



Available online at:

<https://ejournal.upi.edu/index.php/penjas/article/view/26791>DOI: <https://doi.org/10.17509/jpjo.v5i2.26791>**Physical Activity, Nutritional Status, Basal Metabolic Rate, and Total Energy Expenditure of Indonesia Migrant Workers during Covid-19 Pandemic****I Putu Agus Dharma Hita^{1*}, B. M. Wara Kushartanti², Fitri Agung Nanda**

Post Graduate, Sport Science, Yogyakarta State University, Indonesia

Article Info*Article History :**Received July 2020**Revised July 2020**Accepted August 2020**Available online September 2020**Keywords :**basal metabolic rate, nutritional status, physical activity level, total energy expenditure***Abstract**

Physical activity, nutritional status, and total energy expenditure are important components of a human. The purpose of this study was to investigate the depiction of physical activity, nutritional status, basal metabolic rate, and total energy expenditure of Indonesia migrant workers during Covid-19 pandemic. The study was a survey study with a descriptive design. The samples were 86 Indonesia migrant workers. The instrument used was the 24 hour recall physical activity sheet for 14 days. The result of the study showed that 88% of male samples and 95% of female samples gained physical activity level score in light category. The PAL score of the male samples was 1.56, while the PAL score of female samples was 1.52. Related to body mass index, 51% of Indonesia migrant workers were in the normal weight category; 27% were in the overweight category, 17% were in the Obese I Category and 5% were in the Obese II category. 22 Indonesia migrant workers in overweight category had light physical activity category, 15 persons in Obesity I category had light physical activity category and 4 persons in Obese II category. The average of the BMR of the samples during the quarantine, due to Covid-19 pandemic, was 1669 kkal/day for male and 1335 kkal/day for female. The average of total energy expenditure of the samples during Covid-19 quarantine was 2595 kkal/day for male and 2031 kkal/day for female. The physical activity level was light, the nutrition status was normal, total energy expenditure was low, the BMR of the sample was dominated by age factor, sex, and weight of the sample. The result of the study was expected to be a reference of regional and other quarantine systems to improve the immunity system during the 14 days of quarantine.

✉ Correspondence Address : Jl. Bunga Merak 1, Bandar Lampung, Indonesia.

E-mail : fitriagungnanda16@gmail.com

INTRODUCTION

There has been a mysterious epidemic worldwide, and this outbreak is said to be similar to pneumonia but there is a significant difference in its spread. The first case is reported to have started on December 31, 2019 in China. It was reported that there was a mysterious case of pneumonia. The spread of the pneumonia-resembled virus infects 44 people in the span of 3 days only and increased to thousands of cases (WHO, 2020). The virus presumably originates from an animal market in the Wuhan area, because 66% of the patients are associated with the animal market.

After conducting research on what disease the infected patients suffered, it is revealed that there is a new virus infection related to pneumonia, namely coronavirus, which is a new type of betacoronavirus, and is later given the name 2019 Novel Coronavirus (2019-nCoV). WHO first officially announces the outbreak of this virus on February 11, 2020 which is later named Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) and the disease is Coronavirus Disease 2019 (Covid-19) (PDPI, 2020). In no time the spread of the virus is increasingly widespread throughout the world.

The impact of the spread of the Covid-19 pandemic causes many countries from around the world to take anticipatory steps by limiting their activities. Moreover, some countries implement lockdowns by closing shops and tourist attractions to avoid the spread of the virus. The effect of this lockdown was the dismissal of workers, including Indonesian Migrant Workers (PMI). PMI refers to Indonesian citizens who are actively doing work and receiving salaries given from foreign parties outside the territory of the Republic of Indonesia (UU No 18, 2017). The dismissal of PMI due to Covid-19 leads to their return to Indonesia. PMIs who work abroad are returned to their respective hometowns; and some of them are 343 PMIs from Kabupaten Jembrana, Bali Province, consisting of 265 men and 75 women who were sent home on May 21, 2020. In accordance with the policy of the local government, every PMI who comes from outside the area should carry out physical quarantine for 14 days at hotels provided by the Jembrana government.

