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A Comparison of Physical Activity Level (PAL) of Undergraduate General Degree College Students Before and During the Lockdown Period

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Abstract

Many studies reported about worldwide decline in Physical Activity (PA) yet there is a lack of evidence regarding Physical inactivity during Corona Virus Disease-2019 (COVID-19). This is a major problem in India too. During the lockdown, different PAs of the students involving the external world had become almost nil leading to a sedentary lifestyle. The present study aimed to compare the Physical Activity Level (PAL) of undergraduate college students before and during the lockdown to observe whether there is any influence of lockdown on their PA. For this, the self-administered short form of the International Physical Activity Questionnaire (IPAQ) was used. Data have been collected through Google Forms for the estimation of PAL of 94 undergraduate college students (45 males and 49 females) before and during COVID-19 as per IPAQ guidelines. The protocol was approved by the Institutional Human Ethical Committee. Several nations have tested the validity and reliability of the IPAQ short form. The study revealed a 14.84% decline in the High PAL category and a 15.96% increase in the Low PAL category during lockdown. A moderate decrease in the PAL value was also observed in all participants during lockdown. A significant decline in the PAL values of both male and female participants during the lockdown period has also been observed. Such a decline is most probably due to their inactive lifestyles and higher sedentary and related behaviour during lockdowns. Thus, isolation and quarantine during lockdown have increased the health risk and the chance of occurrence of cardiovascular and other lifestyle diseases in this age group. So, this public health issue should be given more attention and the cause-and-effect relationship of physical inactivity needs further investigation in detail.

Keywords: Lifestyle, Metabolic Equivalent (MET), Physical Activity Level (PAL), Public Health, Physical Inactivity

1. Introduction

Physical inactivity is the 4th leading risk factor for death in the world, killing more than 3 million people every year[1]. It is one of the major risk factors of Non-Communicable Diseases (NCDs) in human[2], e.g., hypertension, obesity, Type II diabetes mellitus, hypercholesterolemia, osteoarthritis, depression, anxiety, tension, stroke, coronary heart disease and even colon cancer etc[3,4]. College students are the youth of the Nation. They are the future of the Country. Globally 31.1% of adults have been considered insufficiently active[5]. Their good health is an important issue to all of us. So far no research work has been reported from Kolkata, West Bengal on the effect of COVID-19 Pandemics on the PAL of undergraduate college students. So, an attempt has been

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made through this study to estimate the PAL of college students and also compare their PAL before and during the lockdown period. So, the main objectives of our study are to compare the PAL of undergraduate college students before and during the Lockdown period and also to observe the impact of the lockdown on their PAL. Sedentary behaviour, which includes prolonged periods of physical inactivity, has been recognized as hazardous among adults worldwide in normal conditions. Of them, 41.5% spent four or more hours a day sitting, and one-third were found to be physically inactive[6]. Researchers expected that social separation during the lockdown-which included home confinement and the closure of schools, colleges, and other educational institutions-may lead to a decrease in physical activity levels and an inactive lifestyle[7]. So far, only a few research has provided useful data for diverse people across different nations. Children and teens in Canada showed higher levels of sedentary behaviour (including leisure screen time) and lower PAL during the COVID-19 epidemic, according to a national survey. They also had more duration of sleep[8]. Similar results in Australia have been reported for adults, such as a negative change in PA and sleep[9]. Furthermore, COVID-19 home confinement has been shown to have a detrimental impact on all levels of physical activity intensity and to increase daily sitting time, according to a nationwide survey that involved 35 research institutions[10]. Thus, the present study was conducted to bridge the gap of evidence on the effect of lockdown on PAL of college-going students in Kolkata.

2. Materials and Methods

The study design is Cross-sectional. 94 undergraduate General Degree College students (n = 94), age group: 18-23 years (45 males and 49 females) enrolled in an undergraduate programme at Netaji Nagar Day College, an undergraduate co-ed college in South Kolkata, West Bengal, India participated in the study during February'2020 to September'2020 (Convenience sampling method)[11]. Google form is generated with the help of IPAQ (Short). Questionnaires were translated from English to Bengali by native speakers of Bengali language and retranslated to English. The form was then circulated and sent to the participants through the college website and social media. The collaboration with college authorities, departments, teaching faculties and student organizations was done to facilitate access to students.

