ORIGINAL ARTICLE

Impact of Coronavirus Disease 2019 Lockdown on Back Pain Intensity, Prevalence and Associated Risk Factor Among Adults in Malaysia

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ABSTRACT

Introduction: Low back pain (LBP) is a common musculoskeletal disorder (MSD) that leads to a variety of negative consequences. The prevalence of LBP was found to be high worldwide. Individuals have been forced to remote studying or working conditions during the coronavirus disease 2019 (COVID-19) pandemic, exposing them to the risk factors of LBP to a greater extent. This is a cross-sectional study conducted among 623 adults and aimed to assess LBP intensity and prevalence among adults in Malaysia before and during the COVID-19 lockdown and to identify the association between demographic, physical and psychological factors with LBP. **Methods:** A self-administered questionnaire composed of 36 questions regarding demographic characteristics, physical activities and psychological aspects was distributed to the public. Pearson's Chi-square and Fisher Exact tests were performed using collected data to assess the association between LBP intensity and various risk factors. **Results:** The prevalence of LBP increased from 64.4% before the lockdown to 83.5% during the lockdown. LBP intensity significantly increased during the lockdown. Before lockdown, factors associated with LBP intensity included gender and stress level. While during the lockdown, age, gender, occupation, time spent on computer use, ergonomics as well as stress level affected the intensity of LBP. **Conclusion:** The present study showed that the COVID-19 lockdown has contributed to the increase in both the prevalence and intensity of LBP among Malaysians. The identified risk factors include age, gender, occupation, duration of sitting and computer use, adherence to ergonomic recommendations, and stress level.
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INTRODUCTION

Low back pain (LBP) is one of the most common musculoskeletal disorders (MSDs) in the world. According to a systematic analysis of the Global Burden of Disease (GBD) study 2017, LBP is ranked among the top ten most frequent health issues globally (1). Approximately 51 - 90% of people worldwide were affected by LBP at some point in their life (2). Back pain can lead to absenteeism from work or school, limit activity and efficiency, reduce productivity, and increase both medical and economic burdens (3).

Recently, several studies reported the prevalence of back pain worldwide. In Denmark, a prevalence of 71% LBP was reported among working individuals (2). A study involving 1179 district hospital nurses in Vietnam reported a prevalence of 44.4% and 32.7% for LBP and upper back pain respectively (4). The one-year prevalence of LBP was reported to be 45.6% among Chinese schoolteachers in the study by Yue P et al. (2012) (5). In Malaysia, back pain affects 12% of the population (6). As for LBP, the prevalence was found to be approximately 40.1% among health science undergraduates (7), 76.5% among nurses from public hospitals of Penang (8), 46.1% among medical students from Malaysia Medical College (9), and 37% among office workers from University Putra Malaysia (UPM) (10).

Low back pain is a multifactorial disorder affected by sociodemographic, occupation-related, physical, psychological and lifestyle factors (2,8). Studies reveal conflicting evidence regarding the role of sociodemographic factors including age, gender, body mass index (BMI) and marital status (7,11-13). Besides, physical factors such as frequency of physical activities

(2,4,5), duration of sitting (14) and duration of computer use (9) were also found to be significantly associated with LBP. Adherence to ergonomic recommendations (15), use of ergonomic chairs (10) and smoking (16) are lifestyle factors that were found to be associated with LBP as well. In addition to lifestyle factors, psychological factors including depression have also been suggested as a potential risk factor for LBP and associated with the reduction of life quality (16).

Control measures to manage the ongoing coronavirus disease 2019 (COVID-19) pandemic have included among others curfew enforcement, isolation, quarantine, and personal protection, which have made significant lifestyle changes. These measures may negatively affect an individual's physical activity and mental health (15,17,18). In Malaysia, the Malaysian government imposed the movement control order (MCO), which mandated that residents work or attend school from home. The duration of sitting was lengthened, and the public's physical activities were likewise limited at this time. In addition, people who spend a lot of time at home could be in unnatural and improper positions. Emotional stress levels could rise, and nutritional preferences could change (15,18). These elements are the major causes of LBP.

