

**ASSOCIATION BETWEEN LEVEL OF FATIGUE AND
PHYSICAL ACTIVITY OF POST-COVID-19 SURVIVORS
AMONG IUM KUANTAN COMMUNITY**

ROZLIN ABDUL RAHMAN, MD., PhD. (**CORRESPONDING AUTHOR**)
DEPARTMENT OF PHYSIOTHERAPY AND REHABILITATION SCIENCES,
KULLIYAH OF ALLIED HEALTH SCIENCES, INTERNATIONAL ISLAMIC
UNIVERSITY MALAYSIA, KUANTAN, PAHANG, MALAYSIA
rozlin@ium.edu.my

AFIFAH SUHAILA BT. SEJARI BSc.
DEPARTMENT OF PHYSIOTHERAPY AND REHABILITATION SCIENCES,
KULLIYAH OF ALLIED HEALTH SCIENCES, INTERNATIONAL ISLAMIC
UNIVERSITY MALAYSIA, KUANTAN, PAHANG, MALAYSIA
afifahh.suhaila@gmail.com

ABSTRACT

Introduction: Post-COVID-19 fatigue is symbolic in discussing long COVID. The new emergence of barriers might cause a deterioration in physical activity levels. **Objective:** This study aims to address the level of fatigue in post-COVID-19 survivors among the International Islamic University Malaysia (IIUM) Kuantan community and its association with the level of physical activity. **Method:** A cross-sectional study design was conducted on 75 IIUM Kuantan communities using a convenience sampling method based on the inclusion and exclusion criteria. All respondents answered a questionnaire on the demographic data, Fatigue Severity Scale (FSS) and a short-form version of the International Physical Activity Questionnaire (IPAQ-SF). Descriptive statistics, independent t-test and Chi-square test were applied to analyze the data. **Result:** The mean age of the respondents is 23.64 ± 5.795 , with an average mean score of FSS 4.242 (SD=1.097). The result shows a significant difference ($p < 0.001$) between low and high fatigue groups with a high prevalence in the latter group. Gender ($p = 0.176$) and recovery period post-COVID-19 ($p = 0.175$) were not associated with fatigue levels. The result of the association between fatigue and physical activity level showed no significant relationship present, with a p -value of 0.703. **Conclusion:** Although there was no association found between fatigue and the physical activity level, the IIUM Kuantan post-COVID-19 community did experience high fatigue. Future prevention can target the correct populations and bring more research on fatigue with other factors such as quality of life (QoL) and functional status.

Keywords: fatigue, physical activity level, post-COVID-19

INTRODUCTION

Coronavirus disease (COVID-19), a global pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has led to 626 million confirmed cases and 6.5 million deaths (as of October 2022) (World Health Organization [WHO], 2022a). In Malaysia, 4.8 million confirmed cases were reported, and 36,458 lives succumbed to the infection (WHO, 2022a). The COVID-19 cases are still doing numbers over the years and despite the effort to fight off the symptoms in the acute phase, the survivors may have yet to battle another persistent state of ill health after the initial infection; known as long COVID symptoms (Nehme et al., 2021).

Malik et al. (2022) in their recent meta-analysis study showed that the effects of SARS-CoV-2 infections could last for weeks to months after the initial infection. The risks of getting post-COVID-19 fatigue are likely to affect females, patients with a longer duration of recovery process, old age, pre-existing depression/anxiety, pre-existing comorbidities, pre-existing autoimmune disease, parents with more children and those with higher levels of vitamin D or ferritin (Joli et al., 2022). Meanwhile, in terms of duration, it is said that patients who continued to experience post-COVID-19 fatigue between 4-12 weeks had higher levels of fatigue, as fatigue is likely to subside after 12 weeks post-infection (National Institute for Health and Care Excellence [NICE], 2022).