The inclusion criteria for participation included the willingness of the subject to participate in the study, both male and female, healthy adults aged 18-23 years, and students of undergraduate general degree college living in Kolkata for the past six months. A signed informed consent form was obtained from all the willing participants. Participants above 23 years, below 18 years and with any reported illness were excluded from the study. Data were collected in Google sheet for estimation of PAL before lockdown in February 2020. Six months after the start of the lockdown, the PAL of the same 94 participants was again estimated during the lockdown period using the same questionnaire. The study was approved by the Institutional Human Ethical Committee. Several nations have evaluated the validity and reliability of the short form of the IPAQ, which has been proven to be appropriate for large-scale research and population surveillance[12-14]. The vigorous, moderate and walking Metabolic Equivalent (MET) values were assessed through IPAQ Short[15,16]. Total PAL was calculated in terms of MET- Min./Week by adding those three values and based on the values their PAL has been categorized as Low, Moderate and High PA, respectively. The following standard values have been used as per IPAQ scoring protocols.

I. Walking MET = 3.3 x walking minutes x walking days;
II. Moderate MET = 4.0 x walking minutes x walking days;
III. Vigorous MET = 8.0 x walking minutes x walking days;
IV. Total Physical Activity MET = Walking MET-minutes/week + Moderate MET-minutes/week + Vigorous MET minutes/week scores[17,18].

The estimated Pal value of the participants also concurred with the value obtained through a simple, easy-to-use Microsoft Excel spreadsheet that enables automatic scoring of the data responses of the IPAQ Short Form[19].

3. Results

The result of the study revealed a 14.84% decline in the high PAL category and a 15.96% increase in the low PAL category of the participants during the lockdown period (Figure 1). A decrease in the PAL value of all participants

was also observed during the lockdown period (Table 1 and Figure 2) and its effect size calculated, indicates a moderate effect of lockdown on total PAL value (Eta squared value = 0.06). Effect size (Eta Squared) = 1/[1+(n-1)/t2]; where t = 3.06 which is the calculated value of the dependent sample t-test, n = 94, the sample size [For the calculated value of Eta squared, 0.01- Small effect, 0.06-Moderate effect and 0.14-Large effect].

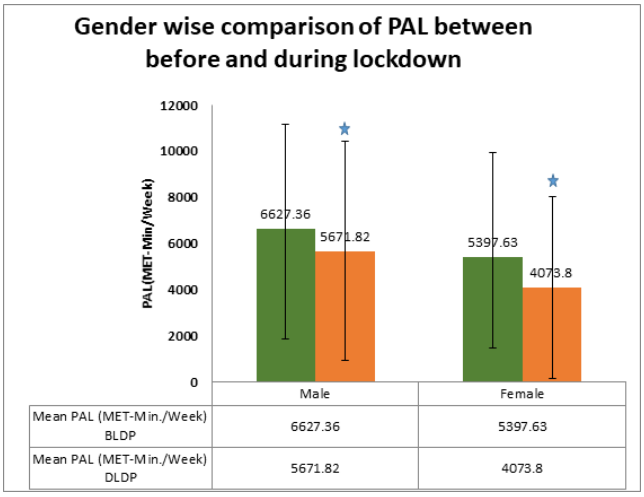


Figure 1. Comparison of different categories of PAL (Low, Moderate and High) before and during the lockdown period. (values are shown in terms of percentage from where percentage differences have been calculated).

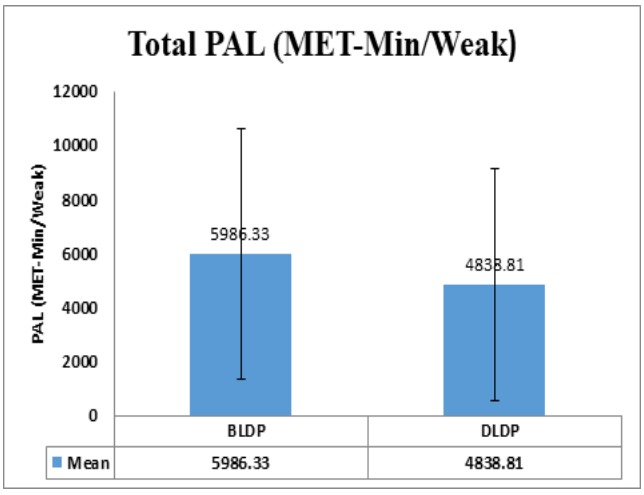


Figure 2. Comparison of total PAL (MET-Min/Week) before and during lockdown period.
(values are mean ± **standard deviation; "t" test was done and** $^{*}p < 0.05$ was considered to be significant).

