Jurnal Gizi Klinik Indonesia
Vol. 20 No. 1, Juli 2023 (1-8)
ISSN 1693-900X (Print), ISSN 2502-4140 (Online)
Tersedia online di https://jurnal.ugm.ac.id/jgki
DOI: https://doi.org/10.22146/ijcn.76302

The difference in physical activity and sedentary behavior during the COVID-19 pandemic in medical and non-medical students at Diponegoro University

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ABSTRACT

Background: *University students are already known as a population at high risk for inactive behavior, and the COVID-19 pandemic can increase this risk.* ***Objective:*** *This research was conducted to analyze differences in physical activity and sedentary behavior during the COVID-19 pandemic in medical and non-medical students at Diponegoro University and analyze factors correlated to physical activity and sedentary behavior.* ***Methods:*** *This was an observational research with a cross-sectional design in two groups conducted online. The subjects were students of Diponegoro University, as many as 102 subjects (51 medical students and 51 non-medical students aged 18-22 years). The research was conducted from September to November 2021. The selection was by quota sampling technique. Data were collected by filling out Google forms and an interview. The dependent variables are physical activity and sedentary behavior, measured by the International Physical Activity Questionnaire-Long Form (IPAQ-LF) and the Adolescent Sedentary Activity Questionnaire (ASAQ). Data were analyzed by the Mann-Whitney test and Spearman's correlation test.* ***Results:*** *Physical activity during the COVID-19 pandemic between medical and non-medical students did not differ significantly (p=0.497). There was no significant difference in physical activity related to work/college, transport, house chores, and recreation (p>0.05). Meanwhile, overall sedentary behavior was not significantly different (p=0.290), as well as sedentary behavior on weekdays and weekends (p>0.05). The level of motivation was significantly correlated with physical activity in medical (p=0.027) and non-medical students (p=0.042).* ***Conclusion:*** *Medical and non-medical students have no differences in physical activity and sedentary behavior during the COVID-19 pandemic. The level of motivation was positively correlated to physical activity in medical and non-medical students.*

KEYWORDS: *COVID-19 pandemic; physical activity; sedentary behaviour; university students*

INTRODUCTION

Coronavirus disease 2019 (COVID-19) was an epidemic of viral respiratory disease that is contagious worldwide starting in 2020 [1]. The COVID-19 pandemic has entered its second year yet positive cases of COVID-19 are still increasing. However, with the vaccine not yet spread in the community, social and physical distancing or the *Program Pembatasan Kegiatan Masyarakat (PPKM)* strategy is implemented to close crowded public places and educational institutions such as schools and colleges [2]. Outdoor activities, regular physical activity, and exercises have been limited and affected daily activities as the result of different lifestyle habits. Lack of physical activity in the long term can reduce immune function and can affect the body's physiological system [3,4].

World Health Organization (WHO) recommends at least 150 minutes of moderate physical activity, 75 minutes of vigorous activity, or a combination of both per week. According to WHO, physical inactivity is the

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How to cite: Anwar RS, Dieny FF, Murbawani EA, Fitranti DY. The difference in physical activity and sedentary behavior during the COVID-19 pandemic in medical and non-medical students at Diponegoro University. Jurnal Gizi Klinik Indonesia. 2023;20(1):1-8. doi: 10.22146/ijcn.76302

fourth highest cause of death globally [5]. The Indonesian Ministry of Health also recommends physical exercise or sports for 30 minutes every day or at least 3-5 days per week [6]. According to the *Riset Kesehatan Dasar* or Basic Health Research 2018 data, the prevalence of physical inactivity in Indonesia is 33.5% [7]. In the course of COVID-19, 74.8% of Indonesian teenagers and adults did physical activity less than three times a week [8].

Decreased physical activity causes an increase in sedentary behavior. Recent studies have shown that adults are encouraged to spend less than 9 hours sitting, specifically sitting less than 6-8 hours to reduce all-cause and mortality from cardiovascular disease [4]. Sitting time exceeds 9 hours a day in university students [1]. University students are already known as a population at high risk for sedentary behavior and the COVID-19 pandemic can increase this risk [9]. All universities including Diponegoro University (Undip) have shifted from offline classes to online classes leading all students to take lessons and exams from their homes [10].

