Assessment of physical activity levels among children aged 10-15 years in select private and government schools of Bangalore urban district during covid-19 pandemic-a cross-sectional study.

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Abstract

Introduction: Physical activity and diet are widely recognized as essential for maintaining health and preventing diseases. 81% of adolescents and 27.5% of adults currently do not meet WHO's recommended levels of physical activity and this affects not only individuals over their life span and their families, but health services and society. The national recommendation for schools is to carry a comprehensive approach to physical education and physical activity in schools. COVID-19 restrictions, like school and park closures, and the cancellation of sports participation and activity training around the world, may prevent children from meeting recommended levels of Physical Activity (PA).

Objectives: To assess the physical activity levels among children aged 10-15 years in select private & government school during the covid-19 pandemic in Bangalore urban district and to determine the factors associated with physical activity levels in the study population.

Methodology: This was a school based cross-sectional study. Prior to the study, permission was taken from the Deputy Director of Public Instruction (DDPI) of Bangalore south zone, Principals of the selected schools and parents of the selected students. The socio-demographic characteristics and physical activity levels of the students were collected using the semi-structured interview schedule. Anthropometric measurements like Weight, Height, waist circumference, and hip circumference were measured. The data obtained was entered in Microsoft Excel. Descriptive analysis was done.

Result: Out of the 400 study subjects aged 10-15 years, most of the participants (45.3 %) were aged of 14 years. The mean age was 13.73 (± 0.856 SD) years and median age was 14 years. The study population had a higher proportion of males (58.8 %) than females. Nearly 22% of the participants reported inadequate physical activity level. There was a significant association between levels of physical activity and gender (p value < 0.001), availability of playground (p value <0.05), and WHR(p value <0.05), there was no association between physical activity levels and type of schools, presence of physical education programme, sufficiency of time for the physical activity and BMI levels.

Conclusion: 21.25 % of the children studied where found to have inadequate physical activity. Given the importance of physical activity in the overall development of the child, measures need to be taken to ensure adequacy of physical activity among children.

Keywords: Physical activity Levels, School children, Covid-19, 10-15 years.

Introduction

Physical activity and diet are widely recognized that, as essential for maintaining health and preventing diseases [1]. Inadequate nutrition and physical activity are linked to several diseases like, cardiovascular disease, cerebrovascular disease, certain cancers, obesity, type 2 diabetes, and depression. According to WHO report 2022, non-communicable diseases (NCDs) are responsible for 71% of all deaths worldwide, numbering 41 million people died annually. 77% of all NCD deaths occur in low- and middle-income countries [2].

According to the Indian Council of Medical Research (ICMR) 2017 India State-Level Disease Burden Initiative, NCDs account for more deaths in India than any other cause, with the average death rate rising from 37.9% in 1990 to 61.8 in 2016. Cardiovascular diseases (CVDs), diabetes, cancers, and chronic respiratory diseases (CRDs) are the four major NCDs,

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***Received:** 04-Mar-2023, Manuscript No. AAPHPP-23-90928; **Editor assigned:** 09-Mar-2023, PreQC No. AAPHPP-23-90928 (PQ); **Reviewed:** 21-Mar-2023, QC No. AAPHPP-23-90928; **Revised:** 01-May-2023, Manuscript No. AAPHPP-23-90928 (R); **Published:** 08-May-2023, DOI: 10.35841/aaphpp- 7.3.176*

***Citation:** Jayaram SK. Assessment of physical activity levels among children aged 10-15 years in select private and government schools of Bangalore urban district during covid-19 pandemic-a cross-sectional study. J Public Health Policy Plan. 2023;7(3):176.*

and they all share four behavioural patterns: an unhealthy diet, a lack of activity, and the use of alcohol and tobacco products [3].

Any body movement requiring energy expenditure that is produced by skeletal muscles is defined as physical activity as per the WHO. Regular physical activity promotes both mental and physical health. It is beneficial for people of all ages and abilities, and it is never too late to start being more active and less sedentary to improve health. According to Global status report on physical activity 2022, 81% of adolescents and 27.5% of adults currently do not meet WHO's recommended levels of physical activity and this affects not only individuals over their life span and their families, but health services and society [4]. According to Status of Non-Communicable Diseases (NCDs) in India, states that inadequate physical activity alone kills approximately 1.6 million people each year [5].