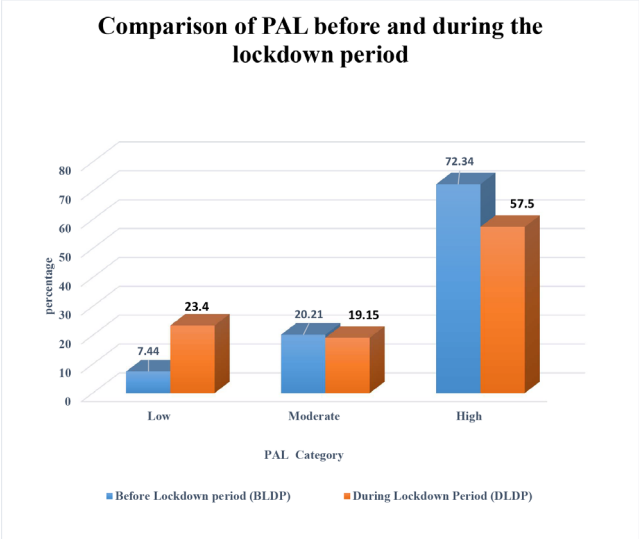


Figure 3. Gender-wise comparison of PAL before and during the lockdown period.
(values are mean ± **standard deviation; "t" test was done and** $^{*}p < 0.05$ was considered to be significant).

A significant decline in the PAL values of both male and female participants was observed during the lockdown period ($p<0.05$) (Table 2 and Figure 3). When the decline in PA during the lockdown period was compared between male and female participants, no significant difference was observed. ($p = 0.623$).

4. Statistical Analysis

Vigorous, Moderate, Walking and Total PA scores are presented as mean ± SD. Various classes of PA e.g. high, moderate and low have been shown in terms of percentage. Bar diagrams have been used to show the comparison of PA of the subjects before and during the lockdown period and also between the male and the female PAL before and during the lockdown period. The normality and linearity analysis was applied to all variables. Dependent sample t-tests / paired *t*-tests have been used to assess the differences between the variables Before the Lockdown Period (BLDP) and During the Lockdown Period (DLDP). The Effect Size of lockdown on total PAL was estimated by the Eta squared test[20]. The comparative decline between male and female participants was found through an Independent sample t-test. The SPSS 26.0 for Windows was used to carry out the statistical analysis.

Table 1. Different categories of PAL before and during the lockdown period

	Category of PAL	Total (n=94)
Before lockdown Period (BLDP)	Walking MET (min/week)	1921.97 ± 1393.65
	Moderate MET (min/week)	1582.64 ± 1567.35
	Vigorous MET (min/week)	2481.70 ± 2691.36
	Total Physical activity MET	5986.33 ± 4652.93
During Lockdown period (DLDP)	Walking MET (min/week)	1524.67 ± 1370.06
	Moderate MET (min/week)	1484.68 ± 1572.87
	Vigorous MET (min/week)	1829.45 ± 2334.85
	Total Physical activity MET	4838.81 ± 4293.20 *

(values are mean **± standard deviation; "t" test was done and** *p < 0.05 was considered to be significant).

Table 2. PAL of male and female participants before and during the lockdown period

Sample size (n)=94	Before lockdown period (BLDL)				During lockdown period (DLDP)			
	Walking MET (min/week)	Moderate MET (min/week)	Vigorous MET (min/week)	Total Physical activity MET	Walking MET (min/week)	Moderate MET (min/week)	Vigorous MET (min/week)	Total Physical activity MET
MALE (n = 45)	2180.86 ± 1443.78	1720.44 ± 1580.82	2726.04 ±2476.21	6627.36± 4528.21	1748.27 ± 1439.46	1614.22 ±1604.88	2309.33 ±2507.97	5671.82± 4546.94*
FEMALE (n = 49)	1684.21 ± 1315.98	1456.08 ± 1560.36	2257.31 ± 2882.04	5397.63± 4734.08	1319.33 ± 1283.55	1365.71 ± 1549.84	1388.73 ± 2093.43	4073.80± 3938.44 *

(values are mean **± standard deviation; "t" test was done and** *p < 0.05 was considered to be significant).