One of the post-COVID-19 complications that has attracted many researchers is the decreasing level of physical activity. Wright et al., (2022) found that the PA level did not seem to improve with the duration of long COVID. In a way, it may be caused by the residual symptoms felt by the survivors that hindered them from returning to pre-

COVID-19 activity levels. In some post-COVID-19 patients, there is a decline in physical and/or mental performance resulting from psychological, central and/or peripheral changes following COVID-19 disease (Rudroff et al., 2020). Aldhahi et al. (2022) demonstrated that the level of fatigue among recovered COVID-19 patients in Saudi Arabia may increase due to low physical activity. The relationship between fatigue and PA level is bidirectional, and the previous study did not explore on the opposite relationship (level of fatigue towards PA). Moreover, the relationship between fatigue in a specific population involving long COVID patients and the PA level is still limited. This study aims to address the level of fatigue in post-COVID-19 survivors among the IIUM Kuantan community and its association with the level of physical activity. This association may help to detect early barrier on physical inactivity among long COVID patients and the evaluation of fatigue is pivotal for post-COVID-19 treatment planning and prognosis.

MATERIALS AND METHODS

After obtaining the ethical approval from the Kulliyyah Postgraduate and Research Committee (reference no.: IIUM/310/14/11/2 ID No. KAHS 96/22), a cross-sectional study was conducted among the post-COVID-19 survivors (with no previous comorbidity and had recovered at least 4 weeks after the last infection with COVID-19) from the International Islamic University Malaysia (IIUM), Kuantan Campus. The self-administered questionnaire was disseminated through the social media platforms and divided into two parts:

Part A: Collection on the sociodemographic data of the respondents.

Part B: A validated structured questionnaire using (i) the Fatigue Severity Scale (FSS) which contains 9-item scale, and it rates the severity in terms of how fatigue affects PA, activities of daily living, and motivation. The cut-off point for FSS of ≥ 4 indicates high fatigue (Lerdal, 2014) and (ii) the short version of the International Physical Activity Questionnaire (IPAQ-SF) (Craig et al., 2003). It captures three different levels of PA intensity (vigorous, moderate, and walking) and sitting time over the course of the previous seven days. The statistical analysis data were done using the Statistical Package for the Social Science (SPSS) version 22 for Windows. The demographic data and level of fatigue were analysed by using the descriptive statistics. The levels of fatigue and its relationship with gender and phase of post-COVID-19 infection were evaluated and reported using the independent-sample t-test. Finally, the association between the level of fatigue and PA level was assessed using the Chi-Square test.

RESULTS

The total of respondents who completed this study was 75 post-COVID-19 survivors, consisting 24 males (32%) and 51 females (68%). The mean age of respondents was 23.64 ± 5.795 . The proportion of the occurrence of COVID-19 infection shows a large difference, once (92%) and twice (8%). Table 1 tabulates the characteristics of the respondents based on each variable.

Table 1 Characteristics of the Respondents (n=75)

Variable	Frequency	Percentage (%)
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Gender:		
Male	24	32.0
Female	51	68.0
Age:		
19	6	8.0
20	4	5.3
21	10	13.4
22	32	42.7
23	14	18.7
31	1	1.3
34	2	2.7
35	1	1.3
37	1	1.3
40	1	1.3
41	2	2.7
50	1	1.3
Occurrence of COVID-19:		
Once	69	92.0
Twice	6	8.0
Last infection:		
More than 3 months	61	81.3
1 to 3 months ago	14	18.7

Level of fatigue

The second part of the questionnaire measured the level of fatigue in post-COVID-19 survivors among IIUM Kuantan community using the 9 items of the FSS questionnaire. In general, the population demonstrated a slightly high fatigue level post-COVID-19, as it is nearly passing the borderline (4.00). Among the respondents, the highest score obtained was 6.33 and the minimum score was 1.00. In comparison to age, the top three highest FSS mean score is among those aged 34 which is 5.056 ± 0.056 , followed by age 22 (4.483 ± 0.179) and age 23 (4.246 ± 0.308).

For the variable of occurrence in COVID-19, from 51 fatigue respondents, 90.2% who experienced a one-time COVID-19 infection were categorized under the fatigue group, while the respondents who had been infected twice acquired only 9.8%. The data shows that 68% of respondents (n=51) were under the category of high fatigue, and it widens the gap between the low fatigue group by 32% (n=24). This means that post-COVID-19 fatigue prevalence is high among the long COVID-19 of IIUM Kuantan community. There was also a significant difference ($p < 0.001$) in the FSS score when comparing the low and high fatigue groups.