One of the most effective ways for individuals to improve their health is through physical activity. Active individuals live longer lives and are less likely to develop serious health problems. Physical activity can help chronically ill individuals manage their conditions and complications. Physical activity could prevent one out of every ten premature deaths, as well as one out of every eight cases of breast cancer, one out of every eight cases of colorectal cancer, one out of every twelve cases of diabetes, and one out of every fifteen cases of heart disease.

The national recommendation for schools is to carry a comprehensive approach to physical education and physical activity in schools. Regular physical activity can assist children and adolescents improve fitness, strengthen the bone and muscles, reducing weight, anxiety and depression symptoms, and decreases the risk of developing health conditions.

Physical activity & academic achievement both are important for students. In vigorous physical activity, students have better grades, attendance, cognitive performance, and classroom behaviours. A benefit of Physical Activity for Children decrease the risk of depression, improves aerobic fitness, muscular fitness, and bone health, encourages a healthy body composition, and improves attention as well as some academic performance measures [6].

As per the international data published in the Lancet Physical Activity Series, nearly 80% of 13–15-year-old children did not meet the current physical activity recommendations of 60 min of moderate-to-vigorous physical activity per day, and this highlights the need for increased physical activity [7].

COVID-19 restrictions, like school and park closures, and the cancellation of sports participation and activity training around the world, may prevent children from meeting recommended levels of physical activity (PA) [8]. Stockwell s.et.al reported that decreases in physical activity and increases in sedentary behaviour during their respective lockdowns across several populations, including children and patients with a variety of illnesses [9].

As some studies were conducted among children during Pre-Covid in Bangalore, this study is to document the assessment of physical activity levels among children aged 10-15 years in both Government & Private schools in Bangalore urban district during a covid-19 pandemic.

Operational Definitions

Physical activity

Any body movement requiring energy expenditure that is produced by skeletal muscles is defined as physical activity as per the WHO.

Insufficient physical activity constitutes those who engaged in < 150 minutes of moderate- intensity physical activity per week OR <75 minutes of vigorous- intensity physical activity per week [10].

Body mass index

BMI was categorized according to WHO (Asian cut-off)

Underweight: <18.5 Kg/m2

Normal weight: 18.5 - 22.99 Kg/m2

Overweight: 23.0- 24.99 Kg/m2

Obesity: ≥25 Kg/m2

Waist circumference

The waist circumference should be measured at the midpoint between the lower margin of the last palpable ribs and the top of the iliac crest, using a stretch-resistant tape. Waist circumference of ≥90cm in males and ≥80cm in females were high risk (as per South Asia Pacific Guidelines).

Hip circumference

Hip circumference should be measured around the widest portion of the buttocks, with the tape parallel to the floor.

Waist-to-hip ratio (WHR)

The WHR is calculated by dividing the waist circumference in cm by the hip circumference in cm. According to the WHO, the WHR is classified as follows (WHO, 2011b) (Table 1).

Objectives of the study

Primary objective

To assess the physical activity levels among children aged 10-15 years in select private & government school during the covid-19 pandemic in Bangalore urban district.

Table 1. *WHR Classification Men & Women Risk level.*

Men	Women	Risk level
<0.90	<0.85	Low
≥0.90	≥0.85	High

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Secondary objective

To determine the factors associated with physical activity levels in the study population.

Review of Literature

A cross-sectional online survey was conducted for three months, from May to July 2020 during the COVID-19 lockdown in Gujarat, India, among 132 adolescent students in the age group of 16–19 years. The study tool, International PA questionnaire-short form (IPAQ-SF) was used for data collection. A total of 123 responses were recorded. The levels showed 1408.13 MET-min/week vigorous PA, 562.18 MET-min/week moderate PA), walking (547.74 MET-min/week), and sitting (3744.16 MET-min/week). The overall results of PA and EE decreased up to 40% in middle adolescence students during the lockdown period. Among vigorous activities, moderate activities, walking, and sitting, adolescence was spending more time sitting rather than in any other activities [11].

