ORIGINAL ARTICLE

Musculoskeletal problems and associated risk factors among health science students in Ethiopia: a cross-sectional study

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Abstract

Background Musculoskeletal disorders (MSDs) are the most common cause of severe long-term pain and physical disability. High prevalence of musculoskeletal pain among medical and other health science students has been reported globally. However, little is known about the magnitude of the problem in Ethiopia among medical and health science students. Therefore, this study aimed to determine the prevalence and identify the associated risk factors of MSDs among medical and health science students in Ethiopia.

Methods Institution based cross-sectional study was conducted from March to May 2018. A stratified random sampling technique was applied to select 422 study participants, and the data was collected by a standardized Nordic questionnaire for the analysis of musculoskeletal symptoms. Bivariate and multivariable binary logistic regression analyses were performed using SPSS version 20.

Results The prevalence of musculoskeletal disorders in any part of the body region among medicine and nursing students was 69.4% (95% CI, 64.9, 73.9). Lower back pain was the most commonly reported body site and its prevalence increased as the year of study increases, ranging from 38% among 2nd year to 74.4% among 5th-year students. As the year of study/academic year increased, the odds of developing musculoskeletal disorders were higher. Furthermore, this study showed that a poorly designed sitting chair was a risk factor for musculoskeletal pain.

Conclusion Ergonomic interventions focusing on modification of workstations, and promoting and delivering ongoing ergonomic education are very important to reduce the problem.

Keywords Musculoskeletal disorders · Low back pain · Health science · Students · University · Ergonomics · Prevalence · Risk factor · Gondar · Ethiopia

Abbreviations

AOR	Adjusted odds ratio
BMI	Body mass Index
CI	Confidence Interval
COR	Crude odds ratio
LBP	Low back pain
MSDs	Musculoskeletal disorders
SPSS	Statistical Package for Social Science
UK	United Kingdom

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Background

Musculoskeletal disorders (MSDs) are impairments of body structures such as tendons, muscles, joints, ligaments, nerves, bones, or a localized blood circulation system (Podniece et al. 2008; Rimpilainen 2016). They are the most common cause of severe long-term pain and physical disability, and affect hundreds of millions of people around the world (Woolf and Åkesson 2001; Woolf and Pfleger 2003). MSDs may affect, in addition to other areas, the back, neck, shoulders, elbows, forearms, wrists, and hands (Buckle and Devereux 2002).

Studies conducted across countries have shown a high proportion of musculoskeletal pain among medical and other health science students, which varied between 31.8% and 74.4% (Alhariri et al. 2016; Alshagga et al. 2013; Smith et al. 2003; Vujcic et al. 2018; Nordin et al. 2014; Iqbal et al. 2017; Abledu and Offei 2015). MSDs are considered to be multi-factorials that are caused due to the interactions between various risk factors, which vary across different occupations (Yasobant and Rajkumar 2014). Body mass index (BMI), computer use, psychosocial factors (Brink et al. 2015), bending, prolonged sitting (Bot et al. 2007), ergonomic pressure, gender, underlying disease (Hänninen et al. 2007), and bad posture have been among the most important reported risk factors of MSDs (Dianat et al. 2013).

Moreover, different studies conducted have shown that mental stress, history of trauma, daily hours of computer use, and carrying heavy bags (Haroon et al. 2018; Alshagga et al. 2013; Alhariri et al. 2016), lack of physical exercise, fatigue and patient handling during assessment (Iqbal et al. 2017; Vujcic et al. 2018), age, year of study, and physical fitness (Nordin et al. 2014) have also been noted as associated risk factors of MSDs among health science students at different universities .

However, little is known about the magnitude of the problem in Ethiopia among medical and health science students. Therefore, this study aimed to determine the prevalence and identify the associated risk factors of MSDs among medical and health science students at the University of Gondar, Ethiopia.

Methods

Study design and setting

The Institution based cross-sectional study design was employed from March 20–May 30, 2018. The study was conducted in the University of Gondar, College of Medicine and Health Science, Ethiopia. The College of Medicine and Health Science is one of the five campuses found under the University of Gondar, and currently about 6888 medicine and other health science students are enrolled.

