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Nutrition Intake, Physical Activity, and Sleep Quality in the Month of Fast During Covid-19 Pandemic

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Abstract

Central Java is one of the provinces with the high number of positive Covid-19 cases in Indonesia, with 46,903 positive infected and a death rate of 2,110 people (4.49%). During the COVID-19 pandemic, community activities decrease, especially during the fasting month, while their diet has also changed. This study aimed to describe and analyse the relationship between nutritional intake and physical activity on people's sleep quality during the fasting month during the COVID-19 pandemic. The benefit of this research is to provide information on factors related to people's sleep quality and to improve public health. The novelty of this research is on aspects of physical activity and people's sleep quality during the fasting month during the covid-19 pandemic. This research method is observational by a cross-sectional approach. The research took time during the fasting month (Ramadan 2021) to find out the nutritional intake, physical activity, and quality of people's sleep while fasting amid the COVID-19 pandemic. This study was attended by 520 respondents, who were willing to fill out a questionnaire distributed via Googleform. Respondents in this study were limited to people who live in Central Java. The selection of respondents using the cluster sampling technique and then the snowball method. The questionnaires were the Pittsburgh Sleep Quality Index (PSQI), IPAQ and DQI. The results showed no relationship between physical activity and slept quality during the fasting month (p : 0.402). There is a relationship between food consumption, sleep quality (p: 0.0001), and physical activity (0.007) during the fasting month.

Introduction

At the end of 2019, the world was shocked by a virus emergence that caused a disease that was quite disturbing. News of the emergence of the virus came from a Huanan Seafood Wholesale Market located in Wuhan City, the capital of Hubei Province, Central China. At the beginning of its appearance, the virus was known as the 2019 novel coronavirus (2019-nCoV) (Chen et al., 2020). The genetic structure is used to name the virus to facilitate the development of diagnostic tests, vaccines, and drugs (Bangash et al., 2020; Han et al., 2020). Coronaviruses are serologic divisions of the Coronaviruses (CoVs) subfamily (Li et al., 2020; Kumar et al., 2020; Lam et al., 2015). Coronaviruses are based on characteristics, such as a crown, sizing from 26 to 32 kilobases. On February 11, 2020, WHO formalized the use of the term Covid-19 or "the Covid-19 virus" which stands for Coronavirus Disease 2019 (Liu et al., 2020; Pan et al., 2020).

The increase in Covid-19 cases has occurred rapidly since discovering the first case in early December 2019 in Wuhan, Hubei Province, Central China. WHO declared PHEIC (Public Health Emergency of International Concern) on January 30, 2020 (Xie et al.,

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2020; Susilo et al., 2020). Infectious diseases that can spread to many regions or countries are a separate consideration in determining a pandemic. On August 10, 2020, the global Covid-19 pandemic spread to 213 countries/ territories. (Ramanathan et al., 2020). As of March 11, 2021, Covid-19 cases in Indonesia were 1,403,722 confirmed cases with 38,049 death and 1,224,603 recovered. Central Java is one of the provinces with the high number of positive Covid-19 cases in Indonesia, with 46,903 positive infected cases, with a death rate of 2,110 people (4.49%).

During the COVID-19 pandemic, community activities tend to decrease. During the month of fasting, in Indonesia, especially in Central Java, where most of the population is Muslim, some will fast during Ramadhan, so their eating patterns also change. In addition, changes in sleep patterns occur because part of the time is used to wake up and do sahur. Pandemic conditions allow people to limit activities. They only leave the house when it is necessary. Physical activities such as sports or walks are significantly reduced compared to before the pandemic. During the fasting period last year, which was during the pandemic, their eating patterns, sleeping patterns, and physical activity also experienced changes compared to standard times. Therefore, the researcher proposed a study titled "Nutrition Intake, Physical Activity, and Quality of People's Sleep in the Month of Fasting During the Covid-19 Pandemic". We hope this research will provide an overview of the community's nutritional intake, physical activity, and sleep quality during the fasting month during the COVID-19 pandemic and the correlation between these variables.