A cross-sectional study was carried out in Ambala district, Haryana. Among 1185 secondary school students aged 10 to 18 years. The aim of the study was to analyse patterns of physical activity and among school going adolescents. A semi-structured questionnaire was used to assess nutritional status, level of physical activity and anthropometric measurement of the children. The results showed that sedentary activity was higher in children aged >12 years, while intensity of MVPA was higher in boys than girls. Physical activity significantly decreased with increase in age ($p<0.001$). There was also a significant decrease in MVPA with increase in age and MET-min, ($p<0.001$) [12].

A randomized controlled trial was conducted among 280 overweight adolescents aged 11-14 years from four urban private schools of Puducherry. The aim of this study was to determine how effective the after-school physical activity intervention would yield the desirable changes in Body Mass Index (BMI) and waist circumference/height ratio from the baseline data and a follow-up data done at an interval of 3 months up till 9 months. After-school physical activity intervention was carried out for a period of 9 months by the study group. The post-tests were carried out at an interval of 3 months up till 9 months. There was a statistically significant difference in BMI between the study and control groups during the 6th and 9th months ($t=1.256$, $P < 0.001$ and $t=0.920$, $P<0.001$), respectively. The repeated measures analysis of variance did not show a significant reduction in BMI and waist circumference/height ratio over a period [13].

An observational cross sectional survey was conducted in Dehradun, Uttarakhand. Among 1266 schoolchildren of select private and government schools in urban and rural areas. The study aimed at documenting physical activity factors associated with overweight and obesity in urban and rural school going children belonging to high and low income groups. The results showed 15.6% being overweight, of which 5.4% were obese. Overweight and obesity were significantly associated with physical inactivity related to passive transport to school, missed opportunities for play during lunch breaks, lack of participation in household work, and excessive viewing of television [14].

A descriptive quantitative study conducted in Chennai, India among 76 adolescents (both boys and girls) to identify the overall Physical Activity of school-going adolescents through their active play, relationship and communication patterns between their family members, peers, and their eating patterns using a semi-structured interview schedule, showed that adolescents do not have active play since they spend their time watching TV and playing games on their mobiles and they gave preference to eating -junk foods [15].

A cross-sectional online survey was conducted between April to May 2020, among 211 parents, legal guardians, and children (aged 5-13) in the U.S to assess the early effects of the COVID-19 pandemic on physical activity and sedentary behaviour in children. The results showed that 90% of children were free to play/ had unstructured activity (running around, tag) and 55% of children went for a walk during the early COVID-19 period and engaged in school-related sitting around about 90 minutes and 8 hours of leisure-related sitting per day. Parents of school - aged children (ages 9-13) perceived greater decreases in PA and higher increases in SB from the pre-to early-covid-19 periods than parents of younger children (ages 5-8). During the early vs pre-covid 19 periods, children were more likely to perform PA at home indoors or on neighbourhood streets [16].

A cross-sectional online survey was conducted in Portugal to investigate the association between the role of household variables and the percentage of physical activity during the time of COVID-19. 2159 children aged younger than 13 years were included. The findings showed that boys and girls did not differ in PA across all age groups, children with an outdoor space and other children in the household were significantly more active, being younger, having a large outdoor area, having other children with in household, and having a minimum one adult free from working from home were positively significant predictors of children's PA, explaining 21% of the overall variance, and children from families with all of the above were major positive predictors of children's PA, explaining 21percent of the overall variance [17].

A cross-sectional study among Chilean schoolchildren was conducted with the goal of analysing the relationship between physical state, body mass index (BMI), level of physical activity, and self-esteem. The study included 515 children aged 10.5±0.5 years from 27 schools in Santiago de Chile, and the study tool used was a Questionnaire Rosemberg scale and Physical Activity Questionnaire for Older Children, PAQ-C, as well as a Course-Navette test, vertical jump, and hand dynamometry. For statistical analysis, structural equations were used, and the findings show an association between BMI and hand dynamometry, as well as a negative relationship between BMI and maximal oxygen consumption, jumping ability, activity level, and self-esteem [18].

