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Original Article

Functional Capacity COVID-19 Survival among Workers in Koja Public Health Center

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Abstract

Background : Coronavirus disease 19 (COVID-19) primarily affects the respiratory system and other organ systems which limit respiratory and physical status. The aim of this study is to evaluate functional capacity COVID-19 survivor among workers in Koja Public Health Center
Methods : participant were enrolled on March–April 2022. Demographics, symptoms, functional scale post COVID-19 questionnaire, risk stratification, and 6-min walk test (6mwt) were analysed. Patients unable to walk were excluded from the study.
Results : 79 participants, 38% was a health care worker, had a median age 33 (21–57) years and 43 women (54.4%). Men had higher 6mwt 518.2 (120–625.8) meter while women had 457 (340–600) meter p (<0.001), VO2max 17.47 (9.74–20.67) in men and 16.45 (14.07–19.19) in women p (<0.001), and METs 5.02 (2.78–5.90) in men and 4.69 (4.02–5.48) in women p (<0.001). Most of the participant had good fitness, 10 participant (12.7%) had functional limitation; 2 participants (2.5%) still had symptom.
Conclusion : Despite being COVID-19 survivors, the workers at the Koja Public Health Center have good functional capacity.

Keywords : COVID-19, survival, Functional capacity, worker, 6mwt

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INTRODUCTION

Coronavirus disease 19 (COVID-19) is a disease due to novel coronavirus SARS-CoV-2 virus that primarily affects the respiratory system and other organ systems.[1] World Health Organization (WHO) declared the situation as a Public Health Emergency of International Concern, and it was finally stated a global pandemic on March 11, 2020.[2] SARS-CoV-2 is an enveloped single-stranded RNA beta-coronavirus which is highly contagious. SARS-CoV-2 can spread directly through droplet and human-to-human transmission and indirectly by contact with contaminated objects and airborne contagion.[1] COVID-19 could affect respiratory status, physical and mental health.3 There are a wide range of symptoms in the infected SARS-CoV-2 patients. It can be ranges from minimal symptoms to severe respiratory failure with multiple organ failure.

COVID-19 could leave some sequelae after infection. Patients with severe COVID-19 disease may have some sequelae that could affect their respiratory status, physical and mental health after hospital discharge.[3] Many patients experience persistent respiratory symptoms months after their initial illness of COVID-19.[4] COVID-19 survivors are reported to have permanent lung damage, as a result of diffuse alveolar damage during the development of the disease.[5] There is also some emerging research to suggest that even mild to moderate COVID-19 can have negative ongoing functional associations for non-hospitalized patients.[6] Notably, also a considerable proportion of low-risk individuals with mild COVID-19 experience prolonged symptoms affecting work, social, and home life.[7] Based on the individual deficits in COVID-19 patients, comprehensive and multidisciplinary rehabilitation such as pulmonary rehabilitation should be offered with attention to improving respiratory, physical and psychological impairments.[8]

Measuring COVID-19 disease severity in a population has been important for understanding the public health impact of each variant of concern. A watershed moment in the COVID-19 pandemic was the emergence of the Omicron (B.1.1.529) variant of SARS-CoV-2 with widespread reports of lower disease severity relative to previous variants such as Delta (B.1.617.2). The case fatality ratio of 3.4% for Delta and 1.9% for Omicron, about a twofold difference. Therefore, Omicron does have lower severity by these measures, with the precise severity drop relative to Delta dependent on how the number of infections is estimated.[9]

We hypothesized that individuals with confirmed COVID-19 likely to have problems with physical capacity. This study conducted to investigate the physical capacity of non-hospitalised patients with COVID-19.

METHODS

Study design

This study was a cross-sectional clinical study on COVID-19 survivors among workers in Koja Public Health Center from March to April 2022. Koja Public Health was chosen as it is one of university partners in community engagement that had covid-19 cure and death percentages in the average range.

Subjects

Participants were recruited with consecutive sampling. The inclusion criteria of the study were aged ≥18 years, negative COVID, hemodynamically stable, respiratory rate <25 breath/min. The patients were excluded from the study if they have neurological, neuromuscular, and musculoskeletal limitations, cognitive dysfunction, end-stage of chronic diseases, and body mass index (BMI) >35 kg/m^2. All patients were instructed to sign a written informed consent after explanation about the details of the study procedures. Koja Public Health Center is managed and financed by the local government, under the DKI Jakarta Provincial Health Service.

