



Original Article

Frequency of Musculoskeletal Pain Among Biomedical Science Students Working in Laboratory

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Article HistoryReceived: 13th March 2021Accepted: 15th April 2021Published: 30th June 2021**ABSTRACT**

Musculoskeletal pain is defined as an unpleasant sensory and emotional experience that occurs with or without the presence of actual or potential tissue damage in the musculoskeletal system **Objective:** To find out the frequency of musculoskeletal pain and to identify risk factors among biomedical science students working in laboratory **Methods:** This cross-sectional study used Nordic musculoskeletal questionnaire among biomedical science students and was conducted in the University of Central Punjab and The University of Lahore, Pakistan. Study sample comprised of 103 participants. Data was collected by using non-probability convenient sampling technique and was analyzed through SPSS version 21.0 **Results:** Out of 103 students, 36 (35.0%) reported musculoskeletal pain in the last 12 months while 16 (15.5%) within 7 days. The lower back (21.4% and 16.5%), neck (13.6% and 9.7%) and shoulders (10.7% and 6.8%) were the most common sites of problems reported within last 12 months and 7-days period respectively. Moreover, feeling of pain or discomfort in lower back, neck and shoulders prevented 18 subjects (17.4%) from performing daily activities while the 10 (9.8%) students required physical assistance during past last year. There was a statistically significant association between work related musculoskeletal pain (WMSP), gender, laboratory activity and students work position. **Conclusions:** It is concluded that significant number of university biomedical science students experienced musculoskeletal pain during their laboratory training activities which was found to be highly prevalent in upper extremities than lower extremities. Students reported WMSP during the last 12 months respectively which affected their daily activities. Few of them also required medical advice by the health professionals. Students need education and awareness for better seating and safer work postures that may reduce the prevalence of musculoskeletal pain.

INTRODUCTION

The term musculoskeletal pain is defined as an unpleasant sensory and emotional experience that occurs with or without the presence of actual or potential tissue damage in the musculoskeletal system [1]. Work related musculoskeletal pain (WMSP) is at the top of the list of main and common health problem in the world and among clinical laboratory workers at workplaces [2]. This health problem is increasing with each passing day [3]. The father of business medicinal drug, Bernardino Ramazzini first noticed WMSP in people. He observed these problems in few people having persistent and irregular moves in unnatural posture [4]. WMSP are a set of painful problems in muscles mass, nerves and tendons arise from hand and arm actions [5]. However, in the ordinary operations of daily life, there is no specific danger, but the unsafe working condition with strong vibration, posture and movement is linked with WMSP [6]. Almost all work uses involvement of hands and arms, for that reason most of the WMSP affected the fingers, hands, neck, elbows, shoulders and wrists. On the other hand, prolonged standing, sitting posture and continual activities can lead to a WMSP of the lower back pain, hip, thighs, ankles, feet and knees [7]. A laboratory employee is an individual performing the realistic



laboratory hands-on job and function in different dimensions such as in healthcare organizations, business, research, and education [8]. There is a great variety of biomedical science students such as microbiologist, pathologist, and biochemist trainers who suffer with different regions of WMSP such as pain in neck, upper back, lower back, shoulder, elbows, wrist, hand, hips, thighs, knee joint and in ankle joints due to workplace laboratory tasks [9].

Those laboratory specialists who work with biomedical job often use monotonous or static manual workout routines to organize specimen [10]. The Australian students of medical science who have been working in laboratories have an elevated incidence of WMSP between 72% and 80% in Australia and two most frequently recorded sites for WMSP in labs are lower back which is reported as (31 to 43%) and the neck which is reported as (18 to 33%) while the shoulders, upper back, wrist and hands have also been described as the prominent regions of the body which suffer from WMSP and have been reported as (58 to 60%), (25 to 57%) and (28 to 57%). Moreover, Achilles and foot pain are also prevalent [11]. Worldwide, the WMSP are very common lab workers which includes pathologist, microbiologist, biochemist and technicians are at high risk for developing WMSP like lower back and shoulder injuries and even other joints [12] and often demand the use of awkward and static postures as they have been engaged in activities that require high level of concentration, repetitive movements use such as in, excessive reaching, compression or contact stress, forceful or static exertions, pinch grip lifting, and safety cabinets, prolong desk activities, waiting for samples using telephone counters, and the usage of video-display terminals which ultimately cause different regions of WMSP [13].