Considering that some of these modifiable factors could lead to a higher prevalence of LBP in future, it is important to identify risk factors associated with LBP and implement early preventive measures to achieve a better life quality. To our knowledge, Malaysia's data reporting back pain is relatively recent and scant while available research focuses on specific occupational groups rather than the general population. In Malaysia, there are insufficient studies that emphasise the importance and management of LBP risk factors, particularly during similar periods of lockdown where movement is restricted. As a result, this study was designed to target these outcomes and raise awareness of factors related to back pain. The present study aimed to: (a) assess LBP intensity and prevalence among adults in Malaysia before and during the COVID-19 lockdown; (b) identify the association between demographic, physical and psychological factors with LBP.

MATERIALS AND METHODS

Study Design

A cross-sectional study was conducted among adults in Malaysia between August and September 2021.

Subjects

The present study can be divided into two parts, which are prevalence and association. The sample size required for the prevalence part in this research was calculated using online sample size calculator Raosoft (19) based on the formula below:

$n = Z^2p \times qN / e^2 (N - 1) + Z^2p \times q$

where n = sample size, Z = confidence level, p = probability of success, q = probability of failure, N = population size, e = sampling error. The confidence interval was set as 95%, the margin of error was 5%, while the probability of success was 0.5. The population of adults in Malaysia was estimated as 22 million. Hence, the calculated sample size was 385.

As for the association study in this research, the sample size was calculated using online sample size calculator from Select Statistical Services (20) based on the formula below:

$n = (Z_\alpha + Z_\beta)^2 \times (p_1 (1 - p_1) + p_2 (1 - p_2)) / (p_1 - p_2)^2$

where n = sample size, Z_α = critical value of normal distribution at threshold probability of rejecting null hypothesis, Z_β = critical value of normal distribution at probability of failing to reject null hypothesis, p_1 = expected sample proportion complies with null hypothesis, p_2 = expected sample proportion complies with alternative hypothesis. The confidence level was set as 95% while the power was set as 80%. Based on the pilot study, p_1 and p_2 were set as 60% and 40% respectively. Hence, the calculated sample size was 95. With two of the sample sizes calculated, the highest sample size of 385 was used in this study.

The present study was based on a questionnaire-based design, with a calculated sample size of 385. However, upon distributing the survey, a total of 631 responses were obtained. Consequently, all responses were included in the analysis, as the larger sample size can offer benefits in terms of precision and accuracy of the results, statistical power, generalizability, and cost efficiency (21). All ethical considerations were met, including the ethical treatment of participants and the protection of their privacy and confidentiality. By adhering to these considerations, the results obtained from the larger sample size are valid and reliable and can provide important insights for future research and practice.

Out of the 631 responses recruited, 623 responses (185 males and 438 females) which met the inclusion criteria were included in the analysis. The inclusion criteria included (a) age between 18 and 60 years; (b) resident in Malaysia; (c) stayed in Malaysia before and during the COVID-19 lockdown imposed by Malaysian government. Participants who were pregnant, had chronic diseases, or had a history of back injuries and spinal problems (spondylolisthesis, spondylosis, spondylolysis, scoliosis, spinal stenosis, prolapsed intervertebral disc, etc.) were excluded. Participants received an information sheet on the study's objectives, benefits, the possible risk associated, assurance of anonymity and a right to withdraw from the study. Those giving consent were recruited.

Questionnaire

A self-administered structured questionnaire was

adapted from Šagát P et al. (2020), with addition of a few questions and minor modification (15). It was piloted on 32 participants before being administered in the present study. As no changes were necessary, the responses from these 32 participants were included in the main study.

