Observational Studies

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Low back-pain among school-teachers in Southern Tunisia: prevalence and predictors

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Abstract

Objectives: In the professional environment, low back pain (LBP) is a multifactorial symptomatology, despite scientific and technological advances in the design and the arrangement of increasingly ergonomic workstations. Teachers are not exempt from this risk, due to prolonged sitting or standing. In light of this, this study aimed to estimate LBP prevalence among teachers in Southern Tunisia and to identify their determinants.

Methods: It was a cross-sectional study including a representative sample of teachers from secondary, middle, and primary schools in Sfax, Tunisia, conducted during the period March-April 2021. LBP intensity was assessed using a visual analog scale from 1 to 10. A severe LBP was defined as VAS≥7.

Results: Among the participants, 292 teachers were females (55.6 %). The median age was 48 years (Interquartile Range (IQR)=[41–53] years). Overall, 377 teachers had a severe LBP, with a global prevalence of 71.8 %. Multivariate analysis showed that independent determinants of LBP among teachers were female gender (Adjusted Odds Ratio (AOR)=2.81;p<0.001), age ≥30 (AOR=5.68;p=0.009), chronic diseases (AOR=2.52;p<0.001), working at primary schools (AOR=1.75;p=0.033), working for ≥4 h per day (AOR=2.41;p=0.005), inadequate ergonomic conditions at work (AOR=1.78;p=0.008) and distance home-school ≥10 km (AOR=2.27;p=0.003).

Conclusions: This study demonstrated that LBP among teachers was alarmingly high. Different individual, ergonomic, and occupational factors were predictors of this symptom. Thus, development of rational strategies for LBP prevention among teachers and the improvement of working conditions are urgently needed.

Keywords: low back pain; predictors; prevalence; teachers

Background

The World Health Organization has characterized “work-related” diseases as multifactorial to indicate that several risk factors, such as physical, work organizational, psychosocial, individual, and sociocultural that contributed to initiating these diseases or disorders [1]. As one of the most prevalent work-related diseases and the most disabling condition affecting people in their productive years, musculoskeletal disorders are major health issues that have a substantial influence on the general population’s quality of life [2].

The changes in the education and school systems have led to more pressures on teachers, predispose them to both stress and ergonomic risks that may affect their physical health, which includes musculoskeletal disorders [3]. The National Institute for Colombian Occupational Safety and Health defined musculoskeletal disorders as a group of conditions that involved the nerves, tendons, muscles and supporting structures of the body [1]. Teaching is a job requiring a lot of mental and physical efforts as well as concentration, since it does not only include teaching, but also preparing lessons at home, evaluating students’ homework, preparing, and correcting exams and sometimes teachers were asked to assure other extra activities. Consequently, teachers are faced to various types of both physical and psychological health problems, which could be related to professional factors and work conditions [4].

Low back pain (LBP) is one of the most prevalent musculoskeletal diseases that affects the working population,

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including teachers, and is a leading cause of disability in both developed and developing countries [5]. It has been shown that LBP is an important health and socio-economic problem of occupational diseases, which touched a large section of occupational population especially teachers [6]. It represented one of the major reasons for consulting in both primary care and emergency setting and one of the most common reasons for absenteeism and loss of productivity [7]. LBP could certainly affect activities of daily living and this fact was reported by previous data [8, 9]. It could reduce mainly the work ability and sexual function [8].

LBP lifetime prevalence has been estimated at nearly 70 % among the general population [10]. Among teachers, a highly exposed population to this problem, several previous data focused on studying this health concern among school-teachers. The prevalence of LBP was variable and ranged between 20 % in Japan in 2002 [6], 40 % in Philippines in 2020 [4], 50 % in Malaysia in 2020 [11] and 90 % as reported in an international systematic review in 2011 [12].

In Tunisia, medical visits for teachers at the workplace to ensure their control and health monitoring are still insufficient and missing. On the other hand, the material conditions are unfavorable and the workload in Tunisian schools could promote or aggravate the occurrence of LBP among teachers. Quantifying this problem among teachers in the local area and determining its risk factors seems to have a permanent importance. However, only limited studies have been conducted considering all these factors among teachers.

In light of this, this study aimed to estimate the LBP prevalence among school-teachers in Southern Tunisia and to identify their main determinants.

Methods

Study design and settings

It was a cross-sectional study including a representative sample of teachers working at primary, middle, and secondary schools in Sfax, Tunisia, during the period March, 1st to April, 30th, 2021.

