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Prevalence and Factors Associated with Musculoskeletal Pain (MSP) Among Medical Students in Malaysia: A Cross-Sectional Study

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Abstract

Musculoskeletal pain (MSP) is the most frequent type of pain affecting the bones, joints, muscles, tendons and ligaments, and has effects on the general quality of life. It is important for medical schools to identify the possible modifiable MSP risk factors and plan an early supportive and preventive measure for a better quality of life for future doctors. This study aimed to determine the relationship between the prevalence and risk factors of MSP and also its impact on the daily lifestyle among medical students of MMMC. This study was conducted among the clinical phase medical students of MMMC, Muar Campus, Malaysia. A self-administered questionnaire was given to the students which comprised of 4 sections including the Standardized Nordic Questionnaire. The data were then processed and analysed using Microsoft Excel and Epi Info software. Based on this study, the risk factors associated with pain due to MSP during the last 12 months include overweight, studying (>3hrs), sleeping (>8hrs) and family history of MSP, whereas risk factor associated with normal activities prevented due to MSP during the last 12 months was only underweight. Pain due to MSP during the last 12 months had impact on students' physical activities and mood while normal activities prevented due to MSP during the last 12 months affected students' study period, physical activities and mood. This study had shown that various factors were associated with MSP and that MSP has an impact on the students' daily life.

Keywords

Musculoskeletal Pain, Medical Students, Standardized Nordic Questionnaire, Exercises, Study

1. Introduction

Musculoskeletal pain (MSP) is the most frequent type of pain that affect the bones, joints, muscles, tendons and ligaments [1]. MSP can be due to jerking movements, car accidents, falls, fractures, sprains, dislocations, and direct blows to the muscle. Other causes of pain include postural strain, repetitive movements, overuse, and prolonged immobilization. Lower back pain is the most common type of musculoskeletal pain. In case of medical students, they are more likely to be affected by increased workload in wards of hospitals, stress and long study hours during the period of their medical training and this contributes to musculoskeletal pain [2].

Previous studies have reported a high incidence of musculoskeletal pain in medical students. According to Derek Smith's study on the prevalence of musculoskeletal pain among Australian medical students was high, most commonly involving the neck followed by low back and shoulders [3]. A study in Saudi Arabia identified the neck pain was much common among female undergraduate students [4]. The burdensome curriculum of medical colleges, make medical students vulnerable to have sedentary lifestyle and perhaps high risk of low back pain [5]. According to this study, the prevalence, body distributions

and risk factors of MSP among Asian undergraduate nurse and medical students, the result shows that the prevalence of medical student was 67.6% and low back pain was the commonest MSP among the medical students [6]. The prevalence rates of MSP in Korean nurse students showed (73.3%) [7], Japanese nurse students (36.9%) [8] and Chinese medical student (67.6%). A study conducted in Karachi, Pakistan, concluded that medical students has increased prevalence of low back pain associated with factors such as smoking and more usage of computer [9]. Low back pain, neck pain and shoulders pain appeared to be highest among health care professionals [10]. A study at a Malaysian medical college found that 65% of students had musculoskeletal pain within the past year and reported an association with clinical years, computer use and a prior history of trauma [11]. Furthermore, a recent study investigated the prevalence of MSP among Malaysian college students and its relationship to computer use and the study reported high prevalence (90%) among females and (76%) male students, but showed no link of MSP to computer use [12]. Another study in Malaysia showed that medical students with family history of musculoskeletal pain, history of trauma and those who were in the clinical years had more prevalence of musculoskeletal pain [13].

According to most of the studies and research done on MSP the risk factors can be divided into two categories: work-related (ergonomic) risk factors and individual related risk factors. The ergonomic factors include force repetition and posture and the individual factors include poor work practices, poor fitness, and poor health habits [14]. During the period of medical training, students are exposed to stress, study problems, long training hours in hospital wards and clinics [15]; in addition to the increasing use of computers in teaching and learning [16]. These events are considered modifiable musculoskeletal pain (MSP) risk factors that may increase the prevalence of MSP among medical students which may affect the quality of productivity, and absenteeism from university lessons [17] which will affect students' future careers.

The development of MSP affects the general quality of life [18] as well as a sudden drop in productivity in educational as well as professional life of an individual [19]. Therefore, it is important for medical schools to identify the possible modifiable MSP risk factors and plan early supportive and preventive measures for a better quality of life for future doctors. In doing so, we have to explore the magnitude of the problem in our medical school, which is a private funded medical college adopting the student centred learning curriculum. This type of teaching is based on students preparing most of their learning material using the computer. Moreover, students of 3rd year and onwards are involved in hospital training which requires them to be engaged in physical activity. Several studies investigated the prevalence and factors associated with MSP among medical students. However, there are no previous studies have been conducted among medical students in Melaka Manipal Medical College. This study aimed to determine the relationship between the prevalence and risk factors of MSP among medical students in MMMC.

2. Methodology

2.1. Study Design, Setting & Population

This analytical cross-sectional study was carried out among the medical students of Melaka Manipal Medical College [Malaysia campus] to assess the prevalence and factors associated with musculoskeletal pain (MSP). This study was conducted at Melaka Manipal Medical College [Malaysia campus] during the period of June 2018 to July 2018. Students of MMMC comprised of FIS (batch 15, 16), MBBS (Batch 33, 34, 35, 36, 37) and BDS (Batch 5, 6, 7).

