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An evaluation of inherent sedentary behavior in college students in Kerala

Arvind Rajendran Menon[1], K. R. Bharath[1], Tessy Thadathil[1]*

[1] *Symbiosis College of Arts & Commerce, Pune, Maharashtra, India*

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ABSTRACT

India was among the first countries to impose a nationwide lockdown due to Coronavirus Pandemic. Social contact was minimized, e-commerce boomed, education became online, and food and groceries were delivered home. A sedentary lifestyle resulted in increased screen time and changes in sleep patterns. All of this leads to mental and physical ailments like depression, obesity and heart problems. This research aimed to observe and analyze Physical Activity (PA) levels, Sedentary Behavior (SD), and Sleep Quality and Sleep Duration of college students in Kerala. The research was cross-sectional in nature. Purposive sampling and snowball sampling were used to find respondents. A total of 81 respondents in the age group of 18 to 22 participated in the survey, of which 56.8% were Male and 43.2% were Female. The International Physical Activity Questionnaire (IPAQ), the Sedentary Behavior Questionnaire (SBQ) and the Pittsburg Sleep Quality Index (PSQI) was used for measuring the variables. One-tailed z-test was used to test the hypothesis. The results of the study showed good levels of physical activity meeting the Metabolic Equivalent of Task (MET) guideline. Sedentary lifestyle was inherent amongst the participants. Majority had a healthy sleep duration but only a small percentage of them had good sleep quality. Thus, the results of this study show that college students in Kerala have a sedentary lifestyle, which might be due to the impact that COVID-19 had on already existing traditional systems.

1. Introduction and Literature Review

The Coronavirus Pandemic broke out in Wuhan, China in late November 2019 and has continued to spread all across the world, majorly disrupting the world economy, infecting around 152 million people and claiming the lives of almost 3 million people,[1,2] In India, and more specifically in Kerala, the first case was reported on 30th January 2020, wherein a few college students of Wuhan University returned and were confirmed to be infected.[3] The Kerala government was very proactive in its approach, followed all the guidelines that were put forth by the WHO, and was efficient in its healthcare. The disease, however, started spreading, and more people got infected. This led to the state government enforcing measures to contain the spread and was one of the first in the country to implement the same. Measures like Break the Chain, social distancing, contact tracing and increased testing were heavily enforced (WHO, 2020).[2] Schools and Colleges were closed down to safeguard the students from the then epidemic. India was among the first countries to impose a nationwide lockdown. Although this meant chaos and confusion among the masses on matters from work to daily essentials, the curb slowed down a possible proliferation. Only the essential shops were kept open, and all other facilities were required to be shut. There was a sudden shift in everything that involved social contact, from a physical aspect to its online counterpart. This has accelerated the shift to e-commerce by around 5 years.[4]

* *Corresponding author*.
E-mail address: tessy.thadathil@symbiosiscollege.edu.in (T. Thadathil).

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People had to find new means to meet their ends. This led to a transformation in systems, even at the grassroots level. Education that never met its evolution, to a great extent, became online, thus eliminating the need for students to attend classes physically in lecture halls. Restaurants that offered fine dining experiences understood the need to operate online and started home delivery and other replacements. Groceries and supplies started reaching people's houses after being shopped online.[4] The consensus amongst the masses was to stay out of social interactions, in other words, practice social distancing. This sudden change around people was met with intolerable and confining social distancing measures, which isolated and modified the mental and physical space of the populous.

The measures taken were of extreme importance at the time, but it could result in a risky sedentary lifestyle, especially among college students. It was anticipated by many researchers at the beginning of the lockdown that the Physical Activity (PA), which plays a huge role in the development of a person's physical as well as mental health, would reduce drastically leading to long term after effects.[5,6]

A huge increase in screen time was expected, owing to the new form of education and the amount of free time that came up. Studies have shown that an increase in screen time is associated with various physical problems, especially with the eyes, but also has a negative impact on the mental health of people too, with anxiety and depression in particular.[6,7]

Sleep patterns and circadian cycles would change as well[8] further adding to the negative impact on physical and mental health. It has also been seen that disturbed sleep patterns can lead to obesity and other related heart diseases.[9]

Adults were already starting to exhibit signs of sedentary behavior with the introduction of all kinds of home delivered products, which meant they were more comfortable at home and did not want to step out and do some form of physical activity. The pandemic further added to that cause and made it on a large scale, all across the world.

