

Effect of a Health Education Program on the Prevention of Work-Related Musculoskeletal Disorders on School Teachers' Knowledge

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ABSTRACT

Background: Physical and occupational demands of teachers due to their profession exposed them various ergonomic risk factors, making them particularly vulnerable to musculoskeletal disorders (MSDs). This study assessed the effect of a health education program on the prevention of work-related musculoskeletal disorders on school teachers' knowledge.

Method: A quasi-experimental study using a one-group pre- and post-test design was implemented at four primary institutes located within the El Mansoura Azharian Zone. A total of 46 school teachers agreed to participate in the study. Three data collection tools were used: a socio-demographic and occupational data self-administered questionnaire, a school teachers' knowledge self-administered questionnaire, and teachers' feedback related to the educational program implementation.

Results: Reported significant improvements with a large effect size ($t=23.88$, $P\leq 0.001$, $d=4.79$) in the teachers' knowledge of work-related musculoskeletal disorders, including definitions, types, signs and symptoms, ergonomics, and management from the pre-test to the post-test assessment of the educational program

Conclusion and Recommendations: The study found that the work-related musculoskeletal disorders program effectively increased teachers' knowledge regarding musculoskeletal disorders and ergonomics. The study recommends continuing to provide interventions such as occupational health education lectures, on-site ergonomics training, and publicity brochures to enhance teachers' health knowledge regarding work-related musculoskeletal disorders.

Keywords: Work-Related Musculoskeletal Disorders; Health Education Program; School Teachers; Occupational Ergonomics; Knowledge Improvement

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INTRODUCTION

Work-related musculoskeletal disorders (WMSDs) are still a significant issue in occupational health, especially for careers that require long periods of being in one position, repetitive movements, and a lot of physical effort, such as teaching [1]. Globally, the prevalence of WMSDs among school teachers can vary, but it is usually quite high. Systematic reviews have shown that anywhere from 40% to 90% of teachers experience musculoskeletal symptoms at some point in their careers [2]. For instance, nearly 75% of

teachers in their study reported having pain in at least one area [3].

Teachers often face various musculoskeletal problems, especially in the neck, shoulders, back, and arms. These consequences come from constant writing, standing, grading, and using computers for long periods [4]. Such problems not only impair teachers' physical health but also contribute to reduced productivity, increased absenteeism, and elevated healthcare expenses [5].

Worldwide, work-related musculoskeletal disorders (WMSDs)

are a leading cause of occupational disability and have significant socio-economic consequences. Nonetheless, educators are often overlooked in occupational health strategies that tend to prioritize other workforce sectors [6]. The teaching profession comes with unique risk factors, such as awkward postures, repetitive tasks, and stress from heavy workloads [7]. Additionally, insufficient ergonomic knowledge among teachers exacerbates these risks and highlights the need for effective preventive measures [8].

In this scenario, community health nurses play important role in preventing and managing WMSDs. They provide education, help to identify risks early, and promote healthier workplace habits. Their role includes offering ergonomic training, helping change behaviors through counseling, advocating for safer environments, and working with different teams to minimize work-related injuries. As accessible health professionals within communities, they are ideally positioned to tailor educational programs specifically for teachers, ensuring interventions are practical, culturally relevant, and long-lasting [9].

Educational programs aimed at preventing WMSDs have been shown to work well in different situations. They improve ergonomic knowledge, encourage correct posture, and promote exercises that can help reduce strain on the body [10]. For teachers, these initiatives can boost awareness about risk factors, support the adoption of ergonomic best practices in their daily routines, and build self-management skills to ease their symptoms. By equipping teachers with appropriate ergonomic knowledge and practical skills, structured educational interventions have been shown to improve preventive behaviors and reduce risks associated with work-related musculoskeletal disorders [11].