2.2. Sample Size

The sample size for this study was obtained from three MBBS batches which were Batch 35, 36 and 37. Hence, the sample size of this study was 268 from the selected batches. The sample size for this research was calculated using the finite population proportion formula as shown below:

$$n = \frac{Np(1-p)z^2_{1-\frac{a}{2}}}{d^2(N-1)+p(1-p)z^2_{1-\frac{a}{2}}}$$

Where,

1 Population size, N = 800
2 Proportion, p = 0.65 [12]
3 Error, d = 0.06
4 Alpha, = 0.05
5 n = Sample size
6 Minimum number = 187

The formula used for adjustment for non-response is as follows below:

$$n_{final} = \frac{n_{calculated}}{1 - nonresponse\%}$$

Calculations:

$$n = \frac{800 \times 0.65(1-0.65)z^2_{1-\frac{0.05}{2}}}{0.06^2(800-1)+0.65(1-0.65)z^2_{1-\frac{0.05}{2}}}$$

$$= 187$$

$$n_{final} = \frac{187}{1-30\%}$$

$$= 267.14 \approx 268$$

2.3. Sampling Method

This cross sectional study was carried out among the medical students using a non-probability sampling method which involved convenience sampling. During this study, the Faculty of Medicine which consists of 5 batches from Batch 33 to Batch 37, were included in this study but due to the

upcoming professional examinations conducted among Batch 33 and Batch 34 in Melaka campus, were unable to take part in this study. The students in Foundation in Science and Faculty of Dentistry were excluded from this study as this study is only applicable to medical students who are exposed to clinical years. Besides, students whom did not provide their informed consent and did not complete their questionnaire were excluded from this study as well. The questionnaires were distributed among the medical students of Batch 35, 36 and 37.

2.4. Data Collection

This study was done with a self-administered questionnaire in English language. The questionnaire was distributed among the students of Batch 35, 36 and 37, along with the participant information sheet and informed consent for the purpose of the study, the assurance of anonymity and the entitlement of the respondents to complete or decline the survey questionnaire. The questionnaire composed of four sections. Section A, included 8 questions on socio-demographic data such as gender, age, ethnicity, nationality, batch, weight, height and body mass index [BMI]. Section B, included 10 questions on the risk factors causing musculoskeletal pain such as exercise, coffee/tea consumption, smoking habits, clinical training hours in the hospital wards and clinics, computer/laptop use, study period, family history of musculoskeletal pain, history of trauma, and condition of the mattress. Section C, included specific questions that concentrated on each anatomical region for the occurrence of musculoskeletal pain focusing on the neck, shoulder, upper back, elbows, wrist or hands, lower back, hips or thighs, knees, ankles or feet during the past 7 days or the past 12 months adapted from the Standardized Nordic Questionnaire along with the a Visual Analog Scale (VAS) for pain. The Standardized Nordic Questionnaire concentrates on anatomical areas in which the musculoskeletal problems are most common. These questions probe more deeply into the analysis of the respective symptoms and contain questions on the duration of the symptoms over past time i.e. entire life, last 12 months and previous 7 days. The main boardening of these questionnaires were that they analyse more thoroughly on the severity on the symptoms in terms of their effect on activities at work or during leisure time, and in terms of total duration of symptoms. The Visual Analog Scale for pain was used to evaluate volunteers' perception of pain intensity experienced during the episode of musculoskeletal pain. The scale has score from 0 to 10, where 0 is no pain and 10 the worst imaginable pain, being classified as mild (1, 2 and 3), moderate (4, 5 and 6) and severe (7, 8, 9 and 10). Section D, included effects of musculoskeletal pain on the students' daily activities such as study hours and exercises and also the effects of MSP on their mood.

2.5. Data Processing & Analysis

The data analysis was performed using the EPI-info app and Microsoft Excel. Descriptive analysis was conducted to obtain the frequency and percentage. Chi-square test was used to interpret the variables. The level of significant of this study was 5% [0.05], therefore, the P-value less than 0.05 was considered significant. The data were then plotted into various charts such as bar charts, scatter plot and pie charts.

2.6. Ethical Consideration

To ensure that the study was conducted as thoroughly and ethically as possible, the students were briefed about the purpose of this study and the informed consent was obtained from the students prior to the study. Besides, the dignity and the wellbeing of the students as well the privacy was protected at all times. Anonymity of the students participating in this study was ensured and the data were kept confidential throughout this study. The students had the right to decline from participating without any specific reason. Lastly, this study was approved by the Institutional Ethics Committee of Melaka Manipal Medical College, Malaysia Campus.

3. Results

Out of the 260 questionnaires distributed, 187 questionnaires were collected and were answered completely, where the response rate was 72%. The study population of 187 participants comprises 40.6% female and 59.4% male, with a mean age of 22 years. The range of the participant's age was between 22 to 25 years old.

