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The prevalence of musculoskeletal pain disorders and its associated factors among school teachers in Tabuk, Saudi Arabia

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musculoskeletal pain disorders; school teacher; prevalence; risk factor; quality of life

ABSTRACT

To investigate the overall and regional prevalence of musculoskeletal pain disorders (MSPDs) during the last 12 months and the last 7 days, their risk factors, and their impact on the quality of life among school teachers in Tabuk, Saudi Arabia. A cross-sectional study was conducted online in Tabuk city using the Arabic version of the Nordic Musculoskeletal Questionnaire. Four hundred teachers were randomly selected from randomly selected public schools. The study included all teachers of both sexes who had at least one year of teaching experience in a governmental school. The prevalence of MSPDs was 93 % within the last 12 months. The lower back (71.3%), shoulders (64.3%), and neck (55.3%) were the most frequently affected body regions. The prevalence of MSPDs was 65.8% over the last 7 days, with the lower back (45.5%), shoulders (35.0%), and neck (28.5%) being the most common. Every unit increase in body weight was associated with a 2.161 increased likelihood of pain (AOR=2.161, CI: 1.044 to 4.474). The female sex was significantly associated with a 3.194 increased likelihood of shoulder pain (AOR=3.194, P<0.001). Elementary teaching was significantly associated with a 1.815 increased likelihood of shoulder pain (AOR=1.815, CI:1.040 to 3.168, P=0.036). The female sex was significantly associated with a 1.681 increased likelihood of neck pain (AOR=11.681, CI: 1.083 to 2.608, P=0.021). Elementary teaching was significantly associated with a 1.849 increased likelihood of neck pain (AOR=1.849, CI: 1.091 to 3.132, P=0.022). The MSPDs were highly prevalent among school teachers in Tabuk, Saudi Arabia. The body regions with the highest prevalence rates of musculoskeletal pain were the lower back, shoulders, and neck. Increased body weight was the only risk factor for low back pain, while female sex and teaching in elementary schools were significantly associated with an increased likelihood of shoulder and neck pain.

1. INTRODUCTION

Musculoskeletal pain disorders (MSPDs) include numerous degenerative and inflammatory conditions that

influence the joints, muscles, ligaments, tendons, bones, nerves, and circulatory system. They develop over time and become evident as musculoskeletal aches, pain, or discomfort with consequent functional disability [1].

Musculoskeletal pain disorders have been recognized as common work-related health problems with several socioeconomic consequences. Inadequately managed musculoskeletal pain adversely affects the quality of life and leads to reduced productivity due to sickness absence, work discontinuance to seek medical treatment, and early retirement [2]. The cost of management of such challenging conditions represents another economic impact [3].

Each workplace has its circumstances that can impact musculoskeletal health. One of the most important workplaces is the schools. Teachers are at increased risk of developing MSPDs than other occupational populations [4]. The teaching profession involves spending a long time in a head-down posture while performing various tasks on computers, reading, checking, and scoring quizzes and assignments. In addition, teachers often sustain mechanical loads, with long periods of standing [5].

Previous studies have estimated that 39–95% of teachers are affected by MSPDs during their job [6], [7], and they have a great risk of developing back, neck, and upper-limb pain [8- 10]. Musculoskeletal pain disorders have several risk factors such as female gender, overweight, sleeping disturbance, and smoking [11].

In Saudi Arabia, several regional studies in Qassim, Taif, Aljouf, Abha, and Eastern provinces have investigated the prevalence of MSPDs among school teachers showing variable results ranging from 62.5 to 91%, with increased prevalence of back, shoulder, and neck pain [12- 17]. However, reports about the prevalence of MSPDs among school teachers in Tabuk city are lacking. As well, studies that investigated both the long-term and the recent prevalence of MSPDs in both male and female teachers and their associated risk factors are missing. Therefore, this study aimed to estimate the prevalence and risk factors of MSPDs among school teachers in Tabuk city, Saudi Arabia.

