were classified as obese. A notable portion (18.6%) of the participants had no formal education. The participants' exercise habits were almost evenly split, with 46.9% reporting regular exercise and 53.1% reporting no exercise. Regarding occupation, most participants (54.9%) were classified as semi-sedentary workers who involved office work, walking, standing, bending, and twisting. Only 23.8% of the participants reported maintaining a straight-back sitting posture, while 30.6% reported using a back support when sitting. Furthermore, 42.9% of the participants reported a prior history of CLBP within their immediate family; this indicates a significant proportion of participants with a familial predisposition to CLBP.

Prevalence of chronic low back pain

As shown in Table 2, the overall prevalence of CLBP was 16.7% (95% CI: 13.6–25.5). Females had a higher prevalence of CLBP than males, 17.8% (95% CI: 14.8–27.5) and 15.4% (95% CI: 12.5–23.1) respectively. However, stratified by gender and age, males showed a slightly higher prevalence (11.7%) among young adults aged 18–27 years compared to their female counterparts (15.6%). Similarly, the prevalence of chronic low back pain among male adults in the age category 38–47 was higher as compared to their female counterparts, 19.4 and 17.5%, respectively. The overall prevalence of chronic low back pain increased with age, with older people showing the highest prevalence compared to young adults, 25.6% (95% CI: 17.9–32.7) and 17.2% (95% CI: 9.4–21.6), respectively.

Risk factors for chronic low back pain

We conducted a multivariable binary logistic regression analysis to identify the biomechanical risk factors associated with CLBP. The final multivariate model included significant variables at the threshold of $p \leq 0.2$ in the univariate analysis. The results, presented in Table 3, revealed the following risk factors that were positively associated with CLBP: overweight (aOR: 5.2, 95% CI:

Table 1 Socio-demographic characteristics of study participants ($N = 830$)

Variable	Frequency ($N = 830$)		Chronic low back pain ($n = 210$)	
	(n.)	(%)	(no.)	(%)
Age				
18–27	63	7.6	20	9.5
28–37	196	23.6	36	17.1
38–47	252	30.4	62	29.6
48–57	238	28.7	56	26.7
58≥	81	9.7	36	17.1
Gender				
Male	341	41.1	89	42.4
Female	489	58.9	121	57.6
Marital status				
Single	153	18.4	42	20.1
Married	462	55.6	112	53.2
Separated	187	22.5	51	24.3
Widowed	28	3.4	5	2.4
Body mass index (BMI)				
Underweight	112	13.5	24	11.4
Normal	286	34.4	51	24.3
Overweight	246	29.6	101	48.1
Obese	186	22.5	34	16.2
Highest level of education				
No formal education	42	5.1	11	5.2
Primary	326	39.2	108	51.4
Secondary	257	30.9	69	32.8
Tertiary	205	24.8	22	10.6
Exercise frequency				
Yes	389	46.9	72	34.3
No	441	53.1	138	65.7
Smoking attitude				
No	223	26.9	52	24.8
Light smokers	264	31.8	94	44.8
Heavy smokers	343	41.3	64	30.4
Alcohol consumption				
No	641	77.2	171	81.4
Occasional	135	16.2	25	11.9
Frequent	54	6.6	14	6.7
Type of work				
Semi sedentary	456	54.9	49	23.4
Sedentary	164	19.7	75	35.7
Manual labor	210	25.4	86	40.9
Sitting posture				
Straight back	198	23.8	36	17.1
Stooped	135	16.3	74	35.2
Backward inclination	231	27.8	63	30.1
Forward inclination	266	32.1	37	17.2
Use of back support				
Yes	254	30.6	49	23.3
No	576	69.4	161	76.7
How long in this occupation?				
< 2	49	5.9	12	5.7
2–3	142	17.1	22	10.5
3–4	165	19.9	36	17.1
4–5	223	26.9	58	27.6

Table 1 (continued)

Variable	Frequency (*N*=830)		Chronic low back pain (*n*=210)	
	(n.)	(%)	(no.)	(%)
6≥	251	30.2	82	39.1
Positive family history of CLBP				
Yes	356	42.9	71	33.8
No	474	57.1	139	66.2

Table 2 Prevalence of chronic low back pain (*N*=830)