Outcome measures

Patient characteristic, clinical symptoms were collected. Post covid-19 functional status scale (PCFS), risk stratification, fitness level and six minute walk test (6MWT) were assessed. Post covid-19 functional status scale was a questionnaire covering the entire range of functional limitations, including changes in lifestyle, sports, and social activities. If there was no limitation of activity, it was graded as Grade 0, if there was a negligible effect on activities for patients was considered Grade 1, whereas a lower intensity of the activities was considered as Grade 2. Grade 3 accounted for the inability to perform certain accomplishments, forcing patients to structurally modify these. Finally, Grade 4 was reserved for those patients with unembellished functional restrictions.[10] Risk stratification consist of symptom, activity and medical condition of subject. If there was a symptom, it was graded as A, if there was no symptom, active, without medical condition it was graded as B, if there was no symptom, active, with medical condition it was graded as C, if there was no symptom, not active, without medical condition it was graded as D, and if there was no symptom, not active, and with medical condition it was graded as E. 6MWT is simple, easy to perform, inexpensive and widely used in clinical routine provides a useful assessment tool of cardiopulmonary and musculoskeletal function that is relevant to daily activities.[11] Using Cahalin formula to predict VO2max from the 6MWT for measuring aerobic exercise capacity.[12]

Statistical analysis

All data were analysed using SPSS version 20. The data were checked for normal distribution by the Shapiro-Wilk test. Data were analysed based on a T-test analysis method to determine the differences between gender and occupation if data normally distributed and Mann Whitney if data non normally distributed. The significance level was set at P<.05 for all outcome measures.

RESULTS

Seventy-nine recovered COVID-19 subjects were enrolled in this study, 36 (45.6%) were men and 43 (54.4%) were women. The median age was (21–57) years. In Thirty subjects (38%) were a health worker which included doctors, dentists, nurses, midwife, physiotherapists, etc; and forty nine subject (62%) were non health worker which included administrations, security, driver, etc (Figure 1).

Ten (12.7%) subjects had functional limitation after COVID-19 infection. The functional state of subject consists of sixty-nine (87.3%) subjects had grade 0, one subject hade grade 1 and nine subjects had grade 2 (Figure 2). Two (2.5%) subjects still had symptom after negative COVID-19 (Figure 3). The 6MWT of the COVID-19 survivors were 487.5 (120–625.8) meter, with VO2max 17(9.74–20.67) and METs 4.84 (2.78–5.9). The