Inclusion criteria and sampling procedures

Teachers of all ages that were present at the day of the survey were included. Incomplete responses were excluded. The participants were selected, using a two-step-stratified sampling to select teachers from primary, middle and secondary public schools in rural and urban zones, proportionally to the number of teachers in each school and in each educational level to obtain a representative sample of teachers.

An exhaustive and update list of all public schools in the governorate of Sfax was obtained from the Sfax Regional Education Directorate. We carried out a three-step cluster sampling procedure: the first step consisted of cluster selection of four delegations from both urban or rural areas. Secondly, schools in each selected delegation were stratified according to their level of study into three groups: primary, middle and high-schools. Afterwards, a batch of establishments was drawn randomly from each group, proportionally to the number of teachers in each school. Then, within each eligible establishment, we carried out an elementary random selection of teachers, proportionally to their number in each educational level.

The sample size calculation was proceeded according to the following formula:

N=[Z*p0*(1-p0)]/i2; N=sample size, Z=1.96 for a 95 % confidence level, i= margin of error 4 %, p0=20 %. The latter was the prevalence of LBP published in a previous similar study among school personnel in Nagoya, Japan [6]. Then, we majored the sample by 10 % to take into account missing data or incomplete responses, giving a minimum required sample of 345.

Data collection and case definition

Data were collected using a self-administered questionnaire distributed anonymously to the participants in the teachers' meeting room during their break between lessons. The study tool was composed of three major parts. The first one included personal, sociodemographic, and clinical characteristics of teachers. Inactive lifestyle was defined as the absence of regular walking or sports activity, regardless of its intensity [13]. Moderate physical activity was defined by practicing regularly walking briskly, dancing, and playing doubles tennis for a duration ≥30 min per day and for ≥3 days per week [14]. Chronic diseases were defined as long duration diseases, generally slow in progression and not transferable from one individual to another, such asheart disease, cancer, and diabetes [15]. The second part focused on the working conditions and the professional characteristics. The last part concerned teachers' physical health.

LBP was defined as a pain that affects the lumbar region of the spine: "This is the lower part of the back, between your hips and the bottom of your ribcage. The pain is usually associated with muscle tension, and often limits your range of movement" [16]. This definition was explained by the investigators to the participants, who were asked to respond to the question "Do you have a LBP?" and to indicate its intensity on a horizontal ***visual analogue scale*** graduated from 1 to 10. A severe LBP was defined as VAS≥7 [13].

In this study, we included all LBP according to the previous definition and that was self-reported by teachers included in our study. The intensity was assessed using a visual analogue scale, and then we studied factors associated with severe LBP.

All LBP cases who were chronic, during at least 3 months, mechanical or inflammatory, intermittent, or constant pain, with or without projection were included in our study.

"Body mass index (BMI) was calculated by dividing weight in kilograms by the square of height in meters measured by a standardized method among all participants". "Overweight and obesity were defined by a BMI≥25 kg/sq.m. and ≥30 kg/sq.m., respectively" [17].

Ethical considerations

Anonymity and privacy were maintained during our survey. The participation was entirely volunteer. We presented the survey to ethical

committee in our region and we obtained the ethical approval (Ethical committee number 0474/2023). We should mention that in Tunisia the questionnaire-based research is exempt from IRB approval in Tunisia.

Statistical analysis

Data were analyzed using SPSS. The descriptive results of continuous variables were presented as mean ± standard deviation or median and interquartile range (IQR), according to the normality of distribution. Categorical variables were presented as percentages. Chi-square test was used to compare two categorical variables in independent samples [Crude Odds Ratio (COR); 95 % Confidence Interval (95 %CI), p)]. Then, factors statistically associated with LBP in the univariate analysis were entered into a multivariate model using a logistic binary regression [adjusted Odds Ratio; (AOR) 95 %CI, p] to identify the teachers' determinants of LBP. Calibration was assessed using the Hosmer-Lemeshow test for goodness of fit, which evaluated expected and observed probabilities in population deciles. The discriminatory power of the prediction model was expressed as the area under the receiver operating characteristic curve (AUROC). The sensitivity and the specificity of the prediction model were calculated. A p value<0.05 were considered as statistically significant.