Based on the preliminary research results, during the COVID-19 pandemic, physical activity decreased due to the recommendation from the government to stay at home. During the fasting month, there are also changes in eating patterns and sleeping patterns, so the problem that will be examined in this study is how the description and relationship between nutritional intake and physical activity on the quality of people's sleep during the fasting month during the COVID-19 pandemic will occur. The research describes the community's nutrition intake, physical activity, and sleep quality during the short month of the covid-19 pandemic.

Methods

This study used an observational design with a cross-sectional method. A cross-sectional design refers to research that does not have a time dimension. The measurement of various variables is carried out once. Cross-sectional studies can find the relationship between risk factors and effects. The research took time during the fasting month (Ramadan 2021) to find out the nutritional intake, physical activity, and quality of people's sleep while fasting amid the COVID-19 pandemic. This study involved 520 respondents who were willing to fill out a questionnaire distributed via Googleform. Respondents in this study were limited to people who live in Central Java. The sampling technique in this study used cluster sampling and snowball. The cluster sampling allows respondents to be randomly selected from groups of individuals in the naturally occurring population. The snowball method allows additional samples with the characteristics desired by the researcher. The materials and tools used for the study were a modified sleep quality questionnaire using the Pittsburgh Sleep Quality Index (PSQI) Scale, International Physical Activity Questionnaire (IPAQ) to determine the respondent's activity level, and the International Diet Quality Index (DQI-I) to determine food quality. The questionnaire was distributed through the electronic media google form to be reached by respondents.

Results and Discussion

The study was conducted during the fasting month (Ramadan, 2021) to determine the community's nutritional intake, physical activity, and sleep quality during fasting amid the COVID-19 pandemic. This study involved 520 respondents willing to fill out the questionnaire. Respondents in this study were limited to those who live in Central Java. The results of processing and analyzing the inputted data can be seen in Table 1.

Table 1. Distribution of Respondents' Characteristics

Respondents Characteristics	N	Per cent
Gender		
Male	139	26.7
Female	381	73.3
Level of Education		
Low	27	5.2
High	493	94.8
Age Group		
Young adult	453	87.1
Middle adult	66	12.7
Old adult	1	0.2
Marital Status		
Not married yet	409	78.7
Married	106	20.4
Widower/widow	5	1.0
Total	520	100.0

Source: Primary Data, 2021

Based on table 1, of 520 respondents, most (73.3%) are female. In this study, the level of education is divided into 2, namely low education and higher education. A low level of education is a group of respondents who are not in school or have the latest elementary or junior high school (or equivalent). Higher education level is a group of respondents with a high school education level (or equivalent), D3, undergraduate, or postgraduate. Most (94.8%) of them have a higher education level.

In this study, age groups were divided into 3, namely young adults, middle adults, and old adults. The young adult age group is respondents aged 15-35 years. The middle adult age group is respondents aged >35 to 55 years, while the old adult age group is respondents aged >55 years. Based on Table 1, of the 520 respondents, most (87.1%) are young adults, while only 0.2% old adults. In this study, marital status was divided into 3. Namely, unmarried, married, and widow/widower. Of the 520 respondents, most (78.7%) had not married yet, while only 1% was widowers/widows. The respondents in this study were limited to those who live in Central Java. Based on the analysis of the data obtained, of the 520 respondents, the most significant percentage (13.5%) of them live in the city of Semarang, followed by the group of respondents who live in the City/Regency of Magelang (7.7%), Semarang Regency (6.9%)), and Kudus Regency (6.9%). At the same time, the rest are scattered in various districts/cities in Central Java.