Although growing evidence supports educational and preventive approaches for WMSDs, systematic reviews indicate that intervention-based studies among teachers remain limited, particularly regarding contextual and organizational influences on outcomes [1]. In addition, previous studies often lack longitudinal follow-up to determine sustained benefits. Therefore, rigorous evaluation of tailored educational programs within the teaching population is essential to inform occupational health interventions and school-based strategies [12].

Thus, this study aims to assess the effect of a health education program on the prevention of work-related musculoskeletal disorders on school teachers' knowledge.

METHOD

Research design:

A quasi-experimental research design using one group (pre and post) was used for this study.

Settings:

This study was conducted at four primary institutes (El Mansoura Azhar Primary Institute, El Mansoura Azhar Girls' Primary Institute, Owaish El Hagar Azhar Primary Institute, and Mit Khamis Azhar Primary Institute) located within the El Mansoura Azharian Zone, which operates under the presidency of the Al-Azhar Institutes Sector in Mansoura

Subjects and sampling:

School teachers working in the previously mentioned institutes were included in the study. The inclusion criteria for participation required that teachers had more than two years of experience in their current work settings. Both male and female teachers of any age were eligible, provided they expressed willingness to participate in the study.

A convenient sampling technique was utilized to enroll school teachers in the study. The sample size was calculated based on the parameters [13].

Data collection tools:

Data were collected using three self-administered questionnaires.

Tool I assessed school teachers' demographic and occupational characteristics. It included two sections: the first gathered personal information (age, gender, marital status, residence, and income), while the second focused on occupational details such as educational level, grade taught, years of experience, working hours, prior training on musculoskeletal disorder (MSD) prevention, and sources of related knowledge.

Tool II evaluated teachers' knowledge of work-related musculoskeletal disorders (WMSDs). It covered definitions, types, causes, symptoms, consequences, ergonomics, and preventive and management strategies. Each correct answer was scored as one point, and incorrect or incomplete answers received zero. Knowledge levels were categorized into three levels based on established cut-off points.

Tool III measured teachers' feedback on the educational program implementation. It assessed the setting, instructor performance, content, and teaching methods. Each "yes" response received one point, with a total possible score of 22 (see Table 1). Feedback levels were classified as good, average, or poor according to predefined criteria (see Table 2).

Table 1. Scoring interpretation

Score	Percentage	Inference
Less than 22.5	<50%	Poor

marks		
From 22.5 to less than 33.75 marks	50%-<75%	Fair
33.75 marks and more	75%-100%	Good

Table 2. Scoring interpretation

Score	Percentage	inference
<11 scores	<50%	Poor
11 to less than 16.5 scores	50%-<75%	Fair
16.5 and more scores	75%-100%	Good

Validity and reliability:

Academic experts reviewed the educational program and tools for content, language, and structure, yielding a Content Validity Index of 0.90. A pilot study involving 10% of the sample (five teachers) assessed face validity, leading to revisions, including added ergonomics questions. Reliability testing showed high internal consistency, with a Cronbach's alpha of 0.87.

Ethical considerations:

The study was approved by the Research Ethics Committee of the Faculty of Nursing, Mansoura University (No. 435), and official permission was obtained from the Al-Azhar Institutes sector in Mansoura. Written informed consent was secured from all participating teachers after explaining the study purpose and their right to withdraw at any time. Participant safety, privacy, and confidentiality were strictly maintained throughout the research process.

four phases. During the assessment phase, teachers' socio-demographic and occupational data were collected, and their baseline knowledge of work-related musculoskeletal disorders (WMSDs) was evaluated using a self-administered questionnaire. In the planning phase, the educational program was developed based on current evidence and initial findings, with clearly defined objectives, content, teaching methods, schedule, and evaluation strategies.

The implementation phase involved two structured sessions delivered in a computer lab at times convenient for teachers. The program covered musculoskeletal disorders, ergonomics, prevention, and management, supported by a colorful illustrated booklet and interactive teaching methods (see Table 3).