Study participants and sampling procedures

Regular undergraduate 2nd year and above medicine and nursing students in the College of Medicine and Health Science, University of Gondar, were included in this study. The sample size was determined by using a single population proportion formula, assuming a 50% proportion of MSDs, 5% margin of error, and 95% confidence interval. In consideration of possible non-response during the data collection period, a 10% non-response rate number was added to the final sample size. Finally, a total of 422 study participants were included in the study.

A stratified sampling followed by a simple random sampling technique was used to select 422 study participants. The participants were stratified based on their respective departments and years of studies.

Data-collection tool and procedure

Data was collected by a self-administered data-collection technique. The MSDs among the study participants were measured by a standardized Nordic questionnaire for the analysis of musculoskeletal symptoms. The reliability of the questionnaire has been shown to be acceptable (Kuorinka et al. 1987). In this study, the Cronbach's alpha for the questionnaire was 0.62. Literature indicates that a value of Cronbach's alpha 0.60 or greater is assumed to be acceptable (Wami et al. 2016). Therefore, the questionnaire in this study was found to have acceptable reliability.

The questionnaire was originally in the English version, and it was translated to Amharic (local language) to make the questions easily understandable by the study participants, then back to English by another translator, to check the consistency of message from a question. The translation was then reviewed by professional experts.

Data management and analysis

All the questionnaires were checked visually, coded and entered into Epi-info version 7, and exported to SPSS version 20 software for further analysis.

The logistic regression model was fitted to determine the effect of various factors on the MSDs. MSDs in our study was defined as self-reported chronic or acute aches, pain, trouble or discomfort in any part of the body region (back, neck, shoulders, elbows/forearms, and hands or wrists). The goodness of the model fit test was checked by the Hosmer–Lemeshow test (p value = 0.753), and the value suggest ed that the model is a good fit (p value > 0.05). In addition, the predictive power of the model was measured through Pseudo R square, and we got the value of 0.39. A binary logistic regression model was fitted and variables with p value < 0.20 at bivariate logistic regression analysis were exported to multivariable logistic regression analysis. The Enter selection method was used in multivariable analysis for selection of variables. The significance level was obtained at 95% CI and p value ≤ 0.05. The adjusted odds ratio was used to determine the strength of association.

Results

All 422 completed and valid questionnaires were returned and considered for the analysis, which gives a response rate of 100%.

Socio-demographic and institution related characteristics

From the total respondents, above half 242 (57.3%) were males. The mean (± SD) age of the respondents was 22.67 ± 1.97 years and the majority [372 (88.2%)] of respondents were medical students.

Nearly three-quarters [316 (74.9%)] of respondents had a clinical practice > 20 h per week. Among the study participants, 83 (19.7%) of respondents mostly used a poorly designed chair that is with no armrest and back support. Three-quarters [317 (75.1%)] of the respondents reported a higher perceived level of stress (Table 1).

Prevalence of musculoskeletal disorders

This study revealed that the prevalence of musculoskeletal disorders in any part of the body in the previous 12 months among medicine and nursing students was 69.4% (95% CI: 64.9, 73.9). The most commonly reported site of pain was lower back (54.0%), followed by neck pain (36.70%), hand/wrist pain (14.9%), shoulder pain (12.3%), and elbow/forearm pain (10.4%).

Comparative results of musculoskeletal disorders across departments and year of study

A higher prevalence of MSDs was reported by medicine students in all body regions, apart from hand/wrist pain, which was higher among nurses (22%).

Furthermore, a higher prevalence of MSDs was reported among 3rd, 4th, and 5th-year students. Lower back pain (LBP) was the most commonly reported MSD, and its prevalence increased as the year of study increased, ranging from 38% among 2nd year to 74.4% among 5th-year students. Neck pain was the second most commonly reported MSD, showing highest prevalence among 4th-year students (47.5%) (Table 2).