University students have the opportunity to learn about a healthy lifestyle and increase nutritional awareness during the process of their studies. Medical students can learn and benefit the most from a healthy lifestyle based on their studies. In addition, the performance and behavior of medical students are expected to reflect on the knowledge and skill they have acquired. In a study conducted among medical students at the University of Malaya, 76% of students do exercise regularly while lack of time and laziness are the main reasons for not exercising [11]. However, a study conducted at the University Malaysia Sabah shows that there is a significant difference in physical inactivity among medical students by 49% and non-medical students by 35% [12]. During the pandemic, as many as 52% of students were classified as high sitting-high active and 40% of students were classified as high sitting-low active based on a study conducted on medical students in Italy [9]. Another study conducted in Croatia showed that 59% of medical students did not reach the recommended level of physical activity during the pandemic [13].

Health students are very vulnerable to unhealthy lifestyles because academic activities take up a lot of time. While non-health students do not receive health material during their studies and usually learn about health-related issues through other sources such as social media. Therefore, non-medical students lack adequate information regarding proper and healthy lifestyles. Research that has assessed physical activity and sedentary behavior during the pandemic among health and non-health students in Indonesia has never been found, so it is not yet known whether there are significant differences. Medical students are future health workers and have an important role in health promotion and socialization of a healthy lifestyle. Moreover, university students must set a good example in practicing a healthy lifestyle. Therefore, it is necessary to evaluate the level of physical activity and sedentary behavior among university students. This study aims to analyze differences in physical activity and sedentary behavior during the COVID-19 pandemic in medical and non-medical students at Diponegoro University and analyze factors related to physical activity and sedentary behavior.

METHODS

Study design and participants

This research was an observational study with a cross-sectional approach that was analyzed by an analytical descriptive. The research was conducted online via WhatsApp and Google Meets from September-November 2021. Ethical approval was obtained from the Faculty of Medicine, Diponegoro University with number 371/EC/KEPK/FK-UNDIP/IX/2021.

The sample size was obtained from the calculation with the Cochran formula [14]. Sampling was carried out by quota sampling technique, namely by selecting individuals who met the inclusion criteria until the number of subjects in each group was met [15]. The number of subjects in this study was 102 with each group having the same number so there were 51 medical students and 51 non-medical students, both male and female students. Medical students consisted of students from the Faculty of Medicine and the Faculty of Public Health. Non-medical students consisted of students from the Faculty of Engineering, Faculty of Animal and Agricultural Sciences, Faculty of Science and Mathematics, Faculty of Fisheries and Marine Sciences, Faculty of Psychology,

Faculty of Economics and Business, Faculty of Law, Faculty of Social and Political Sciences, and Faculty of Humanities. The inclusion criteria were Diponegoro University students aged 18-22 years class of 2017-2020 who were actively studying, did not have any physical disabilities, were not self-isolating, and were not athletes. Meanwhile, the exclusion criteria were withdrawing from the study or not completing all required questionnaires. The independent variable in this study is the background of students, specifically medical and non-medical students. The dependent variables were physical activity and sedentary behavior during the COVID-19 pandemic.

Measures

Physical activity. Physical activity is any body movement produced by skeletal muscle contraction that increases energy expenditure above the resting metabolic rate [16]. Physical activity level was measured using the International Physical Activity Questionnaire-Long Form (IPAQ-LF) questionnaire which included work-related (college), transport-related, housework, recreation physical activity, and intensities (walking, moderate, vigorous), and also sitting time [17]. IPAQ-LF is classified as low (<600 MET/week), moderate (600-3000 MET/week), and high (>3000 MET/week) [18].

Sedentary behaviour. Sedentary behavior is any behavior with an energy expenditure of ≤1.5 METs when in a sitting or lying position. Sedentary behavior level was measured by the Adolescent Sedentary Activity Questionnaire (ASAQ) which includes various sedentary behavior such as screen time, education, travel, cultural, and social sedentary behavior on weekdays and weekends [19]. ASAQ is classified into low (<2 hours/day), moderate (2-5 hours/day), and high (>5 hours/day) [20].

