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ORIGINAL ARTICLE

Sitting Behaviour in Home Working Environment and its Association with Back Pain during Pandemic in Malaysia

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ABSTRACT

Introduction: COVID-19 pandemic leads to working from home culture. Long hours of the static sitting posture on improper chairs at home may lead to low back pain (LBP). This study aims to study the prevalence of LBP in sitting position during usage of portable computing devices and the association of LBP and sitting behaviour in home environment settings. **Methods:** An online questionnaire cross-sectional study was conducted, and the Visual Analog Scale (VAS) and Modified Oswestry LBP Disability questionnaire were adapted. The association between the factors such as duration of chair break, type of posture and the incidence of LBP were examined. **Results:** Majority of the 279 participants who participated in the study experienced LBP while working from home. We found strong evidence for suggesting a significant statistical association between duration of chair break (chi-squared value = 19.86, p-value = 0.006) and LBP. Most of the participants were categorised as having minimal disability, followed by moderate disabilities and only around 1% were crippled. ODI for sitting posture was statistically significant (Z_a value = 16.35, p = 0.022). Posture with round back and increased kyphosis with the feet supported on the floor is the highest reported posture with VAS score. VAS for duration of sitting posture was statistically significant (Z_a value = 10.37, p = 0.035). Those who spent only 5 – 30 minutes in the posture reported significantly lower VAS score compared to more than 30 minutes in the posture. **Conclusion:** Correct posture and taking chair breaks are essential to reduce the incidents of back pain and functional disabilities within the home working environment. The outcome of our research can be evidence-based information to occupational health specialists to optimise the current standard of practice and guidelines in working from home management.

KEYWORDS: Sitting posture, chair break, home working environment, back pain, Malaysia Movement Control Order

INTRODUCTION

The COVID-19 pandemic makes work from home the new normal. Low back pain (LBP) is pain, muscle tension, or stiffness localised below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica) [1]. LBP can be categorised as chronic or acute [2]. Mechanical LBP derives intrinsically from the spine, intervertebral disks, or surrounding soft tissues. Repetitive trauma and overuse are common causes of chronic mechanical LBP, often secondary to occupational injury [2]. On the other hand, for non-specific LBP, its specific pathophysiology is unknown or recognisable [3].

There are many causes of back pain, such as the posture of sitting, standing, and/or carrying a heavy bag [4]. It is suggested that the combination of an awkward sitting position with prolonged static sitting behaviour increases the likelihood of LBP [5]. In addition to proper ergonomics, frequent changes in posture, rest breaks, and stretching exercises are crucial as well [6]. Having the same sitting posture for more than two hours per day is related to having LBP; hence, people need to have proper ergonomic setup as prolonged sitting could lead to increased body discomfort [7].

One in every five persons suffers from pain globally, and one in ten adults are diagnosed with chronic pain each year [8]. Chronic LBP patients

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reported a higher comorbidity burden which contributed to a greater economic spend, as they require greater support on pain-related medication and other treatments [9]. Countries such as the United Kingdom reported LBP as the most significant contributor globally to Years Lived with Disability in the year 2010 which costs over £6.6 billion [10].

Prolonged use of computing devices with inappropriate ergonomic design increases the risks significantly for developing musculoskeletal discomfort and disorders [11]. A study found that 31% of students usually work in front of their computers every day, averaging between six to eight hours [12]. However, studies on the association of LBP with sitting behaviour which focuses on the home environment is lacking, especially during the pandemic, highlighting the research gap in this study. We argued that LBP incidence increased due to compromised ergonomics at home environment setting. Therefore, this study aims to investigate: (a) the prevalence of LBP in sitting position during usage of portable computing devices, and (b) the association of LBP and sitting behaviour in home environment setting.

MATERIALS AND METHODS

Study participants

The first MCO period was between 8 March 2020 - 3 May 2020, the questionnaire collection was held during the recovery MCO period which is around June 2020. An online questionnaire was administered using an exponential non-discriminative snowball sampling method between 30 June 2020 and 26 October 2020 in the comfort of the participants' home as it was during the Movement Control Order (MCO) period of time in Malaysia. A total of 279 responses were collected, and 276 answered "yes" to the filter questions on consent and usage of computing devices during this analysis. Sociodemographic variables including gender, age, race, education level, and the participants' general health status and back pain medical history during the MCO were collected. Consent was obtained from each participant before answering the questionnaire; participants could withdraw at any point without penalty. This research is approved by the University Research Ethics Committee (SUREC 2020/060).