Even after unfolding the unlock measures in different phases, keeping in mind that living with COVID is now the new normal, people are finding it difficult to break out of the shells they have created for themselves. The initial struggle was to not socialize but now even after the COVID measures have loosened, people have become more asocial than before.

Staying indoors definitely helps contain the spread of the virus but it comes with other consequences which are mostly left unnoticed. These can be under-the-radar health issues that might pose a much bigger threat in the long term or a derangement of one's mental space, a topic that people still consider taboo and find hard to wrap their heads around. These health issues can be identified through proper research and analysis of various parameters and consumption patterns of people in recent times. Having found this area of research interesting, the researchers of this paper intend to address the issue at hand, of whether there is a prevalence of sedentary behavior and effects on other activities like physical activity and sleep particularly in college students in Kerala. An earlier study was conducted in Hong Kong on similar lines but the researchers felt the cultures of the two locations differ largely and those results may or may not hold true in this particular scenario.[10,11]

2. Objectives of the Study

1. This study aimed to comprehend and analyze (in college students in Kerala):
   (a) The intensity of physical activity (PA) levels of respondents and how COVID-19 had impacted their PA levels.
   (b) Sedentary behavior (SB) involving least physical effort.
   (c) Sleep duration and quality.
2. To draw out conclusions on whether there is prevalent sedentary behavior in college students in Kerala.

3. Research Question

Does an inherent sedentary lifestyle exist among college students in Kerala in light of the pandemic?

4. Methodology

4.1. Design of the study and respondents

The design of the study was cross-sectional[1] in nature. A total of 81 respondents filled out the questionnaire, which was held from 14^{th} April 2021 to 18^{th} April 2021. 10 responses were rejected as they were found to be faulty and not truthful. Therefore, the sample size was 71. For this study, undergraduate college students were considered as the population. The respondents were in the age group of 18 to 22 of which 56.8% were Male and 43.2% were Female. The following criteria were used for inclusion in the sample:

1. They reside and are studying in a college in Kerala, Or
2. They study in a college outside Kerala but have been residing in Kerala for at least the previous two months.

The respondents were required to complete a questionnaire supported by Google Form, which had four sections in total, namely Demographic Information (Gender, Height, Weight, Whether infected by COVID-19 or not), Physical Activity, Sedentary Behavior and Sleep. The BMI (Body

[1] Cross Sectional Study refers to a study where the study takes place at a single point in time, does not involve manipulating variables, allows researchers to look at numerous characteristics at once and is often used to look at the prevailing characteristics in a given population.

Mass Index) of the participants was calculated later on by dividing the weight in kilograms with the height in meters squared. The questionnaire was approved by our institution and all participants were duly informed about the study's purpose, process and benefits. Care was taken to maintain confidentiality and data privacy throughout the study.

4.2. Physical Activity (PA)

The short version of the International Physical Activity Questionnaire was used to find out the Physical Activity Levels of the respondents.[12] This has been proved to be valid and reliable to measure the same and is often used for surveillance of the population.[13] Three items were calculated using the IPAQ, namely the Vigorous Physical Activity (VPA)[2], Moderate Physical Activity (MPA)[3] and Walking for the past 7 days.

The IPAQ measures the Metabolic Equivalent (MET) minutes per week[4] (MET min/week) was calculated using the formula: Intensity (MET) x Duration of the exercise in a day x Frequency of the exercise in a week.

To score the IPAQ, scoring protocols have been given and as such the intensity (MET) of walking has been taken as 3.3, of Moderate PA as 4 and of Vigorous PA as 8 to arrive at the total MET min/week.[12]

Further, to assess how COVID-19 has impacted the PA of respondents, two additional questions were asked, 1. "How physically active were you before the onset of COVID-19 Pandemic?" and 2. "After the onset of the COVID-19 Pandemic, how has your physical activity levels been?"