The confounding variables in this study were class, level of motivation, income, and social media exposure. The class used in this study is the year starting studying at university. The level of motivation used in this study is the level of motivation in doing physical activity and exercising regularly during the current pandemic. The level of motivation was measured by the Exercise Self-Regulation Questionnaire (SRQ-E). The SRQ-E questionnaire has been tested for validity and reliability (*Cronbach alpha* = 0.882). The results of this questionnaire are in the form of scores. The income used in this study is the student's income from parents/guardians or work wages in one month. Income results in the form of rupiah/month. Social media exposure in this study is social media exposure in a day to view and read information about health. Results of social media exposure in hours/day. Data on income and social media exposure were obtained from the personal identity questionnaire. The level of motivation was classified into low (<51) and high (≥51). The average level of motivation of the subjects was a score of 51. Income is classified into low (<Rp 1,000,000/month), moderate (Rp 1,000,000-Rp 2,000,000/month), and high (>Rp 2,0000,000/month). Social media exposure is classified into low (<26 minutes/day) and high (>26 minutes/day). The average subject's social media exposure is 26 minutes/day.

Data collection was carried out in two phases, namely subject filled out the google form and was then interviewed by the researcher. The questionnaires filled out by the subjects were the personal identity questionnaire and the SRQ-E questionnaire. Next, the researcher interviewed the subjects online using the IPAQ-LF and ASAQ questionnaires via WhatsApp and Google Meets.

Data analysis

Data analysis was used by the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive data is presented in the form of frequency, median, minimum, and maximum. The research data were tested for normality using the Kolmogorov-Smirnov test. The research data was not normally distributed, so the Mann-Whitney test was used to determine the difference between physical activity and sedentary behavior during the COVID-19 pandemic in medical and non-medical students. Confounding variables were analyzed by Spearman's correlation test to see whether these variables were correlated to physical activity and sedentary behavior in each group.

RESULTS

The number of subjects of Diponegoro University medical and non-medical students was 102 people with 51

people in each group. The subject's age range was 18-22 years in the medical group and 19-22 years in the non-medical group. **Table 1** showed that most subjects were females for both groups, specifically 95% (n=48) medical students and 53% (n=27) non-medical students. The majority of subjects from the two groups were from the class of 2018, namely medical students at 56% and non-medical students at 47%. Most of the physical activity in medical and non-medical was in the moderate category. No students have a low or moderate level of sedentary behavior. All students have a high level of sedentary behavior. Most subjects have a high level of motivation for physical activity and exercise. The majority of the subjects had a moderate income level.

Table 1. Characteristics of subjects by medical and non-medical group

Variable		n (%)	
		Medical	Non-medical
Gender	Male	3 (5)	24 (47)
	Female	48 (95)	27 (53)
Class	2017	5 (9)	11 (21)
	2018	29 (56)	24 (47)
	2019	12 (23)	13 (25)
	2020	5 (9)	3 (5)
Physical activity	Low	2 (4)	0 (0)
	Moderate	33 (65)	28 (55)
	High	16 (31)	23 (45)
Sedentary behavior	High	51 (100)	51 (100)
Motivation level	Low	21 (41)	13 (25)
	High	30 (59)	38 (75)
Income	Low	20 (39)	7 (14)
	Moderate	29 (57)	36 (70)
	High	2 (4)	8 (16)
Social media exposure	Low	25 (49)	34 (67)
	High	26 (51)	17 (33)

Table 2 Median physical activity based on IPAQ-LF scoring of medical and non-medical students in the moderate category, specifically 2,328 MET/week and 2,551 MET/week. The median sedentary behavior based on the ASAQ scoring of medical and non-medical students was in the high category, namely 12.70 hours/day and 12.14 hours/day. There was no difference in physical activity (p=0.497) in medical and non-medical students based on the Mann-Whitney test. Physical activity related to work/college (p=0.804), transport (p=0.921), housework (p=0.527), and recreation (p=0.768) did not show any significant difference between medical and non-medical students. In both groups, sedentary behavior (p=0.290) was not significantly different. Sedentary behavior on weekdays (p=0,287) and weekends (p=0,342) had no significant difference between the two groups.