The questionnaire was composed of 36 questions organized into four parts: (a) basic sociodemographic information, (b) risk factors and lifestyle before the COVID-19 lockdown, (c) risk factors and lifestyle during the COVID-19 lockdown, and (d) pain-related aspects (see supplementary material). Majority of the questionnaire responses were structured in multiple choice questions form, while a few utilised a Likert type scale. The questionnaire was presented in Google and Microsoft form.

Data Collection

Convenience sampling was used to choose the participants. The web link to the questionnaire was distributed on 12th August 2021 through social media platform (Instagram, Facebook, WhatsApp) and on personal accounts and via university email. The collection of responses ended on 19th August 2021.

Statistical Analysis

Data entry and statistical analysis were performed utilizing IBM SPSS software version 28.0 for Windows (IBM, Armonk, NY, USA). The independent variables include sociodemographic, work-related, lifestyle and psychological factors. LBP intensity was the dependent variable in this study. Normality of the data was determined using Kolmogorov-Smirnov test. Non-parametric test was chosen as the data was not normally distributed. Pearson's Chi-square test was performed to assess the association between investigated risk factors and LBP intensity. For data with more than 20% of the cells having expected count lesser than 5, Fisher Exact Test was applied. The level of significance was set at 0.05.

Ethical Approval

This study was approved by International Medical University Joint Research and Ethics Committee (IMU-JC) (No. 4.8/JCM-223/2021). Informed consent was obtained from participants and confidentiality was kept.

RESULTS

Of the 631 respondents, 623 (98.4%) submitted completed questionnaires. The mean age (standard deviation) recorded was 25.74 (9.56) years. Most subjects (81.1%) were aged 18-30 years old, and female represented (70.3%) of the sample. The sociodemographic characteristics of the participants are presented in Table I.

Majority of the participants were students before (73.5%) and during (68.2%) lockdown. The number of participants who were working or studying from home had increased significantly from 183 (29.4%) before the lockdown to 536 (86.0%) during the lockdown. Work-related, physical activity, lifestyle and psychological characteristics of participants are shown in Table II.

Table I: Sociodemographic characteristics of the participants

Variables	n (%)	Mean (SD)
Age groups (years)		25.74 (9.56)
18-30	505 (81.1)	
31-60	118 (18.9)	
Gender		
Male	185 (29.7)	
Female	438 (70.3)	
Weight (in kilograms, kg)		57.58 (12.65)
Height (in metre, m)		1.63 (0.09)
BMI (in kg/m^2)		
Underweight (< 18.5)	136 (21.8)	
Normal weight (18.5 – 24.9)	401 (64.4)	21.47 (3.86)
Overweight / Obese (≥ 25.0)	86 (13.8)	

Notes: n: sample number; %: percentage within total participants; BMI: body mass index

The prevalence of LBP increased from 64.4% to 83.5% during lockdown, with an increase in intensity, frequency and change in its location (Table III). Before lockdown, most of the participants had LBP intensity of 1 (33.5%) and 2 (33.2%). The LBP intensity increased during lockdown to 3 (30.5%) and 4 (27.8%) for most participants.

The associations between LBP intensity and various factors were estimated (Table IV). Before lockdown, LBP intensity was significantly associated with gender ($p=0.045$) and stress level ($p<0.001$). However, it was not significantly associated with age, BMI, occupation, online working or studying, length of sitting time at occupation, type of chair, location of computer monitor, duration of daily computer use, frequency of physical activity, alcohol consumption and adherence to ergonomic recommendations. During lockdown, LBP intensity was significantly associated with age ($p=0.032$), gender ($p=0.015$), occupation ($p=0.033$), length of sitting time ($p=0.003$), duration of daily computer use ($p<0.001$), adherence to ergonomic recommendations ($p=0.012$) and stress level ($p<0.001$). In contrast, no significant association was found between BMI, online working or studying, type of chair, location of computer monitor, frequency of physical activity and alcohol consumption with LBP intensity.