Factors associated with musculoskeletal disorders

The multivariable binary logistic regression analysis showed that year of study and sitting chair design had a statistically significant association with musculoskeletal disorders at p value ≤ 0.05 (Table 3).

The year of the study was significantly associated with MSDs. As students' year of study increased, the odds of developing MSDs was higher. Third-year students had 2.72 times higher odds of having MSDs than 2nd-year students (AOR = 2.72, 95% CI: 1.39, 5.32). Similarly, 4th year and 5th-year students were respectively 2.69 and 3.17 times more likely to develop MSDs compared to 2nd-year students (AOR = 2.69, 95% CI: 1.43, 5.10); AOR = 3.17, 95% CI: 1.35, 7.44) respectively.

Table 1 Socio-demographic and institution related characteristics of the study participants, University of Gondar, Ethiopia, 2018 ($n = 422$)

Variables	Frequency (n)	Percent (%)
Gender		
Female	180	42.7
Male	242	57.3
Age (years)		
19–24	348	82.5
25–29	74	17.5
Marital status		
Single	385	91.2
Married	37	8.8
Religion		
Orthodox	272	64.5
Muslim	43	10.2
Protestant	86	20.4
Catholic	13	3.1
Others	8	1.9
Department		
Medicine	372	88.2
Nursing	50	11.8
Year of study		
2nd year	92	21.8
3rd year	118	28
4th year	122	28.9
5th year	90	21.3
Average study hours per day without taking rest break		
2–4 h	108	25.6
5–6 h	236	55.9
> 6 h	78	18.5
Average rest break taken during studying		
≤ 30 min	282	66.8
> 30 min	140	33.2
Body mass index (BMI)		
Underweight	42	10
Normal weight	380	90
Physical exercise		
No	278	65.9
Yes	144	34.1
Smoking behavior		
Never	335	79.4
Past smoker	33	7.8
Current	54	12.8
Alcohol drinking behavior		
No	288	68.2
Yes	134	31.8
Average clinical practice hours per week		
≤ 20 h	106	25.1
> 20 h	316	74.9
Sitting materials comfortable		
No	260	61.6

Table 1 (continued)

Variables	Frequency (n)	Percent (%)
Yes	162	38.4
Design of the sitting chairs		
Have arm rest and back support	161	38.2
Have arm rest but have no back support	56	13.3
Have back support but no arm rest	122	28.9
Have no arm rest and back support	83	19.7
Sitting posture		
Constant position for more than 2 h	180	42.7
Change sitting position per 2 h	88	20.9
Frequently change sitting position	154	36.5
Sleeping materials comfortable		
No	249	59
Yes	173	41
Average sleeping hours per day		
≤ 6 h	190	45
> 6 h	232	55
Stress		
No	105	24.9
Yes	317	75.1

This study showed that sitting in a poorly designed sitting chair was a risk factor for musculoskeletal pain. Respondents who sat most of the time on unergonomic chairs, which do not have armrest and back support, had 2.27 times higher odds of having MSDs than those who used chairs with armrest and back support (AOR = 2.27, 95% CI: 1.03, 4.97).

Discussion

This study revealed that medicine and nursing students are at high risk of developing MSDs. According to this study, 69.4% (95% CI: 64.9, 73.9) of respondents reported that they had a musculoskeletal pain/trouble at least in one part of the body in the previous 12 months.

This finding is in agreement with other studies that have reported the prevalence of MSDs; 67.6% among Chinese medical students (Smith et al. 2005b), 73.3% among nursing students in Korea (Smith et al. 2005a), and 70.1% among 1st-year Ghanaian nursing students (Abledu and Offei 2015). Furthermore, this result is also consistent with the studies that reported 68.9% of MSDs in any part of the body over the previous year among dentists in Iran (Rafie et al. 2015), 68.9% among nurses in Zambia (Nkhata et al. 2015), and 70.79% among faculty members of the University of Medical Sciences in Iran (Modarresi et al. 2017).