In the evaluation phase, teachers' knowledge was reassessed through pre- and post-tests, and feedback was collected to determine the program's effectiveness

The study was conducted from March 2024 to June 2025 in

Table 3. Logistics of the educational program sessions

Logistics	Description
Target group	School teachers
The number of participants	Convenient 49 school teachers were recruited from four schools,
The number of groups	One group receive sessions per week.
The number of teachers in each group	Each group consisting of nearly 12-13 teachers.
Coordinator/facilitators	The researcher (one tutor)
Duration	Four weeks
Duration of session	One hour /session.
Time	11 -12 am.

Statistical analysis:

The data were coded and analyzed with the Statistical

Package for the Social Sciences version 21.0 (SPSS Inc, Chicago, IL). Descriptive analyses were conducted using numerical summaries, which included measures of central tendency and dispersion, to outline the characteristics of the sample. The Kolmogorov-Smirnov test was employed to assess normality. To evaluate the research hypotheses, inferential statistics such as Paired t-tests and Chi-square tests were utilized. Furthermore, Cohen's d was calculated to determine the effect size of the educational program on teachers' knowledge, with the significance level established at 5%

RESULTS

Socio-demographic and health data of the teachers:

Table 4 illustrates the socio-demographic characteristics of the studied school teachers. This table shows that 41.4% of teachers are aged between 35 and less than 40 years old with a mean age of 36.78 ± 5.29 . Additionally, 63% of teachers were females. In terms of marital status, 76.1% of teachers were married. Regarding income, 65.2% of teachers reported having an adequate income, and 54.3% of them resided in rural areas.

Table 4. School teachers' Socio-demographic characteristics (n=46)

Item	N	%
<i>Age</i>		
<25 years	2	4.3
25-<30 years	2	4.3
30-<35 years	11	23.9
35-<40 years	19	41.4
≥40 years	12	26.1
<i>Mean (SD)</i>	36.78 (5.29)	
<i>Gender</i>		
Male	17	37
Female	29	63
<i>Marital Status</i>		
Single	5	10.9
Married	35	76.1
Divorced	2	4.3
Widow	4	8.7
<i>Residence</i>		
Rural	25	54.3
Urban	21	45.7
<i>Income</i>		
Not adequate	16	34.8
Adequate	30	65.2

Table 5A illustrates the occupational characteristics of the studied school teachers. The table shows that 84.8% of the teachers held a bachelor's degree, and 87% taught at the elementary level. Regarding teaching experience, 80.4% had more than six years of experience, with a mean of 5.45 ± 1.22 years. In terms of working hours, 71.7% worked between 20 and less than 30 hours per week, with an average of 28.82 ± 5.79 hours. Additionally, 47.8% had previously attended a

training program on the prevention of musculoskeletal disorders. Among them, 28.3% attended workshops, followed by 10.9% who participated in online courses. Furthermore, 93.5% of the teachers had prior information about the prevention of musculoskeletal disorders, with 80.4% obtaining it from health professionals, followed by 45.7% who received it from colleagues or peers.

Table 5A. School teachers' occupational characteristics

	N	%
<i>Level of education</i>		

Institute	4	8.7
Bachelor's degree	39	84.8
Master degree	3	6.5
Grade Level Taught		
Elementary (Grades 1-5)	40	87
Middle School (Grades 6-8)	6	13
Number of experience years in teaching		
<3 years	3	6.5
3-<6 years	6	13
≥6 years	37	80.4
Mean (SD)	5.45(1.22)	
Average weekly working hours		
<20 hours	5	10.9
20-<30 hours	33	71.7
30-<40 hours	4	8.7
≥40 hours	4	8.7
Mean (SD)	28.82(5.79)	
Attendance of training program about prevention of musculoskeletal disorder	22	47.8
Types of training program*		
Workshops	13	28.3
Online Courses	5	10.9
Peer Learning Groups	4	8.7
Previous information about prevention of musculoskeletal disorder	43	93.5
Source of information about prevention of musculoskeletal disorder*		
Colleagues or peers	21	45.7
Health professionals	37	80.4
Social media or online forums	11	23.9
School workshops or training sessions	2	4.3

Table 5B illustrates the occupational characteristics of the studied school teachers. 95.7% of the teachers reported having experienced musculoskeletal disorders. Among them,

52.2% suffered from sciatica, followed by 32.6% with arthritis and 28.3% with osteoarthritis.