During the lockdown, the intensity of LBP was higher among the age group of 18-30 years old compared to the age group of 31-60 years old, with 32.1% of the participants having LBP intensity of 3, 28.1% of them having LBP intensity of 4 and 5.1% of them having LBP intensity of 5. Most male and female participants experienced LBP intensity of 1 and 2 before lockdown,

Table II: Work-related, physical, lifestyle and psychological characteristics of the participants

Variables	Before lockdown	During lockdown
	n (%)	n (%)
Occupation		
Student	458 (73.5)	425 (68.2)
Others	165 (26.5)	198 (31.8)
Worked or studied online		
Yes	183 (29.4)	536 (86.0)
No	350 (56.2)	37 (5.9)
Partially	90 (14.4)	50 (8.0)
Sitting time at occupation		
Moved around always	153 (24.6)	34 (5.5)
Sat and moved equally	282 (45.3)	73 (11.7)
Sat most of the time	188 (30.2)	516 (82.8)
Type of chair		
Ergonomic	173 (27.8)	173 (27.8)
Non-ergonomic	450 (72.2)	450 (72.2)
Location of computer monitor		
Parallel to eye level	315 (50.6)	341 (64.7)
Not parallel to eye level	308 (49.4)	282 (45.3)
Duration of computer use		
< 6 hours per day	395 (63.4)	129 (20.7)
6-10 hours per day	176 (28.3)	309 (49.6)
> 10 hours per day	52 (8.3)	185 (29.7)
Frequency of physical activity		
< 2 times a week	268 (43.0)	337 (54.1)
2-3 times a week	237 (38.0)	192 (30.8)
> 3 times a week	118 (18.9)	94 (15.1)
Types of physical activity		
None	85 (13.6)	119 (19.1)
Jogging	247 (39.6)	93 (14.9)
Workout at home	238 (38.2)	328 (52.6)
Yoga	70 (11.2)	63 (10.1)
House chores	293 (47.0)	302 (48.5)
Other	122 (19.6)	20 (3.2)
Alcohol consumption		
Yes	294 (47.2)	164 (26.3)
No	329 (52.8)	459 (73.7)
Adherence to ergonomic recommendation		
Disagree	163 (26.2)	208 (33.4)
Neutral	324 (52.0)	273 (43.8)
Agree	136 (21.8)	142 (22.8)
Stress level		
Mild	169 (27.1)	58 (9.3)
Moderate	329 (52.8)	152 (24.4)
Severe	125 (20.1)	413 (66.3)

Notes: n: sample number; %: percentage within total participants

Table III: Back pain characteristics of participants before and during the COVID-19 lockdown

Variables	Before lockdown	During lockdown
	n (%)	n (%)
Prevalence of LBP		
Yes	401 (64.4)	520 (83.5)
No	222 (35.6)	103 (16.5)
Frequency of LBP		
Never	216 (34.7)	93 (14.9)
Once a month	243 (39.0)	166 (26.6)
Once a week	105 (16.9)	200 (32.1)
More than once a week	59 (9.5)	164 (26.3)
Location of back pain		
Nowhere	222 (35.6)	103 (16.5)
Neck	209 (33.5)	372 (59.7)
Shoulder	238 (38.2)	353 (56.7)
Upper back	71 (11.4)	182 (29.2)
Lower back	184 (29.5)	322 (51.7)
LBP intensity		
1	209 (33.5)	93 (14.9)
2	207 (33.2)	137 (22.0)
3	167 (26.8)	190 (30.5)
4	35 (5.6)	173 (27.8)
5	5 (0.8)	30 (4.8)

Notes: n: sample number; %: percentage within total participants; LBP: low back pain

and higher LBP intensity of 3 and 4 during lockdown. During lockdown, participants who were students mostly experienced LBP intensity of 3 (32.5%) and 4 (27.8%). Participants who sat most of the time during lockdown experienced higher LBP intensity of 4 as compared to those who reported that they move around always and those who sat and move equally. Participants who spent more than 10 hours per day on computer had higher LBP intensity, with 33.0% of them experienced LBP intensity of 4 during the lockdown. Participants who disregarded ergonomic recommendations had higher LBP intensity, with 40.0% of them reported LBP intensity of 4 to 5 during lockdown. Lastly, high LBP intensity was observed within participants who had severe stress level.