2. METHODS

2.1 Study design, setting, and date

This cross-sectional study was carried out in Tabuk city, Saudi Arabia, from January to February 2023 to evaluate MSPDs among school teachers.

2.2 Ethical considerations

This study obtained approval from the Ethics Committee of the Directorate of Health Affairs in Tabuk, Saudi Arabia (TU-077/022/168). The survey obtained all participants' informed consent by including a consent statement. The study's nature and goals were explicitly explained to the participants, and they were also informed that their anonymized data will only be used for research and that their confidentiality will be preserved.

2.3 Sample size and sampling technique

The sample size was calculated with a 95% confidence interval (CI) at a 5% marginal error rate and a 70% response rate, and the minimum required sample was 400. (https://www.calculator.net/sample-size calculator.html?type=1&cl=95&ci=5&pp=50&ps=8828&x=36&y=29).

First, a random sample of schools was chosen among the 397 public schools in Tabuk city (with a total of

8828 teachers). As a technique of randomization, the schools were divided into even and odd numbers, and those with even numbers were chosen. Two hundred schools were so chosen from a list that had previously been created. The second step entailed selecting teachers at random from the chosen schools. In these chosen schools, the teachers identified with even numbers were chosen and recruited for the study.

2.4 Inclusion criteria

The study included all teachers of both sexes who had at least one year of teaching experience in a governmental school.

2.5 Exclusion criteria

Teachers who are already retired or work in a private school and those who have a malignant tumor, physical disability, previous surgery, or inflammatory joint disease were excluded from the study.

2.6 Data collection tool

The data were gathered using the online Google Form application. The first page of the form conveyed the study's purpose to the participants and sought their consent to participate in the study. The second page asked for the participants' demographic and work characteristics including age, sex, weight, marital status, smoking habit, academic stage, years of teaching experience, number of working hours per day, and number of classes per week. The survey link was shared with the participants through their WhatsApp accounts.

2.7 Questionnaire

The Arabic version of the Nordic Musculoskeletal Questionnaire (NMQ) was used to collect the required data regarding the prevalence of musculoskeletal disorders (MSDs) among the selected teachers in the selected schools [14]. The NMQ is a reliable, valid, and responsive instrument. Both the Arabic and English versions of the questionnaire have been used in previous studies to investigate musculoskeletal symptoms in work-related health contexts [6], [18]. The NMQ is divided into three main parts. The first part pertains to any pain felt in any of the nine body regions within the last 12 months. The second part pertains to any pain felt in any of the same nine body regions within the last 7 days. The third part pertains to whether a disability occurred due to pain in any of the same nine body regions. The nine anatomical regions are the neck, shoulders, elbows, wrists/hands, upper back, lower back, hips/thighs/buttocks, knees, and ankles/feet. The respondents' answers came in the form of binary responses to some questions (yes and no) and the form of multinominal responses to other questions (no, right side, left side, and both sides).

2.8 Statistics

The data analyses were performed using Statistical Packages for Social Sciences (SPSS, IBM Corp, Armonk, USA) version 22. Descriptive statistics had been presented using numbers, and proportions (%). All the multinominal data were transformed into binary data (yes or no), as follows: "yes" if the answer was on the left side, right side, or both sides, and "no" was left as "no." The total prevalence, the prevalence in both males and females, and the prevalence in each body region were calculated. Cochran's Q test was used to determine if there were differences in pain prevalence among males and females. The socio-demographic and work characteristics were entered as independent variables in a multivariable backward stepwise binary logistic regression analyses to assess the significant risk factors for the low back, shoulders, and neck musculoskeletal pain within the last 12 months. A p-value less than 0.05 was used to determine statistical significance.