Health science students have been identified as suffering MSDs at considerable rates due to their exposure to physical and psychosocial risk factors (Hayes et al. 2014; Smith and Leggat 2007; Leggat et al. 2008; Hayes et al. 2009; Nyland and Grimmer 2003; Goon 2017). Moreover, reasonably long duration sitting when studying and learning in the classrooms, mentally demanding tasks in their clinical practice, and long hours of computer usage and desk-based study might be the factors for an increased report of MSDs among university students (Hayes et al. 2014; Hayes et al. 2009; Smith et al. 2005b; Warren 2010).

On the other hand, the finding of this study result is higher than the studies conducted among Japan female nursing students — 32.9% (Smith 2002) and 36.9% (Chang et al. 2007) — and a study conducted among medical science students — 55% (Tirgar et al. 2014). The possible reason for this variation might be attributed to the better ergonomic training and familiarity with ergonomic measures in those study areas (Tirgar et al. 2014; Sirajudeen et al. 2018). In addition, our study was carried out during the final examination periods when the students were at high academic stress, which might be a risk factor for the high prevalence of MSDs (Abledu and Offei 2015; Tantawy et al. 2017). The finding of this study was also higher than a study that reported 34.54% musculoskeletal problems related to laboratory training in university medical students (Penkala et al. 2018).

However, the prevalence of MSDs in this study is lower than in other studies that reported 74.4% of MSDs among

Table 2 Comparative results of musculoskeletal disorders across department and year of study, University of Gondar, Ethiopia, 2018 (n = 422)

Variables	Musculoskeletal disorders by body regions (%)					P value
	Low back pain	Neck pain	Shoulder pain	Elbow or forearm pain	Hand or wrist pain	
Department						
Medicine	55.6	39.5	12.4	10.5	13.9	0.20
Nursing	42	16	12	10	22	
Year of study						
2nd year	38	11.9	8.7	8.7	10.9	< 0.001
3rd year	55.1	44.1	11.9	12.7	16.1	
4th year	50	47.5	16.4	10.7	16.4	
5th year	74.4	37.8	11.1	8.9	15.6	

Table 3 Bivariate and multivariable binary logistic regression analysis of factors associated with MSDs among health science students in University of Gondar, Ethiopia, 2018 (n = 422)

Variables	MSDs (frequency)		COR (95% CI)	AOR (95% CI)
	No	Yes		
Gender				
Male	70	172	1.19 (0.79, 1.82)	0.97 (0.59, 1.57)
Female	59	121	1.00	1.00
Department				
Medicine	110	262	1.46 (0.79, 2.69)	1.75 (0.83, 3.68)
Nursing	19	31	1.00	1.00
Year of study				
2nd year	47	45	1.00	1.00
3rd year	29	89	3.21 (1.79, 5.76)*	2.72 (1.39, 5.32)*
4th year	37	85	2.39 (1.37, 4.21)*	2.69 (1.43, 5.10)*
5th year	16	74	4.83 (2.45, 9.51)*	3.17 (1.35, 7.44)*
Average clinical practice hours per week				
≤20 h	42	64	1.00	1.00
>20 h	87	229	1.73 (1.09, 2.74)*	1.23 (0.72, 2.10)
Body mass index (BMI)				
Underweight	12	30	1.11 (0.55,2.25)	1.17 (0.54, 2.53)
Normal weight	117	263	1.00	1.00
Physical exercise				
No	91	187	0.74 (0.47, 1.15)	0.87 (0.52, 1.45)
Yes	38	106	1.00	1.00
Smoking behavior				
Never	107	228	1.00	1.00
Past smoker	11	22	0.94 (0.44, 2.01)	0.89 (0.38, 2.07)
Current smoker	11	43	1.84 (0.91, 3.69)	1.57 (0.72, 3.40)
Alcohol drinking behavior				
No	96	192	1.00	1.00
Yes	33	101	1.53 (0.96, 2.43)	1.57 (0.95, 2.61)
Average study hours per day without taking rest break				
2–4 h	30	78	1.00	1.00
5–6 h	81	155	0.74 (045, 1.21)	1.09 (0.61, 1.95)
>6 h	18	60	1.28 (0.65, 2.52)	1.92 (0.87, 4.25)
Sitting materials comfortable				
No	68	192	1.71 (1.12, 2.59)*	1.29 (0.75, 2.25)
Yes	61	101	1.00	1.00
Design of the sitting chairs				
Have arm rest and back support	61	100	1.00	1.00
Have arm rest but no back support	20	36	1.09 (0.58, 207)	0.92 (0.44, 1.90)
Have back support but no arm rest	36	86	1.46 (0.88, 2.41)	1.32 (0.75,2.32)
Have no arm rest and back support	12	71	3.61 (1.81, 7.19)**	2.27 (1.03, 4.97)*
Sleeping materials comfortable				
No	65	184	1.66 (1.09, 2.53)*	1.14 (0.68, 1.90)
Yes	64	109	1.00	1.00
Average sleeping hours per day				
≤6 h	48	142	1.59 (1.04, 2.42)*	1.28 (0.77, 2.11)
7–9 h	81	151	1.00	1.00
Stress				
No	37	68	1.00	1.00
Yes	92	225	1.33 (0.83, 2.13)	1.13 (0.67, 1.91)