Table 2. Relationship between Physical Activity and Sleep Quality

		Sleep Quality						p-value
		Good		Not Good		Total		
		f	%	f	%	f	%	
Physical Activity	High	27	19.3	113	80.7	140	100.0	0.402
	Medium	40	25.6	116	74.4	156	100.0	
	Low	54	24.1	170	75.9	224	100.0	
	Total	121	23.3	399	76.7	520	100.0	

Source: Primary Data, 2021

Physical activity was measured by analyzing the average physical activity in a week. That consists of three categories group, namely high, medium, and low, classified in table 6 of 520 respondents. The most significant percentage of respondents (43.1%) had a low level of physical activity. In contrast, the high and moderate ones were only 26.9% and 30%, respectively. Of the 140 respondents who had high physical activity, 19.3% had good sleep quality, while 80.7% had poor of the 224 respondents who had low physical activity, 24.1% had good sleep quality. In contrast, 75.9% had poor sleep quality. Based on the chi-square test's bivariate analysis, a p-value of 0.402 (> 0.05) was obtained, meaning there is no relationship between physical activity and sleep quality during the fasting month.

Table 3. Relationship between Food Consumption and Sleep Quality

		Sleep Quality						p-value
		Good		Not Good		Total		
		f	%	f	%	f	%	
Food Consumption	Good	85	34.4	162	65.6	247	100.0	0.0001
	Enough	32	12.8	218	87.2	250	100.0	
	Not enough	4	17.4	19	82.6	23	100.0	
	Total	121	23.3	399	76.7	520	100.0	

Source: Primary Data, 2021

Sleep quality in this study was divided into two, namely good sleep quality and poor sleep quality. Based on Table 3, of 520 respondents, (76.7%) had poor sleep quality. Of the 247 respondents who had good food consumption, 34.4% had good sleep quality, while 65.6% had poor sleep quality; of 23 respondents who had less food consumption, 17.4% had good sleep quality, while 82.6% had poor sleep quality. Based on the chi-square test's bivariate analysis, the p-value was 0.0001 (< 0.05), indicating a relationship between food consumption and sleep quality during the fasting month.

Table 4. Relationship between Food Consumption and Physical Activity

		Physical Activity								p-value
		High		Medium		Low		Total		
		f	%	f	%	f	%	f	%	
Food Consumption	Good	55	22.3	91	36.8	101	40.9	247	100.0	0.007
	Enough	81	32.4	59	23.6	110	44.0	250	100.0	
	Not enough	4	17.4	6	26.1	13	56.6	23	100.0	
		140	26.9	156	30.0	224	43.1	520	100.0	

Source: Primary Data, 2021

Several indicators are measured to determine the adequacy of nutritional intake, including the diversity of protein sources, consumption of vegetables, fruits, grains, fibre consumption, protein consumption, iron, consumption of calcium, and consumption of vitamin C. Each indicator is categorised into good, sufficient, and less. These indicators determine the quality of a person's food consumption. Food quality consumed was grouped into three categories. Namely good, sufficient, and poor. Based on table 4, the most significant percentage of respondents had sufficient and good quality food consumption, namely 48.1% and 47.5%, respectively. Of the 247 respondents with good food consumption, 22.3% had high physical activity, while 40.9% had low physical activity. Of the 23 respondents with less food consumption, 17.4% had high physical activity, while 56.6% had low physical activity. Based on the bivariate analysis using the chi-square test, a p-value of 0.007 (< 0.05) was obtained, indicating a relationship between food consumption and physical activity during the fasting month.

The research finds no relationship between physical activity and sleep quality during the fasting month. Different from research by Fakhan, which states that there is a positive relationship between physical activity and sleep quality in the elderly. It took place at the Posyandu Gonilan Sukoharjo (Fakhan, A. 2016). The differences between the results of this study and Fakhan's are the research respondents and the time of the study. The respondents have a productive age, while Fakhan uses the elderly. In addition, this research took time during the fasting month when people used to reduce the intensity of their physical activity.