Table 1. *Demographic characteristic of respondents. (n=187).*

Variables	Categories	N (%)
Gender	Male	111 (59.4)
	Female	76 (40.6)
Ethnicity	Malay	25 (13.4)
	Chinese	56 (30.0)
	Indian	81 (43.3)
	Others	25 (13.4)
Body Mass Index [BMI]	Underweight	12 (6.4)
	Normal	115 (61.5)
	Overweight	48 (25.7)
	Obese	12 (6.4)

Table 1 shows the frequency and percentage of the demographic characteristics of the respondents. Based on the gender, the male respondents are higher compared to the female respondents, which is 111 (59.4%) male and 76 (40.6) female. Based on the ethnicity, the Indian respondents are higher than the other respondents. In our study, 115 (61.5%) respondents has normal body mass index.

Table 2. *Effect of gender, ethnicity and body mass index of the participants associated with the pain due to musculoskeletal pain [MSP] during the last 12 months.*

Independent Variables	Pain due to MSP during the last 12 months		Odds Ratio (95% CI)	Chi-Square	P-Value
	Yes n (%)	No n (%)			
Gender					
Female	77 (69.4)	34 (30.6)	1.5 (0.8, 2.7)	1.6	0.211
Male	46 (60.5)	30 (39.5)			
Ethnicity					
Indians	53 (65.4)	28 (34.6)	1 (Reference)		
Malay	16 (64.0)	9 (36.0)	0.9 (0.4, 2.4)	0.02	0.896
Chinese	35 (62.5)	21 (37.5)	0.9 (0.4, 1.8)	0.1	0.725
Others	19 (76.0)	6 (24.0)	1.7 (0.6, 4.7)	1.0	0.322
Body Mass Index					
Normal	70 (60.9)	45 (39.1)	1 (Reference)		
Underweight	2 (16.7)	10 (83.3)	0.3 (0.1, 1.5)	2.4	0.125
Overweight	38 (79.2)	10 (20.8)	0.4 (0.2, 0.9)	5.1	0.024
Obese	5 (41.7)	7 (58.3)	2.2 (0.7, 7.3)	1.7	0.198

Table 2 shows the effect of gender, ethnicity and body mass index of the participants associated with the pain due to musculoskeletal pain [MSP] during the last 12 months. Based on the gender, the female students are 1.5 times more likely to be have pain due MSP during the last 12 months, but this association is not significant (P value = 0.211, 95% CI = 0.8, 2.7). Based on ethnicity, the Indian participants are the reference group. The Malay participants are 0.9 times less likely to have pain due to MSP during the last 12 months, but the association is not significant (P value = 0.896, 95% CI = 0.4,2.4). The Chinese participants are 0.9 times less likely to have pain due to MSP during the last 12 months, but the association is not significant (P value=0.725, 95% CI=0.4, 1.8) The Others ethnicity participants are 1.7 times more likely to have pain due to MSP during the last 12 months, but the association is not significant (P value=0.322, 95% CI =0.6, 4.7). Based on the body mass index of the participants, the normal BMI participants are the reference group. The underweight participants are 0.3 times less likely to have pain due to MSP during the last 12 months, but the association is not significant (P value =0.125, 95% CI=0.1, 1.5). The overweight BMI participants are 0.4 times less likely to have pain due to MSP during the last 12 months, but the association is significant (P value=0.024, 95% CI=0.2, 1.0). The obese BMI participants are 2.2 times more likely to have pain due to MSP during the last 12 months, but the association is not significant (P value=0.198, 95% CI=0.7, 7.3).

Table 3. *Effect of gender, ethnicity and body mass index [BMI] of the participants associated with the normal activities prevented due to MSP during the last 12 months.*

Independent Variables	Normal activities prevented due to MSP during the last 12 months		Odds Ratio (95% CI)	Chi-Square	P-Value
	Yes n (%)	No n (%)			
Gender					
Female	17 (15.3)	94 (84.7)	1.1 (0.5, 2.5)	0.1	0.743
Male	13 (17.1)	63 (82.9)			
Ethnicity					
Indian	16 (19.8)	65 (80.3)	1 (Reference)		
Malay	4 (16.0)	21 (84.0)	0.8 (0.2, 2.6)	0.2	0.675
Chinese	8 (14.3)	48 (85.7)	0.7 (0.3, 1.7)	0.7	0.408
Others	2 (8.0)	23 (92.0)	0.4 (0.1, 1.7)	1.9	0.171
BodyMass Index					
Normal	17 (14.8)	98 (85.2)	1 (Reference)		
Underweight	5 (41.7)	7 (58.3)	4.1 (1.2, 14.5)	5.5	0.019
Overweight	8 (16.7)	40 (83.3)	1.2 (0.5, 2.9)	0.1	0.761
Obese	0 (0.0)	12 (100.0)	0.00	2.0	0.152