Results

Description of the study population

Among 540 enrollees, 525 teachers completed the questionnaire, giving a response rate of 97 %. Overall, 233 teachers were males (44.4 %), and the median age was 48 years (IQR= [41–53] years). There were 424 teachers (80.8 %) working at urban localities and 256 (48.8 %) subjects working at secondary schools. Chronic diseases were noted among 132 participants (21.5 %) and 85 teachers were current smokers (16.1 %). Overall, 377 teachers reported a severe form of LBP, giving a global prevalence of 71.8 %. The median value of the VAS among participants was about 4 (IQR= [1–6]) (Table 1).

Table 1: Description of the study population.

Characteristics	Number	Percentage
Gender		
Male	233	44.4
Female	292	55.6
Marital status		
Married	478	91
Unmarried	47	9
Establishment locality		
Urban	424	80.8
Rural	101	19.2
Work seniority		
≤20	248	47.2
>20	277	52.8
Number of working hour per day ≥4	438	83.4
Institution type		
Primary schools	151	28.8
Middle schools	118	22.5
Secondary schools	256	48.8
Tobacco consumption		
Current smoker	85	16.2
Passive smoker	193	36.8
Other addictive behaviors		
Alcohol consumption	41	7.8
Illicit drug use	7	1.3
Severe back pain frequency (VAS)[a]≥7	377	71.8

[a]VAS, visual analogic scale.

Factors associated with LBP among teachers: results of univariate analysis

Personal factors associated with LBP among school-teachers were female gender (COR=2.6; p<0.001), age ≥30 (COR=3.35; p=0.04), having a history of chronic diseases (COR=2.33; p<0.001), obesity (COR=1.75; p=0.014), moderate and regular physical activity (COR=0.65; p=0.036). Professional factors associated with LBP were working for ≥4 h per day (COR=2.2; p=0.007), prolonged sitting position ≥6 h per day (COR=1.65; p=0.040), inadequate ergonomic conditions at work (COR=1.77; p=0.004), perception of work overload (COR=1.7; p=0.005), working at primary schools (COR=1.88; p=0.002), distance home-institution ≥10 km (COR=1.62; p=0.046) and a number of taught students ≥120 (COR=1.48; p=0.040) (Table 2).

Independent predictors of LBP among teachers: results of multivariate analysis

Logistic multivariate model

Multivariate analysis showed that independent determinants of LBP among South Tunisian teachers were female gender (AOR=2.81; p<0.001), age≥30 (AOR=5.68; p=0.009), chronic diseases (AOR=2.52; p<0.001), working at primary schools (AOR=1.75; p=0.033), working for ≥4 h per day (AOR=2.41; p=0.005), inadequate ergonomic conditions at work (AOR=1.78; p=0.008) and distance home-institution (in kilometer) ≥10 (AOR=2.27; p=0.003) (Table 3).

Validity of the model

The results of Hosmer-Lemshow chi-square testing (χ 2=5.06; p=0.75) were indicative of good calibration. The AUROC of the predictive logistic regression model was 0.73; p<0.001,

Table 2: Factors associated with back pain among school teachers: results of univariate analysis.