According to the Centers for Disease Control and Prevention (CDC), sleep deprivation is a health problem. Based on data from WHO, the prevalence of sleep disorders in adolescents in America is 68.8%, where female adolescents (71.3%) have a greater risk of experiencing sleep disorders than male adolescents (66.4%). It causes more female adolescents to experience insufficient sleep than their male friends (CDC, 2017). Baso's research at SMA Negeri 9 Manado showed that

adolescents who experienced sleep disorders in the form of mild insomnia were 71%. In contrast, those who experienced severe insomnia were 29% (Baso, 2018). Several factors can affect a person's sleep quality, including physical illness, drugs, lifestyle, emotional stress, environment, physical activity, age, alcohol, and nutrition. Physical activity can affect the quality and quantity of sleep because physical activity or exercise can cause fatigue. Fatigue or fatigue can affect the quality and quantity of a person's sleep because fatigue caused by high physical activity can make a person sleep more to maintain the balance of energy expended during physical activity. People who have done physical activity and reach fatigue, then that person will be able to sleep faster because slow-wave sleep (NREM) is shortened. In addition, regular physical activity can also help regulate the heart system, blood vessels, and body weight. A standard body system can prevent the occurrence of non-communicable diseases (Lemma et al., 2012).

Currently, people are experiencing life-style changes from a traditional to a sedentary lifestyle. These changes can increase the risk of being overweight. A sedentary lifestyle is a lifestyle that is not active, and accompanied by excessive diet intake. Excessive diet intake, especially the content of carbohydrates, fats, and proteins, can trigger overweight and obesity. The increase in the prevalence of overweight and obesity can also lead to sufferers of degenerative diseases, such as type 2 diabetes mellitus, heart disease, stroke, and certain types of cancer. Based on research data, obesity and lack of physical activity increase the 30% risk of cancer (Beaulieu et al., 2016).

The majority of people currently have physical activity tending to decrease annually. The change in activity that used to involve a lot of physical activity outside the home became physical activity at home, especially during the Covid 19 pandemic. For example, nowadays, many people are playing games more often on smartphones, watching television, using computers instead of walking, cycling, or exercising. Lack of physical activity can cause low energy output, so there will be an imbalance between the energy that enters through food and the energy expended. As a result of the lack of energy that comes out of the body, the rest will be stored in the body in the form of fat. If this lasts long enough, it will cause overweight to continue to be obese (Mathieu et al., 2019). The lack of physical activity occurred in society lately will lead to a sedentary lifestyle, where most people will spend a lot of time in front of the screen, reading, sitting, and relaxing (Zhu et al., 2016). In Ramadhan, when people fasting, which is not consuming food and drinks for a full day, they can reduce the energy intake. It can be beneficial so that the remaining energy, usually excess stored in the body, can be reduced.

A sedentary lifestyle is a lifestyle that does not meet the standard of daily physical activity. Someone who has a sedentary lifestyle is someone who does less physical activity and prefers to do activities that do not require a lot of energy. It can be seen from the tendency of society. For example in children, to divert their time from playing actively outside the home to sitting passively in front of the monitor screen or watching television. This sedentary lifestyle is not always due to laziness. But also be due to a person's busy schedule with work or with his family, causing the person to have less opportunity to exercise. Several studies have shown that people with a sedentary lifestyle have a higher risk of becoming obese compared to those with sufficient physical activity.

In theory, sleep quality and physical activity are related. Poor sleep quality can cause fatigue after waking up. It will also lead to a decrease in physical activity. When the body feels tired, people tend to have a sedentary lifestyle, such as watching television or playing games/mobile phones. A sedentary lifestyle is a relaxed lifestyle that minimizes physical activity. Watching television is included in light activities because it does not use much energy. Watching television for a long time, especially by consuming energy-dense snacks, can result in an energy imbalance in the body, increasing the risk of overnutrition. Several factors can cause poor sleep quality, including social factors, such as experiencing life problems, experiencing anxiety, or tension. This social factor is more due to the physiological effects of the hormone epinephrine, where the production of this hormone can trigger an increase in the

frequency of an increased heart rate, cold sweat, or shock. Stress can stimulate the excessive release of the hormone epinephrine, causing the heart to beat harder and faster, affecting sleep quality, feeling tired quickly, easily disturbed, and headaches. Sleep quality indicators are considered reasonable if they do not wake up more than once for five minutes at night. It can be interpreted as falling asleep for less than 30 minutes or 60 minutes for ages over 65 years. To achieve such a state, one must have a relaxed feeling by listening to music before going to bed. One of the instruments that can measure sleep quality is the PSQI questionnaire, where this questionnaire can assess sleep duration data. A person's feelings or thoughts, such as stress or anxiety, can cause a decrease in sleep duration. Hanley's research on Canadian society shows that adolescents aged 10-19 years who watch television >5 hours per day are significantly more at risk of experiencing malnutrition than adolescents who only watch television 2 hours per day (Hanley, 2000).