3. RESULTS

This study included 400 school teachers, with an equal number of males and females. Various age groups

were represented including 26-30 (13.8%), 31-35 (17.3%), 36-40 (28.8%), 46-50 (27.0%), and >50 (13.3%) years. The highest percentages were married (82.3%) and non-smokers (78.3%). The recruited subjects had body weights that ranged from <50 kg to >90 kg, with those having body weights of 51-70 kg being the most frequent (42.5%). The academic stage included elementary (54.0%), secondary (24.5%), and high (21.5%) schools. The teaching experiences of the participating teachers were 1-10 (39.5%), 11-15 (19.5%), 16-20 (12.0%), or >20 (29.0%) years. More than half (56.0%) of the teachers work 6-8 hours per day. Further, 161 (40.3%), and 157 (39.3%) teachers had 13-19 and 20-24 classes per week, respectively. Most of them (59.0%) recorded sleeping only 3-6 hours per day (Table 1).

Table 1. Sociodemographic and work characteristics of the study participants (N=400)

		N=400	%
Sex	Female	200	50.0%
	Male	200	50.0%
Age, years	26-30	55	13.8%
	31-35	69	17.3%
	36-40	115	28.8%
	46-50	108	27.0%
	>50	53	13.3%
Marital status	Married	329	82.3%
	Single	51	12.8%
	Divorced	17	4.3%
	Widowed	3	0.8%
Weight, Kg	<50	24	6.0%
	51-70	170	42.5%
	71-90	149	37.3%
	>90	57	14.3%
Smoking habit	Non-smoker	313	78.3%
	Smoker	87	21.8%
Academic stage	Elementary	216	54.0%
	Secondary	98	24.5%
	High	86	21.5%
Experience, years	1-10	158	39.5%
	11-15	78	19.5%
	16-20	48	12.0%
	>20	116	29.0%
Working hours per day	2-4	17	4.3%
	5-6	159	39.8%
	6-8	224	56.0%
Number of classes per week	5-12	60	15.0%
	13-19	161	40.3%
	20-24	157	39.3%
	>24	22	5.5%
Sleeping hours per day	3-6	236	59.0%
	7-9	164	41.0%

N: number

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Table 2 shows that the prevalence of musculoskeletal pain among the study participants within the last 12 months was 93.0%. The prevalence was slightly higher among females (47.0%) than males (46.0%). The involved body regions ranged from one (10.5%) to nine (7.8%), with the highest percentages (13.3%) recording pain in two body regions, and 82.5% complained of pain in more than one body region.

Table 2. Prevalence of musculoskeletal pain within the last 12 months among the study participants (N=400)

	N=400	%
Musculoskeletal pain		
Yes	372	93.0%
No	28	7.0%
Sex		
Female	188	47.0%
Male	184	46.0%
Number of the involved body region		
No	28	7.0%
One	42	10.5%
Two	53	13.3%
Three	38	9.5%
Four	42	10.5%
Five	50	12.5%
Six	45	11.3%
Seven	39	9.8%
Eight	32	8.0%
Nine	31	7.8%

N: number

Table 3 and Figure 1 demonstrate that the lower back (71.3%), shoulders (64.3%), and neck (55.3%) were the most frequently affected body regions. The prevalence of pain in the low back (38.5% vs 32.8%), shoulder (37.0% vs 27.3%), and neck (30.5% vs 24.8%) regions were significantly higher in females than males (All P-values <0.05).