Variables	Severe back pain		COR[a] (95 % CI[a])	p-Value
	Yes (n[a], %[a])	No (n[a], %[a])		
Gender				
Male	46 (19.7)	187 (80.3)	1	
Female	114 (39)	178 (61)	2.6 [1.75–3.88]	**<0.001**
Age groups				
<30	3 (12)	22 (88)	1	
≥30	157 (31.4)	343 (68.6)	3.35 [1.1–11.38]	**0.040**
Educational locality				
Rural	30 (29.7)	71 (70.3)	1	
Urban	130 (30.7)	294 (69.3)	0.95 [0.59–1.53]	0.851
Marital status				
Married	15 (31.9)	32 (68.1)	1	
Unmarried	145 (30.3)	333 (69.7)	0.93 [0.48–1.77]	0.822
Have you children?				
No	13 (25)	39 (75)	1	
Yes	147 (31.1)	326 (68.9)	1.35 [0.7–2.6]	0.366
Chronic diseases				
No	101 (25.7)	292 (74.3)	1	
Yes	59 (44.7)	73 (55.3)	2.33 [1.55–3.52]	**<0.001**
Obesity				
No	119 (28.1)	305 (71.9)	1	
Yes	41 (40.6)	60 (59.4)	1.75 [1.11–2.74]	**0.014**
Inactive lifestyle				
No	47 (35.3)	86 (64.7)	1	
Yes	113 (28.8)	279 (71.2)	0.74 [0.48–1.12]	0.159
Prolonged sitting position (hours per day)				
<6	128 (28.8)	317 (71.2)	1	
≥6	32 (40)	48 (60)	1.65 [1.01–2.70]	**0.044**
Moderate and regular physical activity				
No	58 (36.9)	99 (63.1)	1	
Yes	102 (27.7)	266 (72.3)	0.65 [0.44–0.97]	**0.036**
Working area				
Within the family region	134 (29.6)	318 (70.4)	1	
Far from the family region	26 (35.6)	47 (64.4)	1.31 [0.78–2.21]	0.304
Number of work hours per day				
<4	16 (18.4)	71 (81.6)	1	
≥4	144 (32.9)	294 (67.1)	2.2 [1.22–3.87]	**0.007**
Inadequate ergonomic conditions at work				
No	52 (23.6)	168 (76.4)	1	
Yes	108 (35.4)	197 (64.6)	1.77 [1.2–2.61]	**0.004**
Institution type				
Middle or secondary schools	99 (26.5)	275 (73.5)	1	
Primary schools	61 (40.4)	90 (59.6)	1.88 [1.31–2.85]	**0.002**
Distance home-institution (in kilometer)				
<10	126 (28.7)	313 (71.3)	1	
≥10	34 (39.5)	52 (60.5)	1.62 [1.01–2.62]	**0.046**
Perception of work overload				
No	70 (25.2)	208 (74.8)	1	
Yes	90 (36.4)	157 (63.6)	1.70 [1.17–2.47]	**0.005**
Number of students taught				
<120	81 (26.9)	220 (73.1)	1	
≥120	79 (35.3)	145 (64.7)	1.48 [1.02–2.15]	**0.040**
Smoking status				
Former or current smoker	40 (22.1)	141 (77.9)	1	
Never smoker	120 (34.9)	224 (65.1)	1.88 [1.25–2.85]	**0.002**

Table 2: (continued)

Variables	Severe back pain		COR[a] (95 % CI[a])	p-Value
	Yes (n[a], %[a])	No (n[a], %[a])		
Exposure to passive tobacco				
No	106 (31.9)	226 (68.1)	1	
Yes	54 (28)	139 (72)	0.82 [0.56–1.22]	0.343
Previous infection with COVID-19				
No	130 (30)	303 (70)	1	
Yes	30 (32.6)	62 (67.4)	1.13 [0.70–1.83]	0.625

[a]n, number; %, percentage; COR, crude odds ratio. Bold values represent $p<10^{-3}$.

Table 3: Predictors of low-back pain among Tunisian teachers: results of multivariate logistic regression model.

Independent factors	AOR[a]	95 % CI[a]	p-Value
Gender			
Male	1		
Female	2.81	[1.84–4.31]	**<0.001**
Age groups			
<30	1		
≥30	5.68	[1.55–20.89]	**0.009**
Chronic diseases			
No	1		
Yes	2.52	[1.61–3.93]	**<0.001**
Institution type			
Middle and secondary schools	1		
Primary schools	1.75	[1.04–2.95]	**0.033**
Inadequate ergonomic conditions at work			
No	1		
Yes	1.78	[1.16–2.72]	**0.008**
Working hours per day			
<4	1		
≥4	2.41	[1.29–4.46]	**0.005**
Distance home-institution (in kilometer)			
<10	1		
≥10	2.27	[1.33–3.88]	**0.003**

[a]AOR, adjusted odds ratio; CI, confidence interval. Bold values represent $p<10^{-3}$.

indicating good predictive power in discriminating LBP patients, with a sensitivity of 75 % and a specificity of 78 %.

Discussions

To the best of our knowledge, this is the first study examining the magnitude and the risk factors of work-related LBP among South-Tunisian school-teachers. The global prevalence of LBP was 71.8 %. As there had not been any similar study in Tunisia conducted on teachers, on other professions or on general population, the results could only be compared with those from other countries. The prevalence rates of back and neck pain were extremely variable across the world. They were about 26 % in Austria, 47 % in the European Union [18], 41 % in Brazil [19], 62 % in Italy [20] and 46 % in China [21]. The previous reported rates of LBP among school-teachers were lower than our results. This could be related to the fact that in developed countries material and work conditions in schools were more favorable and suitable for teachers [22]. As well, the workload could be an additional argument, given the small number of teachers and the relatively high number of students, related probably to the demographic characteristics of the Tunisian population and the scarcity of the resources [23]. In the developing countries, limited data evaluated LBP among school-teachers; it was about 55 % in Jordan [24], 75 % in Turkey [25] and 40 % in Malaysia [26]. All these frequencies are far from being negligible or benign. Therefore, these alarming rates indicated the urgent necessity to pinpoint the determinants and the factors associated with this pathologic symptom among teachers to develop preventive strategies to restrict LBP among teachers.

