

## Original Research



## Pattern of physical activity among school children aged 14-15 years in the district of Kalutara, Sri Lanka

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### Abstract

**Background:** Physical inactivity is a major risk factor for NCD related global mortality. Sri Lanka is on the verge of an epidemic of NCDs. It is imperative that the pattern of physical activity is assessed among adolescents.

**Objective:** To describe the pattern of physical activity among school children aged 14-15 years in the district of Kalutara

**Methods:** A cross-sectional survey was carried out in a sample of 1795 children in government schools in the district of Kalutara. The sample was selected using a multistage cluster sampling method with probability-proportionate-to the size. A total of 90 class rooms (clusters) were included and the average cluster size was 20. The pattern of physical activity was assessed using the validated Physical Activity Questionnaire-S. Moderate to vigorous physical activities for at least 60 minutes per day for  $\geq 5$  days per week were categorized as 'sufficiently active'. Chi-squared test was applied to compare the physical activity level with selected factors.

**Results:** Only 33.1% (n=595) of the adolescents were sufficiently active. Of them, 30.6% (246/805) females and 35.1% (349/990) males were sufficiently active (p=0.04). Of the overweight adolescents, 26.7% (48/176) were sufficiently active, which was significantly different from the normal (35.1%, 412/1175) and underweight (30.4%, 135/144) groups (p=0.04). Only 13.9% (n=249) adolescents participated on three or more days a week in sport clubs, aerobics, dancing or martial art during out-of-school hours; and 66.4% (n=1195) in one or more sport clubs during the previous year. Only 4.8% (n=86) adolescents were active on three or more days during school physical exercise period and 46.8% (n=842) traveling by bicycle to school and back during the previous week. Almost 80% (n=1407) of the adolescents learnt about benefits of physical exercise; 66.2% (n=1187) to develop a plan of physical exercise to improve it; and 80% (n=1434) on injury prevention of physical exercise during the previous year from the schools.

**Conclusions:** Only 33.1% of the adolescents were sufficiently active. Males were more active than females. Participation of physical exercise activities within school and out-of-school hours was low.

**Key words:** adolescents, non-communicable diseases, physical activity, school children

## Introduction

Non-communicable diseases (NCDs) are the world's biggest killer causing 38 million deaths every year and 63% of all deaths globally. Approximately, three quarters of these NCD deaths (28 million) occur in low- and middle-income countries. NCDs account for 75% of all deaths in Sri Lanka as well (1). Physical inactivity is one of the ten leading risk factors for global mortality (2). Globally, 3.2 million deaths each year are attributable to physical inactivity (2).

World Health Organization (WHO) defines physical activity as any bodily movement produced by skeletal muscles that require energy expenditure (3). It encompasses all large muscle movements carried out throughout the day for whatever purpose (3). Globally in 2010, 81% of adolescents aged 11-17 years were insufficiently physically active (2). The Americans in their 'Healthy People 2010' initiative have included physical activity as one of the ten leading health indicators for the nation, partly because of its broad public health impact (4) in increasing the wellbeing of the society. Walking briskly, swimming, recreational, tennis doubles, cycling five to nine miles per hour on level terrain or with a few hills are categorized under moderate intensity activities. Vigorous intensity activities include race walking, jogging, running, swimming laps, cycling for more than 10 miles per hour or on steep uphill terrain, and moving or pushing furniture (5). Physical activity reduces the risk of dying from NCDs. In addition, the potential benefits of physical activity are improved sense of well-being and self-confidence, promotion of psychological well-being, and prevention or control of risky behaviour especially among children and young people (6). The WHO with a few countries developed physical activity guidelines for children and young people (7-8). One of the global targets for prevention and control of NCD is 10% relative reduction in the prevalence of insufficient physical activity by 2025 (9).

In Sri Lanka, a number of data sources show that physical inactivity among school adolescents is an emerging issue. Only a few studies on assessing physical activity among adolescences have been conducted in time to time (10-11). As Sri Lanka is on the verge of an epidemic of NCDs, it is imperative that the pattern of physical activity is assessed among adolescents. Promoting physical activity is a long-term cost-effective strategy for the prevention of NCDs in Sri Lanka. Objective of this study was to describe the

pattern of physical activity of school children aged 14-15 years in the district of Kalutara.

## Methods

This was a school-based, cross-sectional study conducted in the district of Kalutara to describe the pattern of physical activity among school children. The study population consisted of adolescents aged 14-15 years studying in Grade 9 or 10 in government schools and residing for a minimum period of six months in Kalutara District. A child with physical disabilities or with a history of any chronic disease that restricts physical activities was excluded. A multi-stage stratified cluster sampling technique with a probability-proportionate to the school size was applied to select 1795 participants. The primary sampling unit was a classroom. The detail of the methodology has been described elsewhere (12).