During the 14-day quarantine, the PMIs are ex-

pected to keep carrying out physical activity and to control the nutrition intake entering their body to increase body immunity and avoid various diseases or other viruses. Lack of physical activity can affect the level of immunity, in addition to it, the intensity of rest and enough sleep is crucial to increase body immunity (Sukendra, 2015). Physical fitness is needed by our bodies to be able to conduct various daily activities properly, as well as not to get sick easily (Purwanto, 2011). However, problems will arise if the consumption of foods are too excessive and unbalanced, and will certainly increase the risk of being overweight. The number of energy requirements is measured by using basal metabolic rate method (BMR). The individual BMR is influenced by some factors including body weight and gender (FAO, 2001). Basal metabolism is the minimum energy that the individual must possess in order to maximize the basic functions of the body.

In relation to the proper food intake, the overweight occurrence is triggered by unbalanced food consumption such as a very large amount of intake, high fat, lots of carbohydrates, and low fiber without followed by a balanced energy expenditure like physical activities. An individual is categorized as overweight if the value of the BMI (Body Mass Index) is more than 23 (23 - 24.9). Meanwhile, it can be considered obesity if the BMI value is more than 25 (> 25) according to Asia Pacific criteria (P2PTM, 2018). Data from (WHO, 2020) show that in 2016 there are more than 1.9 billion adults aged 18 years and over experience overweight, of which more than 650 millions of them suffering from obesity.

The majority of world population live in larger countries where overweight and obesity kill more people than the disease coming from underweight. There are 38 million children under 5 years old suffering from overweight and obesity in 2019. Meanwhile, more than 340 million children and adolescents aged between 5-19 years are overweight and obese in 2016. As in Indonesia, based on the results of the 2013 Basic Health Research (Kemenkes, 2013), there has been an increase in the prevalence of obesity in people over 18 years old from 13.9% in 2007 to 19.7% in 2013.

Based on the Covid-19 related explanation, the returns of migrant workers from abroad are in line with the importance of proper nutritional intake and physical

activity. According to the government regulations, a quarantine is required before PMIs can return to their normal activities. Regarding the quarantine program, the Jembrana Government also carry out self-quarantine aimed at preventing the spread of the Covid-19 virus. Based on data from the Official Web of the Jembrana Regency Government, the incidence of the spread of the virus in the agency has reached 51 positive patients as of July 17, 2020. Among the patients, 49 people recovered and 0 people died.

This research presents the physical activity, nutritional status, basal metabolic rate, and total energy expenditure of covid-19 quarantine Indonesian migrant workers in Jembrana Regency, Bali Province for 14 days of quarantine. This research is something new and has never been studied before. It is necessary to conduct this study because it will become a reference for regions and even other countries in carrying out quarantine for Covid-19 suspects. In addition, it is important to pay attention to the nutrition/food intake and physical activity because they play important role in increasing immunity and to fight any viruses that attack the body. The research results are also expected to be a reference for further research.

METHODS

This research was a descriptive quantitative study with a survey approach. This study was conducted to define physical activity, nutritional status, basal metabolic rate, and total energy expenditure of PMIs during the Covid-19 quarantine period. This research was conducted in Jembrana Regency, Bali Province, Indonesia for 3 months, from April to June 2020. The population in this study was 343 PMIs who carried out Covid-19 quarantine in Jembrana Regency in 2020. As for the sample, a purposive sampling technique was administered with the results of 86 PMIs consisting of 67 men and 19 women.

The variables in this study were physical activity, nutritional status, basal metabolic rate, and total energy expenditure of the research subject during the Covid-19 quarantine period. To collect data on the level of physical activity, measurements were made using a 24-hour physical activity recall sheet for the 14 days of the Covid-19 quarantine period. The physical activity was

categorized into very light physical activity, light physical activity, moderate physical activity, vigorous physical activity, and vigorous physical activity. The amount of a physical activity carried out was expressed in Physical Activity Level (PAL). PAL is the value of the Physical Activity Ratio (PAR) issued by an individual for 24 hours (FAO, 2001).