Table 3. Prevalence of musculoskeletal pain among different body regions within the last 12 months

	Female Prevalence		Male Prevalence		Total Prevalence	
	N	%	N	%	N	%
Neck	122	30.5%	99	24.8%	221	55.3%
Shoulders	148	37.0%	109	27.3%	257	64.3%
Elbows	90	22.5%	60	15.0%	150	37.5%
Wrist/hands	107	26.8%	59	14.8%	166	41.5%
Upper back	111	27.8%	79	19.8%	190	47.5%
Lower back	154	38.5%	131	32.8%	285	71.3%
Thighs/hips/buttocks	95	23.8%	75	18.8%	170	42.5%
Knees	111	27.8%	95	23.8%	206	51.5%
Ankles/feet	70	17.5%	43	10.8%	113	28.3%

N: number

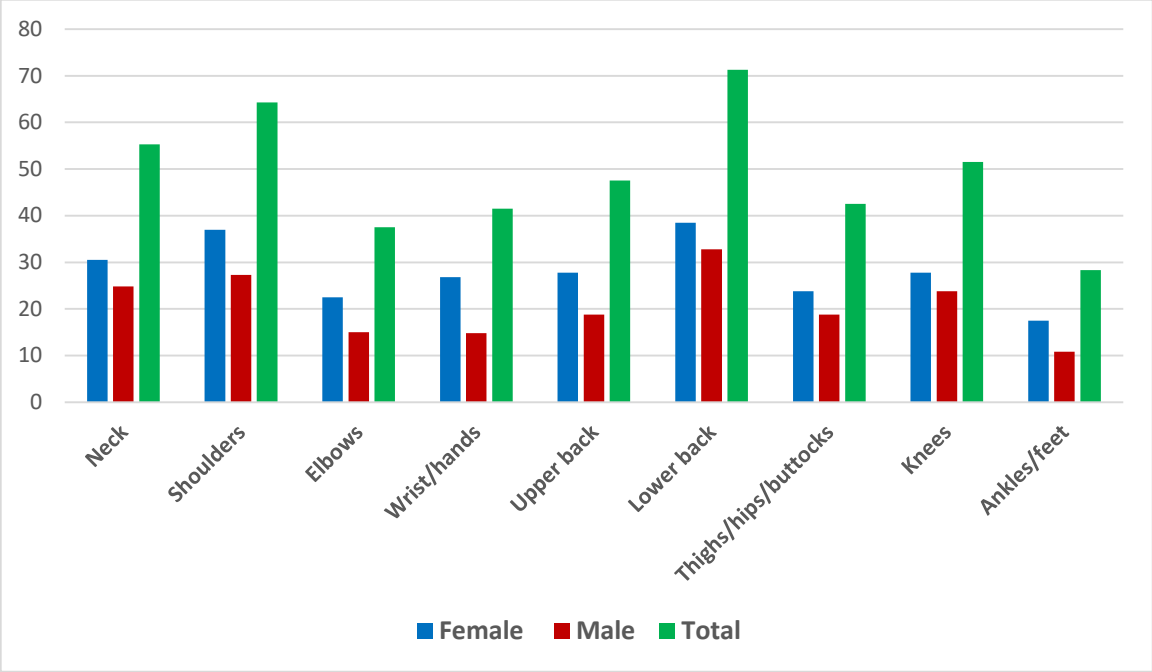

Figure 1. Prevalence of musculoskeletal pain among different body regions within the last 12 months

Multivariable backward stepwise binary logistic regressions were performed to show the risk factors that significantly contribute to the low back, shoulder, or neck musculoskeletal pain within the last 12 months. A body weight of more than 90 kg was significantly associated with low back pain (P=0.038). Every unit increase in body weight was associated with a 2.161 increased likelihood of pain (AOR=2.161, CI: 1.044 to 4.474). Concerning shoulder pain, the female sex was significantly associated with a 3.194 increased likelihood of shoulder pain (AOR=3.194, p<0.001). The age of 26-30 years was significantly associated with shoulder pain (P=0.001). For every unit decrease in the age of the participant, there was a 0.303 increased likelihood of shoulder pain (AOR=0.303, CI: 0.146 to 0.631). Elementary teaching was significantly associated with a 1.815 increased likelihood of shoulder pain (AOR=1.815, CI:1.040 to 3.168, P=0.036). As regards neck pain, the female sex was significantly associated with a 1.681 increased likelihood of neck pain (AOR=11.681, CI: 1.083 to 2.608, P=0.021). Elementary teaching was significantly associated with a 1.849 increased likelihood of neck pain (AOR=1.849, CI: 1.091 to 3.132, P=0.022) (Table 4).