Table 3 Effect of gender, ethnicity and body mass index [BMI] of the participants associated with the normal activities prevented due to MSP during the last 12 months. Based on the gender, the female and the male students are 1.1 times more likely to prevent their normal activities due to MSP during the last 12 months, but the association is not significant (P value=0.743, 95% CI=0.5, 2.5). Based on ethnicity, the Indian participants are the reference group. The Malay participants are 0.8 times less likely to prevent their normal activities due to MSP, but the association is not significant (P value=0.675, 95% CI=0.2, 2.6). The Chinese participants are 0.7 times less likely to prevent their normal activities due to MSP, but the association is not significant (P value=0.408, 95% CI=0.3, 1.7) The Others Ethnicity participants are 0.4 times less likely to prevent their normal activities due to MSP, but the association is not significant (P value=0.171, 95% CI=0.1, 1.7). Based on the body mass index of the participants, the normal BMI participants are the

reference group. The underweight participants are 4.1 times more likely to prevent their normal activities due to MSP, but the association is significant (P value=0.019, 95% CI=1.2, 14.5). The overweight BMI participants are 1.2 times more likely to prevent their normal activities due to MSP, but the association is not significant (P value=0.761, 95% CI=0.5, 2.9). The obese participants are less likely to prevent their normal activities due to MSP, but the association is not significant (P value=0.152, 95% CI=0)

Table 4. *Association between exercises, coffee/ tea consumption, smoking, clinical practice days and hours, study period, sleeping hours and mattress condition with pain suffered due to MSP during the last 12 months.*

Independent Variables	Pain due to MSP during the last 12 months		Odds Ratio (95%CI)	Chi-Square	P-Value
	Yes n (%)	No n (%)			
Exercises					
Yes	70 (66.0)	36 (34.0)	1.0 (0.6,1.9)	0.001	0.931
No	53 (65.4)	28 (34.6)			
Duration of Exercise					
<30 Minutes	41 (68.3)	19 (31.7)	1.4 (0.6,3.1)	0.7	0.392
>30 Minutes	29 (60.4)	19 (39.6)			
Coffee					
Yes	49 (62.0)	30 (38.0)	0.8 (0.4,1.4)	0.9	0.355
No	74 (68.5)	34 (31.5)			
Tea					
Yes	47 (70.1)	20 (29.9)	1.4 (0.7,2.6)	0.9	0.346
No	76 (63.3)	44 (36.7)			
Smoking					
Yes	4 (66.7)	2 (33.3)	1.04 (0.2,5.8)	0.002	0.963
No	119 (65.8)	62 (34.3)			
Clinical practice days					
<5 days	94 (68.1)	44 (31.9)	1.5 (0.8,2.9)	1.3	0.258
≥5 days	29 (59.2)	20 (40.8)			
Clinical practice hours					
≤4 hours	81 (65.3)	43 (34.7)	0.9 (0.5,1.7)	0.2	0.689
>4 hours	43 (68.3)	20 (31.8)			
Computer Use					
< 3 hours	88 (67.2)	43 (32.8)	1.2 (0.6,2.4)	0.4	0.537
≥ 3 hours	35 (62.5)	21 (37.5)			
Study period					
< 3 hours	83 (61.5)	52 (38.5)	0.5 (0.2,0.9)	4.0	0.046
≥ 3 hours	40 (76.9)	12 (23.1)			
Sleeping Hours					
< 8 hours	102 (68.5)	47 (31.5)	2.6 (1.4,5.1)	8.8	0.002
≥ 8 hours	23 (45.1)	28 (54.9)			
Mattress condition					
Comfortable	100 (65.3)	4 (6.3)	0.9 (0.4,1.0)	0.06	0.799
Uncomfortable	23 (67.65)	23 (67.6)			

Based on table 4, the participants who exercise have equal risk of having pain due to MSP during the last 12 months with those who do not exercise, but the association is not significant (P value = 0.931, 95% CI = 0.6,1.9). The duration of exercise of less than 30 minutes are 1.4 times more likely to be affected by the MSP during the last 12 months, but the association is not significant (P value = 0.392, 95% CI = 0.6, 3.1). Students consuming coffee is 0.8 times less likely to have pain due to MSP, but this association is not significant as P value (0.355) and 95% CI (0.4, 1.4) are not significant. Whereas students consuming tea is 1.4 times more likely to have pain due to MSP, but this association is not significant as P value (0.346) and 95% CI (0.7, 2.6) are not significant. Students who smoke have equal chances of developing pain with those who do not smoke but this is not a significant association as P value (0. 963) and 95% CI (0.2, 5.8). Furthermore, students who spend less than 5 clinical days are 1.5 times more likely to have MSP but this is not a significant association as P value (0.258) and 95% CI (0.8, 2. 9). Students who spend less than or equivalent to 4 clinical hours are 0.9 times less likely to have pain due to MSP but this association is not significant as P value (0.689) and 95% CI (0.5, 1.7) are not significant. Students who spend less than 3 hours on computer is 1.2 times more likely to have pain due to MSP but this association is not significant as P value (0.537) and 95% CI (0.6,2.4). On the other hand, students who spend less than 3 hours on study is 0.5 times less likely to suffer from pain due to MSP and it is a significant association as the P value (0.046) and 95% CI (0.2,1.0). Pain due to MSP is 2.6 times more likely to be suffered by the students who sleep for less than 8 hours on an average and this is a significant association as P value (0.002) and 95% CI (1.4, 5.1) are both significant. Lastly, students who sleep on comfortable mattress is 0.9 times less likely to have pain due to MSP but this association is not significant where P value (0.799) and 95% CI (0.4,1.0).