DISCUSSION

The present cross-sectional survey was conducted to assess the prevalence and intensity of LBP and its association with demographic, physical and psychological factors among adults in Malaysia before and during the COVID-19 lockdown.

This study revealed that the prevalence of LBP significantly increased during lockdown, from 64.4% to 83.5%. Similar results were reported by Muniandy

Table IV: Association between different factors and low back pain intensity

Variables	Pain intensity before lockdown					p-value	Pain intensity during lockdown					p-value
	n (%)						n (%)					
	1	2	3	4	5		1	2	3	4	5	
Age groups (years)						0.378						0.032*
18-30	168 (33.3)	171 (33.9)	138 (27.3)	24 (4.8)	4 (0.8)		65 (12.9)	110 (21.8)	162 (32.1)	142 (28.1)	26 (5.1)	
31-60	41 (34.7)	36 (30.5)	29 (24.6)	11 (9.3)	1 (0.8)		28 (23.7)	27 (22.9)	28 (23.7)	31 (26.3)	4 (3.4)	
Gender						0.045*						0.015*
Male	70 (37.8)	57 (30.8)	47 (25.4)	7 (3.8)	4 (2.2)		40 (21.6)	40 (21.6)	48 (25.9)	45 (24.3)	12 (6.5)	
Female	139 (31.7)	150 (34.2)	120 (27.4)	28 (6.4)	1 (0.2)		53 (12.1)	97 (22.1)	142 (32.4)	128 (29.2)	18 (4.1)	
BMI (in kg/m)						0.504#						0.747
Underweight (< 18.5)	49 (36.0)	37 (27.2)	39 (28.7)	10 (7.4)	1 (0.7)		19 (14.0)	33 (24.3)	33 (24.3)	43 (31.6)	8 (5.9)	
Normal weight (18.5 – 24.9)	131 (32.7)	143 (35.7)	101 (25.2)	23 (5.7)	3 (0.7)		61 (15.2)	84 (20.9)	133 (33.2)	105 (26.2)	18 (4.5)	
Overweight/Obese (≥25.0)	29 (33.7)	27 (31.4)	27 (31.4)	2 (2.3)	1 (1.2)		13 (15.1)	20 (23.3)	24 (27.9)	25 (29.1)	4 (4.7)	
Occupation						0.682#						0.033*
Student	156 (34.1)	153 (33.4)	123 (26.9)	22 (4.8)	4 (0.9)		51 (12.0)	95 (22.4)	138 (32.5)	118 (27.8)	23 (5.4)	
Others	53 (32.1)	54 (32.7)	44 (26.7)	13 (7.9)	1 (0.6)		42 (21.2)	42 (21.2)	52 (26.3)	55 (27.8)	1 (5.9)	
Worked or studied online						0.634						0.832
Yes	64 (35.0)	60 (32.8)	45 (24.6)	12 (6.6)	2 (1.1)		76 (14.2)	118 (22.0)	161 (30.0)	153 (28.5)	28 (5.2)	
No	122 (34.9)	118 (33.7)	92 (26.3)	16 (4.6)	2 (0.6)		7 (18.9)	7 (18.9)	13 (35.1)	9 (24.3)	1 (2.7)	
Partially	23 (25.6)	29 (32.2)	30 (33.3)	7 (7.8)	1 (1.1)		10 (20.0)	12 (24.0)	16 (32.0)	11 (22.0)	1 (2.0)	
Sitting time at occupation						0.056						0.003*
Moved around always	48 (31.4)	50 (32.7)	43 (28.1)	10 (6.5)	2 (1.3)		10 (29.4)	9 (26.5)	9 (26.5)	4 (11.8)	2 (5.9)	
Sat and moved equally	107 (37.9)	92 (32.6)	75 (26.6)	7 (2.5)	1 (0.4)		19 (26.0)	16 (21.9)	25 (34.2)	11 (15.1)	2 (2.7)	