A systematic review conducted from November 2019 to October 2020, electronic databases were searched for terms

and synonyms related to physical activity, sedentary behaviour, and COVID-19. The researchers wanted to find out how people's physical activity and sedentary behaviour changed before and during the COVID-19 pandemic lockdown. 64 studies reported changes in physical activity, with the majority of these reporting decreases in physical activity and increases in sedentary behaviour during their respective lockdowns across several populations, including children and patients with a variety of illnesses [19].

A cross-sectional study was conducted in China, involving 9979 children and adolescents (11.63 ±1.23 years old) from Yan'an. The study's goal was to investigate the impact of social isolation on levels of physical activity and mood states in adolescents and children., as well as the correlation between them during the COVID-19 epidemic, and the study tool used was the International Physical Activity Questionnaire Short Form (IPAQ-SF) and the Profile of Mood States (POMS). According to the study findings, the average of students' moderate-to-vigorous PA (MVPA) was 23.19 minutes per day. The total mood disturbance was significantly lower in the moderate and high-level PA groups than in the low-level PA group (p 0.05). Furthermore, both boys and girls had significant differences in PA levels, and the PA levels of students in different grades were also significantly different [20].

In Spain, a descriptive-comparative and cross-sectional study was conducted to analyse physical activity and daily routine among children (0-12 years) during the lockdown and to establish the main relationships between the variables. The study population consisted of 837 Spanish children aged 0-12, who were chosen using a convenient sampling design. The study tool, the "Children and confinement" questionnaire, was used and distributed electronically through Google Forms, and social networks, and was activated for 45 days. The results show that the use of digital screens is an important part of children's daily routines. Their daily activities were practiced for more than three to six years, with more time spent by girls, and the duration children dedicated to sleep was directly proportional to the amount they dedicated to physical activity and indirectly proportional to the time they spent watching screens. Levels of physical activity in the sample were low, as were times spent on activities such as music or games [21].

Materials and Methods

Source of Data

Primary data from the select private & government school-going children (the age group of 10-15 years) in Bangalore urban district.

Study subjects

Private & government school going children (the age group of 10-15 years) in select schools of Bangalore urban district.

Study Period

3 months.

Study design

Cross-sectional study.

Study Area

Bangalore Urban District.

Study Population

Children aged 10-15 years studying in Government and Private schools of Bangalore Urban District.

Sample Size

Based on the study, titled - Impact of Coronavirus Disease-19 lockdown on physical activity and energy expenditure among middle adolescents - A cross-sectional e-survey conducted in Gujarat India, the results show that reduction in physical activity and energy expenditure is 40 % in middle adolescence students during the lockdown period [22].

p=40 %, q=100-p =100-40 =60, 95% confidence interval and precision of 5% (d)

Formula for sample size (n) = (Zα/2)2 p*q /d2

Where, Zα/2 at α=5% will be 1.96 = (1.96)2 = 3.8416 Precision (d) =5, d2=25, p=40, q=60

Sample size (n) =3.8416*40*60/25

Sample size (n) = 368.79

Sample size (N) = n+10% nonresponse error

N =368.79+36.8

N= 405.59

N=400 (round off)

Sampling design

Multi-stage sampling method has been used to select the samples. Under the Department of Public Instruction, Ministry of Primary and Secondary Education, Government of Karnataka, Bangalore division has been divided into 3 administrative zones. These are Bangalore rural, Bangalore north and Bangalore south. From among these 3 zones, one zone was selected by simple random sampling. There are a total of 13 blocks in these three zones, four in Bangalore rural, four in Bangalore north and five in Bangalore south zone. From the chosen zone, one block was selected by simple random sampling. In each block, there are multiple clusters. One cluster was chosen from the selected block by simple random sampling. In each cluster, there are many government and private schools. In the chosen cluster, among the government and private schools, 3 government and 4 private (7 schools) were chosen by simple random sampling. In the 7 schools, children in the 8^{th} and 9^{th} standard were identified. Depending on the number of students in each school in 8^{th} and 9^{th} standard, using population proportional to size method, the total number to be studied in each school was determined. Thereafter, by simple random sampling, the students to be included in each school were identified. After identification and determining that the children were aged between 10-15 years, the process of informed consent was undertaken from the children included in the study (Figure 1).