Relationship between gender and fatigue level

It was found that females have a higher number of high fatigue compared to males (37 vs 14), with similar findings in the low fatigue group where females are higher than males (14 vs 10) (Figure 1). For the FSS mean score, female respondents showed a higher score on FSS, 4.360 ± 1.136 , whereas male respondents only recorded a slightly lower score, 3.991 ± 0.986 . Further analysis showed there were no differences in gender when compared with their level of fatigue (p -value=0.176) (Table 2).

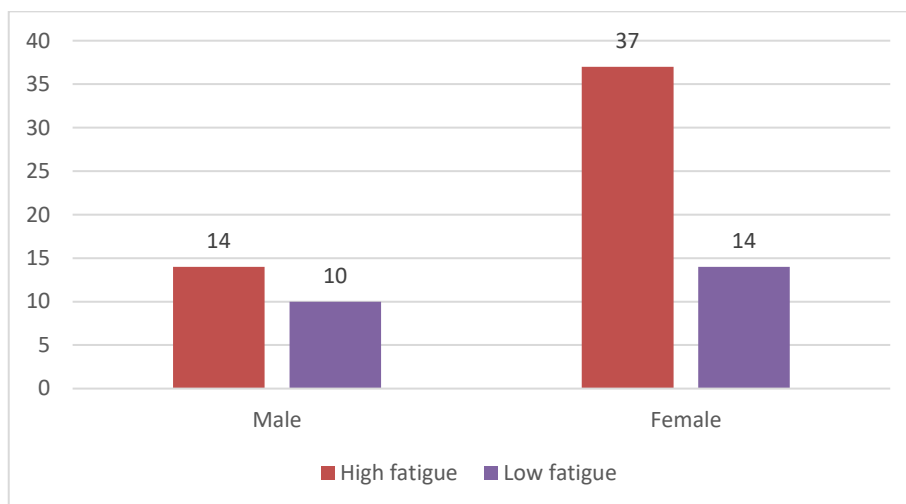


Figure 1: Bar Chart on Frequency of High and Low Fatigue Groups in Genders ($n=75$)

Table 2: Comparison of Gender and Level of Fatigue using independent t -test ($n=75$)

Variable	Male ($n=24$)		Female ($n=51$)		Mean differences (95% CI)	t - statistics (df)	p - value
	Mean	SD	Mean	SD			
FSS score	3.991	0.986	4.360	1.136	-0.369 (-0.907, 0.170)	-1.365 (73)	0.176

Relationship between the Phase of Post-COVID-19 Infection and Fatigue Level

The respondents were asked for two phases of the post-infection period: 1 to 3 months ago and more than 3 months ago. A total number of 61 respondents (81.3%) accumulated for the last COVID-19 infection more than 3 months ago while the remaining 14 respondents (18.7%) accounted for 1 to 3 months ago.

Looking at the high and low fatigue groups, descriptively, quite a high number of respondents reported high fatigue in the subgroup of “more than 3 months ago” as compared to “1 to 3 months ago” (43 vs 8). Meanwhile, in low fatigue groups, the subgroup of “more than 3 months ago” was also found to be higher than the subgroup of “1 to 3 months ago” (18 vs 8) (Figure 2). In finding the differences in the relationship between fatigue level and recovery phase post-COVID-19, the p -value was 0.175 (Table

3). Therefore, there was no significant difference between the last time of experiencing COVID-19 infection and fatigue level, despite the differences between the subgroups.