Their profession demands continual repetitive hand movements, such as pipetting, which is a major source of concern [14]. Additionally, medical research center technology is one of the most quickly growing and creating human services fields in both developed and under developing nations. They are most likely to be influenced through contact pressure comprise of laying wrists on the sharp edge of a work area performing undertakings, squeezing of gadget handles into the palms, obligations that require hand pounding, and sitting without sufficient area for the knees, increased work load in laboratories as well as at homes and also during the duration of their medical practice of long working hours have a great impact on their musculoskeletal system [15]. So the WMSPs are the major cause of severe long-term pain, disability, loss of productivity and reduced quality of life of students which can lead to reduced educational achievement or accomplishment among students [16].

During their nature of duty, WMSP have a negative impact on healthcare practitioners as it contributes significantly to workplace absenteeism as they cause employees to avoid going to work [17]. A Laboratory physical design and layout of some universities are not in such a good condition and may affect students' training performance, their health, security, quality of products and effectiveness of products [13]. Long working hours, work without breaks and bad ergonomic circumstances in the workplace are associated with different musculoskeletal and psychosocial problems among biomedical students in Australia [18]. The aim of this study was to determine the frequency and to identify different risk factors that contribute to the development of WMSP, common sites of WMSP among biomedical science students working in laboratory during the last 12 months and last 7 days respectively and how much their pain was affecting their activities of daily livings and social life. Knowing the prevalence and common sites of WMSP is an important step to aware the biomedical science students with current interventions and teaching proper working posture in order to limit the WMSP in future.

METHODS

This was a cross-sectional, analytical study design conducted in the period between December 2019 to June 2021 in University of Lahore and university of central Punjab, Pakistan. Data was collected after taking ethical approval from institutional Review board of the University of Lahore. The study used a Non-probability convenient sampling technique to determine the frequency of laboratory work related musculoskeletal pain among 103 biomedical science students that were enrolled in study after taking informed written consent. The research included both male and female biomedical science students between the ages of 21 to 25 years. The participants who were having pain due to history of previous surgery or fracture, laboratory technicians and professional

health care workers were excluded from study. Data were collected by using Standardized Nordic Musculoskeletal Questionnaire (SNMQ) and analyzed using SPSS version 21. Mean and standard deviation was calculated for quantitative variables and qualitative variables were presented in the form of frequency and percentages. The chi-squared test (χ^2) was used to compare the association between the musculoskeletal pain and job nature. A probability level of 0.05 or less was used to indicate statistical significance.

RESULTS

Out of 103 biomedical science students, 53 (59.2%) were females while 50 (40.7%) were males. The mean age of study participants was 23(\pm 1.923) and majority 43(41.7%) students of fourth year were participated in the study. Main working position was standing position for the most of the time. 65.0% of biomedical science students indicated they had poor posture, with 76.70% indicated that they did not perform exercise, 44(42.7%) students were involved in pipetting laboratory activity as shown in Table 1.

Characteristics	Frequency N (%)
Age (years), mean (SD)	23(\pm 1.923)
Gender	
Female	53 (51.5)
Male	50 (48.5)
Year of study	
Year 1	11 (10.7)
Year 2	23 (20.3)
Year 3	26 (25.2)
Year 4	43 (41.7)
Weekly laboratory hour, mean (SD)	3.0194(\pm 1.02881)
Percentage time in a laboratory activity	
Fume cupboard	2 (1.9)
Pipetting	44 (42.7)
Desk activities	23 (22.3)
Waiting for sample	34 (33.0)
Perceived posture	
Poor	67 (65.0)
Good	31 (20.0)
Excellent	5 (4.9)
Main work position	
Seated	8 (7.8)
Standing	51 (49.5)
Equal seated/standing	44 (42.7)
Type of seating	
Adjustable chair	18 (17.5)
Stool	85 (82.5)
Hand dominance	
Right	95 (92.2)
Left	8 (7.8)
Perform physical performance	
Yes	24 (23.3)
no	79 (76.7)