The minimum sample size required for this study is calculated using the formula for cross-sectional study by Charan & Biswas (2013) [13]. In the formula, the LBP prevalence of 12% [14] is used and the calculated required sample size is 163. A total of 200 participants was targeted for this study, assuming less than 30% incomplete or missing data that may be excluded from the study. A total of 279 responses were collected during this period. Individuals aged 18 and above, able to provide consent online, and literate in the English language were included in the study. Participants with or without LBP experience or knowledge were included in the study and the operational definition of LBP was solely based on the participants self-reported level of back pain – without a clinical diagnosis. Individual who are suffering from any neurological or psychological illness and unable to read and provide consents online are excluded from the study.

Questionnaire Design

The questionnaire consists of four parts as outlined in the following subsections.

Sitting Posture

Picture A to H (Figure 1) were shown to participants, and participants were asked to pick their usual sitting posture. The characteristics of each sitting posture are illustrated. Picture B's posture was selected as the reference point for the analysis as this position provides the physiological curvatures maintenance, lumbar column activation that stabilises the musculature, and the symmetrical distribution of the centre of gravity, which can be considered as the optimal sitting position. Other postures are considered as the possible risk factors for back pain [15].

Description for picture A to H are:

A. Round back and increase kyphosis with the feet supported on the floor
B. Increase of the lordosis but with feet supported on the floor
C. Straight back with lumbopelvic control, with the feet supported on the floor
D. Back support and reversion of the lumbar curvature, with the feet supported on the floor

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E. Rounded back or increase of the kyphosis, feet supported on another chair
F. Rounded back or increase of the kyphosis and crossed leg
G. Straight back and lumbopelvic control, crossed leg
H. Back support and reversion of the lumbar curvature, with the feet supported on another chair.

Past studies reported an association between duration of sitting time during occupational work and taking a break from sitting on the chair with LBP [16]. Thus, we evaluated the duration of sitting and the frequency and duration of taking the chair breaks per day among the participants.

Figure 1 Sitting posture of participant

Figure 2 Participant's type of chair

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Types of Chairs

Figure 2 was shown to participants, and participants were asked to pick the usual type of chair they used (Picture A to I) while they work in a home environment. Different ergonomic chairs could determine the severity of the back pain [17]. For instance, the type of chair used, such as a chair with armrests, or sitting in front of a work desk determine the existence of LBP in the musculoskeletal system [18]. The chair's characteristics are related to the back, width, depth, height of the chair, and armrest; adequate space between chairs also influence the spine angle [19]. Different types of chairs provide different supports to the back, and the support also differs from sitting on a chair or using the bed as the chair.

Visual Analog Scale (VAS)

Pain intensity means the level of pain endured by a patient and reflects the overall magnitude of the pain experience [20]. In the context of LBP, pain intensity is the factor that ranked the highest among various pain domains such as quality of pain, temporal aspects of pain, the behaviour of pain, and pain interference [21].

Visual analogue scale (VAS) is the most frequently used objective patient-reported test to measure pain intensity in LBP studies [22]. The VAS is a validated, objective, and unidimensional measure for acute and chronic pain; VAS has been widely used in diverse adult populations [23]. Scores are recorded by making a handwritten mark on a 10-cm line that represents a continuum between "no pain" and "worst pain imaginable" [23].

In our study, the participants' VAS score was recorded whereby each participant was required to provide a score they perceive using a pain scoring. VAS scores after the MCO were recorded. The changes in the scores are rated following the scale by Bodian et al. (2001) [24].

Oswestry Disability Index (ODI)

Modified Oswestry LBP Disability Questionnaire is a self-reported measurement of disability. It is an essential tool that researchers used to measure how back pain affects a person's ability to carry out activity daily [25]. It reports the Oswestry Disability Index (ODI). Examples of daily living activities in the ODI questionnaire include the ability to sit, lift, walk, or sleep [25]. The questionnaire was designed following the published questionnaire by Hart et al. (2012) [25]. The evaluation method was performed following indexes developed by Yates and Shastri-Hurst (2017) [26].