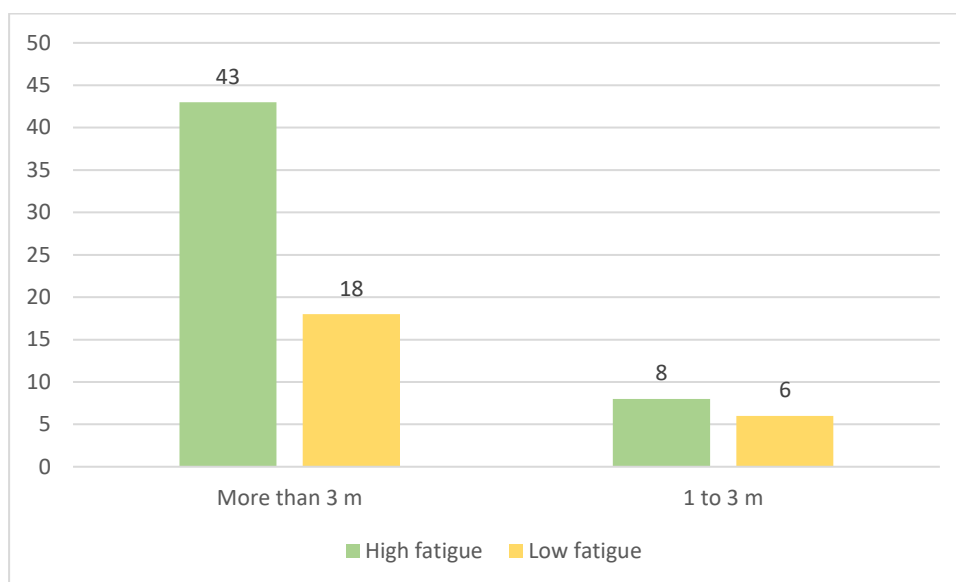


Figure 2: Bar Chart on the Frequency of Low Fatigue and High Fatigue Groups in COVID-19 Occurrence (n=75)

Table 3: Comparison of the Post-COVID-19 Infection Phase and Level of Fatigue using independent t-test (n=75)

Variable	1 to 3 months (n=14)		More 3 months (n=61)		Mean differences (95% CI)	t-statistics (df)	p-value
	Mean	SD	Mean	SD			
FSS score	3.881	1.075	4.324	1.094	0.443 (-0.201, 1.088)	1.371 (73)	0.175

Association Between Level of Fatigue and Physical Activity Level in Post-Covid-19 Survivors of IIUM Kuantan Community

For the physical activity level, a moderate level was achieved in almost half of the respondents (48%), followed by a vigorous level (38.7%), and lastly low level (13.3%). The result indicated a good habitual practice of post-COVID-19 IIUM Kuantan survivors towards PA. When comparing genders and PA levels, the majority of the females (52.9%) have moderate PA levels while in males, they were dominant in high PA levels (58.3%). Much to our surprise, there was no significant association found between fatigue and physical activity, with a p-value higher than α (0.703 > 0.05).

DISCUSSION

Consistent with the previous studies, the current result shows that post-COVID-19 fatigue was highly prevalent in long COVID patients, with the total respondents of 68% reported that they experienced this prominent symptom (Joli et al., 2022; Malik et al., 2022). In addition, it was found that the mean age of the respondents in this study is 23.64 ± 5.795 . Although older age could be a contributing factor to fatigue, this finding shows that being young is not an exception in getting post-COVID-19 fatigue. Davis et al. (2021) surveyed long COVID in young adults (age 18-39 years old) and identified fatigue as the most frequent symptom, forcing 22% of patients to cut their working hours in half, along with the inability to work. Hence, the young age group (age 18 to 44 years old) who in general are more active in physical activity (WHO, 2022b) are prone to post-COVID-fatigue relapses because being overly active may lead to muscle loss and consequently affect the acceleration of muscle fatigue. Practicing a good lifestyle is not harmful, but in long COVID people, muscle fatigue must be tackled first before returning to pre-morbid PA level or else it will worsen the fatigue symptom. Incorrect PA patterns can cause worsening of long COVID symptoms such as fatigue (Wright et al., 2022).