Table 4. Multivariable backward stepwise binary logistic regression results for lower back, shoulder, and neck musculoskeletal pain within the last 12 months with sociodemographic and work characteristics

	B	SE	Wald	df	P-value	AOR	95% CI
Lower back pain							
Weight >90 kg	0.771	0.371	4.31	1	0.038*	2.161	1.044 to 4.474
Constant	0.172	0.215	0.64	1	0.424	1.188	
Shoulders							
Sex (Female)	1.161	0.244	22.74	1	<0.001*	3.194	1.982 to 5.148
Age (26-30 years)	-1.193	0.373	10.21	1	0.001*	0.303	0.146 to 0.631
Elementary teaching	0.596	0.284	4.40	1	0.036*	1.815	1.040 to 3.168
Constant	-0.028	0.319	0.008	1	0.931	0.973	
Neck							
Sex (Female)	0.519	0.224	5.360	1	0.021*	1.681	1.083 to 2.608
Elementary teaching	0.615	0.269	5.221	1	0.022*	1.849	1.091 to 3.132
Constant	1.225	0.683	3.220	1	0.073	3.405	

B: coefficient; SE: standard error; df: degree of freedom; AOR: adjusted odds ratio; CI: confidence interval; *Significant at P<0.05

Table 5 shows that the prevalence of musculoskeletal pain among the study participants within the last 7 days was 65.8%. The prevalence was higher among females (38.8%) than males (27.0%). The involved body regions ranged from one (13.8%) to nine (5.8%).

Table 5. Prevalence of musculoskeletal pain within the last 7 days among the study participants (N=400)

	N=400	%
Musculoskeletal pain		
Yes	263	65.8%
No	137	34.3%
Sex		
Female	155	38.8%
Male	108	27.0%
Number of the involved body region		
No	137	34.3%
One	55	13.8%
Two	52	13.0%
Three	36	9.0%
Four	38	9.5%
Five	17	4.3%
Six	12	3.0%
Seven	16	4.0%
Eight	14	3.5%
Nine	23	5.8%

N: number

Table 6 demonstrate that the lower back (45.5%), shoulders (35.0%), and neck (28.5%) were the most frequently affected body regions. The prevalence of pain in the low back (28.0% vs 17.5%), shoulder (24.5% vs 10.5%), and neck (18.3% vs 10.3%) regions was significantly higher in females than males (P<0.001).

Table 6. Prevalence of musculoskeletal pain among different body regions within the last 7 days

	Female Prevalence		Male Prevalence		Total Prevalence	
	N	%	N	%	N	%
Neck	73	18.3%	41	10.3%	114	28.5%
Shoulders	98	24.5%	42	10.5%	140	35.0%
Elbows	46	11.5%	20	5.0%	66	16.5%
Wrist/hands	74	18.5%	18	4.5%	92	23.0%
Upper back	82	20.5%	37	9.3%	119	29.8%
Lower back	112	28.0%	70	17.5%	182	45.5%
Thighs/hips/buttocks	65	16.3%	38	9.5%	103	25.8%
Knees	79	19.8%	49	12.3%	128	32.0%
Ankles/feet	42	10.5%	21	5.3%	63	15.8%

N: number

The impact of musculoskeletal pain on the quality of life among male and female subjects is shown in Table 7. The highest percentage (43.5%) recorded no absence due to pain, while 144 (36%) and 53 (13.3%) teachers recorded 1-3 days and 4-10 days of absence, respectively. The absence of 1-3 days was 19.8% in females and 16.3% in males, while the absence of 4-10 days was 7.0% in females and 6.3% in males, with no significant differences. The participants documented the continuity of pain for less than 3 months (27.0%), 3-6 months

(4.5%), or more than 6 months (26.5%), with comparable percentages in males and females. Sleeping for 3-6 hours was higher in females than males (31.8% vs 27.3%).