Nutritional status was determined by measuring body height and weight using the BMI method. The data collection method in this study was by filling out an identity form by PMIs during the Covid-19 quarantine period. The BMR value was obtained by looking at sex, age, and body weight which were directed to the formula in the table reviewed by (FAO, 2001).

The total energy expenditure referred in this study was the average energy expenditure of the PMIs during the 14 day Covid-19 quarantine period obtained by means of the BMR x PAL value (FAO, 2001). The data analysis technique used in this study was descriptive.

RESULT

According to the regulation issued by the Jembrana Regency Government, all PMIs were required to carry out a 14-day quarantine at the provided places. The following was the frequency distribution of the places where the quarantine was carried out as described in table 1.

Table 1. The Frequency Distribution of Quarantine Places

Hotel	Frequency	Percent
Hotel Bali Sunset	17	19.8
Hotel Hapel	1	1.2
Hotel Jimbarwana	9	10.5
Hotel Negara	30	34.9
Hotel Ratu	9	10.5
Hotel Jati	20	23.3
Total	86	100.0

Based on the table of the frequency distribution of the PMIs quarantined above, 19.8% (17 people) of the PMIs stayed at the Bali Sunset Hotel, 1.2% (1 PMI) at the Hapel Hotel, 10.5% (9 PMIs) at Jimbarwana Hotel, 34.9% (30 PMIs) in Negara Hotels, 10.5% (9 PMIs) at

Ratu Hotel, and 23.3% (20 PMIs) at Jati Hotel. Clearly, the majority of the research subjects carried out a quarantine at Negara Hotel.

Of the total of 86 PMIs as the research subjects, 77.9% (67 people) were males and 22.1% (19 people) were females. Doing regular physical activity is very useful for maintaining the body's immunity level. If the immunity is weak, it will be very susceptible to viruses or other diseases. Boosting immunity can be reached by doing physical activities and sports as well as enough rest. Poor physical fitness can be fixed by doing physical activities (Purwanto, 2011). The following was the frequency distribution of PMIs' physical activity levels based on gender.

Table 2. The Frequency Distribution of Physical Activities

		Sex				Total	PAL Average	
		M	%	F	%		M	F
PAL Level	Very light	0	0	1	5	1	1.56	1.52
	Light	59	88	18	95	77		
	Moderate	8	12	0	0	8		
Total		67	100	19	100	86		

Table 2 showed that 59 male PMIs (88%) were in the light category, 8 (12%) in the moderate level, and the rest were in the heavy category of physical activity. Meanwhile, the level of physical activity for female PMIs indicated 5% (1 PMI) in a very light level, 95% (18 PMIs) in light category, and the rest were in the moderate category. In total, the average male activity scores were PAL 1.56, and PAL women were 1.52. The low level of physical activity carried out by PMIs during the Covid-19 quarantine greatly affects the body immunity in preventing the transmission of the Covid-19 virus or other viruses. The higher the level of physical activity, the greater the effect are on the body immunity. It is in line with (Jee, 2020) that sport is identified as a factor that can increase body immunity and function as a vaccine against certain diseases and infections.

Not only reduce the level of immunity, lack of physical activity can also lead to accumulation of fat in the body because the intake of energy stored into the body from the food is greater than the energy sporting when doing physical activity. The use of a little energy

can affect the individual's movement and productivity, in this regard, individuals suffering from overweight are advised to do more vigorous physical activity. The overweight will determine the size of the nutritional status that the body obtained. The following table presents the distribution frequency of the PMIs nutritional intake.

Table 3. The Frequency Distribution of Nutritional Status

Nutritional Status					
		Frequency	Percent	Male	Female
Valid	Normal	44	51.2	35	9
	Overweight	23	26.7	17	6
	Obese I	15	17.4	12	3
	Obese II	4	4.7	3	1
	Total	86	100.0	67	19

Based on the table of the frequency distribution of nutritional intake, it showed that the nutritional status of PMIs who carried out the Covid-19 quarantine for 14 days was in the normal category of 51.2% (44 PMIs), which consisted of 35 males and 9 females. In the overweight category was 26.7% (23 PMIs) consisting of 17 males and 6 females, while 17.4% (15 PMIs) consisting of 12 males and 3 females was in obesity I category and 4.7% (4 PMIs) was in obesity II category with three males and one female.