Table1: Demographic characteristics of the participants

Body area	Problems within last 12 months N (%)	Problems preventing daily activities N (%)	Problems requiring physician or professional assistance N (%)	Problems within last 7 days N (%)	Problem within both 12 month and 7 days.	No pain reported
Neck	7 (6.8%)	3(2.9%)	9(8.7%)	7(6.6%)	7 (6.8%)	2 (1.9%)
Shoulders	6 (5.8%)	2 (1.9%)	6(5.8%)	3(2.9%)	5 (4.9%)	2 (1.9%)
Upper back	2 (1.9%)	1 (1.0%)	1(1.0%)	1(1.0%)	2 1.9%)	3 (2.9%)
Elbow	1 (1.0%)	1 (1.0%)	1(1.0%)	1 (1.0%)	1 (1.0%)	1 (1.0%)
Wrist/hands	3(2.9%)	1 (1.0%)	2(1.9%)	1(1.0%)	2 (1.9%)	2 (1.9%)
Lower back	10(9.7%)	5 (4.9%)	21(20.5%)	5(4.9%)	12 (1.7%)	3 (2.9%)
Hip/thighs	1(1.0%)	1 (1.0%)	2(1.9%)	1(1.0%)	1 (1.0%)	1 (1.0%)
Knees	4 (3.9%)	1 (1.0%)	1(1.0%)	1(1.0%)	3 (2.9%)	1 (1.0%)
Ankle/feet	2 (1.9%)	1 (1.0%)	5(4.9%)	3(2.9%)	1 (1.0%)	2 (1.9%)

Table 2: Overall frequency of laboratory work-related musculoskeletal pain within the last 12 months and 7 days (Total sample = 103)

Results demonstrated in table 2 showed that out of 103 students, 86 students presented with WMSP, in which 36 participants reported a laboratory WMSP in the last 12 months. In the more immediate time frame of 7 days, 16 participants reported a laboratory WMSP. The WMSP reported by students during both in 12 months and last 7 days were accounted 34/103. Moreover 17 participants did not complain of any pain in any region. The mean number of concurrent sites of problems reported by students in the 12 months and 7-day recall periods were $8.07(\pm 3.072)$ and $9.16(\pm 2.27)$ respectively. The frequency of the WMSP in different body areas are shown in table 2. The most common sites of reported WMSP in the last 12 months were the lower back (21.4%), neck (13.6%), and shoulders (10.7%). The lower back (16.5%), neck (9.7%), and shoulders (6.8%) were the most common sites of pain reported in the last 7 days. While the least common site of pain reported in the upper back (3.9% and 2.9%) and elbow (1.9% and 1.9%) within the last 12 months and 7 days, for many of them (20.3%). WMSP affected students' performance and leading them to seek medical assistance were reported in (11.7%) students since past 12 months. In the past 12 months 7(6.7%) and in the past seven days 5(4.4%) students reported musculoskeletal pain in lower limbs, 9 students had negative impact on their performance and 3 students need physical assistance during last 12 months (Table 2).

Variables	Categories	Musculoskeletal symptoms				p-value
		12 months	7days	mixed	None of them	
Gender	Male	23	7	9	11	.008
	Female	13	9	25	6	
Year of study	Year 1	3	0	0	4	.498
	Year 2	9	4	7	3	
	Year 3	11	6	6	3	
	Year 4	13	6	17	7	
Weekly laboratory hour	2 to 4 hr	4	4	4	0	.269
	4 to 6 hr	4	1	6	6	
	6 to 8 hr	12	6	9	4	
	8 to 10 hr	16	5	15	7	
Percentage time in laboratory activities	Fume cupboard	1	0	1	0	.034
	Pipetting	19	2	14	9	
	Desk activities	8	3	11	1	
	Waiting for samples	8	11	8	7	
Perceived posture	Poor	19	14	22	12	.254
	Good	15	1	10	5	
	Excellent	2	1	2	0	
	Seated	7	0	1	0	.019