Table 7. Impact of musculoskeletal pain on the quality of life among male and female subjects

		Female		Male		Total	
		N	%	N	%	N	%
Number of days of absence due to pain in a year	0	81	20.3%	93	23.3%	174	43.5%
	1-3	79	19.8%	65	16.3%	144	36.0%
	4-10	28	7.0%	25	6.3%	53	13.3%
	>10	12	3.0%	17	4.3%	29	7.3%
Duration of pain	No	80	20.0%	88	22.0%	168	42.0%
	<3 months	54	13.5%	54	13.5%	108	27.0%
	3-6 months	9	2.3%	9	2.3%	18	4.5%
	>6 months	57	14.3%	49	12.3%	106	26.5%
Sleeping hours per day	3-6	127	31.8%	109	27.3%	236	59.0%
	7-9	73	18.3%	91	22.8%	164	41.0%

N: number

4. DISCUSSION

The current study investigated the long-term prevalence of MSPDs within the last 12 months as well as the recent prevalence within the last 7 days among school teachers in Tabuk, Saudi Arabia. In addition, the risk factors contributing to the development of long-term MSPDs and their impact on the quality of life were analyzed.

The results of this study show that MSPDs are highly prevalent among teachers in Tabuk, Saudi Arabia. More than 90% of the participants developed MSPDs within the last 12 months, with a slightly higher prevalence among females (47.0%) than males (46.0%). Interestingly, 10.5% complained of MSPDs in a single body region while 82.5% complained of MSPDs in more than one body region. Furthermore, the current study also showed a lower prevalence of recent MSPDs within the last 7 days (65.8%) than the long-term prevalence, which was higher among females (38.8%) than males (27.0%).

The detected overall prevalence rate of MSPDs in the current study is consistent with an earlier systematic review that concluded that teachers are at great risk of MSPDs, with a prevalence varying from 39% to 95% [11]. Previous studies involving school teachers in Saudi Arabia revealed comparable high prevalence rates of MSPDs in Hail (93.6%) [19] and Qassim (91%) [12]. Alternatively, lower prevalence rates were observed in the Eastern Province where 41.1% of school teachers recorded musculoskeletal pain that prevented carrying out daily activities for the past 12 months and 35.4% of them reported pain or discomfort within the last 7 days [17]. Studies that involved Saudi female teachers working in secondary schools detected a prevalence of 79.17% in the Al-Khobar area [14] and 68.50% in the Aljouf region [15]. A study enrolled governmental male secondary school teachers in Abha city revealed a prevalence rate of 62.5% [20].

The identified prevalence rate of MSPDs in Tabuk, Saudi Arabia in the current study is higher than that reported in other countries such as China (31.8%) [21] and (66.7%) [11], Turkey (28.0%) [11] and (60.3%) [8], Egypt (66.77%) [4], India (65.1%) [22], Malaysia (40.1%) [23], Taiwan (82%) [24], and Chile (88.9%) [25]. The observed differences in the prevalence rates of MSPDs among different countries and between various regions of Saudi Arabia might be due to differences in populations, the investigated duration of

musculoskeletal pain, the selected sex of the included teachers, or the type of school.

The current study also revealed that the lower back, shoulders, and neck were the most frequently affected body regions in the long term (71.3%, 64.3%, and 55.3%) as well as the recent pain (45.5%, 35%, and 28.5%), with a significantly higher prevalence among females than the males. These results are in line with previous studies in Saudi Arabia [12], [15], [19], [20], [26]. The low back was listed as the most affected body region by MSPDs among school teachers in other countries like China [27], Turkey [28], Brazil [29], and Malaysia [29]. The high prevalence of low back pain may indicate the overuse and overloading of the spine [30]. Teachers are susceptible to bad posture and body mechanics while sitting and standing for a long time.