4.3. Sedentary Behavior

The Sedentary Behavior (SB)[5] of respondents were measured using the Sedentary Behavior Questionnaire (SBQ), the validity and reliability of which has been already proved.[14] Modifying the categories to only the relevant ones, the new seven categories the researchers which were selected by the researchers were: Watching TV and Mobile for Leisure including Social Media, Video Games, Sitting Listening to Music, Sitting Talking on the Telephone, Online Classes and Related Works, Doing Hobbies (Arts, Crafts, Musical Instruments), and Sitting for Transport.

All these items were measured for a usual weekday in the past month with nine options (None, ≤ 15 minutes, 30 minutes, 1 hour, 2 hours, 3 hours, 4 hours, 5 hours, and 6-8 hours). The same was not measured for the weekends to save time and reduce workload. Also, it was felt that the pandemic had made the days all feel quite similar and sedentary behavior would remain somewhat the same on all days.

The time spent on each activity was changed into hours, for example a response of 30 minutes would be converted into 0.5 hours, and then cumulatively added up for all the 7 categories. It was seen that if two activities overlapped or rather if the respondents did two activities together, the time spent for one activity was to be none and time spent for the other activity was to be the total time spent. This was done so as to avoid a multiplying effect and give a more accurate view of the total time spent in SB.

4.4. Sleep

The sleep of the respondents, being the third parameter under scrutiny in this study, was assessed using the Pittsburgh Sleep Quality Index (PSQI) which is a widely used subjective sleep scale to gauge sleep quality and sleep duration.[15] Since the study intends to quantify the self-assessment of one's sleep, only a few selected and modified questions were asked to the participants which is largely based on the 19-item, self-reported questionnaire, which is categorized into seven sleep quality components (sleep latency[6], subjective sleep quality, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction). The observations made on the sleep of the respondents had to be over the past one month. The sum of all the seven sleep quality components ranged from 0 to 21. Based on their individual global PSQI score, they were classified as having "good quality sleep" (Scores of 5 or <5), and "poor quality sleep" (Scores >5). In addition to this, another question was asked to comprehend the impact of COVID-19 on the respondents' sleep quality; "How has your sleep quality been affected since the onset of the pandemic?" (Like has improved, no change, has worsened).

4.5. Statistics

The International Guidelines for the three activities, PA, SB and Sleep were applied for the respondents to see who all met the standard.

1. For physical activity, an achievement of 75 minutes of Vigorous Physical Activity (VPA) throughout the week or at least 150 minutes of Moderate Physical Activity throughout the week.[11,16]
2. For sedentary behavior, engagement in <9 Hours of SB per day for adults.[17]

[2] Vigorous Physical Activity refer to activities that take hard physical effort and make you breathe much harder than normal such as Heavy Lifting, Fast Bicycling etc.

[3] Moderate Physical Activity refer to activities that take moderate physical effort and make you breathe somewhat harder than normal like carrying light loads, regular paced bicycling or light sports but does not include walking.

[4] MET is the Metabolic Equivalent of the exercise and is used to represent the intensity of the same. In general, 1 MET stands for the amount of oxygen you consume and the number of calories you burn at rest.

[5] Sedentary Activities are those which require little to no physical effort and is often done sitting down.

[6] Sleep latency or sleep onset latency is the length of time required to accomplish the transition from full wakefulness to sleep, normally to the lightest of the non-REM sleep stage.

3. For sleep, a global PSQI score of <5 alongside a sleep duration between 7 to 9 hours.[15]

From the previous methodology used, the BMI of respondents were calculated as height/meter squared of the respondents.[10] Since the total number of respondents were greater than 30, 1 tailed z-tests were conducted to find out relevant statistics of the three major activities. The Interquartile Range (IQR) of total MET minutes per week was also calculated as a proportion of participants for the categorical variable. Only basic tests to test the hypothesis were conducted owing to the lack of time and warrants further study for more accurate results. All tests were conducted on Microsoft Excel.