Table 5. *Association between exercises, coffee/ tea consumption, smoking, clinical practice days and hours, study period, sleeping hours and mattress condition with normal activities which are prevented due to MSP during the last 12 months.*

Independent Variables	Normal activities prevented due to MSP during the last 12 months		Odds Ratio (95%CI)	Chi-Square	P-Value
	Yes n (%)	No n (%)			
Exercises					
Yes	70 (66.0)	36 (34.0)	1.0 (0.6, 1.9)	0.001	0.931
No	53 (65.4)	28 (34.6)			
Duration of exercise					
<30 Minutes	0 (0.0)	12 (100.0)	0.0	3.0	0.083
>30 Minutes	10 (20.8)	38 (79.2)			
Coffee					
Yes	12 (15.2)	67 (84.6)	0.9 (0.4, 2.0)	0.074	0.786
No	18 (16.7)	90 (83.3)			
Tea					
Yes	9 (13.4)	58 (86.6)	0.7 (0.3, 1.7)	0.5	0.467
No	21 (17.5)	99 (82.5)			
Smoking					
Yes	0 (0)	6 (100)	0.0	1.2	0.276
No	30 (16.6)	151 (83.4)			
Clinical practice days					
<5 days	22 (15.9)	116 (84.1)	1.0 (0.4, 2.4)	0.004	0.950
≥5 days	8 (16.3)	41 (83.7)			
Clinical practice hours					
≤4 hours	23 (18.6)	101 (81.5)	1.8 (0.7,4.5)	1.7	0.190
>4 hours	7 (11.1)	56 (88.9)			
Computer use					
< 3 hours	23 (17.6)	108 (82.4)	1.5 (0.6, 3.7)	0.7	0.388
≥ 3 hours	7 (12.5)	49 (87.5)			
Study period					
< 3 hours	21 (15.6)	114 (84.4)	0.9 (0.4, 2.1)	0.1	0.770
≥ 3 hours	9 (17.3)	43 (82.7)			
Sleeping hours					
< 8 hours	23 (15.4)	126 (84.6)	0.6 (0.3, 1.5)	1.0	0.323
≥ 8 hours	9 (22.0)	32 (78.0)			
Mattress condition					
Comfortable	22 (14.4)	131 (85.6)	0.6 (0.2, 1.3)	1.73	0.189
Uncomfortable	8 (23.5)	26 (76.5)			

Based on Table 5, the participants who exercise have equal risk of having normal activities prevented due to MSP during the last 12 months with those who do not exercise, but the association is not significant (P value = 0.931, 95% CI = 0.6, 1.9) Those whose duration of exercise is less than 30 minutes are less likely to have their normal activities prevented, but the association is not significant (P value = 0.083, 95% CI = 0). Students consuming coffee is 0.9 times less likely to have normal activities prevented due to MSP, but this association is not significant as P value (0.786) and 95% CI (0.4, 2.0) are not significant. Whereas students consuming tea is 0.7 times less likely to have normal activities prevented, but this association is not significant as P value (0.467) and 95% CI (0.3, 1.7) are not significant. Students who smoke are less likely to have normal activities prevented due to MSP but this is not a significant association as P value (0. 276). Furthermore, students who spend less than 5 clinical days have equal chances of having normal activities prevented as those who spend more than 5 clinical days but this is not a significant association as P value (0. 950) and 95% CI (0.4, 2. 4). Students who spend less than or equivalent to 4 clinical hours are 1.8 times more likely to have normal activities prevented due to MSP but this association is not significant as P value (0.190) and 95% CI (0.7, 4.5) are both not significant. Students who spend less than 3 hours on the computer is 1.5 times more likely to have their normal activities prevented by MSP but this association is not significant where P value (0.388) and 95% CI (0.6,3.7). Students who spend less than 3 hours on studies is 0.9 times less likely to have normal activities prevented by MSP but this is not a significant association as P value (0.770) and 95% CI (0.4,2.1). Students who sleep for less than 8 hours is 0.6 time less likely to have normal activities prevented by MSP but this is not a significant association as P value (0.323) and 95% CI (0.3, 1.5). Lastly, students who claimed to have comfortable mattress is 0.6 times less likely to have normal activities prevented by MSP but this association is not significant as P value (0.189) and 95% CI (0.2, 1.3).

Table 6. *Association between family history of musculoskeletal pain (MSP) and history of trauma to the pain suffered due to MSP during the last 12 months.*

Independent Variables	Pain suffered due to MSP during the last 12 months.		Odds Ratio (95% CI)	Chi-Square	P-Value
	Yes n (%)	No n (%)			
Family history of MSP					
Yes	50 (79.4)	13 (20.6)	2.7 (1.3, 5.5)	7.8	0.005
No	73 (58.9)	51 (41.1)			
History of trauma					
Yes	26 (76.5)	8 (23.5)	1.9 (0.8, 4.4)	2.1	0.146
No	97 (63.4)	56 (36.6)			

Based on table 6, Student who had family history of MSP suffering from pain due to MSP is 2.7 times more likely to have pain during the last 12 months, and this association is significant due to P value (0.005) and 95% CI (1.3, 5.5). Students who had have history of trauma is 1.9 times more likely to have pain during the last 12 months, but this association is not significant because of the P value (0.146) and 95% CI (0.80, 4.43).

