

Original Research Article

Impact of pandemic control measures on physical activities and sedentary behaviour of medical students in Kozhikode

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ABSTRACT

Background: For a highly contagious disease like COVID-19, restriction of movement and public gatherings is an age-old control measure. But these measures can have some physical and psychological impact on people. This study aimed at investigating the impact of such restrictions on the physical activities (PA) and sedentary behaviour (SB) of students at a medical college in Kozhikode. The objective was to find out the changes in PA and SB among the medical students at government medical college, Kozhikode before and after COVID-19 restrictions.

Methods: Cross-sectional study was conducted using modified WHO GPAQ questionnaire sent as google form to potential candidates through whatsapp messenger. Collected data were analysed using Microsoft excel software and statistical comparison was done using the paired t test. Quantitative data was expressed as mean and SD and qualitative data as percentage.

Results: The average BMI of the candidates was 21.1 kg/m² and 21.7 kg/m² pre and post COVID-19 restrictions, respectively. The PA was 1790.2 and 1445.4 MET minutes before and after the period of study. There is significant reduction in PA (p=0.033) and increment in SB (p<0.01). Weight gain was significant in females (p=0.02).

Conclusions: There was decline in the total PA and increase in SB significantly post restriction. There was also an increase in the self-reported weight and BMI of medical students. Almost half of the students made effort to change their physical activity pattern indicating their awareness of increasing SB.

Keywords: COVID-19, Physical activity, Lockdown, Medical students

INTRODUCTION

The coronavirus disease 2019 (COVID-19) is a viral disease that had its first cases in the city of Wuhan, China during December 2019. On 11 March 2020, WHO declared COVID-19 as a pandemic which was an unprecedented crisis that shook the globe.¹ The virus is transmitted by inhalation or contact with infected droplets.² India reported its first case of COVID-19 on 30 January 2020 in the southern state of Kerala.³ But it was from march onwards that Indian saw its first wave of

COVID-19 cases.⁴ Indian government imposed strict nationwide lockdown from 24 March 2020 extending it to 31 May 2020.⁵ After a brief period of falling cases and fatalities, India is currently witnessing the second wave of infection from April 2021 where daily cases have surpassed 0.2 million.⁴ Under such circumstances, many Indian states are forced to impose strict restrictions to control to number of daily infections.⁶

Restricting the free daily social activities of people has some physical, mental and socio-economic implications.

Extensive physical distancing policies restricted the day-to-day activities and implied people to spend most of the time at their home. This created significant changes in the lifestyle of majority of people in society. Lockdown measures have important impact on the physical and mental health of individuals.^{7,8} Impact on the socio-economic spheres of citizens lives is also being studied seriously.⁹ Yet, for a highly contagious disease, restricting public gathering is an important non pharmacological tool to prevent further transmission, especially, considering the unavailability of any definite pharmacological intervention such as vaccines. Hence it was imperative for the world governments to use appropriate lockdown measures to prevent the spread of disease.

Studies conducted in and out of India have described the impact of these measures on physical activities including travel and recreational activities like outdoor sports and gym sessions and showed that there was decline in physical activities and increase in sedentary behavior.¹⁰ Hence it is important to assess the impact of restrictions on the sedentary behavior of medical students who are the future physicians and advocates of healthy and active lifestyle.

The objective of this study was to find out the changes in PA and SB among the medical students of government medical college, Kozhikode.

METHODS

This was a cross-sectional study conducted at government medical college, Kozhikode from January 2020 to January 2021. Data was collected over a period of one month. First, second and third year medical students who were willing to participate and give consent were included in the study. Those who didn't have online access and to whom the delivery of questionnaire was not possible were excluded. Convenience sampling method was used.

The required sample size for this cross-sectional study was estimated by using the formula for estimating proportion with the prevalence of SB as 15.5% and a precision of 4%.¹¹ Thus the minimum number of participants required for this study was estimated to be 300. Data were collected using pretested semi structured questionnaire as google form send through whatsapp messenger. The physical activity assessment was based on modified WHO GPAQ and captured in two domains, travel and recreational activities. The form was sent to 450 students, 150 from each batch out of which 348 received it and 293 responded. Informed consent was taken from students who were willing to participate.