This part of the questionnaire examined perceived levels of disability in ten different aspects of everyday activities of daily living. Each item is scored from 0 to 5, with higher values representing greater disability. The scores for all questions answered are summed, then multiplied by 2 to obtain the ODI score. The severity of disability was determined according to ODI score as below:

a) Minimal disability (ODI score: 0 – 20)
b) Moderate disability (ODI score: 21 – 40)
c) Severe disability (ODI score: 41 – 60)
d) Crippled (ODI score: 61 – 80)
e) Bed bound or exaggerated (ODI score: 81 – 100).

Statistical Analysis

The statistical analysis is conducted using R software. Descriptive analysis such as median and inter-quartile range (IQR) are computed for VAS and ODI scores. In order to test the hypothesis put forth in this paper, non-parametric procedures namely Wilcoxon test [27] and Kruskal-Wallis test [28] are used since the values do not meet the assumption of normality required in traditional two-sample t-tests or ANOVA. For the hypothesis tests, p-values < 0.05 suggest evidence of significance.

RESULTS

Participants

This study included 276 participants and their demographic information is given in Table 1. A total of 69.9% or 193 of the participants are female and the rest is male. Majority of the respondents are in the age group of 18-30 years old constituting 53.3% of the sample size. Respondents of Chinese ethnicity made up the highest percentage (46.4%) in our sample, followed by those of Malay (28.3%) and Indian (10.1%) ethnicities. A high percentage of 62.7% stated that they spent more than six hours with a computer device per day at the

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present time. A total of 77.2% of the participants reported experiencing LBP while working with a computing device during this period. 36.2% of the participants also said that they experienced LBP at least 2 – 3 times a week when working long hours with a computing device, but surprisingly, 75% of them did not seek medical advice.

Table 1 showed the median and IQR for VAS and ODI scores for different gender and age groups. Females have higher average VAS and ODI scores compared to males. Since the scores were not normally distributed based on the Shapiro-Wilk test for normality, we performed the non-parametric Wilcoxon Rank Sum Test [27] to determine if the difference in the average scores between these two gender groups is statistically significant. It was found that the average ODI scores for females were significantly higher with a p-value of 0.041 whereas there is no significant difference (p-value = 0.220) for the average VAS scores between males and females.

From Table 1, it was demonstrated that the 41 – 50 age group has the highest average ODI and VAS scores. Since the scores were not normally distributed, the Kruskal-Wallis test [28] was performed to determine if the difference in the average scores between all age groups considered in the study was significant. Results indicated that there is no significant difference in the VAS (p-value = 0.1936) and ODI (p-value = 0.0985) scores between different age groups.

Table 1 VAS and ODI scores by gender and age group (n=276)

Group	n(%)	VAS Median (IQR)	ODI Median (IQR)
Gender			
Male	79 (28.6%)	4.00 (3.00)	4.00 (12.00)
Female	193 (69.9%)	5.00 (4.00)	6.00 (14.00)
Preferred not to say	4 (1.4%)		
Age Group			
Total	276 (100%)	5.00 (4.00)	6.00 (16.00)
18-30	147 (53.3%)	4.00 (3.00)	4.00 (12.00)
31-40	74 (26.8%)	5.00 (4.00)	7.00 (13.00)
41-50	44 (15.9%)	6.00 (5.00)	12.00 (16.50)
51 or more	11 (4.0%)	5.00 (3.00)	10.00 (11.00)

Association between Usage Duration and Ergonomic and Posture with Incidence of Low Back Pain

An association analysis using Pearson's chi-square test was performed to investigate the incidence of LBP from the usage of computing devices at home. Our results revealed that most of our participants experienced LBP about 2 – 3 times per week and did not seek medical advice on their condition.

Two main factors were considered in this association analysis, namely (a) duration of the usage, and (b) ergonomic and posture. The effect of usage duration of computing devices on incidence of LBP was examined from two perspectives, namely (a) usage duration during MCO, and (b) difference in usage duration during MCO when compared to before MCO (either same, increase, or decrease). On the other hand, the

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effect of ergonomic and posture on the incidence of LBP was investigated by considering the type and duration of sitting posture, frequency, and duration of chair breaks, as well as type of chair used.

Our results revealed that there is no significant association between the incidence of LBP and usage duration of portable computing devices as measured in our study (Table 2). We found strong evidence for suggesting a significant statistical association between duration of chair break (chi-squared value = 19.86, p-value = 0.006) and incidence of LBP.

