Musculoskeletal pain among school teachers: are we underestimating its impact?

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ABSTRACT

Background: **Musculoskeletal disorders (MSDs) are a common occupational health condition which may significantly impact both work attendance and performance. School teachers represent an occupational group among which there appears to be a high prevalence of neck and/or shoulder pain (NSP) and low back pain (LBP). Epidemiological data on NSP and LBP in South African teachers are limited.**

Objectives: **To determine the prevalence of NSP and LBP among primary school teachers in the Central Durban area of KwaZulu-Natal, South Africa; to identify predominant occupational factors associated with NSP and LBP pain; and to highlight key actions associated with such factors so as to direct future preventive measures/interventions.**

Methods: **A cross-sectional, questionnaire-based study was conducted on teachers from 12 randomly selected primary schools.**

Results: **Among the 97 completed questionnaires, the prevalence of NSP and LBP was 80.4% and 68.0%, respectively. There was no association between age and NSP ($p < 0.250$) or LBP ($p < 0.595$). However, there were higher prevalence rates of NSP and LBP among the 45-54 years age group (39.2% and 33.0%, respectively). Factors associated with NSP included marking of assessments (56.7%; n = 55), and writing on a blackboard (39.2%; n = 38); prolonged standing was associated with LBP (83.5%; n = 81). These findings highlighted specific actions, such as forward-bending of the head for prolonged periods (61.9%; n = 60), backward-bending of the head for prolonged periods (20.6%; n = 20), and reaching/stretching with arms above chest height (41.2%; n = 40).**

Conclusion: **Key occupational factors associated with MSP, and associated actions identified in this study can be used as a basis to direct strategies that can be applied to reduce the prevalence of MSP and the onset of MSD in teachers.**

Keywords: **musculoskeletal disorders, musculoskeletal pain, neck and/or shoulder pain, low back pain, occupational risk factors**

INTRODUCTION

Musculoskeletal disorders (MSDs) are defined as inflammatory and degenerative conditions, involving the tendons, muscles, ligaments, peripheral nerves, joints and supporting blood vessels.[1] Such conditions result in overexertion of bones, ligaments and muscles, and typically manifest as musculoskeletal pain (MSP) with subsequent functional impairment.[2,3] Musculoskeletal disorder represents one of the most common and expensive occupational health disorders in developed and developing countries.[4] Additionally, MSP impacts negatively on quality of life, has financial implications with regard to compensation costs and wages,[5] reduces work productivity, and often leads to ill health retirement.[4]

Pope et al.[6] found that the prevalence of MSP was increased in people with occupations that are monotonous, involve high workloads with little personal autonomy, and are demanding in terms of time-based outputs. As such, school teachers are susceptible to the development of MSP and subsequent MSD. Recent epidemiological studies confirm this in reports of significantly high prevalence rates of MSP amongst school teachers.[4,5,7,8] MSP has been associated with factors such as heavy lifting; awkward postures; bending, twisting or stooping; prolonged sitting or standing; and repetitive motions.[4,8-11] A Saudi Arabian study conducted among female school teachers corroborated that a high work and improper posture is associated with frequent reports of neck and/or shoulder pain (NSP), upper limb pain (ULP), and low back pain (LBP).[2] In Scotland, MSP has been reported to be the second most common cause of ill-health retirement in teachers.[12,13] Erick and Smith (2015) postulated that "If little or nothing is done to reduce the prevalence of this crucial workplace problem, MSD may potentially lead to reduced teacher performance, increased absenteeism, ill-health, early retirement and increased health care costs".[14]

More recently, in 2017, LBP and NSP in high school teachers were correlated with psychological distress and work-related psychosocial characteristics.[15] Multivariate analysis demonstrated an association of both self-reported LBP and NSP, with depression and anxiety. The incidence and management of MSP among teachers warrants further research,[5,10,16,17] particularly in Africa.[18] Despite the wide exploration of both prevalence of, and risk factors for, MSDs, especially in the workplace, there is a paucity of studies that investigate the prevalence of, and risk factors associated with, MSP among South African teachers.[19]

This study aimed to calculate the prevalence of NSP and LBP among primary school teachers in the Central Durban area of KwaZulu-Natal, South Africa; to identify occupational factors associated with NSP and LBP; and to identify associated key actions, to direct future preventive measures and/or interventions.