Physical Activity Questionnaire-Sinhala (PAQ-S) (10) was used for data collection. It is a self-administered questionnaire. This has been translated, culturally adapted and validated for Sri Lanka (10). It was found to have a moderate correlation ( $r=0.41$ ) with pedometer average step counts and moderate agreement (kappa coefficient=0.55) in test-retest reliability assessment (10). PAQ-S consisted of the following sections: socio-demographic characteristics, physical activity pattern of adolescents, participation in organized and non-organized sport teams and exercises, physical fitness and knowledge on physical activity.

Participation in moderate to vigorous physical activity (MVPA) for at least 60 minutes per day for five or more days per week was categorized as sufficiently active, or otherwise insufficiently active (10). The height and weight of each child were measured following standard procedures. Nutritional status was categorized according to body mass index (BMI) of the participants and defined as underweight ( $< -2SD$ ), normal ( $-2SD$  to  $< +1SD$ ) and overweight and obese ( $> +1SD$ ) (13).

All questions were manually checked, and data cleaning and coding was done. Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 16. Descriptive statistics were used to describe the socio-demographic data, parents' information and the pattern of physical activity. Cross tabulations were carried out between the sufficiently and insufficiently active groups and selected variables.

Chi-squared test was performed to assess the categorical data and p value less than 0.05 was considered as statistically significant.

## Results

Of the 1958 school-going children who were invited to participate, 1795 completed the questionnaire, giving a response rate of 91.7%. Mean age of the sample was 14.3 (SD=0.47) years. According to the age distribution, majority (n=1225, 68.2%) of the participants were 14 years of age at their last birthday. The sex ratio of boys to girls was 1:1.2. The major ethnic group was Sinhalese (n=1512, 84.2%) followed by Moors/Malay (n=166, 9.2%) and Tamils (n=117, 6.5%). Only 43.1% (n=774) of fathers and 41.0%

(n=735) of mothers of adolescents had studied up to General Certificate of Education (GCE) Ordinary Level while 92.7% (n=1667) of the fathers of participants were employed in contrast to 75.3% (n=1352) of mothers who were not employed.

A total of 595 (33.1%) adolescents were engaged in MVPA for at least 60 minutes per day for five or more days per week (sufficiently active), while 1200 (66.9%) of participants' physical activity level was insufficient. More male adolescents (n=349, 35.3%) were sufficiently active than females (n=246, 30.6%) (p=0.04), urban adolescents (n=216, 36.2%) than rural (n=379, 31.6%) (p=0.06) and normal weight adolescents (n=412, 35.1%) than overweight (n=48, 26.7%) and underweight adolescents (n=135, 30.4%) (Table 1).

**Table 1. Physical activity level by sex, sector, family income and nutritional status of the adolescents (N=1795)**

Factor	Physical activity level, No. (%)		Total No.	p value <sup>1</sup>
	Insufficiently active (n=1200)	Sufficiently active (n=595)		
<b>Sex</b>				
Male	641 (64.7)	349 (35.3)	990	
Female	559 (69.4)	246 (30.6)	805	<b>0.04</b>
<b>Residential area</b>				
Urban	381 (63.8)	216 (36.2)	597	
Rural	819 (68.4)	379 (31.6)	1198	0.06
<b>Family income</b>				
Rs. 20,000 or less	808 (68.3)	375 (31.7)	1183	
Rs. > 20,000	392 (64.0)	220 (36.0)	612	0.07
<b>Anthropometry</b>				
Underweight	309 (69.6)	135 (30.4)	444	
Normal weight	763 (64.9)	412 (35.1)	1175	<b>0.04</b>
Overweight	128 (73.3)	48 (26.7)	176	

<sup>1</sup>Bold lettering indicates significant associations at 5% significance level.

Of the adolescents, 47% (n=842) travelled by bicycle to school and back for three or more days per week. Among the sufficiently active group, 54.6% (n=325) were traveling by bicycle for three or more days per week. For the insufficiently active group, the respective figure was 42.9% (n=515;  $p<0.001$ ). 65% (n=1195) of the adolescents participated in one or more sports clubs in during the last 12 months. A majority (n=479, 80.5%) of sufficiently active group participated in one or more sports clubs during the last 12 months and the corresponding figure for insufficiently active group was 59.4% (n=714;  $p<0.001$ ). Only 13.9% (n=249) adolescents participated on three or more days per week in sport clubs, aerobics, dancing and martial art during out-of-school hours. 117 (19.4%) adolescents in the sufficiently active category participated on three or more days per week in sport clubs, aerobics, dancing and martial art during out-of-school hours while this was 10.9% (n=130) among participants in the insufficiently active group ( $p<0.001$ ). Only 4.8% (n=86) adolescents participated on three

or more days in school physical exercise period during the last five days prior to data collection (Table 2).