Table 2 Factors associated with low back pain (n=276)

	Incidence of Low Back Pain		Chi-square value	p-value
	Yes (n, %)	No (n, %)		
Usage Duration				
(a) Usage duration of computing device during MCO				
Less than 1 hour	4 (1.4)	1 (0.4)	0.1123	0.990
1 – 3 hours	15 (5.4)	5 (1.8)		
4 – 6 hours	67 (24.3)	19 (6.9)		
More than 6 hours	127 (46.0)	38 (13.8)		
(b) Difference in usage duration before and after MCO				
Decrease	24 (8.7)	7 (2.5)	0.4201	0.811
Increase	66 (23.9)	22 (8.0)		
Same	123 (44.6)	34 (12.3)		
Ergonomic and Posture				
(a) Sitting posture				
A	73 (26.4)	11 (4.0)	10.63	0.156
B	22 (8.0)	11 (4.0)		
C	39 (14.1)	18 (6.5)		
D	15 (5.4)	4 (1.4)		
E	10 (3.6)	3 (1.1)		
F	24 (8.7)	6 (2.2)		
G	15 (5.4)	7 (2.5)		
H	15 (5.4)	3 (1.1)		
(b) Duration of sitting posture				
5 – 30 minutes	33 (12.0)	17 (6.2)	8.98	0.062
31 minutes – 1 hour	65 (23.6)	13 (4.7)		
1 – 2 hours	53 (19.2)	12 (4.3)		
2 – 3 hours	27 (9.8)	5 (1.8)		
More than 3 hours	35 (12.7)	16 (5.8)		
(c) Number of chairs breaks every 3 hours				
0 – 2 times	88 (31.9)	25 (9.1)	1.33	0.856
3 – 4 times	74 (26.8)	23 (8.3)		
5 – 6 times	32 (11.6)	9 (3.3)		
7 – 10 times	14 (5.1)	3 (1.1)		
> 10 times	5 (1.8)	3 (1.1)		
(d) Duration of chair break				
0 – 2 minutes	30 (10.9)	23 (8.3)	19.86	0.006**
3 – 4 minutes	71 (25.7)	21 (7.6)		
5 – 10 minutes	74 (26.8)	11 (3.9)		
> 10 minutes	36 (13.0)	8 (2.9)		
Depends	2 (0.7)	0 (0.0)		

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(e) Type of chair				
A	40 (14.5)	15 (5.4)	7.47	0.487
B	62 (22.5)	15 (5.4)		
C	9 (3.3)	5 (1.8)		
D	12 (4.3)	3 (1.1)		
E	4 (1.4)	1 (0.4)		
F	56 (20.3)	14 (5.1)		
G	15 (5.4)	6 (2.2)		
H	1 (0.4)	2 (0.7)		
I	14 (5.1)	2 (0.7)		

Note: Chi-square analysis is used with significance level of $p < 0.05$

Effect of Sitting Posture and Ergonomic and Posture on Low Back Pain Intensity

Table 3 presented the average pain intensity as measured by VAS and ODI scores for various sitting postures listed in the questionnaire. Participants in our study were asked to select their current sitting posture. Posture A was the most popular among the participants (30.43%) with the highest average pain intensity of 5.05 based on VAS score and third-highest average pain intensity of 11.88 based on ODI scores, respectively. On the other hand, posture B, which was the reference point for our analysis, has the lowest average VAS score whereas sitting posture G has the lowest average ODI score. Sitting posture E was the least popular among the participants.

Table 3 Average VAS and ODI Scores for Sitting postures

Sitting Posture	Percentage of Participants, n (%)	Average VAS Score	Average ODI Score
A 	84 (30.43)	5.05	11.88
B 	33 (11.96)	4.09	7.88
C 	57 (20.65)	4.47	9.61
D 	19 (6.88)	4.95	14.32
E 	13 (4.71)	4.69	10.31

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F 	30 (10.87)	4.70	13.33
G 	22 (7.97)	4.73	5.45
H 	18 (6.5)	4.50	11.78

Kruskal-Wallis Test on Pain Intensity

The non-parametric Kruskal-Wallis test was performed to determine if there is a significant difference in intensity of LBP as measured by the VAS and ODI scores during and after the MCO due to the two main factors: usage duration and ergonomic and posture. The results are shown in Table 4 below.