Age (years)	Prevalence of CLBP Males		Prevalence of CLBP Females		Overall Prevalence of CLBP	
	no.	% (95%CI)	no.	% (95%CI)	no.	% (95%CI)
18–27	8	11.7 (4.7–24.6)	12	15.6 (4.56–41.7)	20	17.2 (9.4–21.6)
28–37	13	8.3 (3.6–18.7)	23	21.7 (9.2–26.8)	36	19.4 (12.7–25.3)
38–47	29	19.4 (14.6–31.5)	33	17.5 (9.8–24.8)	62	14.6 (9.3–17.4)
48–57	22	11.4 (9.2– 31.8)	34	19.3 (17.8–34.6)	56	22.5 (14.7–31.8)
58≥	17	22.5 (15.3–38.5)	19	34.1 (18.6–47.6)	36	25.6 (17.9–32.7)
Overall	**89**	**15.4 (12.5–23.1)**	**121**	**17.8 (14.8–27.5)**	**210**	**16.7 (13.6–25.5)**

1.9–8.4), no formal education (aOR: 4.6, 95% CI: 1.6–8.4), lack of regular physical exercises (aOR: 3.7, 95% CI: 1.8–6.3), smoking more than 11 cigarettes per day (aOR: 4.8, 95% CI: 2.4–12.6), a sedentary lifestyle (aOR: 8.3, 95% CI: 3.5–18.9), manual work (aOR: 7.9, 95% CI: 5.9–16.7), and a stooped sitting posture (aOR: 3.5, 95% CI: 0.9–8.2).

In comparing the adjusted odds ratios, regularly smoking more than 11 cigarettes per day (aOR: 4.8) had over three times the odds of predicting CLBP compared to regularly smoking less than ten cigarettes per day (aOR: 1.2). Interestingly, a sedentary lifestyle (aOR: 8.3) had higher odds of predicting CLBP compared to manual labor (aOR: 7.9). Additionally, we conducted a separate logistic regression analysis specifically for females to examine the association of pregnancy with CLBP. After adjusting for other factors, the results presented in Table 4 indicated that pregnancy was significantly associated with CLBP (aOR: 1.8, 95% CI: 0.8–3.5).

Discussion

This cross-sectional study investigated the prevalence and risk factors associated with chronic low back pain (CLBP) among Syrian adults attending outpatient neurology clinics across seven centers in four provinces. The findings revealed a CLBP prevalence of 16.7% in the study population, which is notably higher than rates reported in many other regions. For example, studies from Saudi Arabia report a prevalence of 18.5% among healthcare workers [22], while rates in the United States and Europe are generally lower, ranging from 10 to 15% [23, 24]. Similarly, data from Asia and Africa suggest lower prevalence rates compared to our findings [23, 25]. These comparisons underscore the elevated burden of CLBP in Syria, highlighting the need for targeted interventions in this population.

The prevalence of CLBP observed in this study was higher than that reported in previous studies conducted in other populations. For instance, the prevalence in our study (16.7%) exceeds the 15.4% reported in the general Japanese adult population [15], the 13.4% observed in Wales [16], and the 10.2% among adults in California [11]. Conversely, a study by Noormohammadpour et al. [13]reported a higher prevalence of 27.18% among Iranian adults aged 30 to 70 years. However, it is important to note that comparing these studies is challenging due to differences in methodologies, study populations, and contextual factors. These variations highlight the need for more homogeneous studies employing similar methods to enable direct comparisons and draw firmer conclusions. Further research is essential to improve comparability and provide robust recommendations regarding the prevalence and management of CLBP across diverse populations.

When examining the data by gender, the study found that the prevalence of CLBP was 15.4% among males and 17.8% among females. A multivariable regression analysis identified several significant predictors of CLBP, including being overweight, lacking formal education, not engaging in regular physical exercise, smoking cigarettes, leading a sedentary lifestyle, performing manual labor, and adopting a stooped sitting posture.