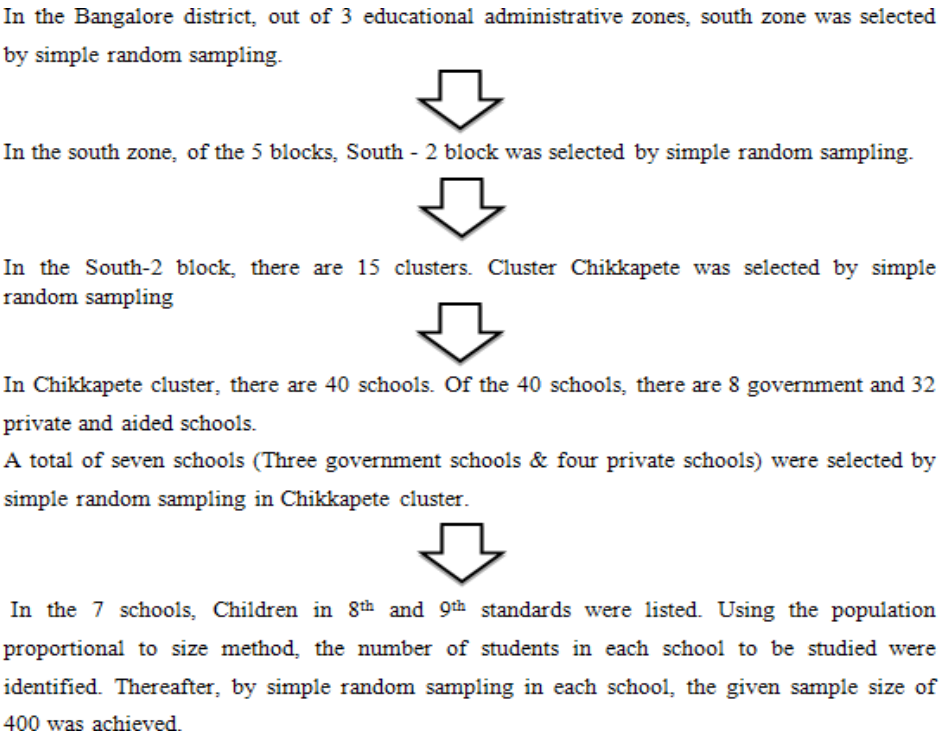

Figure 1: *Sampling design.*

Process followed for this study,

Variables

Dependent variables

*P*hysical activity levels of private & government school-going children.

Independent variables

Age, gender, space for play, type of school, height, weight, waist-to- hip ratio and body mass index.

Inclusion Criteria

All students in the age group of 10-15 years of selected private & government schools in Bangalore urban district.

Exclusion Criteria

1. Students who are all absent on the day of data collection.
2. Students with disabilities or who could not perform activities/ exercise.

Methodology

1. ***Study tool:*** Global Physical Activity Questionnaire (GPAQ).The WHO developed the Global Physical Activity Questionnaire (GPAQ) for physical activity surveillance back in 2002. Since then, the GPAQ has undergone a research programme which shows that it is valid and reliable, but also adaptable to incorporate cultural and other differences. It has been used in more than 100 countries globally, mainly through the WHO STEP wise approach to NCD risk factors surveillance (STEPS). The GPAQ covers several components of physical activity, such as intensity, duration, and frequency, and it assesses three domains in which physical activity is performed (occupational/school physical activity, transport-related physical activity, and physical activity during discretionary or leisure time) [23].
2. ***Data collection and management:*** Before the study, permission was obtained from the DDPI of south zone of Bangalore urban district and the school head/principal of selected government and private schools. Thereafter, the students were informed regarding the study, those assenting for the study were asked to inform their parents and obtain written informed consent from their parents. Using a semi-structured interview schedule, which included the demographic details and the GPAQ, details were collected. Weight was assessed by using a portable digital weighing machine. Height was assessed by using a portable stadiometer. Waist circumference and hip circumference were assessed by using a non-stretchable measuring tape. The data was entered in a Microsoft excel sheet and statistical analysis was using by SPSS version 22.0 software.
3. ***Statistical Analysis plan:*** Data was cleaned and checked for its completeness & all variables. Simple descriptive statistics were used for all variables, mean & median was applied. Custom tables were used for more than two variables. For categorical variable chi-square test was applied to find any association between variables. A p value <0.05 was considered for statistical significance. When the expected value in a cell was <5 in a 2*2 table, Fisher's exact probability test was used as a test of significance, and when the expected value in cell was <5 in other tables, likelihood ratio test was used a test of significance.