5. Results of the Study

5.1. Demographics of the participants

There were a total of 81 respondents in the survey, however only 71 could be taken for data analysis owing to discrepancies in the response and had to be removed. Since this was a study conducted to know about Sedentary Behavior in College Students, the age of the respondents were fixed at a range of 18-22 and as such the age was not asked in the survey. Around 56.8% of the respondents were Male and the rest 43.2% were Female. The height and weight of the respondents were asked to calculate BMI. This was done by the researchers to see whether the BMI of the participants had any correlation with the activities that were being studied. As such, based on WHO's recommendations for Asian adults, which suggests a BMI of 25 and above to be overweight, 18% of the participants were found to be overweight.[18]

Table 1: Body mass index (BMI) of the participants

Variable	Mean ± SD	*p*-value
BMI	22.51 ± 4.32	<0.01

5.2. Lifestyle behavior of the participants

Lifestyle behaviors are given in Table 2 below. Out of the total responses we got, 85% of them have met the physical activity guideline. 25% of the participants stayed within the daily threshold of 9 hours/day. As for the sleep, 69% of the participants seemed to have a sleep duration well within the healthy range of 7-9 hours whereas only 37% of the participants had their sleeps rated 'good quality' under the PSQI.

6. Discussion

Kerala is a southwestern coastal state of India, which has the highest levels of literacy in India.[19] It is also the state where the first case of COVID-19 was reported in India.[1] Although a study of the same kind was already conducted in Hong Kong, the researchers wanted to study the levels of physical activity, prevalence of sedentary behavior and sleep patterns in terms of duration and quality, among college students in Kerala. This study was conducted in the month of April 2021 when lock down due to COVID-19 still prevailed in the country.[2,19]

Table 2: Table showing the results of the cross-sectional study with regards to the participants' lifestyle behaviors

Variables	Median (IQR) or Mean ± SD or Percentage (%)	
	All (*n*=71)	*p*-value
Physical Activity (PA)		
Total energy expenditure (Total MET7 min/week)	2373 (2835)	<0.01
MET guideline	85	
Sedentary Behaviour		
Daily SB	11.31 ± 3.29	<0.01
MET guideline	25	-
Sleep		
Sleep duration	7.05 ± 1.05	<0.01
METguideline	69	-
Sleep quality	5.26 ± 2.08	0.16
MET guideline	37	-

MET: Metabolic Equivalents; SB: Sedentary Behavior

In the survey conducted with the help of the International Physical Activity Questionnaire (IPAQ), it was surprisingly established that almost 85% of the participants had in fact met the guideline of physical activity as set by World Health Organization.[12,13] From various studies carried out it has been observed that during the initial phase of the lockdown, people had a negative situational perception and lack of motivation for fitness and exercising. However, as the lockdown progressed there was a gradual increase in positive self perception and the motivation to get over the dependence on gyms and fitness equipment strengthened. People found ways to continue exercising from home.[20] As per an article which surveyed worldwide fitness trends, wearable technology was the number one trend which was motivating people to indulge in more physical activity in the confines of their homes during lockdown. This technology included activity trackers, smart watches, heart rate trackers etc. These devices could track heart rate, body temperature, calories, sitting time, sleep time, blood pressure, oxygen saturation, respiratory rate, electrocardiogram monitors etc. Simultaneously, online fitness training at home instead of gyms was another trend that was fast catching up.[21] So in all likelihood, these developments lead to increase in physical activity levels as people had found ways to exercise within the walls of their homes.

On the other hand, a major finding of this study was that even though physical activity level was high there was a sedentary lifestyle in the majority of the sample population. As mentioned earlier, any time less than 9

hours spent doing sedentary activities is acceptable, but only 25% of the participants met this guideline. The reason could be that there has been an explosion in digital technology. Schools, colleges, offices, playgrounds were shut. Restricted social interaction aggravated overuse of these digital devices. Many got attached to social media, messaging and video conferencing. People also relied on technology to sustain relationships. Not just that, there was a major increase or shift to online classes and online learning. So using computers, laptops and smart phones for work and recreation lead to the consequential increase in screen time. The jump in screen time for children and adults was found to be higher than the prescribed six hours as was observed by the American Academy of Child and Adolescent Psychiatry. This lessened outdoor time and aggravated sedentary behavior. It affected health adversely in terms of eye strain, sleep disturbance, carpel tunnel syndrome, neck pain and mental health problems.[6,22] Even after lockdown was lifted, in modern times people find it difficult to abstain from screen time.[23]