When stratified by gender, we found that the prevalence of CLBP was higher among females (17.8%) than males (15.4%); this aligns with the findings of several other studies [26, 27] that have consistently reported a higher overall prevalence of CLBP among females compared to males. Interestingly, our study revealed a unique pattern among individuals aged 38 to 47. In this age group, males had a higher prevalence of CLBP (19.4%) than their female counterparts (17.5%). This difference could be attributed to various factors, including

Table 3 Risk factors for chronic low back pain ($N=830$)

Characteristics	No. (%)	Univariate		Multivariate	
		COR (95%CI)	p-value	AOR (95%CI)	p-value
Age					
18–27	63 (7.6%)	1 (ref)		1 (ref)	
28–37	196 (23.6%)	2.1 (0.9–2.5)	0.722	1.6 (0.7–6.3)	0.351
38–47	252 (30.4%)	1.9 (0.3–2.2)	0.832	2.4 (0.6–12.5)	0.451
48–57	238 (28.7%)	1.7 (0.5–3.1)	0.711	3.8 (0.5–9.6)	0.173
58≥	81 (9.7%)	1.9 (1.2–4.3)	0.351	4.1 (1.3–19.9)	0.062
Gender					
Male	341 (41.1%)	1 (ref)		1 (ref)	
Female	489 (58.9%)	1.2 (0.8–2.7)	0.318	2.4 (0.8–4.6)	0.390
Marital status					
Single	153 (18.4%)	1 (ref)		1 (ref)	
Married	462 (55.6%)	2.7 (0.8–2.9)	0.682	1.9 (0.5–2.3)	0.081
Separated	187 (22.5%)	1.2 (0.7–2.7)	0.083	0.6 (0.3–1.9)	0.259
Widowed	28 (3.4%)	1.9 (1.1–4.6)	0.731	1.4 (0.9–3.6)	0.172
Body mass index (BMI)					
Underweight	112 (13.5%)	1 (ref)		1 (ref)	
Normal	286 (34.4%)	1.3 (0.8–2.4)	0.931	1.2 (0.6–4.2)	0.745
Overweight	246 (29.6%)	3.4 (1.9.– 5.9)	0.006	5.2 (1.9–8.4)	0.0041*
Obese	186 (22.5%)	5.2 (2.1–7.3)	0.041	3.5 (1.2–11.3)	0.361
Highest level of education					
No formal education	153 (18.6%)	3.2 (1.9–6.3)	0.001	4.6 (1.6–8.4)	0.003*
Primary	269 (32.4%)	0.8 (0.6–2.9)	0.549	3.4 (0.4–8.4)	0.163
Secondary	233 (28.1%)	2.1 (0.9–4.6)	0.831	2.9 (0.7–7.3)	0.962
Tertiary	174 (20.9%)	1 (ref)		1 (ref)	
Exercise frequency					
No	389 (46.9%)	2.8 (1.9–4.6)		3.7 (1.8–6.3)	0.027*
Yes	441 (53.1%)	1 (ref)	0.007	1 (ref)	
Smoking attitude					
No	223 (26.9%)	1 (ref)		1 (ref)	
Yes– 1 to 10 cigarettes	264 (31.8%)	2.4 (0.8–3.2)	0.004	1.2 (0.9–6.3)	0.008**
Yes– 11 and above	343 (41.3%)	5.1 (2.6–11.3)	0.031	4.8 (2.4– 12.6)	0.003**
Alcohol consumption					
No	641 (77.2%)	1 (ref)		1 (ref)	
Occasional	135 (16.2%)	1.3 (0.7–2.8)	0.042	1.4 (0.8–4.7)	0.047*
Frequent	54 (6.6%)	3.0 (1.4–7.3)	0.006	4.9 (1.8–14.6)	0.073
Type of work					
Semi sedentary	456 (54.9%)	1 (ref)		1 (ref)	
Sedentary	164 (19.7%)	9.5 (5.2–11.5)	0.002	4.2 (2.1 8.5)	0.003**
Manual labor	210 (25.4%)	8.9 (3.7–17.9)	0.008	3.8 (1.9 7.6)	0.005**
Sitting posture					
Straight back	198 (23.8%)	1 (ref)		1 (ref)	
Stooped	135 (16.3%)	2.7 (1.9–5.9)	0.027	3.5 (0.9–8.2)	0.039*
Backward inclination	231 (27.8%)	4.3 (0.9–8.4)	0.094	2.7 (0.6–5.9)	0.143
Forward inclination	266 (32.1%)	1.3 (0.9–2.5)	0.039	1.7 (0.9–6.7)	0.194
Use of back support					
Yes	254 (30.6%)	1 (ref)	0.041	1 (ref)	
No	576 (69.4%)	4.2 (1.7–5.6)		1.7 (0.6–4.7)	0.842
How long in this occupation?					
< 2	49 (5.9%)	1 (ref)		1 (ref)	
2–3	142 (17.1%)	1.7 (0.9–2.6)	0.753	1.4 (0.6–2.3)	0.089
3–4	165 (19.9%)	0.9 (0.8–3.8)	0.832	0.7 (0.6–2.6)	0.142
4–5	223 (26.9%)	0.4 (0.9–1.9)	0.722	0.8 (0.4–1.5)	0.253