5. Discussion

The findings of this study shed light on the impact of lockdown measures on the PAL of undergraduate college students, a crucial aspect of public health, particularly during the COVID-19 pandemic. The study revealed a significant decline in PAL during the lockdown period. This aligns with previous research highlighting the adverse effects of COVID-19-related restrictions on PAL. For instance, Alrushud *et al.,* noted a similar decline in PA among Saudi medical students during the pandemic, attributing it to increased Sedentary Behaviour (SB) and decreased access to recreational facilities due to lockdown measures[21]. The observed decline in PAL among both male and female participants underscores the universal impact of lockdowns on PA irrespective of gender. This finding is consistent with studies by Allè *et al.,*[22] and Stanton *et al.,*[9] that reported reduced PAL among Italian and Australian populations, respectively, during the pandemic-induced lockdown. Furthermore, the study identified a moderate effect size of lockdown on total PAL, indicating a substantial impact on PA behaviour. This finding is supported by Stockwell *et al.,* who conducted a systematic review revealing significant reductions in PA and increases in SB during COVID-19 lockdowns across various populations[23]. A recent study during COVID-19 showed that 51.1% of participants gained weight. Their meal consumption frequency and weight gain were correlated[8,24]. The consequences of increased SB, such as increased risks of weight gain, deconditioning, diastolic dysfunction, heart failure and arrhythmia, may be intensified by restricted access to medical care also[25,26]. Enhancing the immune system via PA stands as a promising strategy to mitigate the adverse impacts of COVID-19[27].

The decline in PAL is possibly due to inactive lifestyles, higher SB (including leisure time), and more sleep during the lockdown period[21]. The result of the study also aligns with the observation that reduced PA and prolonged SB during Covid 19 pandemic negatively affected PAL and are found to be associated with detrimental effects on mental and physical health, including weight gain[25], psychological issues[28], loss of muscles[29,30] and cardiorespiratory fitness[26], type-II diabetes mellitus[31], colon cancer[32] and even poor academic performance[21]. According to the current data, people have not been

able to sustain their typical PA routines with activities at home. Recent research has also shown the impacts of COVID-19 home confinement on eating habits and PA[7]. Our current observation supports previous reports that the COVID-19 pandemic has caused an unanticipated disruption to students' lifestyles[33]. Schools, sports clubs, and indoor fitness centres, including swimming pools, were closed. Students no longer had access to college-based PA. In addition, all planned recreational activities were suspended because of lockdown regulations that forbade gatherings even in public areas[7]. Most of the systematic and scoping reviews showed a significant drop in PAL relative to pre-pandemic levels.

6. Conclusion

Thus, isolation, quarantine and more sleep during lockdown have increased the health risk and the chance of occurrence of NCDs[34]. Besides academic performance, some types of activities may also be practised in the daily lifestyle of the students routinely. They must avail all the resources (e.g.: parks, physical fitness Centres, re-creational Centres and worksites) available to them near their home to keep them active and physically fit. This study focuses light on a significant public health concern, specifically the well-being and health status of college students. Our study also revealed that during the lockdown period, the students became physically inactive. It also showed that there is no significant difference in the decline of PA between males and females. Thus both genders are equally vulnerable to the adverse effects of lockdown. They should utilize all the available resources present in their surroundings to remain physically fit and healthy. Thus, during quarantine, staying active and maintaining a physical exercise routine will be essential for maintaining good mental and physical health. The study's limitations, such as its cross-sectional design and reliance on self-reported data, are acknowledged, ensuring a balanced interpretation of the findings. Moreover, it is suggested to utilize the existing resources to uphold active lifestyles while addressing the negative impacts of lockdowns on health and well-being.

In conclusion, this study contributes to our understanding of the impact of COVID-19 lockdowns on the PAL of undergraduate college students. By integrating findings with existing literature, the discussion underscores the significance of addressing physical activity as a public health priority during pandemics and other periods of restricted mobility. The results thus demonstrate a credible foundation for students' active lifestyles and health.

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