Variables under study included general characteristics such as age, gender, physical activities in two domains, sedentary behavior and self-reported weight and BMI.

Data was entered, rechecked and analyzed in MS excel. Quantitative data was expressed as mean and SD, qualitative data as percentage. The statistical comparison of variables pre and post restrictions and at present was done using paired t test and level of significance was $p < 0.05$.

Operational definitions

PA is defined as any bodily movement produced by skeletal muscles that require energy expenditure.¹² There are two components to physical activity that need to be considered.

Aerobic fitness

Moderate to vigorous activity that makes you feel a bit warm and causes an increase in your breathing rate, breathing depth and your heart rate.

Strength and balance

This is often the forgotten component of physical activity but it is an essential part and has many benefits.

The 2020 WHO guidelines clearly state the average amount of PA required for various age groups.¹² Adults for substantial health benefits should engage in 150-300 minutes of moderate-intensity aerobic physical activity (e.g. brisk walking) or 75-150 minutes of vigorous activity (e.g. running) or in combinations throughout the week. Adequate amount of PAs have been found to have various health benefits and decrease the risk of chronic diseases.

METs (metabolic equivalents) are commonly used to express the intensity of physical activities and are also used for the analysis of GPAQ data. One MET is defined as the energy cost of sitting quietly and is equivalent to a caloric consumption of 1 kcal/kg/hour. When calculating a person's overall energy expenditure using GPAQ data, 4 METs get assigned to the time spent in moderate activities, and 8 METs to the time spent in vigorous activities.¹³

RESULTS

Among the 348 potential candidates, 293 responded, giving a response rate of 84.2%. The mean (SD) age of the participants were 21.4 (3.8) years and majority 173 (59%) were female (Figure 1).

The weight, BMI and physical activity in MET minutes per week pre restrictions and at present is shown in Table 1.

There is an increase in average weight, BMI and there was a significant decrease in PA and an increase in SB, pre and post restrictions.

Figure 2 shows comparison of physical activity in subjects pre restrictions and at present.

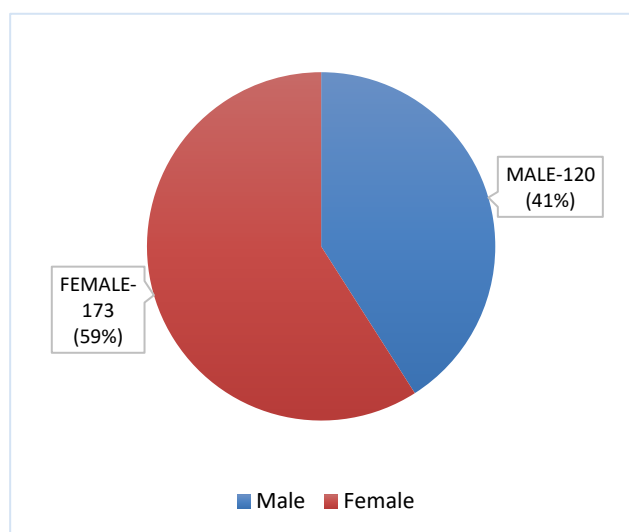


Figure 1: Sex distribution (n=293).

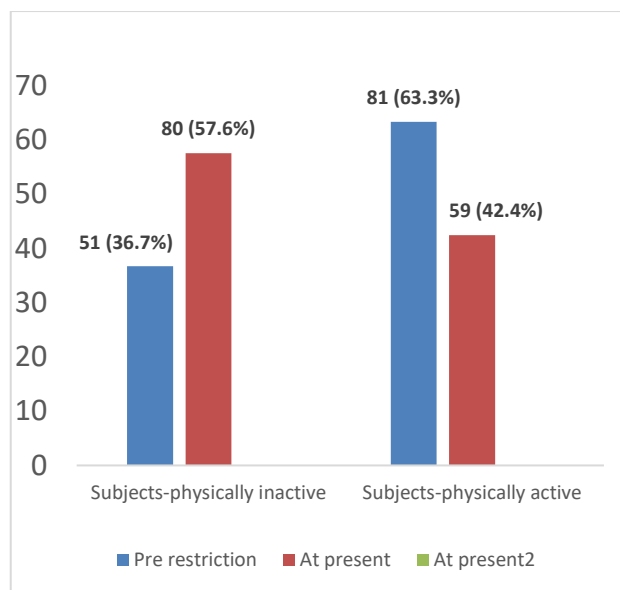


Figure 2: Physical activity pre restrictions and at present.