Sat most of the time	54 (28.7)	65 (34.6)	49 (26.1)	18 (9.6)	2 (1.1)		64 (12.4)	112 (21.7)	156 (30.2)	158 (30.6)	26 (5.0)	
Type of chair used						0.524						0.306
Ergonomic chair	62 (35.8)	53 (30.6)	43 (24.9)	15 (8.7)	0 (0.0)		21 (12.1)	43 (24.9)	58 (33.5)	46 (26.6)	5 (2.9)	
Non-ergonomic chair	147 (32.7)	154 (34.2)	124 (27.6)	20 (4.4)	5 (1.1)		72 (16.0)	94 (20.9)	132 (29.3)	127 (28.2)	25 (5.6)	
Location of computer monitor						0.524						0.068
Parallel to eye level	110 (34.9)	105 (33.3)	81 (25.7)	15 (4.8)	4 (1.3)		50 (14.7)	85 (24.9)	101 (29.6)	95 (27.9)	10 (2.9)	
Not parallel to eye level	99 (32.1)	102 (33.1)	86 (27.9)	20 (6.5)	1 (0.3)		43 (15.2)	52 (18.4)	89 (31.6)	78 (27.7)	20 (7.1)	
Duration of computer use						0.128#						< 0.001*
< 6 hours per day	142 (35.9)	136 (34.4)	94 (23.8)	20 (5.1)	3 (0.8)		37 (28.7)	38 (29.5)	33 (25.6)	16 (12.4)	5 (3.9)	
6-10 hours per day	54 (30.7)	53 (30.1)	59 (33.5)	9 (5.1)	1 (0.6)		38 (12.3)	62 (20.1)	102 (33.0)	96 (31.1)	11 (3.6)	
> 10 hours per day	13 (25.0)	18 (34.6)	14 (26.9)	6 (11.5)	1 (1.9)		18 (9.7)	37 (20.0)	55 (29.7)	61 (33.0)	14 (7.6)	
Frequency of physical activity						0.485						0.589
< 2 times a week	87 (32.5)	88 (32.8)	77 (26.7)	13 (4.9)	3 (1.1)		45 (13.4)	75 (22.3)	98 (29.1)	100 (29.7)	19 (5.6)	
2-3 times a week	74 (31.2)	87 (36.7)	58 (24.5)	16 (6.8)	2 (0.8)		35 (18.2)	41 (21.4)	61 (31.8)	50 (26.0)	5 (2.6)	
> 3 times a week	48 (40.7)	32 (27.1)	32 (27.1)	6 (5.1)	0 (0.0)		13 (13.8)	21 (22.3)	31 (33.0)	23 (24.5)	6 (6.4)	
Alcohol consumption						0.928						0.608
Yes	97 (33.0)	101 (34.4)	78 (26.5)	15 (5.1)	3 (1.0)		28 (17.1)	39 (23.8)	47 (28.7)	45 (27.4)	5 (3.0)	
No	112 (34.0)	106 (32.2)	89 (27.1)	20 (6.1)	2 (0.6)		65 (14.2)	98 (21.4)	143 (31.2)	128 (27.9)	25 (5.4)	
Adherence to ergonomic recommendation						0.700						0.012*
Disagree	49 (30.1)	61 (37.4)	41 (25.2)	11 (6.7)	1 (0.6)		21 (10.1)	40 (19.2)	60 (28.8)	72 (34.6)	15 (7.2)	
Neutral	107 (33.0)	105 (32.4)	93 (28.7)	17 (5.2)	2 (0.6)		44 (16.1)	60 (22.0)	93 (34.1)	68 (24.9)	8 (2.9)	
Agree	53 (39.0)	41 (30.1)	33 (24.3)	7 (5.1)	2 (1.5)		28 (19.7)	37 (26.1)	37 (26.1)	33 (23.2)	7 (4.9)	
Stress level						< 0.001*						< 0.001*
Mild	73 (43.2)	67 (39.6)	24 (14.2)	4 (2.4)	1 (0.6)		19 (32.8)	23 (39.7)	12 (20.7)	4 (6.9)	0 (0.0)	
Moderate	106 (32.2)	103 (31.3)	104 (31.6)	14 (4.3)	2 (0.6)		39 (25.7)	35 (23.0)	57 (37.5)	19 (12.5)	2 (1.3)	
Severe	30 (24.0)	37 (29.6)	39 (31.2)	17 (13.6)	2 (1.6)		35 (8.5)	79 (19.1)	121 (29.3)	150 (36.3)	28 (6.8)	