The second most frequently affected region was the shoulders, which might be linked to using computers or writing on the whiteboard with the shoulders raised. There is a piece of evidence that repeated overhead activities result in compression of the humeral head against the coracoacromial arch causing pain and substantial functional impairment [31].

The third most commonly affected body region was the neck. This increased frequency may be elucidated by the prolonged “head down” positioning while reading, preparing lessons, and marking assignments. Other work activities such as writing on or reading from the board for a long time can cause prolonged neck extension with subsequent injuries, pain, and disability [14], [21].

One of the goals of this study was to determine the risk factors of MSPDs among teachers. Only a body weight of more than 90 kg was significantly associated with low back pain. Every unit increase in body weight was associated with a 2.161 increased likelihood of pain. A previous study found a significant relationship between body mass index and low back pain among school teachers in Northern Dakha city, Bangladesh [32]. On the other hand, a study conducted among school teachers in Botswana demonstrated that BMI was not significantly associated with the low back pain [11].

Furthermore, being a female and teaching in an elementary school were significantly associated with 3.194 and 1.815 increased likelihood of shoulder pain. As regards neck pain, the female sex and elementary teaching increased the risk of developing MSPDs by 1.681 and 1.849 times, respectively. These results partly agree with Althomali [19] who found that female teachers are at increased risk for developing MSPDs by 2.46- and 2.51-folds in the shoulders and neck, respectively. The critical review of Erick and Smith [33] also considered that sex is a risk factor for MSPDs depending on the body region; though, they recommended bad posture or psychological factors as more critical risk factors. Furthermore, it has been reported that elementary school teachers are more vulnerable to developing MSPDs due to their job requirements including prolonged sitting, standing, and frequently directing their pupils to observe their understanding and learning progress or may be related to their working environment [4].

Work-related musculoskeletal pain can affect the teacher’s well-being and even the teaching process. The impact of musculoskeletal pain on the quality of life in this study is indicated by the absence from work due to pain where 1-3 days of absence was recorded by 36% of teachers, while 4-10 days of absence was recorded by 13.3% of teachers. Sleeping hours per day might also reflect the effect of musculoskeletal pain on the quality of life. The respondents reported sleeping for 3-6 hours in percentages that were higher in females than males (31.8% vs 27.3%). Correspondingly, previous studies documented a negative impact of musculoskeletal pain on both the physical and mental scores of the quality of life among the teachers who reported MSPDs [4], [8], [11], [14], [19], [21].

Limitations

There are some limitations to this study. First, participants in the study who were in good health and still working were evaluated; those who took sick leave or retired early due to a crippling MSPD were not included. The prevalence rate of MSPDs among teachers may be underestimated as a result of this type of bias. Second, due to the nature of retrospective surveys and the lengthy recall period, there may be a chance of recall bias even though we used the Nordic questionnaire, a widely used and internationally validated instrument. For instance, the teachers may not accurately recall the presence of MSPDs in the previous 12 months. Third, none of the assessed variables were based on an objective clinical diagnosis by a specialist; rather, they were all self-reported and subjective.

5. Conclusions

In conclusion, MSPDs were highly prevalent among school teachers in Tabuk, Saudi Arabia since 93% of them had experienced MSP at any body region over the past 12 months, and 65.8% within the last 7 days. The body regions with the highest prevalence rates of musculoskeletal pain were the lower back, shoulders, and neck. Only a body weight of more than 90 kg was a risk factor for developing low back pain, while female sex and teaching in elementary schools were significantly associated with increased likelihood of shoulder and neck pain. The musculoskeletal pain had a negative impact on the teacher's quality of life as indicated by the increased absence days from work. These findings indicate the need to educate school teachers about adequate care to avoid these pains. The higher authorities need to address the problem and put prevention programs in place.

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