Table 4. The Frequency Distribution of Nutritional Status

Nutritional Status* PAL					
		PAL			Total
		Very Light	Light	Moderate	
Nutritional Status	Normal	0	37	7	44
	Overweight	0	22	1	23
	Obese I	0	15	0	15
	Obese II	1	3	0	4
Total		1	77	8	86

Of the total PMIs that carried out Covid-19 quarantine, there were 22 PMIs in the category of excess in doing the lightest physical activity, 15 PMIs in the obesity I category with a fairly light level of physical activity, and four PMIs in the obesity II category with very light physical activity level (1 person) and light physical activity level (3 people). This shows that PMIs

awareness in carrying out physical activity is still very low, especially PMIs who have nutritional status conditions of overweight, obesity I, and obesity II. The following is a table of frequency distribution of nutritional status based on level of physical activity.

Energy in the form of calories released by the body is very dependent on the activities carried out in daily activities which contain physical activity. The higher the activity we do, the higher the calories we spend. Metabolic processes in the body also require energy to run, where energy measurements for the body's metabolic processes are carried out using the BMR method. BMR or basal metabolic rate is the calories needed for the basal activity. In this study, it was found that the average BMR from the PMIs during the Covid-19 quarantine was 1669 for men and 1335 for women. Therefore, the average calories needed by PMIs during the 14 days of Covid-19 quarantine to carry out basal activities are 1669 kcal/day for men and 1335 kcal/day for women. The following is the descriptive statistical BMR data of PMIs in the Covid-19 quarantine.

Table 5. The Statistic of Basal Metabolic Rate (BMR)

	Basal Metabolic Rate			
	N	Min	Max	Mean
Total	86	1195	2123	1594.92
Male	67	1493	2123	1668.68
Female	19	1195	1598	1334.78

In this study, the average total energy expenditure of the PMIs during the 14 days of Covid-19 quarantine was 2595 kcal/day for men and 2031 kcal/day for women. The following is the statistical description of PMI's total energy expenditure during the Covid-19 quarantine.

Table 6. The Statistic of Total Energy Expenditure

	Total Energy Expenditure			
	N	Minimum	Maximum	Mean
Total	86	1783	3243	2470.19
Male	67	2157	2595	2594.81
Female	19	1783	2220	2030.85

DISCUSSION

The results of the study show the total average activity value of the male PMIs in 1.56 and 1.52 for the women, which is in the light category of physical activity level. Among the PMIs that carry out quarantine, there were 22 PMIs in the overweight category with light physical activity level, 15 PMIs in the obesity I category with light physical activity level, and 4 PMIs in the obesity II category with very light physical activity level (1 person) and light physical activity level (3 people). This shows that PMIs' awareness in carrying out physical activity is still very low, especially the PMIs who have nutritional status of overweight, obesity I, and obesity II. The average calories needed by the PMIs during the Covid-19 quarantine period to carry out their basal activities is 1669 kcal/day for men and 1335 kcal/day for women. The average total energy expenditure of the PMIs during the 14 day Covid-19 quarantine is 2595 kcal/day for men and 2031 kcal/day for women. The findings revealed the physical activity, nutritional status, average calculation of BMR which was related to body immunity against bacteria and viruses. The results of this study are in accordance with several previous literature reviews.

There needs to be a balance of physical activity and food intake to increase body immunity. Further, the excessive physical activity can reduce body immunity and vice versa for doing low physical activity with high food intake, it will cause a buildup of food in the body (T. Ahmed, 2012). The immune system is an important factor in maintaining the physiological function of foreign substances and bacteria, viruses through a complex and multi-layered mechanism. The human immune system has two parts, namely the adaptive and the acquired immune system. Some are also influenced by certain things that can interfere with the immune system, nutrition, psychological factors, environments, and physical exercises or activities. Neutrophils are important components of the innate immune system, initiating phagocytosis of many bacterial and viral pathogens and releasing immunomodulatory cytokines. In addition, two other environmental factors, improper nutrition and psychological stress, can negatively affect immunity (Anastasia et al., 2019). Physical activity and diet carried out by individuals in community are related to the metabolic system. The results revealed that inappropriate

ate diet and physical activity would affect public health. People were less able to assess dietary intake that their body receive by balancing it with physical activity (Lam et al, 2015).