Table 3 (continued)

Characteristics	No. (%)	Univariate		Multivariate	
		COR (95%CI)	p-value	AOR (95%CI)	p-value
6≥	251 (30.2%)	1.6 (0.7–4.9)	0.469	1.1 (0.4–3.6)	0.082
Positive family history of CLBP					
Yes	356 (42.9%)	3.7 (0.8–6.2)	0.026	2.6 (0.6–4.6)	0.471
No	474 (57.1%)	1 (ref)			

Bold p-values on multivariate analysis were statistically significant

*Sig at $p<0.05$

**Sig at $p<0.001$

Table 4 Risk factors of chronic low back pain among females ($N=489$)

		Females			
Characteristics		Univariate		Multivariate	
	No. (%)	COR (95%CI)	p-value	AOR (95%CI)	p-value
No. of pregnancies	489 (58.9%)	2.2 (1.6–2.7)	0.021	1.8 (0.8–3.5)	0.032
Education					
Primary education	237 (48.5%)	1.2 (0.5–2.6)	0.351	1.3 (0.7–2.1)	0.043
Secondary education	210 (42.9%)	1.6 (1.1–4.2)	0.742	2.1 (0.9–1.4)	0.025
Exercise Frequency					
No	289 (59.1%)	2.3 (1.4–4.3)	0.005	2.1 (1.9–4.7)	0.033
Smoking attitude					
Yes– 11 and above	246 (50.3%)	11.3 (7.9–22.6)	0.024	24.7 (14.9–67.6)	0.005
Type of work					
Sedentary	103 (21.1%)	11.7 (6.7–25.9)	0.000	46.2 (8.9–78.4)	0.002
Manual labor	112 (22.9%)	15.8 (7.9–28.2)	0.032	34.6 (5.7–83.7)	0.007
Sitting posture					
Stooped	72 (14.7%)	3.7 (2.9–8.9)	0.011	12.7 (3.9–51.7)	0.009
Forward inclination	184 (37.6%)	2.5 (2.2–7.3)	0.005	6.8 (3.4–25.7)	0.027

Bold p-values on multivariate analysis were statistically significant

*Sig at $p<0.05$

**Sig at $p<0.001$

a higher proportion of male individuals in this age group who smoke, consume alcohol frequently, and engage in manual labor compared to females. Our study also identified pregnancy as a significant predictor of CLBP, which is consistent with the findings of several other studies [28–34] that have reported similar associations between pregnancy and CLBP.

Contrary to the findings of some cross-sectional studies [10, 15, 16, 26, 27], our multivariate analysis did not find increasing age to be a significant predictor of CLBP. However, it is worth noting that Knauer et al. [27] reported a decrease in the prevalence of CLBP among the elderly population, which contradicts our findings.

This study found that being overweight was a significant predictor of CLBP, which is consistent with the findings of Iizula et al. [15]; this can be explained by the postural theorem, which suggests that an increase in the virtual weight of the lumbar spine places a more significant load and stress on the surrounding anatomical structures. Over time, this can lead to micro trauma that accumulates and eventually manifests as chronic disabling pain.

Furthermore, our study identified a lack of formal education as a significant predictor of CLBP, similar to the findings of Dionne et al. [35], Hagen et al. [36], and Jonsdottiir et al. [16]. This association may be attributed to lower health awareness among individuals with limited formal education. Additionally, those with no formal education are more likely to engage in manual occupations that involve frequent bending, twisting, and lifting of heavy objects, all of which have been strongly associated with CLBP.