Table 1: Physical activity in met min per week, BMI and weight pre-pandemic and at present.

Parameters	Pre-restrictions	At present	P value
Mean (SD) weight (N=139) (in kgs)	55.1 (12.2)	58.0 (12.6)	0.203
Mean (SD) BMI (N=82) (in kg/m ²)	21.4 (3.6)	21.9 (3.7)	0.361
Mean (SD) MET minutes per week	1695.4 (2071.8)	1190.4 (1867.7)	0.033
Average time spent sedentary/day (hours/day)	5.8	9.04	<0.01

Table 2: Variations in PA in males.

Parameters	Pre-restrictions	At present	P value
Mean weight (in kgs)	56.6	59	0.06
BMI (in kg/m ²)	21	21.8	0.78

Table 3: Variations in PA in females.

Parameters	Pre-restrictions	At present	P value
Mean weight (in kgs)	56.6	58.4	0.02
BMI (in kg/m ²)	21	21.7	0.15

Our study showed that there is a decrease in PA after the restrictions were imposed. PA was more during the pre-restrictions and reduced much at present.

Only 20.8% were aware about any of the internationally recognised PA guidelines before lockdown but this increased to 49.8% by the end of COVID-19 restrictions. Out of the 293 participants, 146 (49.8%) of participants implemented changes to improve PAs during lockdown, while 93 (31.7%) thought of implementing but could not.

The decrease in PA was more in females. The number of males who were physically inactive increased from 38 (34.5%) to 55 (50%), while the number of females who

were physically inactive increased from 87 (50.3%) to 110 (63.6%), pre restrictions and at present, respectively.

Table 2 and 3 shows the gender wise variations in PA.

There was a significant increase in weight after the restriction period in females.

DISCUSSION

This cross-sectional study was done with another online survey study as reference study and it described the changes in SB and PA of medical students at government medical college, Kozhikode from January 2020 to

January 2021.¹⁴ The study had a response rate of 84.2% with 348 candidates to whom the survey link was delivered using a web-based platform. Web-based surveys were easy to implement and safer as it can prevent physically contacting people. Srivastav et al describes the impact of COVID-19 on physical activities and energy expenditure of physiotherapy professionals including students with response rate of 54.8% from 261 potential survey participants.¹⁴

There was a significant decrease ($p=0.033$) in the PAs and increase in SB ($p<0.01$) of participants during the time of study. Their mean MET minutes per week reduced from 1695.4 to 1190.5 ($p=0.033$). Spending more time at home and going out less due to imposed movement restriction as a pandemic control measures might be the reason for this increase in sedentary behavior. This was also reflected in the average daily sedentary time which rose from 5.6 hours/day to 9.04 hours/day as extrapolated from the results mentioned above. Among male participants, the number of physically inactive individuals increased from 31.4% to 45.5% while their female counterparts show an increase from 50.5% to 64%. Even before the pandemic, medical students are reported to have lesser level of PAs compared to students of other streams.¹⁵ Similar results were obtained in reference study as well as in other studies on university students and general population.^{14,16-18} These studies reported significant increase in SB and decrease in PA among said population indicating the world-wide influence of lockdown measures on physical health. The decrease in physical activity was an important risk factor for many lifestyle disorders.¹⁹ This was of concern considering the effect of comorbidities on the overall outcome of COVID-19 mortality.²⁰