Table 5B. School teachers' occupational characteristics

Item	N	%
Suffer from previous musculoskeletal	44	95.7

disorder		
Type of previous musculoskeletal disorder*		
Arthritis	15	32.6
Osteoarthritis	13	28.3
Sciatica (leg pain)	24	52.2
Tendonitis	12	26.1
Disc prolapse	17	37

Teachers' knowledge about work related musculoskeletal disorders:

Table 6A presents the school teachers' knowledge levels across various categories related to musculoskeletal disorders (MSDs) before and immediately after the implementation of the educational program. The total MSD domain included knowledge of types, causes, signs and symptoms, and potential consequences of MSDs. Before the program, 65.2% of the teachers had a "Fair" level of knowledge regarding MSD types and causes, 56.5% for signs and symptoms, and 76.1% for potential consequences. In contrast, immediately after the program, 93.5% demonstrated a "Good" level of knowledge regarding types, 89.1% for both causes and signs

and symptoms, and 91.3% for potential consequences.

The paired t-test revealed highly statistically significant improvements with large effect sizes in the mean scores of all school teachers' knowledge categories regarding musculoskeletal disorders (MSDs) between the two phases of the educational program. Significant gains were observed in knowledge of MSD types ($t = 15.33$, $p \leq 0.001$, $d = 3.08$), causes ($t = 14.49$, $p \leq 0.001$, $d = 2.88$), signs and symptoms ($t = 11.43$, $p \leq 0.001$, $d = 2.43$), and potential consequences ($t = 17.51$, $p \leq 0.001$, $d = 3.52$).

Table 6A. School teachers' level of knowledge' categories regarding prevention of work-related musculoskeletal disorders before and after implementation of the educational program

Items	Pre-Test		Post-Test		Significant Tests
	n = 46		n = 46		
	No.	%	No.	%	
Types of musculoskeletal disorders score = (6)					
Poor	14	30.4	0	0	$\chi^2=81.09$, * p ≤ 0.001
Fair	30	65.2	3	6.5	
Good	2	4.3	43	93.5	
Mean (SD)	2.95 (1.05)		5.71 (0.71)		t=15.33, * p ≤ 0.001 d =3.08
Causes of musculoskeletal disorders score = (7)					
Poor	16	34	0	0	$\chi^2=74.85$, * p ≤ 0.001
Fair	30	65.2	5	10.9	
Good	00	00	41	89.1	
Mean (SD)	3.82 (1.08)		6.67 (0.89)		t=14.49, * p ≤ 0.001 d =2.88
Signs and symptoms of musculoskeletal disorders score = (8)					
Poor	13	28.3	0	0	$\chi^2=51.30$, * p ≤ 0.001
Fair	26	56.5	5	10.9	
Good	7	15.2	41	89.1	
Mean (SD)	4.30 (1.39)		7.43 (1.18)		t=11.43, * p ≤ 0.001 d =2.43
Potential consequence of musculoskeletal disorders score = (6)					
Poor	11	23.9	0	0	$\chi^2=77.64$,
Fair	35	76.1	4	8.7	

Good	00	00	42	91.3	* p ≤ 0.001
Mean (SD)	3.17 (0.85)		5.76 (0.60)		t=17.51, * p ≤ 0.001 d =3.52
Total Musculoskeletal disorders score = (28)					
Poor	14	30.4	0	0	χ ² =77.77, * p ≤ 0.001
Fair	32	69.6	4	8.7	
Good	00	00	42	91.3	
Mean (SD)	14.26 (1.94)		26.52 (3.20)		t=22.35, * p ≤ 0.001 d =4.63