Physical fitness is inseparable from physical activity, where every physical activity that is routinely carried out and has a stable activity will affect physical fitness. Physical fitness is a person's ability to carry out daily activities easily without excessive fatigue and still have energy remaining or reserves to enjoy leisure time or for purposes used at any time. So, physical fitness is a manifestation of a person's functional loyalty to do a particular job with good or satisfactory results (Wiklund, 2016). In general, humans need rest by sleeping to rest their organs after physical activities, such as exercising. Sleep also serves to restore body fitness. During sleep, the body has recovery process to restore the body's stamina so that the condition will return to optimal.

The research finds a relationship between food consumption and sleep quality during the fasting month. Researchers have not found similar studies. In Tovar's study, there were differences in food intake and sleep quality in the obese and non-obese groups (Tovar et al., 2012). Consumption of food (food intake) can affect obesity, whereas the incidence of obesity can later affect a person's sleep quality. Consumption of food, especially snacks, contributes significantly to energy intake and other macronutrients. Examples of snack foods in great demand by the public are cakes and fast food, where these types of food are high in energy (Eichler et al., 2019, Setyawati & Setyowati, 2015, Masthalina et al., 2015).

Carbohydrates in the body will be in the blood circulation as glucose for energy. Some of the carbohydrates will be stored as liver glycogen and muscle tissue. The rest will become fat. So no wonder someone who consumes excessive amounts of carbohydrates will become overweight. The research finds a relationship between food consumption and physical activity during the fasting month. Researchers have not found similar studies but research from Farooq & Sazonov stated a relationship between diet and adolescent nutritional status. This nutritional status will affect a person's ability to perform physical activity (Farooq & Sazonov, 2016).

Protein intake will affect the increase in energy that enters the body. If the amount of protein that enters the body is excessive, it will experience deaminase. Nitrogen will be released by the body, while the remaining carbon bonds will be converted into fat and stored in the body. It will cause an increase in fat tissue, affect weight gain, and increase the risk of overnutrition. Protein's mechanism in the body is almost the same as the excess carbohydrates in the body. Excess of both will be stored as fat in the body. Nowadays, fibre rich foods are not popular with the community, especially teenagers, who prefer foods high in calories but low in fibre. It can trigger the occurrence of more nutritional status. The dislike of consuming vegetables and fruit is a significant factor in low fibre intake. Physical activity is essential because it can reduce the risk of cardiovascular disease and type 2 diabetes and prevent obesity (Tovar et al., 2012).

Coronavirus Disease 2019 (Covid-19) is a respiratory tract infection caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), or the so-called coronavirus. This virus has a high mutation rate and is a zoonotic pathogen that can persist in humans and animals (Chen et al., 2020). Coronavirus is a positive single-strain RNA virus, encapsulated and unsegmented. Coronavirus belongs to the order Nidovirales, family Coronaviridae.

Coronaviridae is divided into two subfamilies distinguished by serotype and genomic characteristics. There are four genera namely alphacoronavirus, beta coronavirus, delta coronavirus and gamma coronavirus (Pan et al., 2020).

In COVID-19, it is not known with certainty the process of transmission from animals to humans, but phylogenetic data allows COVID-19 could be a zoonosis. Subsequent data developments show that human to human transmission is predicted through droplets and contact with viruses released in droplets. Several case reports suggest that transmission from asymptomatic carriers is suspected, but the exact mechanism is unknown. Cases related to transmission from asymptomatic carriers generally have a history of close contact with COVID-19 patients (Han et al., 2020). The implementation of the physical distancing policy has been established in several countries to prevent the transmission of the virus through droplets, including Indonesia which has begun to implement social distancing, or physical distancing, by avoiding crowds or crowds of people. Forms of physical distancing include efforts to limit work, schools, and universitie. Replacing them with online meetings to reduce face-to-face meetings between several people (Xie et al., 2020).