METHODS

A cross-sectional study was conducted among primary school teachers in randomly selected public schools in the Central Durban area, KwaZulu-Natal, during July to September 2015. Twelve schools were randomly selected from a list of 95 public primary schools obtained from the KwaZulu-Natal Department of Education. All teachers employed in the selected schools (approximately 20 teachers per school) were invited to participate in the study. A total of 177 self-administered questionnaires were distributed.

The questionnaire was constructed and adapted from the Dutch Musculoskeletal Questionnaire.[20] Demographic variables, teaching history, and information on NSP and LBP (with possible associated occupational risk factors), formed the basis of the questionnaire.

Ethical considerations

Ethical clearance from the institutional research ethics committee at the Durban University of Technology was obtained prior to conducting the study (REC 68/14). Permission to conduct research within schools was obtained from the KwaZulu-Natal Department of Education and from the principals of the selected schools. The teachers received letters outlining the study, explaining their voluntary participation, and assuring confidentiality of the data provided. A letter of informed consent was signed by each participant.

Statistical analyses

Data were analysed using the SPSS statistical package (version 21), with statistical significance set at $p \leq 0.05$. Descriptive analyses were performed on categorical variables (summarised as frequencies and percentages) and continuous variables (summarised as means and standard deviations). Associations of factors with MSP were assessed using bivariate analyses (chi-squared tests and independent t–tests), where appropriate.

RESULTS

The response rate was 54.8% (97 of the 177 questionnaires were returned). Most of the participants were female (80.4%, n = 78). Nearly 60% were Indian (58.8%, n = 57), 18.6% were coloured (n = 18), 12.4% were black (n = 12), and 8.3% were white (n = 8). Almost half of the respondents (44.3%, n = 43) were in the 45-54 years age group; a minority was in the 55-65 years age group (12.4%, n = 12). There was an even distribution of participants in the 25-34 (16.5%, n = 16) and 35-44 (19.6%, n = 19) years age groups.

Most of the respondents experienced NSP (80.4%, n = 78) and/or LBP (68.0%, n = 66) in the previous 12 months. Marking of written assessments was significantly associated with both NSP

Table 1. Association between MSP and demographics/period of onset (N = 97)

Category	NSP			LBP		
	n	%	p-value	n	%	p-value
Sex			0.576			0.300
Male	9	9.3		7	7.2	
Female	63	64.9		54	55.7	
Ethnicity			< 0.001*			0.008
White	5	5.2		3	3.1	
Black	5	5.2		4	4.1	
Indian	51	52.6		44	45.4	
Coloured	16	16.5		14	14.4	
Age			0.247			0.594
25-34 years	11	11.3		10	10.3	
35-44 years	16	16.5		13	13.4	
45-54 years	38	39.2		32	33.0	
55-65 years	10	10.3		9	9.3	
Time of day			0.097			0.097
Morning	6	6.2		5	5.2	
Afternoon	16	16.5		9	9.3	
Evening	15	15.5		14	14.4	
Time of the week			0.417			0.584
Beginning of work-week	1	1.0		4	4.1	
End of work-week	4	4.1		6	6.2	
Weekend	3	3.1		4	4.1	

*statistically significant ($p \leq 0.05$)

Table 2: Key actions associated with occupational factors contributing to MSP (N = 97)

Region of pain	Activity	Key action	n	%	p value
Neck/ shoulder	Marking assessments	• Forward-bending of head for a prolonged time	60	61.9	0.001*
	Writing on a blackboard	• Stretching arms above shoulder height	40	41.2	0.766
		• backward-bending of head for a prolonged time	20	20.6	0.016*
	Carrying/lifting equipment/ teaching resources	• Carrying heavy loads	17	17.5	0.120
		• Carrying heavy loads in awkward posture	8	8.3	0.055*
		• Carrying heavy loads that are difficult to hold	8	8.3	0.558
Low back	Prolonged gait	• Standing for a prolonged time	81	83.5	0.000*
		• Sitting for a prolonged time	24	24.7	0.743
		• Walking for a prolonged time	27	27.8	0.365
	Prolonged postural discomfort	• Stooping for a prolonged time	9	9.3	0.789
		• Working in a bent posture for a prolonged time	33	34.0	0.059*
		• Working in a twisted posture for a prolonged time	10	10.3	0.163
		• Working in a bent and twisted posture for a prolonged time	10	10.3	0.486
		• Working in uncomfortable postures	23	23.7	0.054

n and % indicate the number and proportion of participants who responded positively when asked about the actions performed during the various activities.
* statistically significant ($p \leq 0.05$)