χ^2 : Chi square test, t: Paired t-test, d: Cohen's D (effect size of t test), * $P<0.05$ significant.
who had a

Table 6B demonstrates the teachers' knowledge categories related to ergonomics, management and preventive actions before and immediately after the educational program implementation. Before the educational program, it was found that 89.1% of the teachers had a "Poor" level of knowledge in the ergonomics domain, compared to 80.4%

"Good" level immediately after the program. In the MSD management and preventive actions domain, 67.4% of teachers had a "Fair" level of knowledge before the program, while 87% of the teachers improved to a "Good" level after the program

Table 6B. School teachers' level of knowledge' categories regarding prevention of work-related musculoskeletal disorders before and after implementation of the educational program

Items	Pre-Test		Post-Test		Significant Tests
	n = 46		n = 46		
	No.	%	No.	%	
Ergonomics score = (7)					
Poor	41	89.1	0	0	$\chi^2=79.14$, * p ≤ 0.001
Fair	5	10.9	9	19.6	
Good	00	00	37	80.4	
Mean (SD)	2.47 (0.96)		6.45 (1.00)		t=20.36, * p ≤ 0.001 d =4.06
Management and preventive actions score = (10)					
Poor	15	32.6	0	0	$\chi^2=71.89$, * p ≤ 0.001
Fair	31	67.4	6	13	
Good	00	00	40	87	
Mean (SD)	4.95 (1.34)		9.17 (1.53)		t=13.50, * p ≤ 0.001 d =2.39

χ^2 : Chi square test, t: Paired t-test, d: Cohen's D (effect size of t test), * $P<0.05$ significant.

Furthermore, the paired t-test indicated highly significant differences with huge effect sizes between the mean scores of all teachers' knowledge categories in ergonomics, management, and preventive actions throughout the two phases of the educational program ($t=20.36$, $P \leq 0.001$, $d=4.06$; and $t=13.50$, $P \leq 0.001$, $d=2.39$).

The total score of the studied teachers' knowledge regarding the prevention of work-related musculoskeletal disorders before and after the implementation of the educational

program is presented in Table 7. At the baseline assessment, 52.2% of the studied teachers reported a "Poor" level of knowledge, with a mean score of 22.08 ± 2.64 . In comparison, after the immediate post-test, the level of teachers' knowledge improved to a "good" level among 91.3% of the teachers with a mean score of 42.15 ± 5.30 . The Paired t-test indicated a highly significant improvement between the means of the total teachers' knowledge score regarding the prevention of work-related musculoskeletal disorders throughout the two educational program phases ($t=23.88$, $P \leq 0.001$, $d=4.79$).

Table 7: School teachers' total level of knowledge regarding prevention of work-related musculoskeletal disorders before and after implementation of the educational program

Items	Pre-Test	Post-Test	Significant Tests
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	n = 46		n = 46		
	No.	%	No.	%	
Total knowledge score = (45)					
Poor	22	47.8	0	0	$\chi^2=78.46$, * p ≤ 0.001
Fair	24	52.2	4	8.7	
Good	00	00	42	91.3	
Mean (SD)	22.08 (2.64)		42.15 (5.30)		t=23.88, * p ≤ 0.001 d =4.79

χ^2 : Chi square test, t : Paired t -test, d : Cohen's D (effect size of t test), * $P < 0.05$ significant.

School teachers' feedback regarding the education program implementation.