The first underlined determinant was female gender. This fact was in line with a previous large-scale survey from Philippines in 2020 [6] and with other international data from Malaysia, Japan and Brazil [27]. The possible reasons of this independent association were firstly the difference between males and females in terms of practicing physical regular exercise, which was universally known as a protective factor from LBP. In fact, among Tunisian general population, males were reported to be more likely involved in regular physical activity [28]. Secondly, the overload that female teachers must face daily compared with males could be another explanation. Indeed, apart from teaching and other school activities, women were also called to do many domestic households after work [4]. Another explication could be attributed to this was that women had more likely suffered from physical and psychological pain, compared with men and this was related to physiologic differences between genders [21].

Another interesting result in the present study was that advanced age was an independent factor of LBP, which was

in line with previous studies [4, 21, 29]. Age was largely known as an associated factor with musculoskeletal disorders. A possible explanation of this fact was that senior teachers had more responsibilities than recently recruited ones, such as supervising, teaching terminal classes, and preparing exams, so that they were more at risk to develop LBP [4]. In addition, the physiologic degradation of muscle tonicity as well as bone force and density could be another reason for aged teachers to have more LBP [21].

The present study showed that a history of chronic diseases was independently associated with LBP. This finding was similarly reported in a recent published study from Germany [30]. This could be related to the increased vulnerability of teachers with chronic diseases to more perceive pain. This fact was considered not only for osteoarticular diseases specifically but also for internal diseases psychological, neurological, respiratory, and oncological diseases [30, 31].

Working ≥4 h/day was another predictive factor. Several precedent data were harmonized with this result. In fact, this might be because of the physical efforts during teaching, including prolonged standing in an inappropriate way for more than a few hours inside the classroom [31]. Consequently, encouraging break times during working hours and performing regular daily exercises could reduce the extent of this problem.

Working at primary schools was also an independent factor of LBP. Results reported previously were controversial [21, 32, 33]. It seems that teachers in primary schools in our country had higher work-load and more inadequate working conditions. Furthermore, primary school teachers had more physically demanding work, such as long hours of standing, sitting, pliable and uncomfortable posture [34], so that they experienced more LBP.

Inadequate ergonomic conditions at work were found to be an independent predictor of LBP. This fact was illustrated previously [21, 33, 35]. In fact, inappropriate work conditions such as uncomfortable chairs with proper back support deficiency or lack of adapted boards could make teachers adopting bad postures [29].

Distance home-institution (in kilometer) ≥10 was also an independent factor of LBP. Increased LBP among teachers that spent a daily long-distance home-institution could be explained by the extra time spent to arrive at the workplace, which could intensify the fatigue level for teachers and could be an additional factor of bad postures.

This study was original and valuable highlighting the prevalence and the determinants of LBP among South Tunisian teachers. This study could be used as a referent document, since it was carried out on a representative randomized sample of teachers. Furthermore, the detailed and clear methodology of this work gave an added value because it provided clarity and reproducibility. Nevertheless, there are few limitations. Specifically, the cross-sectional design of this study does not necessarily determine cause and effect; only associations between risk factors and LBP can be established. Moreover, the data collection was a time-demanding process, and it was difficult to estimate the prevalence of neck-shoulder pain simultaneously to the LBP. Besides, the low likelihood of significant multiplicity issues should be considered due to multiple comparisons performed in this study. Further adjustment methods are required to have more accurate results. Lastly, although the used instrument contains validated scales both internationally and locally, there was still a possibility of bias results since the data collection tool was self-administered.

Conclusions

The findings of this study pointed up an alarmingly high prevalence rate of LBP among Tunisian teachers. Several individual, ergonomic, and occupational factors were potential predictors of this symptom. This survey underlined the need to promote rational strategies for LBP prevention among teachers, starting firstly from the improvement of working conditions, with a special accent on the most vulnerable categories and the exposed to predictors as well. Given the noble and the major purpose of education towards the progress of nations, teachers' well-being should be a priority for policymakers to ensure a good education quality for future generations.

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