Physical activity is the most effective alternative to prevent and manage a number of serious diseases including cardiovascular disorders and type 2 diabetes. One to three people fall into a higher level of physical activity category with lower all-cause mortality, better bodily function and better recovery from upper respiration problems and microbes (Hudson & Sprow, 2020). While there was still much to figure out about new coronavirus disease 2019 (COVID-19).

A detailed and accurate medical history of a COVID-19 patient, and from analyzing the CFR in addition to the recovery rate, can enable the identification of the area with the highest risk in order to set efficient medical care (Khafaie & Rahim, 2020). Furthermore, it is said that physical activity and good food intake will influence the increase in immunity to survive from the COVID-19 disease in infected patients. So it is important to maintain physical activity and nutritious food intake in order to increase body immunity to avoid the attacks of any bacteria and the COVID-19 virus. In addition to good nutritional intake, it needs to be balanced with vitamin D intake which is needed to increase the immune system against bacteria, viruses and other diseases (Carter et al, 2020).

Physical exercise is the best alternative as one of the natural therapies to increase body immunity against the COVID-19 virus (Jiménez-Pavón et al, 2020). This virus is known to attack the body's immune system. Physical exercise is expected to be able to increase the immunity NSCA, (2020). Conducting outdoor sports has a big risk in the spread of covid-19. However, it still can be performed by adhering to the protocol. A proper physical activity is needed to increase immunity in anticipating the COVID-19 (Chen et al, 2020).

Self-quarantine by avoiding direct contact with public facilities, reducing physical interaction through social distancing, and closing public gatherings including sporting events, concerts, restaurants and schools is one of the most important ways to reduce the risk of COVID-19 spread (Ng, 2020).

An adequate physical activity will have a good

relation with the nutrients absorbed by the body. It is further revealed that the immune function during obesity shows that excessive adiposity is associated with impaired immune response leading to pathology (Huang et al., 2013).

Physical activity and physical fitness carried out are associated closely with body weight that comes from the food intake. If the food intake received by the body is not excreted through physical fitness and activity, it will probably results in obesity or overweight which will have a bad impact on health (Simbolon & Firdausi, 2019). The individual's habit of doing physical activity is a method used to build the immune system or immunity. The physical activity performed can develop a healthy lifestyle and encourage a healthy behavior in society (Apriantono et al, 2018).

CONCLUSION

Based on the results obtained, this study concludes that PMI's physical activity were in the light category which affected PMI immunity during the quarantine period. The nutritional status during the quarantine was normal because the fulfillment of the food intake given was in accordance with the needs by the body, while PMI's total energy expenditure was in the low category because PMI was in quarantine and was associated with light physical activity. The average BMR during 14 day quarantine was dominated by the factors of age, sex, and body weight (BW) of the PMI during the COVID-19 quarantine period. Hopefully every individual, especially PMI, will further increase their physical activity in order to maintain the immunity level to avoid the Covid-19 virus and other viruses attacks. The results of this study are expected to be a reference for local governments and other quarantine systems to focus on increasing body immune system while conducting a 14 day quarantine.