Table 3 shows the relationship between class, level of motivation, income, and social media exposure with physical activity and sedentary behavior in each group. Based on Spearman's correlation test, the level of motivation was significantly positively correlated to physical activity in medical (p=0.027) and non-medical students (p=0.042). Social media exposure was significantly positively related to physical activity in the non-medical group (p=0.047) but not significantly related to the medical group. Class and income did not have a significant relationship with physical activity or sedentary behavior in both groups.

Table 2. Differences in physical activity and sedentary behavior during the COVID-19 pandemic in medical and non-medical students

Variable	Median (min-max)		p
	Medical	Non-medical	
Physical activity (MET/week)	2,328 (331-9,696)	2,551 (767-9,282)	0.497
Work/college	651 (0-5,340)	537 (0-7,812)	0.804
Transportation	347 (33-2,772	347 (66-3,555)	0.921
Housework and family care	360 (0-2,640)	420 (0-2,100)	0.527
Recreation, sports, and leisure activities	720 (0-3,570)	622 (0-6,951)	0.768
Sedentary behavior (hour/day)	12.70 (5.71-14.96)	12.14 (5.60-14.95)	0.290
Weekdays	12.90 (6.07-15.25)	12.13 (6.07-15.07)	0.287
Weekend	12.17 (4.79-15.92)	12.00 (3.75-16.00)	0.342

min = minimum value; max = maximum value; *significant (p<0.05; Mann-Whitney test)

Table 3. Relationship between class, level of motivation, income, and social media exposure with physical activity and sedentary behavior

Variable	Medical				Non-medical			
	PA		SB		PA		SB	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Class	-0.122	0.393	0.242	0.087	-0.127	0.373	0.038	0.792
Motivation level	0.310	0.027*	-0.141	0.324	0.286	0.042*	-0.002	0.992
Income	0.264	0.061	0.051	0.720	-0.015	0.919	-0.023	0.864
Social media exposure	0.101	0.481	0.091	0.525	0.280	0.047*	-0.064	0.654

*PA = physical activity; SB = sedentary behavior; *significant ($p<0.05$; Spearman's correlation test)*

DISCUSSION

University students being physically active is an important part of a healthy lifestyle. The health benefits of physical activity include improved health and fitness. Therefore, all health workers must remain physically active in order to stay healthy and be role models for the community to motivate them to carry out physical activities. This research is focused on physical activity and sedentary behavior during the COVID-19 pandemic for Undip students. The COVID-19 pandemic has entered its second year when this research was conducted. The subjects in this study were 102 people with 51 medical students and 51 non-medical students. The majority of the subjects were females for both groups. This shows that the participation rate of female subjects is much higher than that of male subjects.

The physical activity of medical students was not significantly different from non-medical students. There was no significant difference in physical activity related to work/college, transportation, housework, and recreation in the two groups. During the COVID-19 pandemic, Undip has switched to online classes so that all students take classes from home and do not go to campus. Since offline lectures and sports facilities were closed during the pandemic, students who are normally active have lost the opportunity to walk and do sports. Medical and non-medical students have the same lifestyle although they have different curriculums with different lecture hours and different assignments [9,21].

However, descriptively, the medical group had lower physical activity than the non-medical group. These results are the same as the research conducted on University Malaysia Sabah students [12]. The high activity level in the non-medical group was greater than in the medical group. Medical students learn about health during their studies so that they have good knowledge about health. Nevertheless, this can happen because there are factors that influence the change of knowledge into positive behavior. Factors such as lack of support from family or friends, having previous habits, and hobbies have not been studied in this study [22].