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4. ***Ethical Approval:*** Ethical approval for the study from the Institutional Ethics Committee, St. John's Medical College & Hospital, Bangalore, (IEC Study Ref.No-223/2022). Informed consent was obtained from parents/ guardians and the school administration prior to study enrolment. The anonymity of the students was maintained in this study.

Results and Discussion

This analysis included 400 students aged 10-15 years. Table 2 shows the socio demographic profile of the study participants. Most of the participants (45.3 %) were aged 14 years. The participants mean age was 13.73 (± 0. 856 SD) years and median age was 14 years. The study population had a higher proportion of males (58.8 %) than females.

Table 2. *Sociodemographic characteristics of the study participants (N=400).*

Characteristics	n (%)
Gender	
Male	235 (58.8 %)
Female	165 (41.3 %)
Age (In years)	
12	34 (8.5 %)
13	112 (28.0 %)
14	181 (45.3 %)
15	73 (18.3 %)
Religion	
Hindu	311 (77.8 %)
Muslim	73 (18.3 %)
Christian	14 (3.5 %)
Others	02 (0.5 %)
Type of family	
Nuclear	233 (55.8 %)
Joint	177 (44.3 %)
Type of Diet	
Vegetarian	20 (5.0 %)
Non vegetarian	380 (94.8 %)
	02 (0.5 %)
Socio economic status	
Upper class	206 (51.5 %)
Upper middle	104 (26.0%)
Lower middle	41 (10.3 %)
Upper lower	15 (3.8 %)
Lower	34 (8.5 %)
Type of school	
Government	198 (49.5 %)
Private	202 (50.5 %)
Physical education (PT) programme in school	
Yes	379 (94.6 %)
No	21 (5.3 %)
Availability of playground	
In school only	155 (38.8 %)
Near home only	100 (25.0 %)
Both in school & home	110 (27.5 %)
No where	35 (8.8 %)
School routine allow enough time to play	
Yes	349 (87.3 %)
No	51 (12.8 %)
Physical Activity	
Inadequate	85 (21.3 %)
Adequate	315 (78.8 %)
Body Mass Index	
Under weight	229 (57.25 %)
Normal weight	118 (29.50 %)
Overweight	29 (07.25 %)
Obese	24 (06.00 %)
Waist Hip Ratio	
Normal Level	329 (82.25 %)
High Level	71 (17.75 %)

Majority of the participants (77.8 %) belonged to the Hindu religion, most (51.5 %) were from upper-class socio-economic status, most (55.8%) belonged to nuclear family. An almost equal proportion studied in government and private schools. Majority (94.6%) participants had physical education (PT) programme in their schools.

Only one third of the participants had a playground that was only at their school (38.8 % of participants had a , followed by a quarter who had a playground both at their school and close to their home (27.5%), and one tenth of them had a playground that was nowhere (8.8%).

87.3% of participants reported that there was enough time during the school routine for physical activity.

With regard to the nutritional status by BMI, 57.2% were underweight, followed by 29% were normal and 13.5 % were overweight/obese. 82.25 % of the participants had normal level of waist-to-hip ratio.

Table 3a, shows that males had a higher physical activity level (84.25 %) as compared to females (70.90 %). There was the significant association between Gender and Physical activity levels ($p < 0.005$) participants with physically inactive had a significantly higher rate (p value=0.001) among females than male participants. Females had reported more prevalence of inadequate physical activity when compared with male counterparts.

Table 3b, shows that although younger children (aged 12 & 13 years) had higher physical activity levels compared to older children (14&15 years), there was no significant association between the two factors.

Table 3c, showed that children at private schools had a slightly higher physical activity levels (81.8%), as compared to children at government schools (76.26 %). There was no significant association between the two factors.