(56.7%; n = 55; p = 0.001) and LBP (40.2%; n = 39; p = 0.016). In addition, 39.2% (n = 38) of the respondents indicated that writing on a blackboard contributed to their NSP, while 25.8% (n = 25) reported that it contributed to LBP. Computer use and carrying/lifting equipment/teaching resources was also reported to be a contributor to MSP: 34.0% (n = 33) and 25.8% (n = 25) for NSP, respectively; and 21.7% (n = 21) and 23.7% (n = 23) for LBP, respectively.

The associations between MSP (NSP and LBP) and selected demographic variables are shown in Table 1. We failed to demonstrate any statistically significant associations between age and gender, and the onset of MSP. Despite the statistical difference observed amongst race groups, we did not conduct a post-hoc test to determine the between group effect (i.e. between which race groups the statistical difference was). The small sample size of some of the race groups reduced the statistical power for such a comparison. Although more incidents of MSP were reported during the afternoons/evening in comparison to the mornings, the difference was not statistically significant. There were also no significant differences in the frequency of MSP at the beginning of the work-week, and the end of the work-week or weekend.

Work-related activities associated with the onset of NSP and LBP

Table 2 highlights the key actions associated with the occupational factors contributing to NSP and LBP. Holding the head in a forward-bent posture (61.9%; n = 60) and reaching/stretching with arms above chest height (41.2%; n = 40) were reported as the most common risk factors linked to the onset of NSP. In addition, standing for a prolonged time (83.5%; n = 81) and working in a bent posture for prolonged periods (34.0%; n = 33) were associated with LBP. It is possible that marking assessments (when the head in forward-bent posture), and writing on a blackboard (when the head is in backward-bent posture and the arms are stretched forward above chest height) might be activities that aggravate the frequency and onset of NSP. Standing for prolonged periods and working in a bent posture for prolonged periods might be aggravators of LBP.

DISCUSSION

Primary school teachers are predisposed to MSP since the bulk of their time is spent walking or standing in an attempt to supervise or ensure complete learner understanding of the teaching material.[2] The increased mobility and reduced rest breaks between class sessions may be key in understanding the risks attached to MSP. Our study demonstrated a 80.4% prevalence of NSP and a 68.0% prevalence of LBP in the 12 months prior to administration of the questionnaires. These findings are much higher than those from a recent Chinese study that reported prevalence rates of 48.7% and 45.6% for NSP and LBP, respectively,[4] and a Turkish study that reported prevalence rates of 42.5% for neck pain, 28.7% for shoulder pain, and 43.8% for LBP.[16] However, they are similar to those from a Hong Kong study conducted among secondary school teachers, which reported a prevalence of 69.3% for neck pain.[21] The high prevalence observed in the teachers in our study might be related to the increased job demands in the South African context, which include dealing with the steadily increasing number of students in the classroom, particularly in public schools.

Despite the lack of a statistically significant difference between age, and either NSP (p = 0.247) or LBP (p = 0.594), the highest prevalence of NSP (39.2%) and LBP (33.0%) was in the 45-54 years age group. Similar prevalence rates have been reported for NSP in the 46-50 and 40-49-year age groups in Asia[16,22] and it has been suggested that NSP is associated

with age-associated degenerative changes within the joints, muscles, ligaments and tendons.[23] Ehsani and coworkers recently (in 2018) reported a significantly higher prevalence of NSP amongst teachers older than 40 years,[24] which might be linked to age-associated physical deterioration, reduced restoration of damaged tissue, and joint cartilage weakening.[4]

There was no statistically significant association between gender and MSP in our study, but this might be due the small number of males in the study (n = 16). Other studies have shown higher prevalence rates of NSP in women,[4,24,25] and have attributed this to the housework commonly done by women.[26]