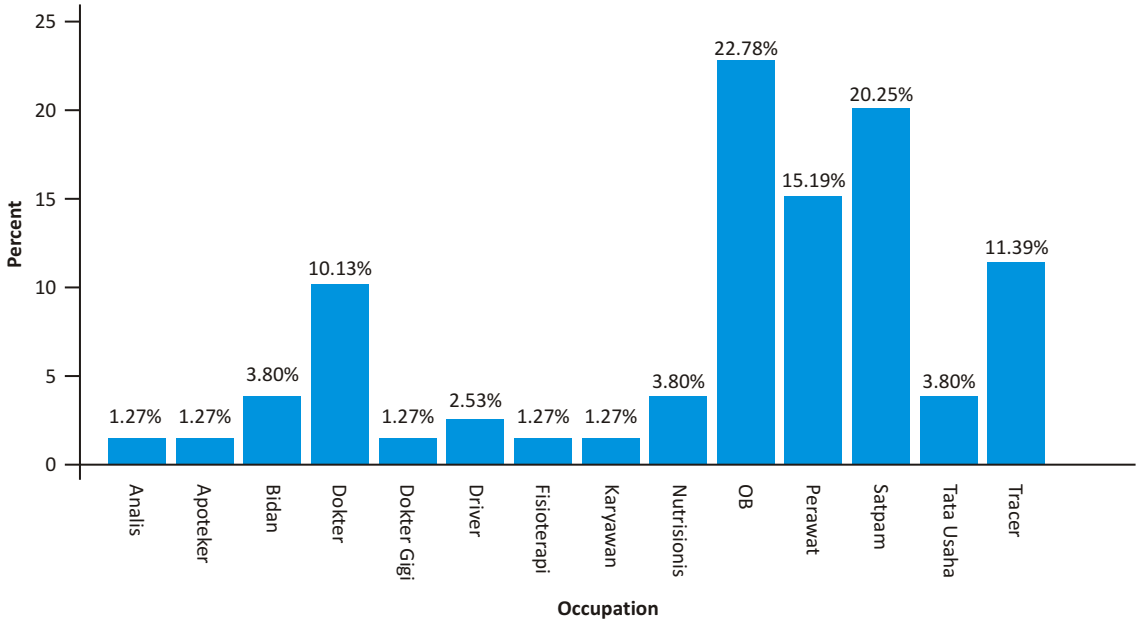

Figure 1. Type of Occupation

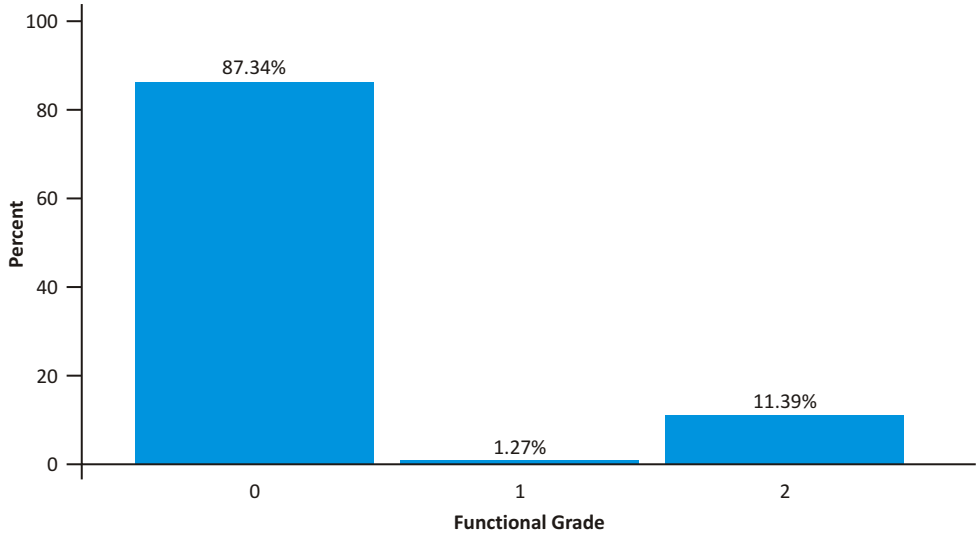

Figure 2. Functional Grade

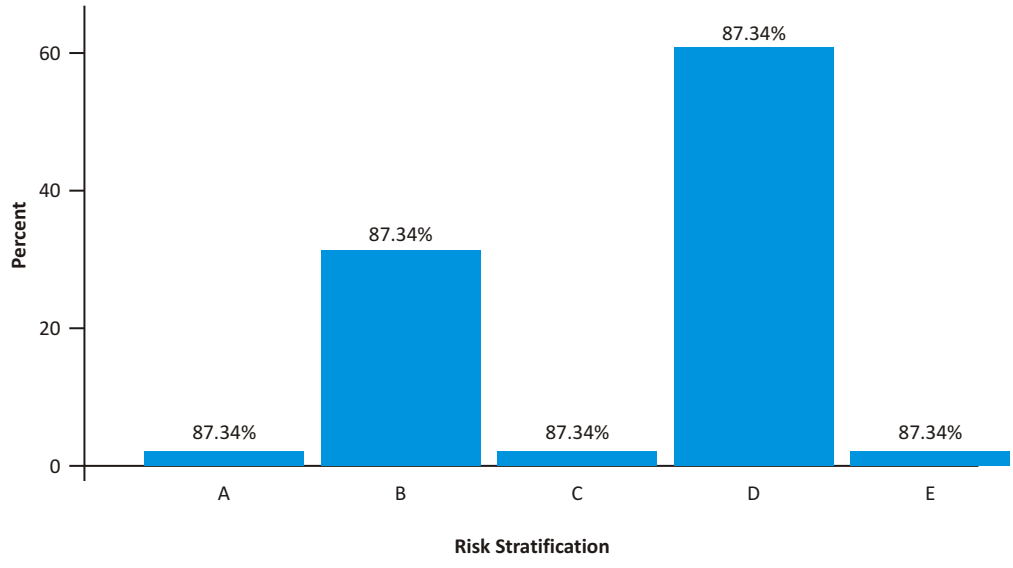

Figure 3. Risk Stratification

TABLE 1
Functional Capacity

Variable		Subject (n=79)	p
6MWD (m)	Men (n=36)	518.2 (120 – 625.8)	<0.001*[a]
	Women (n=43)	457 (340 – 600)	
Vo2max (ml/kg/min)	Men (n=36)	17.47 (9.74 – 20.67)	<0.001*[a]
	Women (n=43)	16.45 (14.07 – 19.19)	
METs	Men (n=36)	5.02 (2.78 – 5.90)	<0.001*[a]
	Women (n=43)	4.69 (4.02 – 5.48)	