Table 3d, showed that the proportions of the student had no access to playground (65.71 %) compared to the children who had access in school/close to home/ both (77.80 %) were had adequate physical activity, this association of were found to be significant ($p<0.05$).

Table 3e, shows that nearly equal proportions of with and without PE programme at school reported adequacy of physical activity levels. There was no significant association between these two factors.

Table 3f, shows that there was no significant difference of physical activity levels based on the reported perception of adequacy of time to play. Children who reported adequacy of time to play had higher physical activity levels (79.94 %), as compared to children had reported no adequate time to play (70.58 %).

Table 3g, showed that there was no significant difference of physical activity levels based on the BMI levels. Children who engaged in adequate physical activity had a lower prevalence of overweight/obesity (12.3%), compared to children who did not engage in adequate physical activity (16.3%).

Table 3h, shows that participants with adequate physical activity levels had normal levels of WHR (66.8 %), as compared to participants with inadequate physical activity levels (15.5 %). There was the significant association between Physical activity levels and WHR ($p<0.05$).

3a) *Distribution of physical activity levels by gender.*

Characteristics	Inadequate Physical activity n (%)	Adequate Physical activity n (%)	Total N (%)	Chi- square test p-value
Gender				
Male	37 (15.74 %)	198 (84.25 %)	235 (100 %)	**0.001**
Female	48 (29.09 %)	117 (70.90 %)	165 (100 %)	

3b) *Distribution of physical activity levels by age.*

Characteristics	Inadequate Physical activity n (%)	Adequate Physical activity n (%)	Total N (%)	Chi- square test p-value
Age				
12	07 (20.58 %)	27 (79.41 %)	34 (100 %)	
13	18 (16.07 %)	94 (83.90 %)	112 (100 %)	
14	43 (23.75 %)	138 (76.24 %)	181 (100 %)	0.42
15	17 (23.28 %)	56 (76.71 %)	73 (100 %)	

3c) *Distribution of physical activity levels by type of school.*

Characteristics	Inadequate Physical activity n (%)	Adequate Physical activity n (%)	Total N (%)	Chi- square test p-value
Type of school				
Government	47 (23.73 %)	151 (76.26 %)	198 (100 %)	0.22
Private	38 (18.80 %)	164 (81.18 %)	202 (100 %)	

3d) *Distribution of physical activity levels by availability of playground.*

Characteristics	Inadequate Physical activity n (%)	Adequate Physical activity n (%)	Total N (%)	Chi- square test p-value
Availability of playground				
In school/ close to home/ both	81 (22.19 %)	284 (77.80%)	365(100%)	**0.026**
No where	12 (34.28 %)	23 (65.71 %)	35 (100 %)	

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3e) *Distribution of physical activity levels by physical education programme in school.*

Characteristics	Inadequate Physical activity n (%)	Adequate Physical activity n (%)	Total N (%)	Chi- square test p-value
PE Programme in school				
Yes	81 (21.37 %)	298 (78.62 %)	379 (100 %)	
No	04 (19.04 %)	17 (80.95 %)	21 (100 %)	0.80

3f) *Distribution of physical activity levels by School routine allow enough time to play.*

Characteristics	Inadequate Physical activity n (%)	Adequate Physical activity n (%)	Total N (%)	Chi- square test p-value
School routine allow enough time to play				
Yes	70 (20.05 %)	279 (79.94 %)	349 (100%)	0.12
No	15 (29.41)	36 (70.58 %)	51 (100 %)	

3g) *Association of physical activity levels and BMI of study participants.*

Characteristics	Under Weight n (%)	Normal weight n (%)	Over-weight n (%)	Obese n (%)	Total N (%)	Chi- square test p-value
PA Levels						
Adequate	182(57.7%)	94(29.8%)	24 (7.6%)	15(4.7%)	315(100%)	0.24
Inadequate	47(55.2%)	24(28.2)%	5 (5.8 %)	9(10.5%)	85 (100%)	