Gender and BMI were adjusted covariates

Note: 1:00 = reference, * = variable p value < 0.05, ** = p value ≤ 0.001

medical students in Pakistan (Haroon et al. 2018), 80% among nursing students in Australia (Smith and Leggat 2004), 77.66% among university students in Bahrain (Tantawy et al. 2017), and 76.2% among dental students in Pakistan (Sardar et al. 2014). The possible explanation for the difference might be the repetitive and physical demands associated with clinical practice/activities in those countries, which might contribute to a higher prevalence of MSDs (Penkala et al.

2018). Moreover, in the latter studies, the study participants might spend more time on computers, engaging in deskwork, which increases the risk of MSDs (SMITH et al. 2005b).

According to this study, the lower back was the most commonly reported site of pain. Similarly, various studies have shown that back pain was the most commonly reported/affected body part among university health science students and health professionals, which might be attributed to high

academic stress, repetitive nature of the activities, and prolonged stiff posture (Haroon et al. 2018; Ekpenyong et al. 2013; Bid et al. 2017; Anderson and Oakman 2016).

The year of the study was found to be a factor which was significantly associated with MSDs; the prevalence rate increased as the year of study increased, with a noticeable increase in the final year of study. This finding is supported by a study conducted among dental hygiene students that showed that the prevalence of MSDs steadily increased over the 3-year period (neck pain from 66% to 68.3%, lower back pain 60.8% to 68.3%, wrist/hand pain 34% to 43.9%) (Hayes et al. 2014). This might be due to long hours of clinical practice, increased use of a computer, engagement in more repetitive and physically demanding activities, and exposure to psychosocial hazards.

This study also showed that an unergonomic chair was a risk factor for the musculoskeletal problem. This finding is supported by other studies done among medical and health science students, which states that prolonged poor sitting/working posture and uncomfortable college furniture were associated with MSDs (Penkala et al. 2018; AlShayhan and Saadeddin 2018; Van Niekerk et al. 2012). This might be explained by the following; sitting on a chair that does not offers back support forces the muscular system to support your structure, which leads to the spine being bent out of its natural shape, which in turn has negative effects on and damage to the muscular system over time. In addition, it may impair the ability of the postural muscles to support the body and also lead to abnormal strain of the neuromuscular system, consequently causing pain (Van Niekerk et al. 2012).

Conclusion

In conclusion, a high prevalence of MSDs among medicine and nursing students was found in this study, with pain in the back being the most common body region affected. High-risk factors associated with the development of MSDs include poorly designed sitting chairs and year of study.

Limitation

An inability to use different diagnostic procedures to strengthen the self-reported symptoms was a limitation of this study. Also, the possibility of recall bias could not be ruled out, since more serious and recent pains or troubles are remembered better than less serious and older ones. But we tried to minimize the effect by using a standardized questionnaire for assessing musculoskeletal pain.

Compliance with ethical standards

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