Notes: n: sample number; %: percentage within the corresponding selection group under variables; p: significance level was set at < 0.05; *: significant association; #: Fisher Exact Test

et al. (2022) who reported a prevalence of 61.1% of LBP among University Malaysia Sabah staff and undergraduates during the COVID-19 lockdown (22). Our results are also in accordance with the findings of a study conducted by Šagát P et al. (2020), in which the prevalence of LBP among citizens of Riyadh increased from 38.8% to 43.8% during quarantine (15). The prevalence of LBP reported by our study seemed to be higher than the prevalence of LBP that was reported by similar studies conducted among certain groups in Malaysia as health science undergraduates, medical students and office workers in 2013 and 2014 (7,9,10) which implies the increasing trends of LBP over years with the added burden of COVID-19 lockdown and its consequences on limitation of the physical activities and prolonged sitting times which have been proved to be significantly associated with the increased prevalence and intensity of LBP. The differences in the prevalence of LBP reported by different studies could be also related to the differences in work burden, activities being carried

out by each occupation or study group.

The back pain intensity was higher during lockdown, with the neck region being the most common site of pain reported, followed by shoulder. This pattern differed from results of other Malaysian studies where the lower back was the most common musculoskeletal pain (MSP) area (9,11,12). A difference in participants' occupations, the length they spent sitting, body posture that is required for each occupation, and the physical activities related to each may explain this observation. Furthermore, participants reporting MSP in all four regions (neck, shoulder, upper back and lower back) increased during the lockdown, with a decrease in the number of participants who reported an absence of any kind of back pain.

An analysis of demographic factors revealed an association of the intensity of LBP with age and gender during the lockdown, and with age only before the lockdown. This may be due to the increased LBP intensity during lockdown affecting all ages. Similar findings were reported in other studies (4,23). However, several studies revealed contradictory findings (10,12,13,18). Higher LBP intensity was observed among younger participants in the age group of 18-30 years old. This result was different from the study conducted by Luan HD et al. (2018), which reported that older age was associated with higher intensity of LBP (4). This could be explained by the increased number of participants between the age of 18-30 years old (81.1%), which were significantly more than 31-60 years old (18.9%) due to the sampling distribution in this study. The present finding illustrated that females have higher percentages of experiencing LBP intensity of 2 to 4 compared to males, which is similar to other studies (4,5,24). This may be explained by the fact that females are more prone to emotional exhaustion as compared to males, and they used to have a lower pain threshold (5).

Previous studies demonstrated that overweight or obese individuals with high BMI have a higher risk of experiencing LBP as increased body mass can in turn elevate one's physical load (25). Moreover, the high amount of adipose tissue for individuals who have high BMI could restrict their movement, hence putting stress on their musculoskeletal tissue and causing MSP (3). Regarding this, a few studies found that BMI is associated with back pain (5,9,23). Nevertheless, there was no significant association between BMI with LBP intensity before and during the lockdown in this study. This finding is similar to the results from some of the previous studies (7,12,13,18). This can be explained by the fact that the mean BMI of the study's participants was 21.47 kg/m2, which indicates normal body weight.