*p<0.05=Significance, [a]Mann Whitney

median 6MWD, VO2max and METs was significantly lower in women (P <0.001) is presented in Table 1. Only one subject (1.3%) had poor level fitness (1,5–3 METS) and seventy-eight (98.7%) had moderate level fitness (3–6 METS). There was no significant different among health worker when compare with non-health worker for 6MWD (p=0.538), VO2max (p=0.443) and METs (p=0.430).

DISCUSSION

COVID-19 causes a wide range of pulmonary and extrapulmonary clinical symptoms, including functional capacity impairment. (e.g., muscle weakness, mobility decline, reduced exercise tolerance, circulatory limitation, lung damage, and myopathy). Previous experience with SARS, another severe viral respiratory syndrome comparable with COVID-19, suggests that patients with this illness have experienced varying degrees of abnormalities in their muscle capabilities, quality of life, and cardiorespiratory after a year of follow-up. In fact, as many as 23.7% showed a decreased exercise capacity after a year of hospital discharge, compared to the predicted levels for age-matched healthy adults. Vianna *et al* found lower levels of 6MWT distance (~21%) and percentage of predicted 6MWT distance (~20%). The multisystemic nature of COVID-19 could be one possible theory. The performance of functional tests not only dependant by the respiratory system, but also the integration of multiple physiologic systems. The combined effects of detraining and COVID-19 sequelae may limit exercise capacity, and both leg muscles and respiratory are susceptible to a variety of systemic illnesses that reduced strength and mobility. Anaemia and myopathic changes were found to be the primary causes of reduced exercise capacity rather than pulmonary, respiratory, cardiac impairments, or vascular on the day before hospital discharge in previous

studies of COVID-19 pneumonia survivors. In line with the role of peripheral factors on exercise capacity, the most common persistent symptoms are fatigue or muscle weakness (63%) after 6 months COVID-19 onset. The combined effect of COVID-19 symptoms and detraining was predicted to alter the arousal of post viral fatigue syndrome, hence effecting exercise capacity.[13]

6MWD was performed to assess the global and integrated responses to exercise.[14] Age, gender, race, height, and weight were all statistically significant predictors of 6MWD.[15] In this study Men had higher 6MWD 518.2 (120–625.8) meter while women had 457 (340–600) meter p (<0.001), VO2max 17.47 (9.74–20.67) in men and 16.45 (14.07–19.19) in women p (<0.001), and METs 5.02 (2.78–5.90) in men and 4.69 (4.02–5.48) in women p (<0.001). Given that taller people tend to take longer steps, which makes walking more efficient and allows for greater distances to be covered by taller women and men.[15] Walking distance cut off points were examined between genders. In male subjects, actual walking distance were taken as normal if it was greater than 483 meters, poor if it was 434–483 meters, and very poor when less than 434 meters. As for female subjects, normal when greater than 442 meters, poor when 405–442 meters, and very poor in distance when less than 405 meters.[16] Based on the cut off value, it may be assumed that, on average, the majority of functional participants are in excellent condition.

Most age groups had low 6MWT distance, myopathy and muscular wasting might be responsible for this, since most of COVID-19 survivors had a very well-preserved lung function. Muscle loss and physical deconditioning may result from extended bed rest and hospitalization. In addition, medication using systemic corticosteroids might contribute to myopathy.[14] In older study, found that the 6MWT distance of the 21 (80.7%) test subjects from the COVID-19 group (561.1 ± 71.0 m) was lower than the controls (652.6 ± 53.4 m), ($p < 0.05$).[17] The COVID-19 Group's SpO2 measured during the 6MWT was substantially lower, and their measurements of leg fatigue, general fatigue, and dyspnea scores were all significantly greater. Severe COVID-19 patients have persistent lung damage that lowers their functional capability, quality of life, and respiratory function. According to Ferrandi *et al* hint that covid-19 virus may affect some skeletal muscle through angiotensin-converting enzyme-2 (ACE-2). While the SARS-COV 2 is active in the lungs and leukocytes infiltrate the lung tissue, these leukocytes produced cytokines (most notably IL-6) which disrupts metabolic homeostasis and causes muscle loss by entering and infiltrating into the muscle. Furthermore, inadequate oxygen diffusion and delivery to peripheral tissues, due to fibrosis could explain peripheral muscle weakness. All these explanations about declining strength of the peripheral muscles could be the cause of shorter 6MWT distance.[17]