Table 7. *Association between family history of musculoskeletal pain (MSP) and history of trauma with normal activities prevented due to MSP during the last 12 months.*

Independent Variables	Normal activity prevented due to MSP during the last 12 months		Odds Ratio (95% CI)	Chi-Square	P-Value
	Yes n (%)	No n (%)			
Family history of MSP					
Yes	11 (17.5)	52 (82.5)	1.2 (0.5, 2.6)	0.1	0.706
No	19 (15.3)	105 (84.7)			
History of trauma					
Yes	5 (14.7)	29 (85.3)	0.9 (0.3, 2.5)	2.1	0.146
No	25 (16.3)	28 (83.7)			

Based on table 7, student who had family history of MSP is 1.2 times more likely to have their normal activity prevented due to MSP during the last 12 months, and this association is not significant due to the P value (0.706) 95% CI (0.5, 2.6). Furthermore, students with history of trauma is 0.9 less likely to have their normal activity prevented due to MSP during the last 12 months and this association is not significant due to the P value (0.146) 95% CI (0.3, 2.5)

Table 8. *Frequency of body parts affected due to trauma (History of trauma).*

Area affected during trauma	Frequency of being affected due to musculoskeletal pain during the past 12 months n (%)
Neck	1 (0.5)
Shoulder	3 (1.6)
Elbow	5 (2.7)
Wrist	6 (3.2)
Back	7 (3.7)
Hip	2 (1.1)
Thigh	1 (0.5)
Knee	12 (6.4)
Ankle	11 (5.9)
Others	20 (10.7)

Based on Table 8, the most frequent body part to encounter trauma was the other parts of the body (10.7%) such as head, palms and soles and this followed by knee (6.4%). The body parts which were affected the least were neck (0.5%) and thigh (0.5%).

Table 9. *Interpretation of Standardized Nordic Questionnaire.*

Body Parts	Have you at any time during the last 12 month had trouble (such as ache, pain, discomfort, numbness) in: n (%)	During the last 12 month have you been prevented from carrying out normal activities (e.g. job, housework, hobbies) because of this trouble in: n (%)	During the last 12 month have you seen a physician for this condition: n (%)	During the last 7 days have you had trouble in: n (%)
Neck	91 (48.66%)	10 (5.35%)	13 (6.95%)	29 (15.51%)
Shoulders	68 (36.36%)	5 (2.67%)	5 (2.67%)	25 (13.37%)
Upper Back	44 (23.53%)	3 (1.60%)	3 (1.60%)	16 (8.56%)
Elbows	13 (6.95%)	4 (2.14%)	1 (0.53%)	4 (2.14%)
Wrists/ Hands	33 (17.65%)	6 (3.21%)	6 (3.21%)	12 (6.42%)
Lower Back	83 (44.39%)	12 (6.42%)	6 (3.21%)	39 (20.86%)
Hips/ Thighs	26 (13.90%)	3 (1.60%)	2 (1.07%)	10 (5.35%)
Knees	40 (21.39%)	10 (5.35%)	5 (2.67%)	13 (6.95%)
Ankles/ Feet	46 (24.60%)	11 (5.88%)	6 (3.21%)	22 (11.76%)

Based on the table 9, the most frequent body part affected during the last 12 month had trouble (such as ache, pain, discomfort, numbness) is neck (48.66%) and the least is elbows (6.95%). The body part affected during the last 12 month and has prevented from carrying out normal activities (e.g. job, housework, hobbies) because of this trouble is lower back (6.42) and the least is upper back (1.60%) and hips/thigh (1.60%). Furthermore, neck (6.95%) being the most affected body part had made the students to seek a physician for this condition during the last 12 months. The table also showed lower back (20.86%) is the most affected part during the last 7 days.

This Pain Assessment Scale is used to determine the degree of pain suffered by the students during episodes of musculoskeletal pain. Score O is considered as no pain, score 1 to 3 are considered as minor pain, score 4 to 6 are considered as moderate pain whereas score 7 to 10 are considered as severe pain. Based on table 10, 50% of the students who had MSP suffered from minor pain during episodes of MSP, 31% of the students suffered from moderate pain, 5% of the students felt severe pain whereas 14% of the students did not have musculoskeletal pain.

Table 10. *Pain Assessment Scale.*

Severity of pain felt during MSP	n (%)
No pain	26 (14)
Mild pain	94 (50)
Moderate pain	57 (31)
Severe pain	10 (5)

Table 11. *Association between pain and normal activities prevented as a result of MSP during the last 12 months with their effects on the study period.*

Independent Variables	Study period affected		Odds Ratio (95% CI)	Chi-Square	P-Value
	Yes n (%)	No n (%)			
Pain due to MSP during the last 12 months					
Yes	32 (26.0)	91 (74.0)	1.9 (0.9, 4.2)	2.6	0.106
No	10 (15.6)	54 (84.4)			
Normal activities prevented due to MSP during the last 12 months					
Yes	18 (60.0)	12 (40.0)	8.3 (3.6, 19)	28.9	<0.001
No	24 (15.3)	133 (84.7)			

Based on table 11, students who suffered from pain due to MSP during the last 12 months were 1.9 times more likely to have their study period affected but this association is not significant as P value (0.106) and 95% CI (0.9,4.2). Students who had their normal activities prevented due to MSP were 8.3 times more likely to have their study period affected and this association is significant.