Analysis on work-related and occupational factors reveals that occupation, length of sitting time at occupation and duration of using computer daily during lockdown were significantly associated with LBP intensity. These findings were supported by similar results of Yue P et al. (2012) and Shaukat M et al. (2020) (5,14) as prolonged sitting during computer use was identified to have an impact on increasing both spinal compression load and activities of paraspinal muscles due to the greater pressure exerted on vertebral disc in sitting position, leading to tissue microdamage and paraspinal muscle dysfunction, and consequent LBP (7,10). However, evidence of no association between duration of computer use with LBP was also found by others (9,16). There were no association between other work-related and occupational factors (online working or studying, type of chair, location of computer) with LBP intensity, which may be due to the reason that these factors alone are not associated with the development of back pain without co-exposure factors such as poor posture and long period of inactivity.

The association between frequency of physical activity and LBP intensity was analysed in the present study. There was no association between physical activity frequency with LBP intensity before and during lockdown. This result was in line with most previous studies (7,12,13,16). However, a previous study suggested that LBP intensity can be decreased effectively through physical activity (7). The difference may be attributed to the study scale applied in different studies and recall bias of participants.

The lifestyle factor that was associated with LBP intensity during lockdown was adherence to ergonomic recommendations. Higher intensity of LBP was found among participants who disregarded ergonomic recommendations. This finding was in agreement with a study conducted by Preto-González P et al. (2021) (18), while contradictory finding was observed in the study by Šagát P et al. (2020) (15). The difference in findings can be explained by the different populations recruited, different study designs and the presence of other contributing factors in each study. The present study also identified that there was no association between LBP intensity and alcohol consumption, which was in line with studies by Kirsch Micheletti J et al. (2019) and Ganesan S et al. (2017) (2,13). This can be explained by the high number of participants not consuming alcohol during lockdown (73.7%) in present study compared to participants who consumed alcohol (26.3%).

Prolonged duration of quarantine could worsen the mental health of individuals and is exemplified by the increase in the number of participants who reported experiencing severe stress during lockdown (Table II). Chronic stress can trigger cortisol dysfunction which is responsible for the increase in free radicals and oxidative stress, systemic tissue degeneration, cellular aging or injury that eventually leads to symptoms such as pain (26). This finding was consistent with the present study which revealed that stress levels before and

during lockdown were significantly associated with the intensity of LBP, with participants having severe stress level experiencing higher LBP intensity. Similar results were shown in other studies as well (15,18).

The present study was able to address the objectives, however some limitations should be acknowledged. Firstly, since the survey was conducted through online platform, it limited the controls over participants. Moreover, the use of self-reported questionnaires can generate systemic bias as well as response bias. Since most of the participants were female students with age between 18-30 years old, the results in present study should be carefully generalized to other populations.

This study provides evidence on drawbacks of the lockdown on back pain and highlights the increased number of risk factors associated with LBP during the lockdown. It also provides evidence on the importance of increasing awareness among individuals to reduce duration of sitting and computer use. Since convenience sampling technique was applied in present study which may undermine the generalisation of sample, additional studies with larger sample size obtaining more heterogenous sampling population in variables such as age, gender and occupation would be useful and accurate for better understanding of the risk factors for back pain among general population. Considering the high prevalence of back pain, future studies should investigate the possible preventive and control methods that can be followed by the general population to control back pain incidence.

CONCLUSION

The COVID-19 lockdown has led to a significant elevation of the intensity and prevalence of back pain. Neck and shoulder areas are the most common sites of back pain among the study group. Risk factors which were determined to be associated with LBP intensity include gender, age, occupation, length of sitting time at occupation, duration of computer use per day, adherence to ergonomic recommendations and stress level. The intensity of LBP is higher among females, young age group of 18-30 years old and students. Prolonged duration of sitting and computer use per day, non-adherence to the ergonomic recommendations, and severe stress level were significantly associated with higher LBP intensity.

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