Good nutrition is vital for everyone. Nutrient intake is the amount of nutrients that enter through daily food consumption to obtain energy to carry out daily physical activities (Heydenreich et al., 2020). Lack of nutrients in the food consumed by workers will have poor effects on the workers' bodies, such as: decreased body defense against disease, lack of physical ability, decreased weight, thin body, pale face, lack of enthusiasm, lack of motivation, sluggish reaction and so on. others (D'Addesa, et al., 2010). Food will be broken down into nutrients and absorbed through the intestinal wall and into body fluids. General functions of nutrients include: 1) As a source of energy; 2) Contribute to body growth; 3) Maintain body tissues, replace damaged cells; 4) Regulate metabolism, balance water, minerals and acids - bases in body fluids; 5) Play a role in the body's defense mechanism against disease as antibodies and antitoxin.

Physical activity is any body movement due to skeletal muscle contraction that requires more calories than energy expenditure at rest. Physical activity that is not carried out in a structured and planned manner is called daily physical activity, as physical activity in a structured and planned is called physical exercise (Callow et al., 2020). The classification based on energy needs is light, moderate, and heavy physical activity. Light physical activity is anything similar to daily activities including walking and household chores (Colley, R., et al., 2013). Moderate physical activity is an activity that requires continuous muscle movement with light intensity, such as cycling, jogging, and brisk walking. Heavy physical activity is a body movement that requires a lot of muscle movement and burns many calories, including activities such as swimming, climbing mountains, and lifting weights (Mota et al., 2016).

Sleep quality is a measure where a person can make it easier to start and maintain sleep. A person's sleep quality can be described by the length of time and the complaints he feels while sleeping or after waking up (St-Onge et al., 2016). Sleep needs are not determined in addition to the number of hours but also by the depth of sleep (Mendonça et al., 2019). Some that affect the quantity and quality of sleep are physiological and psychological factors, environment, and lifestyle. These factors affect a decrease in daily activities, feeling weak, tiredness, decreased endurance, and instability of vital signs. Psychological factors affect depression, anxiety, and difficulty concentrating.

The fulfillment of sleep needs for each person is different. Some can fulfill it well, and even vice versa. Factors that affect sleep quality include a) Health Status. A person whose body condition is healthy allows him to sleep soundly, while someone who is not healthy (sick) and feels pain will not sleep well.; b) Environment. The environment can increase or keep a person from sleeping. In a clean environment, with a cold temperature, an atmosphere that is not noisy (quiet), and lighting that will not make a person too bright, and vice versa if the environment is dirty, with a hot temperature, a crowded atmosphere, and

very bright lighting, it can affect the quality of sleep.; c) Psychological Stress. Anxiety and depression will cause disturbances in the frequency of sleep. This is because the worrying condition will increase blood norepinephrine through the sympathetic nervous system. This substance will reduce stage IV NREM and REM (Shaheen & Shamini, 2010).; d) Diet. Foods that contain lots of L-Tryptophan such as cheese, milk, meat, and tuna can cause a person to sleep easily. On the other hand, drinks that contain caffeine or alcohol will interfere with sleep.; e) Lifestyle. The fatigue that a person feels can also affect the quality of a person's sleep. With moderate fatigue people can sleep well. Meanwhile, excessive fatigue will cause shorter REM sleep periods.; f) Drugs. Some of the drugs that a person consumes have the effect of causing sleep, while others interfere with sleep (Ohayon et al., 2017).

Conclusion

The study finds no relationship between physical activity and sleep quality during the fasting month. There is a relationship between food consumption, sleep quality, and physical activity during the fasting month. Suggestions to the community are to pay attention to their food intake, both in quality and quantity, even when fasting. It can be adjusted when breaking the fast or sahur to get good quality sleep and physical activity. The quality of sleep and good physical activity will affect a person's overall quality of life.

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