Association between NSP and LBP and work-related factors

Occupational activities, such as marking written assessments, writing on blackboards, and standing for long periods are accompanied by awkward and static occupational positions/postures.[4,8,9,11] These occupational postures may result in shortened muscles which compress the nerves, resulting in weakened muscles and muscle imbalances.[27] We found associations between NSP and forward-bent posture of the head/backward-bent posture of the head, and lifting of heavy loads. These results support findings from previous studies in which significant associations between neck pain and static and repetitive neck positions, especially with prolonged neck flexion, and static and repetitive or forceful movements of the arms, were found.[9,28]

Marking of assessments was identified as the largest aggravating factor for both NSP (56.7%) and LBP (40.2%). The majority of respondents with NSP reported that teaching required them to keep their heads in a forward-bent posture for a prolonged time, which can be expected due to the hours spent marking, reading, writing and leaning forward to help scholars. Our study corroborates the findings from a study by Chiu and Lam (2007)[21] which showed that 85.1% of neck pain was due to a head-down posture. Similarly, Ehsani and co-workers studied NSP in Iranian teachers,[24] and reported that occupational activities such as computer usage, and marking and reviewing of examination scripts, which support a head-down posture, increased vulnerability to NSP.[24] They also reported that age, sex, physical inactivity, occupational satisfaction, overall physical health and employment duration predisposed the teachers to NSP.[24]

Da Silva and Almeida (2012)[29] also explored the posture and physical activities to which teachers are exposed during their daily classroom routines. They reported that changes in posture as a result of the different occupational activities that teachers are required to perform, predispose them to MSP.[29] They also suggested that postural changes, combined with general fatigue in the classroom, increase the vulnerability of teachers to disease and MSP if they are not physically active. A more recent study, conducted in Sweden, revealed that MSP amongst teachers may be more strongly linked to psychosocial factors than to physical workload.[30] The emotional demands that teachers experience within the classroom might increase their risk of MSP.

Recent studies found LBP to be associated with standing for a prolonged time, specific sitting habits, a sudden change in posture, and carrying heavy objects.[31,32] These studies also reported a correlation between LBP in teachers and routine classroom activities, such as marking of examination scripts and increased computer use.[31,32] These reports support our findings of a relationship between standing for a prolonged time and LBP. In our study, standing for a prolonged time was the second most common aggravating factor for LBP, after marking. Others suggest that prolonged standing and resultant LBP might be attributed to the lack of spinal movement, which increases the load on lumbar spinal tissues, and subsequently causes MSP.[33] Andersen et al.[34] reported that LBP might be associated with standing for longer than 30 minutes.

Limitations

The cross-sectional nature of the study allows for associations to be identified, but no inferences on causality could be established. The questionnaire used relies on recall and self-reporting, which might result in recall bias, and underestimation of the prevalence. The small sample size and poor response rate might have also resulted in bias: those with MSP might have been more likely to participate in the study. Other potential contributors to MSP, such as personal and work-related psycho-social stressors which might contribute to MSP, over and above the occupational physical demands, were not incorporated into the questionnaire.

CONCLUSION AND RECOMMENDATIONS

This is the first study, to our knowledge, on MSP among teachers in South Africa. MSDs are an important consideration in the workplace. School teachers, due to physical demands related to the profession, are at risk of developing MSDs. Strategies need to be developed to reduce the prevalence of MSDs in teachers. These include primary prevention strategies at an organisational level (such as educational drives to inform teachers of the implications of MSDs, education about ergonomics and appropriate postures); primary prevention strategies at an individual level (such as taking rest breaks between activities, keeping physically active, and engaging in regular muscle flexibility exercises); and secondary prevention strategies (such as improved access to healthcare, supported and subsidised by the organisation).

We recommend further research, targeting various job types/occupational activities within the teaching community to provide information on MSD from a wider representation of teachers. Future studies should use a longitudinal study design to determine the role of psychosocial factors (both work-related and external) in the development of MSP among teachers.

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DECLARATION

The authors declare that they have no conflicting interests.

LESSONS LEARNED

- Prevalence rates of NSP and LBP among teachers in South Africa might be higher than in many other countries.
- NSP and LBP in teachers are related to the specific activities performed in the profession.
- Strategies to reduce the incidence of MSD in teachers need to take into account the activities undertaken, and postures adopted, during working activities.

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