Main work position	Standing	16	12	15	8	
	Equal seated/standing	13	4	18	9	
Main type of seating	Adjustable chairs	6	2	9	1	.286
	Stools	30	14	25	16	
Hand dominance	Right	33	16	30	16	.531
	Left	3	0	4	1	
Perform physical exercise	Yes	11	5	3	5	.113
	No	25	11	31	12	

Table 3: Factors associated with MSP during Past 12 month and 7 days among biomedical science students

Table 3 shows the association between the demographic variables and reported WMSP in past 12 months and 7 days. The common risk factors of WMSP in present study were associated with gender ($p=0.008$), and student's work position ($p=0.019$), laboratory activities ($p=0.34$). Reported WMSP in 12 months and 7 days were not associated with year of study($p=.498$), weekly working hour(.269), perceived posture ($p=.254$), type of seating ($p=.286$), hand dominance ($p=.531$), perform physical exercise ($p=.113$).

DISCUSSION

The aim of present study was to find the frequency of musculoskeletal pain among biomedical science students in relation to their individual and work-related physical factors. This study suggests that gender, students work position, laboratory activities are all risk factors for developing musculoskeletal pain. The mean age of the students was $23(\pm 1.923)$. In this study, the frequently involved site during the last 12 months among biomedical science students working in laboratories were lower back 22(21.3%) followed by neck 14(13.6%) and shoulder 11(10.6%) as same as common sites for pain during last 7 days were lower back 17(16.5%) followed by neck 10(9.5%) and shoulders 7(6.5%). Pain reported in the lower back, neck and shoulders prevented daily activities were 18(17.4%) and in the majority of cases with very few participants seeks medical assistance were 10(9.8%). In comparison with the study conducted by Rahimi A *et al.*, in 2010, the past 12 month and past 7 days prevalence rate of WMDP were highest in the neck (33.3% and 35.6%) and back (21.6% 23.1%) followed by arm (9.8% and 7.9%) and then elbow (7.8% and 8.8%). Of all affected cases no one reported that they had sought treatment from other health practitioners [19]. Lower limb musculoskeletal pain was less prevalent as compared to upper limb, and the common site of pain reported by medical science learners were knees, ankles/feet and hip/thigh(6.5%), (2.9%) and (1.0%) in the last 12 months and about (4.9%), (1.9%) and (8.7%) over last 7 days as compared to previous literature conducted by Penkala S *et al* in 2018, hips/thighs, knees, ankles/feet were 3 (2.7%), 4 (3.6%) and 4 (3.6%). Studies from around the world have revealed musculoskeletal pain to be associated with posture. However, in this study no relationship to posture was found. Females was significantly associated with WMSP than males in present study ($p < 0.008$) same as in the previous study conducted by Maulik S in 2015 that female gender was more associated with WMSP. Females with bad posture were revealed to have had WMSP in the current research ($p=0.000$). Similarly, according to the research undertaken by Penkala S *et al* learners who said they had postures were more likely to report WMSP in the past 12 month and last 7 days [11]. The interaction of the long-term standing position and the activity pipetting was also associated with WMSP in present study. which is consistent to the past study conducted by Park J-K *et al.*, in 2013 which shows that, the extensive use of pipettes been suspected to cause upper-limb disorders [20].

CONCLUSIONS

Biomedical science students experienced WMSP during their laboratory training activities since the last 12 months and last 7 days and it was highly prevalent in upper extremities then lower extremities. It has affected their daily activities with few seeking medical assistance during the last 12 months. In addition, there is significant relationship found between WMSP and gender, poor posture and main work position. Students suggesting need for better seating and education about safer work postures to reduce the prevalence of WMSP. Further research is needed to investigate the stages of WMSP experienced by students, and the different preventive strategies

should be done to analyze the effects of exercise on working performance and the ergonomic impact of student's work station.

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