Kruskal-Wallis test results showed that there was no significant difference in the pain intensity as measured by VAS score due to different usage duration of computing devices. On the other hand, we found that there is a significant difference in the pain intensity due to the duration spent in the sitting posture. Post-hoc test on this factor showed that those who spent only 5 – 30 minutes in the posture reported significantly lower VAS score compared with those who spent more than 30 minutes in the posture. Analysis on ODI scores show similar findings, with the addition that the sitting posture was also found to be significant. Participants who selected posture G reported significantly lower ODI scores compared to those who selected posture A, D, F, and H.

Activity of Daily Living (ADL)

The ODI scores were tabulated and categorised. Most of the participants (84.78%) were categorised as minimal disability, 9.42% had moderate disabilities, 4.35% had severe disabilities and 1.45% are crippled. These suggest that majority of the respondents reported only minimal disability based on the ODI score.

In order to understand if LBP affected the participants' activities of daily living, the average and standard deviation of the ODI scores for each of the nine domains in the ODI questionnaire were computed. The average ODI scores range from 0.18 to 0.86 with lifting and sitting having the highest mean ODI scores (0.86 and 0.83, respectively). These results implied that these two domains or activities were the most affected by LBP amongst our participants. On the other hand, sex life and social life were the least affected by LBP amongst our participants, having a mean of 0.18 and 0.24, respectively. The remaining domains of walking, travelling, sleeping, personal care and standing have average ODI scores ranging from 0.41 to 0.61.

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Table 4 Pain intensity based on VAS and ODI Scores (n=276)

			VAS			ODI		
	Categories	**n (%)**	**Median (IQR)**	**Z_a**	**p-value**	**Median (IQR)**	**Z_a**	**p-value**
Usage duration								
(a) Usage duration of computing device during MCO	Less than 1 hour	5 (1.8)	4.00 (1.00)	3.85	0.278	8.00 (40.00)	6.03	0.110
	1 – 3 hours	20 (7.2)	6.00 (5.00)			15.00 (26.50)		
	4 – 6 hours	86 (31.2)	4.50 (4.00)			6.00 (16.00)		
	More than 6 hours	165 (59.8)	4.00 (4.00)			6.00 (10.00)		
(b) Difference in usage duration before and after MCO	Decrease	31 (11.2)	5.00 (4.00)	0.70	0.703	10.00 (20.00)	1.87	0.393
	Increase	88 (31.9)	4.00 (3.00)			5.00 (13.00)		
	Same	157 (56.9)	5.00 (4.00)			6.00 (14.00)		
Ergonomic and Posture								
(a) Sitting posture	A	84 (30.4)	5.00 (4.00)	4.74	0.692	9.00 (14.50)	16.35	0.022*
	B	33 (12.0)	4.00 (4.00)			4.00 (12.00)		
	C	57 (20.7)	5.00 (4.00)			4.00 (12.00)		
	D	19 (6.9)	6.00 (4.50)			4.00 (17.00)		
	E	13 (4.7)	5.00 (4.00)			4.00 (10.00)		
	F	30 (10.9)	4.00 (3.00)			9.00 (12.00)		
	G	22 (8.0)	6.00 (5.75)			0.00 (4.00)		
	H	18 (6.5)	4.00 (4.75)			6.00 (9.50)		