REFERENCES

- Anastasia, A., Noora Adam, A., Ghaidda Bassem, A., Hisham, H., & Samreen, A. (2019). How Does the Immune Response to Exercise Differ from the Immune Response to Infection? How can this be Applied while Advising Athletes Regarding Return to Activity/Competition? *EC Orthopaedics*, 9(10), 837–843.
- Carter, S. J., Baranaukas, M. N., & Fly, A. D. (2020). Considerations for Obesity, Vitamin D, and Physical Activity Amid the COVID-19 Pandemic. *Obesity*, 28(7), 1176–1177. <https://doi.org/10.1002/oby.22838>
- Chen, P., Mao, L., Nassis, G. P., Harmer, P., Ainsworth, B. E., & Li, F. (2020). Coronavirus disease (COVID-19): The need to maintain regular physical activity while taking precautions. *Journal of Sport and Health Science*, 9(2), 103–104. <https://doi.org/10.1016/j.jshs.2020.02.001>
- FAO. (2001). Human Energy Requirements. Food and Nutrition Technical Report Series, 26(1), 166.
- Huang, C. J., Zourdos, M. C., Jo, E., & Ormsbee, M. J. (2013). Influence of physical activity and nutrition on obesity-related immune function. *The Scientific World Journal*, 2013. <https://doi.org/10.1155/2013/752071>
- Hudson, G. M., & Sprow, K. (2020). Promoting physical activity during the COVID-19 pandemic: Implications for obesity and chronic disease management. *Journal of Physical Activity and Health*, 17(7), 685–687. <https://doi.org/10.1123/jpah.2020-0318>
- Jee, Y. S. (2020). How much exercise do we need to improve our immune system?: Second series of scientific evidence. *Journal of Exercise Rehabilitation*, 16(2), 113–114. <https://doi.org/10.12965/jer.2040178.089>
- Jiménez-Pavón, D., Carbonell-Baeza, A., & Lavie, C. J. (2020). Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus in older people. *Progress in Cardiovascular Diseases*, (xxxx), 9–11. <https://doi.org/10.1016/j.pcad.2020.03.009>
- Kemendes. (2013). Riset Kesehatan Dasar 2013. www.litbang.depkes.go.id.
- Khafaie, M. A., & Rahim, F. (2020). Osong Public Health and Research Perspectives Cross-Country Comparison of Case Fatality Rates of. *Osong Public Health Res Perspective*, 11(2), 74–80.
- Lam, N., Muravez, S. N., & Boyce, R. W. (2015). A comparison of the Indian Health Service counseling technique with traditional, lecture-style counseling. *Journal of the American Pharmacists Association* (Vol. 55). <https://doi.org/10.1331/JAPhA.2015.14093>
- Ng, K. (2020). Adapted physical activity through COVID-19. *European Journal of Adapted Physical Activity*, 13(1), 1–3. <https://doi.org/10.5507/EUJ.2020.003>
- NSCA, N. S. and C. A. (2020). Return to Training Guidance on Safe Return to Training.
- P2PTM. (2018). Klasifikasi Obesitas Setelah Pengukuran IMT. P2PTM Kemenkes RI, 1–2.
- PDPI. (2020). Pneumonia Covid-19 - Diagnosis dan Penatalaksanaan Di Indonesia (Vol. 55). Jakarta: Perhimpunan Dokter Paru Indonesia. <https://doi.org/10.1331/JAPhA.2015.14093>
- Purwanto. (2011). Dampak Senam Aerobik terhadap Daya Tahan Tubuh dan Penyakit. *Jurnal Media Ilmu Keolahragaan Indonesia*, 1(1), 1–9. <https://doi.org/10.15294/miki.v1i1.1128>
- Simbolon, M. E. M., & Firdausi, D. K. A. (2019). The Association between Body Mass Index and Physical Fitness among Adolescents. *Jurnal Pendidikan Jasmani Dan Olahraga*, 4(1), 1–7. <https://doi.org/10.17509/jpjo.v4i1.13758>
- Sukendra, D. M. (2015). Efek Olahraga Ringan Pada Fungsi Imunitas Terhadap Mikroba Patogen : Infeksi Virus Dengue. *Jurnal Media Ilmu Keolahragaan Indonesia*, 5(2), 57–65. <https://doi.org/10.15294/miki.v5i2.7890>
- T. Ahmed, E. (2012). Exercise and Immunity. *Journal of Novel Physiotherapies*, 02(04), 7025. <https://doi.org/10.4172/2165-7025.1000e115>
- UU No 18. (2017). Perlindungan Pekerja Migran Indonesia. Undang - Undang Republik Indonesia.
- WHO. (2020a). Novel Coronavirus (2019-nCoV) Situation Report - 1. *WHO Bulletin*, (JANUARY), 1–7.
- WHO. (2020b). Obesity and overweight, (April), 1–6.