3h) *Association of physical activity levels and WHR of study participants.*

Characteristics	WHR		Total N (%)	Chi- square test p-value
	Normal Levels	High Levels		
PA Levels				
Adequate	267 (66.8 %)	48 (12.0%)	315 (100%)	**0.011**
Inadequate	62 (15.5 %)	23 (05.5%)	85 (100%)	

Discussion

The current study reported the physical activity levels (in school, travel to and from places and recreational activities) among school going children aged 10-15 years. The participants mean age was 13.73 (0.856 SD) years and median age was 14 years. The findings from our study show that, prevalence of physical inactivity among study participants was 21.25 %. The WHO recommends that adolescents engage in at least 60 minutes per day of moderate to vigorous-intensity PA. 60 minutes of average PA per day also provide additional health benefits. In adolescents, India stands at the lowest levels of insufficient PA amongst the adolescent's population. As per the Global status report on physical activity, 2022, 81% of adolescents and 27.5% of adults currently do not meet WHO's recommended levels of physical activity [24].

According to the findings of our study, females and those aged < 13 years were more physically inactive, than others in the study population. Anmol G, Lyngdoh and Ponnambalam have reported that prevalence of physical inactivity was higher among the 12-14 years age group and among female participants [25-27].

Most of the participants comes from upper class socio-economic status, followed by upper middle. Almost all participants had Physical Education (PT) programme in their schools.PE programme had no impact on physical activity levels of the participants, although compared to students who attend schools without a PE programme, students in schools with PE programmes reported more insufficient physical activity.

The present study results found that risk factors and physical inactivity was highly significant. The risk factors for physical inactivity are gender, age, and availability of playgrounds, PE programme, and enough time to play in schools, BMI, and WHR. The results did not show a significant association between BMI, and PA. Ponnambalam and Bhargava have reported that, overweight and obesity (BMI) were significantly associated with physical inactivity which was different from our study results [28,29].

The present study did not show a significant difference between the Government and Private school students both had reported the same levels of physical activity. Although when compared to students in private schools, students in government schools had slightly higher levels of physical inactivity.

In our study results show that, highly significant between availability of playgrounds (in school only, near to home only and both in school & near to homes) and physical activity levels, Bhargava, et al (2016) [30] have reported that, the absence of the playground near the house was not significantly associated, which is different from our study results. However, Insufficient physical activity was more prevalent (34.28%) among participants without playgrounds than among those who had playgrounds only in schools (22.58%), only close to homes (24.00%), and both in schools and close to homes (12.72%).which was found in our study.

The present study, results show that, high significance between WHR, and physical activity levels. Insufficient physical activity was more common (32.39%) among students with higher levels of WHR than among their peers (18.84%). Ponnambalam had reported that, after school physical activity intervention among overweight adolescents, had significant reduction was seen in the mean scores of waist circumference/ height ratio in the study group when compared to the control group at P< 0.00 [31].

Limitations

1. Being a cross-sectional study design, no causal association can be inferred.
2. The information reported by the students may be under/ over reported.
3. Literature concerning GPAQ does not specifically refer to the school going age group, therefore the need to identify a standardized tool to estimate physical activity levels among school going children is needed.
4. The current study has only data of few schools of south zone of Bangalore, therefore the findings are not necessarily applicable for whole population of the Bangalore city.

Conclusion

21.25 % of the children studied where found to have inadequate physical activity. Given the importance of physical activity in the overall development of the child, measures need to be taken to ensure adequacy of physical activity among children.

Recommendations

1. It is important to increase physical activity levels among school going children through various measures such as- better infrastructure in all schools, especially in government schools.
2. Gender equity of physical activity.
3. Sensitization of children, parents and teachers regarding importance of physical activity.
4. Public health policy incorporating physical activity among school going children.

List of abbreviations

BEO- Block educational officer

BMI – Body mass index

CDC – Centre of disease control

COVID-19- Coronavirus disease-19

CVD- Cardiovascular diseases

CRD- Chronic respiratory diseases

DDPI- Deputy director of public instruction

GPAQ- Global physical activity questionnaire

ICMR - Indian council of medical research

NCD - Non-communicable disease

PA- Physical activity

SPSS- Statistical package for the social sciences

WHO -World health organization

WHR- Waist-to-hip ratio

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