Table 12. *Association between pain and normal activities prevented as a result of MSP during the last 12 months with their effects on the academic performances.*

Independent Variables	Academic performances affected		Odds Ratio (95% CI)	Chi-Square	P-Value
	Yes n (%)	No n (%)			
Pain due to MSP during the last 12 months					
Yes	8 (6.5)	115 (93.5)	1.0 (0.3, 3.6)	0.005	0.946
No	4 (6.3)	60 (93.8)			
Normal activities prevented due to MSP during the last 12 months					
Yes	2 (6.7)	28 (93.3)	1.1 (0.2, 5.1)	0.003	0.951
No	10 (6.4)	147 (93.6)			

Based on table 12, students who had pain due to MSP during the last 12 months showed no association with academic performances being affected as P value and this association is not significant as P value (0.946) and 95% CI (0.3, 3.6). Students who had normal activities prevented due to MSP during the last 12 months were 1.1 times more likely to have their academic performances affected but this association is not significant as P value (0.951) and 95% CI (0.2, 5.1).

Table 13. *Association between pain and normal activities prevented as a result of MSP during the last 12 months with their effects on exercises and sports activities.*

Independent Variables	Exercises and sports activities affected		Odds Ratio (95% CI)	Chi-Square	P-Value
	Yes n (%)	No n (%)			
Pain due to MSP during the last 12 months					
Yes	43 (35.0)	80 (65.0)	5.2 (2.1, 13)	10.5	<0.001
No	6 (9.4)	58 (90.6)			
Normal activities prevented due to MSP during the last 12 months					
Yes	20 (66.7)	10 (33.3)	8.8 (3.7, 20)	30.3	<0.001
No	29 (18.5)	128 (81.5)			

Based on table 13, students who had pain due to MSP during the last 12 months were 5.2 times more likely to have their exercises and sports activities affected, and this association is significant as P value (<0.001) and 95% CI (2.1, 13.0). Students who had their normal activities prevented due to MSP during the past 12 months were 8.8 times more likely to have their

exercises and sports activities affected and this association is significant as P value (<0.001) and 95% CI (3.7, 20.9).

Table 14. *Association between pain and normal activities prevented as a result of MSP during the last 12 months with their effects on mood.*

Independent Variables	Mood affected		Odds Ratio (95% CI)	Chi-Square	P-Value
	Yes n (%)	No n (%)			
Pain due to MSP during the last 12 months					
Yes	73 (59.4)	50 (40.7)	5.2 (2.1, 13.0)	10.5	<0.001
No	22 (34.4)	42 (65.6)			
Normal activities prevented due to MSP during the last 12 months					
Yes	22 (73.3)	8 (26.7)	3.2 (1.3, 7.5)	7.3	0.007
No	73 (46.5)	84 (53.5)			

Based on table 14, students who had pain due to MSP during the last 12 months were 5.2 times more likely to have their mood affected and this association is significant as P value (<0.001) and 95% CI (2.1,13.0). Students who had their normal activities prevented due to MSP during the last 12 months were 3.2 times more likely to have their mood affected and this association is significant as P value (0.007) and 95% CI (1.3,7.5).

Table 15. *Frequencies of mood affected as a result of pain suffered from MSP and normal activities being prevented as a result of MSP during the last 12 months.*

Mood	Frequency of mood being affected due to musculoskeletal pain during the past 12 months n (%)
Angry	9 (4.8%)
Afraid	5 (2.7%)
Annoyed	70 (37.4%)
Depressed	8 (4.28%)
Worried	20 (10.7%)
Others	9 (4.8%)

Table 15 shows the frequencies of mood of the participants affected by musculoskeletal pain during the last 12 months. The table shows that most of the participants felt annoyed (37.4%) when they were suffering from musculoskeletal pain, followed by feeling worried (10.7%). The frequency of feeling angry and 'others' are the same, which is 4.8%. Least number of students felt afraid (2.7%) during episodes of musculoskeletal pain.

4. Discussion

Different studies had showed the increased prevalence of musculoskeletal pain among medical students and had reported the prevalence rate above 40% [20]. Based on this study conducted, various results regarding the association of various factors related to the musculoskeletal pain [MSP] during the last 12 months and the normal activities prevented due to MSP among the medical students of Melaka Manipal Medical College, Muar Campus.

Basic investigations mainly with Chi-Square test showed that most of the demographic factors did not differ significantly between those students reporting MSP and those who did not. As a whole overview, in percentages, the proportion of students who had musculoskeletal pain during the last 12 months and prevent their normal activities due to MSP were higher among the female population compared to the male population.

Besides, the statistics showed that medical students who consumed coffee had a lower prevalence of pain as compared to those who consumed tea. However, as showed in this study, consumption of coffee and tea did contribute to MSP but it was not significantly associated with pain. A study by McPartland and Mitchell stated that even though caffeinated drinks helps in combating fatigue and drowsiness and alleviating pain, it reported high consumption of caffeine was associated with low back pain and discussed the importance of reducing coffee intake among those with chronic low back pain. [21] A previous study on MSP in a Malaysian medical school stated that clinical practice was shown to be associated with MSP among students who suggested the complicity of clinical training in hospitals whereby the study has shown that students in clinical years were twice as likely to have MSP. [22] In this study, it was shown that duration of clinical practices partly contributed to the pain but it was not significantly associated with pain. This was probably due to students in clinical years spend more time in standing position during bedside teaching, clerking or observing procedures which may had contributed to pain along with other risk factors and also probably due to students were recruited to various postings, therefore our research was limited in terms of measuring specific risk factors sought in each posting.