There was also an increase in the self-reported weight and BMI of participants. Mean weight rose from 55.1 kgs to 58.0 kgs and self-reported BMI increased from 21.6 kg/m² to 21.9 kg/m². Similar studies conducted in Kerala and outside Kerala also shares similar results pertaining to weight gain.^{21,22} Broadly, weight gain in a person can occur due to increased calorie intake as well as reduced utilization. In this case, this weight gain may be more likely to be contributed by reduced physical activity and increased sedentary behavior rather than unhealthy eating habits as studies by Chopra et al, Sankar et al and Basu et al show an improvement in healthy eating habits of Indians during the restriction period.²²⁻²⁴ Weight gain was significantly higher in females ($p=0.02$). While the percentage increase in the number of physically inactive participant was nearly the same among both the sexes (13.37% in females compared to 14.049% in males) such a finding might be due to the larger proportion of females being physically inactive (50.4% compared to 31.4% of male participants) even before the pandemic. Another possibility is the gender disparity in weight gain and fat that resulted in the significant weight gain in females.^{25,26} An elaborate study considering more variables like dietary habits will be helpful to learn more about such

gender differences in weight gain. The shortcomings of doing a self-reported BMI can be justified by the limitations on public movement we had at the time and consistency of our findings with that of other studies.

Nearly half (49.8%) of the participants made some lifestyle changes to improve their PA and another 31.7% have thought about implementing some changes. This might reflect their concern about increasing SB, similar to findings from studies by Chopra et al, Sankar et al and Basu et al where an improvement in eating habits were noted.²²⁻²⁴ Percentage of students who were aware about internationally recognized recommendations about PA increased by 29%, which again, indicated their concern over decrease in PA. Another study showed poor compliance among Indian medical students in following recommended dietary intake and PA.²⁷ Poor knowledge about recommended levels of PA and failure to follow them properly are reflected in a good proportion of medical students being overweight.^{27,28}

Decrease in PA and SB are serious risk factors for various lifestyle diseases.¹⁹ A study by Khan et al had shown that 21% of medical students were at moderate risk and 2.8% students at high risk of developing cardiovascular diseases, which is comparable to general population.²⁹ Prolonged decrease in physical activity will further aggravate this situation. Moreover, co-morbidities like diabetes and hypertension are important determinants in the outcome of COVID-19.²⁰ It has been well proven that moderate amount of PA can improve insulin sensitivity and reduce the risk of insulin resistance, metabolic syndrome and type 2 diabetes. Exercise stimulates the translocation of GLUT4 receptors into cell membrane facilitating glucose entry into cells.³⁰ PA is commonly recommended as an important lifestyle modification that may aid in the prevention of hypertension.³¹ Recent epidemiologic evidence has demonstrated a consistent, temporal and dose-dependent relationship between PA and the development of hypertension. Experimental evidence from interventional studies has further confirmed a relationship between PA and hypertension.³¹ Physically inactive COVID-19 patients are found to have poor prognosis than physically active ones.³² Acute exercise is an immune system adjuvant that improves defense activity and metabolic health. Exercise training has an anti-inflammatory influence mediated through multiple pathways.³³ COVID-19 have shown to affect the mental health of general population in a negative way, creating psychological stress.³⁴ Psychological stress can dysregulate human immune system.³⁵ Decrease in physical activity that has increased during this COVID-19 period combined with the psychological stress induced by world-wide lockdown measures, social isolation and anxiety about future can affect the immunity of general population directly as well as indirectly by making them susceptible to lifestyle disorders like diabetes.³⁴ Thus, it is important from public health point of view to make strategies to tackle such issues.

A web-based e-survey was adopted considering both the popularity of WhatsApp messenger among the youth and wide accessibility to internet services as well as its advantage of collecting data from distance. Such a method is cost-effective, eco-friendly and easy to collect and interpret data as well as safe during a pandemic.

Small sample size, self-reporting of BMI, weight and participants from a single institute were the limitations of our study. Future studies including diverse range of participants with more variables may be planned for.

CONCLUSION

Our study showed that there is a significant increase in the self-reported weight and an increase in BMI of medical students after the lockdown. Weight gain was significant in females than in males. PAs have declined significantly and there is a significant increase in SB. Not many medical students were aware about the average PA requirements for leading a healthy life. A good proportion of students tried to know more about improving physical activities. Nearly half of participants implemented changes to improve their PAs.

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