Different with previous studies, we found only two subjects still had symptom after negative COVID-19 and only one subject had poor level fitness. Most of subject had moderate level fitness (3–6 METS), and 87.4 % had grade 0 functional capacity (Figure 2), which means they do not have activity limits despite being exposed to COVID-19. This condition may be due to all subjects had mild symptom and non-ARDS patients. Anastasio *et al* found correlation between SpO2/FIO2 ratio and SpO2 at rest (p<0.001) and during 6MWT (p<0.001) was higher in non-ARDS patients.[18] Furthermore numerous studies finds no evidence of Omicron having lower severity than Delta, as determined by the percentage of positive test-takers who report symptoms or the percentage of individuals who seek medical treatment after the infection. However, currently there are relatively little hospitalization data available.[19] The lower disease severity observed populations during the Omicron wave of the SARS-CoV-2 pandemic infection can be attributed to mutations in the virus that limit its ability to spread in the lungs and, probably most importantly, to increased immunity in the population by COVID-19 vaccination and also, previous infection. The severity of the disease is measured by the outcomes such as the need for additional ventilation, supplemental oxygen, total hospital admissions, and mortality. This results in a case fatality ratio of 1.9% for Omicron and 3.4% for Delta, which about two times of a difference. As a result, Omicron does have lower severity compared with Delta depending on how the COVID-19 infection is estimated.[9] Limited information regarding the type of variant and onset of COVID 19 in each participant is a weakness in this study. As a result, the analysis of the correlation between the COVID-19 variation and the level of fitness cannot be conducted.

Among the findings of this study, 60.76% (Figure 3) of participants were classified as stratification grade D, which implies they have no symptoms and no history of disease but are not physically active. This is especially concerning because a lack of physical exercise raises the risk of chronic diseases such as cardiovascular disease, metabolic disorders, and other cognitive disorders.[20] Furthermore, being in a condition of passive activity, particularly during the COVID-19 epidemic, can increase the occurrence of depression, stress, and anxiety. As a consequence, it is essential to empower people to maintain physical activity.[21] Unfortunately, there was no details on prior activity history in this study. As a result, we cannot determine whether this inactivity is related to Covid19 or has been in the past.

CONCLUSION

The functional capacity and health status of COVID-19 survivors was good in workers in Koja Public Health Center. The lack of data on the onset of covid, the number

of times exposed to covid, and the level of fitness prior to covid were weakness in this study. There for, further research is recommended, using better design.

Abbreviations

COVID-19 : Corona Virus Disease 2019, 6MWT : 6 Minute Walking Test, METs : Metabolic Equivalents, WHO : World Health Organization, RNA : Ribonucleic Acid, BMI : Body Mass Index, PCFS : Post Covid 19 Functional Scale, SPSS : Statistical Package for the Social Sciences,6MWD :The 6-min walk distance,SPO2 :peripheral capillary oxygen saturation, ACE 2 : Angiotensin-converting enzyme 2,IL-6 : Interleukin 6,ARDS : Acute respiratory distress syndrome.

Ethics Approval and Consent to Participate

The study was approved by the Medical Faculty of University Indonesia Research Ethic Committee.

Competing Interest

The authors declare that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The datasets generated and/or analysed during this study are not publicly available due to confidentiality but are available upon reasonable request.

Authors' Contribution

IM was the project leader and was responsible for study and project design. MH, WK PS, BL, N, and RK as conceptualized designs and as advisers. RE, ED, VN, and PO performed the data collection. AD, RZ, RF, and FL calculated the study results. NS, ES, SP and JT contribute in coordinating with research sites and assisting in data collection LM, YT, and GR were co-writing and involved in the revision of the manuscript.

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