The study also revealed that a lack of regular exercise was a significant predictor of CLBP, consistent with previous research [22, 37, 38]. Insufficient physical activity weakens the back's myofascial structures and disrupts proper biomechanics, contributing to the development of CLBP. Increased smoking was found to be a significant predictor of CLBP, aligning with the results of similar studies [13, 39–42]. Several explanations have been proposed to clarify this association. Firstly, smoking reduces bone mineral content, increasing the risk of osteoporosis and micro-injuries in the vertebral body, thus accelerating the degenerative process of the spine. Secondly, smoking-induced coughing raises intradiscal and intra-abdominal pressures, leading to an elevated risk of disc herniation. Lastly, smoking diminishes blood flow to the intervertebral discs, affecting their metabolic balance and contributing to disc degeneration. However, prospective studies are needed to investigate this topic further. Additionally, our study identified a sedentary lifestyle and manual labor as significant predictors of CLBP, consistent with similar cross-sectional studies [43, 44]. Prolonged sitting without proper back support increases the virtual weight on the lumbar spine, straining the surrounding anatomical structures and potentially causing micro-injuries, scar tissue formation, and fibrosis.

The findings of this study align with previous research highlighting the significant burden of chronic low back pain (CLBP) globally. For instance, a systematic review by Hoy et al. reported that CLBP is the leading cause of disability worldwide, affecting approximately 10% of the population, with higher prevalence rates observed in low- and middle-income countries [45]. Similarly, a study by Hartvigsen et al. emphasized the socioeconomic impact of CLBP, including reduced productivity and increased healthcare costs [14].

Our finding that sedentary lifestyle is a significant risk factor for CLBP is consistent with the results of a meta-analysis by Shiri et al., which reported a strong association between physical inactivity and chronic musculoskeletal pain [46]. Additionally, the association between smoking and CLBP may be explained by the detrimental effects of nicotine on spinal disc nutrition and blood flow, as demonstrated in experimental studies by Uematsu et al. [47].

The high prevalence of CLBP among manual workers highlights the need for workplace interventions, such as ergonomic training and regular breaks, to reduce the risk of musculoskeletal disorders [47]. Future studies should investigate the long-term effectiveness of multidisciplinary interventions, including physical therapy and cognitive-behavioral therapy, in managing CLBP.

A critical finding of this study is the association between lack of formal education and the occurrence of CLBP. To address this, social support groups and health education programs must be developed for individuals with limited health literacy. Community health workers can be crucial in delivering health information and promoting preventive measures to this population. The study also highlights the significance of regular exercise in preventing CLBP; this calls for community leaders and policymakers to implement social and sporting events and initiatives encouraging regular physical exercise. In addition, efforts should be made to include the senior population in these initiatives, promoting a healthy lifestyle across all age groups.

The association between cigarette smoking, excessive, and CLBP emphasizes the importance of regular awareness campaigns and the implementation of policies aimed at discouraging smoking, particularly among young adults. These campaigns should focus on educating individuals about the detrimental effects of these habits on back health. Furthermore, the study identifies a sedentary lifestyle as a significant predictor of CLBP. To address this, employers should ensure employees can access comfortable chairs with ergonomic lumbar support. Health and safety policies should incorporate guidelines for sitting ergonomics and regular workplace inspections by qualified health and safety officers to enforce these measures.

Given the ongoing humanitarian crisis and healthcare challenges in Syria, tailored interventions are essential to address the high prevalence of CLBP. First, community-based health education programs should be implemented to raise awareness about modifiable risk factors, such as sedentary behavior, poor ergonomics, and smoking. These programs can be delivered through local mosques, community centers, and schools, leveraging existing networks to reach vulnerable populations. Second, low-cost ergonomic adaptations, such as providing lumbar support cushions or adjustable chairs, should be promoted in workplaces and households. Third, integrating CLBP prevention into existing humanitarian aid efforts, such as distributing educational materials or organizing free physiotherapy sessions, could help mitigate the burden of CLBP. Finally, partnerships with local NGOs and international organizations could facilitate the implementation of public health initiatives, such as mobile clinics offering ergonomic assessments and preventive care. These strategies, while simple and cost-effective, could significantly reduce the burden of CLBP in Syria.