(b) Duration of sitting posture	5 – 30 mins	50 (18.1)	3.00 (3.75)	10.37	0.035*	4.00 (16.00)	9.37	0.052
	31 mins – 1 hour	78 (28.3)	5.00 (3.75)			4.00 (12.00)		
	1 – 2 hours	65 (23.6)	5.00 (4.00)			6.00 (16.00)		
	2 – 3 hours	32 (11.6)	6.00 (2.25)			10.00 (11.00)		
	More than 3 hours	51 (18.4)	4.00 (4.50)			8.00 (9.00)		
(c) Number of chair breaks every 3 hours	0 – 2 times	113 (40.9)	4.00 (4.00)	2.71	0.607	6.00 (14.00)	2.64	0.620
	3 – 4 times	97 (35.1)	4.00 (3.00)			6.00 (12.00)		
	5 – 6 times	41 (14.9)	5.00 (4.00)			4.00 (14.00)		
	7 – 10 times	17 (6.2)	6.00 (2.00)			6.00 (18.00)		
	> 10 times	8 (2.9)	4.00 (5.25)			2.00 (7.00)		
(d) Duration of chair break	0 – 2 minutes	53 (19.2)	4.00 (4.00)	11.35	0.124	8.00 (14.00)	5.84	0.558
	3 – 4 minutes	92 (33.3)	4.00 (4.00)			6.00 (16.00)		
	5 – 10 minutes	85 (30.8)	6.00 (4.00)			8.00 (14.00)		
	> 10 minutes	44 (15.9)	5.50 (4.00)			4.00 (9.00)		
	It depends	2 (0.7)	4.50 (0.50)			9.00 (9.00)		
(e) Type of chair	A	55 (19.9)	4.00 (3.00)	12.05	0.149	6.00 (19.00)	11.57	0.171
	B	77 (27.9)	5.00 (4.00)			6.00 (12.00)		
	C	14 (5.1)	6.00 (2.75)			13.00 (34.00)		
	D	15 (5.4)	3.00 (4.50)			4.00 (10.00)		
	E	5 (1.8)	7.00 (0.00)			0.00 (20.00)		
	F	70 (25.4)	4.00 (3.75)			4.00 (13.00)		
	G	21 (7.6)	5.00 (4.00)			10.00 (14.00)		
	H	3 (1.1)	6.00 (2.00)			14.00 (27.00)		
	I	16 (5.8)	3.00 (3.25)			0.00 (7.50)		

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DISCUSSION

This study aimed to evaluate the prevalence of LBP after MCO, and the association between LBP and usage of computing devices and ergonomics and posture such as sitting posture, type of chairs, and duration of sitting in home environment setting. Overall, the results of our study indicate that females experience higher pain intensity. Duration of chair break is associated with the incidence of LBP as measured by ODI score. From the ODI scores, our study found that lifting and sitting were most affected by LBP.

Our results showed that females reported a significantly higher average ODI score, which implies that the females' activity of daily living were more affected by LBP as compared to males. A biopsychosocial model of chronic pain attributes sex differences in pain due to sociocultural factors, biological, and psychological [29]. The hypersensitivity of pain among woman suggests bigger intensity of pain by women compared to men [30]. Variations in pain sensitivity during the menstrual cycle may explain sex disparities in pain reporting in younger adults [31]. Additional reasons of LBP include the biological response to pregnancy and childbearing, the physical stress of childrearing, and perimenopausal abdominal weight gain [30]. Oestrogen deficiency-accelerated disc degeneration was shown in postmenopausal women, supporting the higher incidence of LBP in a woman [30]. In addition, we argue that during this period of working from home due to COVID-19 pandemic, females need to fulfil the social norms of performing domestic care work in a household [32]. Participants from different age groups do not show statistically different average pain intensity scores, implying that different age groups in our sample experience similar pain intensity levels.

To maintain proper posture, the spine extensor muscle ensures the upright and accurate position of the trunk [33]. However, the decreased performance of the extensor muscle causes instability of the spine, leading to pain and muscle fatigue [33]. The failure to stabilise the spine due to imbalance between the trunk extensor and the flexor muscles is a clear sign of the disorder of the development of lumbar spine [34]. Consequently, isometric resistance involvement of muscles of this segment will lead to chronic LBP [34]. Our results revealed that sitting posture B, C and G with straight and with backrest at the chair had shown significantly lesser pain intensity compared to other postures. This depicts that sitting posture that maintains the natural lumbar curvature with the backrest on the chair suffered less pain [35]. The ergonomic principle further supports that postures that lean backwards or forward or twisted for a long duration could obstruct the blood flow of the muscles [36]. Even though the sitting posture is followed by proper ergonomic principles, long hours of the same posture could still lead to body discomfort [36].

However, although the sitting posture is a significant factor on pain intensity, our results showed that the type of chair does not affect LBP. Our results also indicate that taking a chair break are associated with lesser LBP. Having the same sitting posture for more than two hours per day is related to having LBP; hence, it is suggested to take a break in between prolonged sitting [7]. Prolonged sitting is also associated with back muscle fatigue due to deficiency in the lumbar spine flexor and extensor muscles resistance [37]. The explanation between the strength of lumbar spine erector muscles and vertebral column functional or physical integrity maintenance is that muscle fatigue will lead to additional stress on the passive elements (intervertebral disks, capsules, ligaments) which also provide stability to the trunk during the execution of specific movement patterns of certain activities, leading to damages to structures sensible to distension, producing pain [38]. The muscle which is fatigued is more likely to reach ischaemic levels compared to strong muscle, which allows a poorer biomechanical alignment, increase in muscle tension, and postural compensation when carrying out activities of daily living [39]. There was also evidence that a combination of prolonged static sitting behaviour with an awkward sitting position increases the chances of LBP [5].