Based on this study, duration of sleep for less than 8 hours contributed to the MSP among medical students. The results suggested that hours of reported sleep on the previous night was a highly significant predictor of the current day's pain frequency obtaining either less than 6 or more than 9 hours of sleep was associated with greater next-day pain. In addition, pain prospectively predicted sleep duration, though the magnitude of the association in this direction was somewhat less strong. Collectively, these findings indicate that night-to-night changes in sleep affect pain report, illuminating the importance of considering sleep when assessing and treating pain [23]. In another significant factor was the studying

period which causes musculoskeletal pain during the last 12 months.

In this study, the most common site of MSP reported was neck followed by lower back and shoulder. According to a study in Australia, the most frequent site of MSP in medical undergraduates was neck. A study of Thailand also concluded that the neck pain was much common among undergraduate students and there were many risk factors causing persistent neck pain. A Nigerian study showed a significant number of students had episodes of neck pain after admission into the university than before [24]. Recent survey showed static postures such as during prolonged computer work, reading and writing increased the risk of neck pain among undergraduates. [25] However, statistical analysis of this study showed that mattress condition and past history of trauma partly contributed to the pain but it was not significantly associated whereas family history of MSP was significantly associated with pain. This study shows that most of the students have found their mattress to be uncomfortable and this had prevented a small percentage of student's normal activity. This scenario had also lead to development of body ache in some students. Besides, most of the students experienced minor pain based on the pain assessment scale.

Numerous studies showed that multiple domains of psychosocial functioning were affected by MSP experiences such as social relationships, self-esteem, mood, social roles, family duties, life satisfaction, and independence in satisfying one's own needs [26]. In this study among medical students, MSP mostly affects their exercises and sports activities, and also mood. The study conducted at four universities in Poland indicated that MSP interferes with or limits daily activities of the students, such as sitting, standing, or physical activity [27]. According to a study on the impact of MSP on the quality of life, the physical domain, which includes sports and restriction to physical activities, was mainly affected by MSP [28]. A study on low back pain and everyday functioning of students found that most of the students who had low back pain suffered from limitations in their physical activities and few of them gave up on physical activities. [29] This study showed that physical activities (exercises and sports activities) and mood were highly affected due to pain and normal activities prevented as a result of MSP during the last 12 months. The study period of the students was affected as a result of normal activities being prevented by MSP but not because of pain suffered due to MSP, and the occurrence is much lesser than the occurrence of physical activities and mood being affected. Most of the studies concluded that physical activities were more likely to be affected by MSP, however, our study concluded that mood was more likely to be affected as compared to physical activities. This may be due to lack of exercises of the participants in our study as only 108 out of 187 participants carried out exercises. A study on Low Back Pain among Medical Students in Belgrade (Serbia) concluded that most of the students felt annoyed during episodes of musculoskeletal pain [30], which was the same as the result of our study. According to a study on the effects of positive and negative mood on university students' learning and academic performance, the study concluded that students who had bad mood tend to be lazy to do various activities, especially activities associated with academic matters, and thus the learning process was disrupted [31]. Therefore, students should take measures to prevent the occurrence of MSP which may have impact on their studies and their daily lifestyle.

Being in clinical years, history of trauma, positive family history, being overweight and long computing period was associated with higher prevalence of symptoms whereas normal BMI and adjusted hours of computing appeared to be protective [32]. Jones set out to identify factors relating to persons who do not report of musculoskeletal pain in the general adult population and found that good sleep quality, normal illness behaviour, low psychological distress, and an absence of recent adverse life events characterized those without reported pain [33]. These findings indicate that there were a variety of risk factors in this condition, as suggested by others. [34]

Limitations of the study

The results from this study were limited by the low response rate which, was probably due to lack of time as this research has to be completed within 6 weeks and the population of this study was limited to undergraduate students of batch 36 and 37 only as the other batches were having final examinations. In this cross sectional study, we could not obtain the follow up data and find the causes and risk factors of the musculoskeletal pain. Recall bias could not be excluded because it was a self-reported questionnaire. Nevertheless, the results were alarming, and careful attention should be given by medical schools to increase students' awareness of MSP, weight reduction and ensure some modifications among the students to lead a better life. Moreover, medical school should evaluate the physical health of the students who were doing hazardous physical activity during clinical attachment, particularly the students with history of physical trauma or positive family history of musculoskeletal disorders

5. Conclusion

In a nutshell, this study can conclude that there is a significant association between the body mass index (BMI), study hours, sleeping hours and family history with musculoskeletal pain (MSP) during the last 12 months, which supports our hypothesis. Moreover, based on this study, the underweight students tend to have their normal activities prevented due to MSP during the last 12 months. Despite the minor limitations of this study, the fact that pain due to MSP has effects on exercise and sports activities, and mood whereas normal activities prevented due to MSP has effects on the study period, exercise and sports activities, and mood. However, further studies should be done to assess other domains and also for a more accurate results.

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