Relationship between Gender and Fatigue Level

This study attempted to find out whether there would be any differences in the fatigue levels among the male and female respondents. While reporting that there was no significant difference between gender and the level of fatigue ($p=0.176$), female respondents tend to have a higher level of fatigue as measured by the FSS score (4.360 ± 1.136) as compared to males (3.991 ± 0.986). In support of this finding, Boter et al. (2014) also found that gender is independent of the level of fatigue. Concurrently, Aldhahi et al. (2022) examined the fatigue severity among recovered COVID-19 subjects, and reported that females were prone to have high fatigue as compared to males. The existence of these gender-based differences may have its explanation. Sex hormones may come into play in discussing the development of high fatigue in females. Meanwhile, the inflammatory response, which is the associated factor in fatigue is different between males and female. The cytokine interleukin 6 (IL-6) found in persistent fatigue was said to be higher in females than males. In summary, females are prone to high fatigue because they are at risk of muscle fatigue, more exposed to long COVID symptoms, have more immune symptoms, and are associated with various diseases caused by hormonal changes. However, this current study has limitations in analyzing gender-based differences in post-COVID-19 fatigue. The more comprehensive and explorative study is required to further explore this relationship.

Relationship between Phase of Post-COVID-19 Infection and Fatigue Level

The study showed that there was no significant difference between the phase of post-COVID-19 infection and fatigue level. Furthermore, even the FSS mean score value shows the phase for “3 months ago” is higher than (4.324 ± 1.094) the phrase “1 to 3 months ago” (3.881 ± 1.075). This finding is in contrast with the initial finding by NICE (2022), which stated that the long COVID symptoms are supposedly to subside after 12 weeks post-infection.

Augustin et al. (2021) found that at a period of more than three months post-infection, 14.2% of their respondents complained of fatigue. This is supported by Goërtz et al. (2020), who did a study among 2,113 participants at three months following the onset of COVID-19 symptoms and found that fatigue is one of the most prevalent symptoms, impacting 87% of the participants. COVID-19 is the main factor for fatigue but with the presence of co-factors such as less sleep quality, mood disorders as well as abnormal illness beliefs and behavior (e.g. over-exercise to fight off the exertion) these might conjure a set of determinants in post-COVID-19 fatigue (Sandler et al., 2021).

Association Between Level of Fatigue and Physical Activity in Post-Covid-19 Survivors of IIUM Kuantan Community

There is no association found between fatigue and physical activity level among IIUM Kuantan post-COVID-19 survivors ($p=0.703$). To the writer's knowledge, there is no direct study that examined the association between fatigue and physical activity in a population of post-COVID-19 in Malaysia. The emergence of COVID-19 is quite new, and most of the research explored these two variables independently such as physical activity level and pattern alone without connecting the relationship with fatigue level.

Several researcher has found a relationship between fatigue and physical activity but in different populations. Özkeskin et al. (2021) conducted research in multiple sclerosis (MS) patients with and without a COVID-19 history. The findings showed that the PA level was lower in COVID-19 MS patients and fatigue has an association with the PA level, in which the author found that the PA level is lower when the fatigue level is higher. Meanwhile, Vieira et al. (2021) conducted a study among chronic obstructive pulmonary disease (COPD) patients and found that those with higher scores of fatigue have lower PA levels, though the relationship is weak. There is also a study that explores the middle age groups and the results are similar to the above (Liao et al., 2017). In explaining the older age association with fatigue-PA level relationship, Vetrovsky et al. (2021) stated that functional status in this age group was influenced by fatigue. Older adults who typically had higher levels fatigue took fewer steps/day. However, this current study did not include any respondents above 65 years old and had received fewer participants from different ranges of age. Therefore, this might conceal the fact that older age may be the contributing factor to the association between fatigue and physical activity level. It is understood that fatigue is likely to affect physical activity levels, considering the fact from the pathological view. The small sample size and an instrument of self-reported fatigue and physical activity in this study might explain the less accuracy in determining the relationship.

CONCLUSION

This study has shown that fatigue is highly prevalent in post-COVID-19 survivors among the IIUM Kuantan community despite the mean age being from young age, and a significant difference between high and low fatigue groups. It is noteworthy to mention that even though there is no significant difference in the fatigue level when comparing to gender and post-COVID-19 infection phase as well as no association between fatigue and physical activity level, there is an important finding that elucidated a clear relationship between these two variables. This study may suggest that future

researchers to look into the level of fatigue in different timeframes and comprehensive assessment by the clinician to come up with more meaningful data.

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