Limitations

The study has several limitations that should be considered. Firstly, the research was conducted in only four provinces in Syria, which restricts the generalizability of the findings to a broader population. The results may not apply to other regions or countries with different demographics, cultural factors, or healthcare systems. Secondly, while the study controlled for known confounders, such as age and gender, it did not account for several potential confounders, including pre-existing musculoskeletal disorders, mental health conditions (e.g., depression), and broader socioeconomic factors beyond education level. These factors could influence the relationship between the predictors and CLBP, and their absence may limit the ability to fully control for confounding effects. Future studies should aim to collect and adjust for these variables to provide a more comprehensive understanding of the risk factors associated with

CLBP. Thirdly, the study relied on self-reported data, which introduces the possibility of recall bias and reporting bias, particularly for variables such as posture, physical activity, and smoking habits. While we took steps to mitigate these biases—such as providing clear instructions, specifying time frames for recall, and conducting a pilot study to refine the questionnaire—these limitations remain inherent to self-administered surveys. Additionally, although the questionnaire demonstrated good internal consistency (Cronbach's Alpha = 0.89), it did not include validated scales for assessing CLBP severity or functional impairment, such as the Visual Analog Scale (VAS) or Oswestry Disability Index (ODI). Future studies should incorporate such validated tools to enhance the accuracy and reliability of the measurements.

Fourthly, as a cross-sectional study, our findings cannot establish causality or determine temporal relationships between risk factors and CLBP. For example, while we observed associations between factors such as a sedentary lifestyle, smoking, and being overweight with CLBP, it is also possible that CLBP could lead to reduced physical activity, creating a bidirectional relationship. This highlights the need for cautious interpretation of the results and underscores the importance of longitudinal studies to clarify the direction of these associations. Fifthly, the study relied on a clinic-based sample from outpatient neurology clinics, and no random sampling method was employed to ensure a broader, more representative population. This introduces significant selection bias, as the study population is not representative of the general Syrian population. Individuals visiting neurology clinics are more likely to have neurological complaints, including chronic pain, which may inflate the observed prevalence of CLBP and limit the generalizability of the findings. Consequently, the results cannot be extrapolated to the wider Syrian population. Future research should consider large-scale population-based studies targeting households, employing random sampling methods to obtain more accurate prevalence estimates and risk factors. Lastly, the study's cross-sectional design prevents establishing any causal relationships between the predictors and CLBP. Future longitudinal or experimental studies are needed to determine causality and better understand the complex relationships between risk factors and CLBP, while also accounting for additional confounders such as pre-existing musculoskeletal disorders, mental health conditions, and socioeconomic factors.

Conclusion

The prevalence of CLBP in Syrian adults attending neurology clinics was high, with significant predictors including being overweight, lacking formal education, sedentary lifestyle, smoking, manual labor, and stooped sitting posture. To address these risk factors, targeted interventions are recommended: (1) The Syrian Ministry of Health should implement public health campaigns on physical activity, ergonomic practices, and smoking cessation; (2) Local municipalities and NGOs should establish community exercise programs; (3) Employers should enforce ergonomic guidelines and provide posture training for manual workers; and (4) Healthcare providers should integrate weight management programs into routine care. Further research is needed to evaluate the effectiveness of these interventions.

Supplementary Information

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Supplementary Material 1

Author contributions

FAK wrote the initial draft of the manuscript, provided language help, and critically revised it; YAK co-initiated the study and critically revised the manuscript, providing language help and proofreading the article; WA revised the manuscript by providing language help and proofreading the article; DA did all the statistical analysis; AZH: co-initiated the study and critically revised the manuscript; MMG: co-initiated the study and critically revised the manuscript; XD provided language help.

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Data availability

The datasets generated and/or analyzed during the current study are not publicly available due [to maintain the privacy of the patients participating in the study] but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The studies involving human participants were reviewed and approved by the Neijiang Normal University Institutional Review Board Consent Letter NUU–IRB 202404047. All procedures were conducted under the ethical principles outlined in the 1964 Declaration of Helsinki and its subsequent revisions. All our methods were carried out under relevant guidelines and regulations. Informed consent was obtained from all the participants and their legal guardian(s). For illiterate participants, informed consent was obtained from legally authorized representatives. We explained the purpose of the study to the patients and their family members before using their data in this study. It was all voluntary; no names were taken, so we provided anonymous data collection.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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