The level of motivation in medical and non-medical students is significantly positively correlated to physical activity. The majority of medical and non-medical students have a high level of motivation with moderate and high levels of physical activity. Increased motivation is the driving force or the force responsible for the initiation, diligence, direction, and strength of goal-directed behavior. High motivation can increase an individual for increasing physical activity and reduce sedentary behaviour [22]. Motivation can be researched further by looking at the Stages of Change (SOC) in physical activity using the Transtheoretical Model (TTM) [1].

Social media exposure was significantly positively correlated to physical activity in the non-medical group. This can cause non-medical students to have a higher level of physical activity than medical students. Social media is a source of health-related information for students who did not learn about it throughout college, specifically non-medical students. Information related to health and a healthy lifestyle is made easier to read and share through sites like Instagram and YouTube [23]. The use of social media has positive feedback to increase physical activity from sharing information and videos, also is used as a substitute or addition to social contact related to physical activity or sports such as online exercise classes. High use of social media can increase the time for someone to do physical activity and exercise [24].

Sedentary behavior during the COVID-19 pandemic, the two groups did not have a significant difference, as well as sedentary behavior on weekdays and weekends. Medical and non-medical students have high levels of sedentary behavior (>5 hours/day). Despite having a moderate level of physical activity, medical and non-medical students had high levels of sedentary behavior, as shown in a study conducted in America. The COVID-19 pandemic has led to increased screen time for online lectures and spare time such as watching movies or playing games. Students must continue to attend online classes and their social life is limited due to government regulations [25]. Medical and non-medical students have responsibilities that require a long time to follow their lecture hours and to do their assignments, causing high sedentary behaviour [1]. However, medical students had higher sedentary behavior overall as well as on weekdays and weekends compared to non-medical students. Medical students have a time-consuming curriculum so they spend more time sitting in front of a laptop for classes or practicum until the weekend is used to continue their assignments. College life can cause academic and social stress for students. In addition, this pandemic may be a stressor that can increase some sedentary behaviors. But stress levels have not been studied in this study [26].

The class factor did not have a significant relationship with physical activity or sedentary behavior. This result is the same as the research conducted on medical students at Brawijaya University. Students who have been exposed to more health materials during lectures have no effect on their level of physical activity. Physical activity behavior is very dependent on the habits that have been instilled previously. There is a possibility that a person has sufficient physical activity as an adult if physical activity is implemented regularly since childhood [27].

Income factor is known to have no significant relationship with physical activity or sedentary behavior. Nevertheless, these factors have different effects on physical activity and sedentary behavior. Several studies have found that higher incomes are associated with a greater likelihood of participating in moderate to vigorous physical activity because it is easier to access facilities for activities or exercise [28]. On the other hand, higher incomes tend to have many facilities in their homes and rooms, such as televisions and computers, so screen time will increase and sedentary behavior will also increase [29].

Efforts to increase physical activity and reduce sedentary behavior will benefit the health of both medical and non-medical students. University students are recommended to do physical exercise or sports for 30 minutes every day or at least 3-5 days a week [6]. During the lockdown, students can increase their physical activity by studying in a standing position or walking during phone calls to reduce prolonged sedentary behavior. In addition, if they want to travel from place to place, students can do active mobility such as walking or cycling. Students are recommended to reduce their sitting time by doing home workouts if it is not possible to do sports outside the home in their spare time [9].

This study has the advantage of filling out the IPAQ-LF and ASAQ questionnaires carried out by researchers and done together with respondents so that more accurate data is obtained. However, this research has some limitations. First, the study design was cross-sectional which only allowed prevalence estimation and did not allow to describe cause and effect. Second, this study uses a questionnaire as a tool that allows memory bias that can lead to overestimation or underestimation. Third, the selected group is only from one university so it does not represent a larger and more diverse population.

CONCLUSIONS

Medical and non-medical students have no differences in physical activity and sedentary behavior during the COVID-19 pandemic. The level of motivation was positively correlated to physical activity in medical and non-medical students. Students need to make efforts to increase physical activity and reduce sedentary behaviour that will benefit the health of health and non-health students. Students are recommended to do physical exercise or sports for 30 minutes every day or at least 3-5 days a week.

Declaration of conflicting interests

No potential conflict of interest was reported by the authors.

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