On the parameter of sleep, the guideline to be met was 7 to 9 hours of healthy range of sleep duration combined with a global PSQI score <5. After analysing the global PSQI score, it was found that 38% of the participants had their sleeps rated poor (PSQI score>5). Upon further analysis, the average sleep duration was observed to be 7.05 hours, which is within the healthy range. Many studies have also been conducted that show the influence of sedentary behavior on sleep.[24] In this study the correlation coefficient of sleep duration and Sedentary Behavior is 0.15, i.e., it is weakly positive. These scattered results convoluted the relationship between sleep duration and Sedentary Behavior. There are also studies that suggest that being exposed to screen (e.g., computers, smart phones, television etc leads to a sedentary lifestyle affecting the quality of sleep. Anxiety and emotional stress also adds to the poor sleep quality.[25]

So overall the conclusion for this sample group is that on an average they were physically quite active, yet had a sedentary lifestyle. They had good sleep duration yet the quality of sleep was poor.

7. Suggestions

Sedentary lifestyle, even after being linked to chronic health issues, appears to be a significant health issue. Often left unnoticed, a few minor changes that we can incorporate into our daily life can do a lot good for our community health. The researchers, at this point would like to make some suggestions in this front.

To break up prolonged sitting time by ideally standing up every 30 minutes. To reduce strain on eyes, adopt the 20-20-20 model (20 minutes 20 feet away for 20 seconds);

Adjusting the circadian rhythm[7] to form a particular routine which accounts for the necessary college classes and other works along with the required physical activity and maintaining a healthy sleeping pattern.

8. Limitations

The study does suffer from a few limitations. Firstly, due to the second wave of COVID-19, any geographical movement was restricted. This limited our data collection to google form. The questionnaires used in evaluating PA, SB and Sleep were based on subjective scales and not on evidence. As a result of which, few responses had to be rejected owing to discrepancies. The time constraint of having just one month could only be sufficed to conduct a cross-sectional study. The sampling method of convenience sampling and then snowballing through a few respondents might have a slight selection bias.

This study does not distinguish between weekdays and weekends. Studies have shown that the sleep patterns and sedentary hours in weekdays are different from that of weekends.[11]

9. Conclusion

A pandemic that occurs perhaps once in a century has ravaged the world over. It has taken its toll on mankind both physically and emotionally to a great extent. As such this study was conducted to know whether there was an inherent sedentary lifestyle in college students in Kerala as this was one of the major problems of staying at home. From this study, it was found that close to 75% of the participants did not meet the sedentary behavior guideline and consequentially had a sedentary lifestyle. However, from previous research, it has been seen that it is usually backed up by low levels of Physical Activity. In this particular study, it was seen that around 85% of the respondents were physically active, to the requirements of the WHO. This gives contrasting results but it makes sense as it has already been one year since the pandemic began and people have had the time to come up with ways to keep fit. At the same time, with everything almost shifting online, there is an increased rate of sedentary lifestyle and people are hesitant to do things like they used to earlier. While the sleep duration of 69% of the respondents fell within the healthy range of sleep duration, 37% of the participants had good quality of sleep as rated under PSQI. These results are scattered and no potential link can be established between the sleep quality and duration. Although as discussed in the case study, further research on the relationship between sleep and sedentary hours can provide more insights into solving a complex lifestyle issue.

[7] A circadian rhythm, or circadian cycle, is a natural, internal process that regulates the sleep–wake cycle and repeats roughly every 24 hours

The results of this study can be helpful for the state governments to take the required action to reduce such a lifestyle so that it does not have any major consequence in the future. It has already been proven that such a lifestyle can have drastic effects especially during the child and adolescent stages. This study, however, warrants further research as there are certain key limitations that hinder this study and can be undertaken for a more holistic view of the situation.

10. Source of Funding

None.

11. Conflict of Interest

None.

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Author biography

Arvind Rajendran Menon, Student

K. R. Bharath, Student

Tessy Thadathil, Associate Professor https://orcid.org/0000-0002-1153-7538

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