The total score of the teachers' feedback on the implementation of the educational program for preventing

of work-related musculoskeletal disorders is presented in Table 8 and Figure 1. The evaluation results showed that the 89.1% of teachers rated the program as "Good," with a mean score of 20.19 ± 3.18

Table 8: School teachers' total feedback regarding the prevention of work-related musculoskeletal disorders' education program implementation

Items	No.	%
Total feedback score=(22)		
Mean (SD)	20.19(3.18)	
Average	5	10.9
Good	41	89.1

Figure 1. School teachers' total feedback regarding the prevention of musculoskeletal disorders' education program implementation



DISCUSSION

Concerns regarding the risk of work-related musculoskeletal disorders (WMSDs) have been on the rise within the education sector. Generally, school teachers exhibit a higher incidence of WMSDs compared to other professional groups [1]. While there is a large body of published literature dating back ten years or more on the relationship between teachers and WMSDs, little has been published on the prevalence of WMSDs, including intervention studies, aimed at the teaching profession [5]. Thus, this study aimed to assess the effect of implementing a health education program about the prevention of work-related musculoskeletal disorders on

school teachers' knowledge.

The socio-demographic and occupational profile of educators provides essential insights into the elements that influence their health knowledge, practices, and overall wellbeing, while also guiding evidence-based policy formulation. In this regard, the current study evaluated the socio-demographic and occupational characteristics of the studied teachers. The results revealed that most participants were married women aged between 35 and 40 years, with moderate economic stability, living in rural regions. These findings align with earlier research [14-16].

The study reveals a high prevalence of musculoskeletal

disorders among school teachers, particularly sciatica, arthritis, and osteoarthritis, aligning with global trends [1]. These findings highlight the urgent need for targeted occupational health interventions to reduce MSD risk and enhance teacher health [17].

The educational program on work-related musculoskeletal disorders (MSDs) significantly enhanced teachers' knowledge across all measured domains, including types, causes, signs and symptoms, and potential consequences of MSDs. Before the intervention, most teachers demonstrated a "Fair" level of knowledge concerning musculoskeletal disorders and their potential impacts. This initial level of knowledge corresponds with earlier research that emphasizes the generally low awareness of MSD risk factors and symptoms among school teachers, which leads to underreporting and postponed treatment of symptoms [18,19,13].

After completing the educational program, a significant improvement was observed, with most teachers reported a "Good" level of knowledge regarding types, causes, and symptoms, and many demonstrating an understanding of potential consequences. This notable difference illustrates the success of focused health education in equipping teachers to swiftly identify MSD risks and symptoms. This result is supported [18] that cited that "the health education and ergonomic interventional program could reduce pain, improve knowledge and change attitude of school teachers in rural areas." Similar findings have been demonstrated in recent workplace intervention research, where structured ergonomics and MSD awareness training reported significant improvements in participant knowledge and preventive behaviors [20,21,16].

The significance tests indicated statistically significant improvements, with substantial effect sizes observed across knowledge categories related to ergonomics, management of work-related musculoskeletal disorders, and prevention. This implies that heightened cognitive awareness is associated with implementation of preventive measures, including ergonomic adjustments [22,23,16]. This finding is supported by previous research demonstrating that structured educational programs significantly enhance participants' knowledge, attitudes, and practices (KAP) regarding the prevention of work-related musculoskeletal disorder (WMSD) risks [11]. The magnitude of change observed in the present study underscores the capacity of educational interventions to bridge critical knowledge gaps that may otherwise compromise teacher health and productivity.

The data indicates that effectively organized educational interventions can greatly improve school teachers' knowledge of MSDs, which is an essential step towards prevention and early intervention. This conclusion advocates for the implementation of continuous MSD awareness programs as part of teacher professional development and occupational health initiatives. Sustained knowledge improvements, reinforced by supportive ergonomic improvements, holds promise to reduce the burden of MSDs within the teaching profession, enhancing both teacher physical health and the educational outcomes [24,11].

CONCLUSION

The results of this study confirmed the proposed hypothesis and suggest that the program on work-related musculoskeletal disorders effectively enhanced the knowledge of the studied teachers about musculoskeletal disorders and ergonomics

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