The present study revealed that pain intensity affects daily living activities such as lifting and sitting. This finding agrees with a previous study in which patients with chronic LBP also reported lower quality in

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daily life activities e.g., reduced frequency in walking, gardening, or preparing their food. In recent years, researchers have challenged the commonly assumed relationship where patients with LBP would reduce physical activity levels. The relationship was further tested, and results revealed that only LBP with high levels of disability reported having low levels of physical activity [40]. From other literature of Europe population, LBP got worse in 41.1% participants with VAS mean went from 49.5 ± 21.6 before to 53.5 ± 22.4 during lockdown, suggesting that there is an increase of participants who self-perceived LBP during lockdown [41]. The LBP point prevalence before the quarantine was 38.8%, and 43.8% after the quarantine in Saudi Arabia [42]. However, from our best knowledge, there is no prevalence before and after lockdown reported in Malaysia.

Limitation and Remarks

In the present study, we evaluated the prevalence of LBP and sitting behaviour of adults who had a sudden transformation in working culture from working in an office to working from home during the COVID-19 pandemic. However, the results may not be sufficient to derive a causal relationship between the factors considered and LBP. The incidence of LBP is based on self-reported symptoms and does not require clinical diagnosis thus may be subjected to personal perception. Type of occupation was not collected, and therefore, correlation could not be made between nature of work and pattern of low back pain. The data collection was conducted within six months when working from home was enforced. Nevertheless, these results can help as input to longitudinal study design to evaluate the long-term effects of working from home. Since the participants are mostly residing in urban or suburban areas, the results obtained from this study may not be representative of the overall population of Malaysia.

This new normal requires workers to work around the computing device(s) and furniture setup at home. Our study showed that participants suffered from back pain and with minimal ergonomic equipment at home. They did not practice correct sitting postures nor having enough breaks for mobilisation. It implies the awareness and practice of proper sitting behaviour and postures remained low.

The outcome of our research can be evidence-based information to occupational health specialists to optimise the current standard of practice and guidelines in working from home management. Besides, individuals may also use timers or online applications to alert themselves on having periodical breaks with constant reminders. Current technologies such as smartwatch applications that remind the user to be physically active at predetermined intervals have been successful in physical activity intervention [41].

CONCLUSION

Our study showed that there is a significant association between duration of chair break and incidence of LBP. Type of sitting posture is significantly associated with pain intensity ODI. Most of the participants (84.78%) were categorised as having minimal disability, 9.42% had moderate disabilities, 4.35% had severe disabilities and 1.45% were crippled. Posture with round back and increased kyphosis with the feet supported on the floor is the highest reported posture with the highest VAS score. Those who spent only 5 – 30 minutes in the posture reported significantly lower VAS score compared to those who spent more than 30 minutes in the posture.

Our study focuses on factors such as sitting posture, period chair break, and type of chairs, which affect LBP incidence in the home environment specifically during MCO period, which was previously not reported, highlighting the strength of our study.

Before herd immunity is achieved, we may need to work from home for a period of time and this may be the new normal in the future. Learning from this survey, individuals may consider equipping their families with ergonomically designed furniture and awareness on the importance of ergonomic designs, and pay attention to sitting posture in a home working environment. Our study reported that duration of chair break and duration of sitting posture would affect the intensity of LBP. Therefore, individuals who are working from home need to be aware of their sitting posture and are advised to spend no more than 30 minutes in the same posture at any one time. The duration of their chair break should also be taken into consideration.

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Conflict of Interests

Authors declare none.

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Authors' Contribution

Conception or design of the work – Phoey Lee The, Ker Woon Choy

Data collection – Phoey Lee The, Yeh Ching Low, Pei Boon Ooi

Data analysis and interpretation – Yeh Ching Low

Drafting the article – Ja Young Shin

Writing the article – All authors

Final approval of the version to be published – All authors

All authors read and approved the final manuscript.

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