Among adolescents, 78% (n=1407) learnt about benefits of physical exercise during the previous year from schools. A majority of the sufficiently active group (n=474, 79.7%) and insufficiently active group (n=933, 77.6%) learnt about benefits of physical exercise during previous year at schools ( $p=0.07$ ). 87% (n=1434) of adolescents learnt about knowledge of injury prevention of physical exercise during the previous year at schools. It was 84.3% (n=502) among the sufficiently active group and 77.4% (n=932) among the insufficiently active group ( $p=0.003$ ) (Table 3). 66% (n=1187) of the adolescents learnt to develop a plan to improve physical exercise during the previous year at school. A majority (n=810, 67.6%) of the insufficiently active group and 63.4% (n=377) of sufficiently active participants learnt at schools to develop a plan to improve physical exercise during the previous year ( $p=0.06$ ).

**Table 2. Physical activity level of adolescents by physical activity behaviour (N=1795)**

Physical activity behaviour	Physical activity level, No. (%)		Total	p value <sup>1</sup>
	Insufficiently active (n=1200)	Sufficiently active (n=595)		
<b>Traveling by bicycle to school</b>				
0-2 days per week	685 (57.1)	270 (45.4)	955 (53.2)	
3 days or more per week	515 (42.9)	325 (54.6)	840 (46.8)	<b>0.001</b>
<b>Participated in sports clubs during last 12 months</b>				
None	486 (40.6)	116 (19.5)	602 (33.6)	
One or more	714 (59.4)	479 (80.5)	1193 (66.4)	<b>&lt; 0.001</b>
<b>Participated in sport clubs, aerobics, dancing and martial art during out-of-school hours</b>				
2 days or less per week	1070 (89.1)	478 (80.6)	1548 (86.1)	
3 days or more per week	130 (10.9)	117 (19.4)	247 (13.9)	<b>&lt; 0.001</b>
<b>Participated in school physical exercise period during last 5 days</b>				
0-2 days	1150 (95.7)	560 (94.1)	1710 (95.2)	
3 or more days	50 (4.3)	35 (5.9)	85 (4.8)	0.13

<sup>1</sup>Bold lettering indicates significant associations at 5% significance level.

**Table 3. Physical activity learning pattern during school physical exercise period among adolescents (N=1795)**

Physical activity behaviour learning during last year	Physical activity level, No. (%)			p value <sup>1</sup>
	Insufficiently active (n=1200)	Sufficiently active (n=595)	Total	
<b>About the benefits of physical exercise</b>				
Yes	933 (77.6)	474 (79.7)	1407 (78.3)	0.75
No	132 (11.1)	64 (10.7)	196 (11.0)	
Do not know	135 (11.3)	57 (9.6)	192 (10.7)	
<b>About the injury prevention of physical exercise</b>				
Yes	932 (77.4)	502 (84.3)	1434 (79.6)	<b>0.003</b>
No	145 (12.0)	53 (8.9)	198 (11.0)	
Do not know	123 (10.6)	40 (6.8)	163 (9.4)	
<b>About developing a plan of physical exercise to improve physical exercise</b>				
Yes	810 (67.6)	377 (63.4)	1187 (66.2)	0.05
No	200 (16.6)	127 (21.4)	327 (18.2)	
Do not know	190 (15.8)	91 (15.2)	281 (15.6)	

<sup>1</sup>Bold lettering indicates significant associations at 5% significance level.

## Discussion

Current study findings revealed that 33.1% of the adolescents were engaged in MVPA for at least 60 minutes per day on five or more days per week. A comparative study (10) among 13-year aged school children in Ratnapura District using the same study instrument found that 38% of the adolescents were sufficiently active, which included 40% of the boys and 36.4% of girls were sufficiently active. In Sri Lanka, the Global School Health Survey (11) revealed that adolescents who were physically active for at least 60 minutes per day on all seven days during the past week was 14.2% (SD=2.3) among all adolescents aged 13-15 years, 17.4% (SD=3.0) for males and 11.1% (SD=2.3) for females. In contrast to our findings Mahfouz and colleagues (14) found that approximately 31% of Saudi Arabian adolescents aged 17.2 (SD=1.1) years did not engage in at least 30 minutes of physical

activity in the past seven days. In Taiwan, Huang & Malina (2002) revealed that 32% of girls and 55% of boys aged 12 to 14 years were not moderately or vigorously active based on the results of the 3-day activity recall questionnaire (15). Consistent with our findings, several studies have reported that more males were sufficiently active than female adolescents (10). Several studies had also reported that females are less physically active than their male counterparts among children and adolescents (16-18).

Urban school adolescents (35.1%) are more physically active than rural adolescents (30.6%) even though it was not statistically significant. Several studies (19-21) showed similar findings, suggesting that culture or societal background has little impact on the urban/rural differences and that perhaps is a ubiquitous occurrence (7, 22), and the reasons may be that urban adolescents have more opportunities to

access sport facilities and also more choices for recreational and leisure activities.

The present study revealed that only 26.7% of overweight adolescents were sufficiently active and showed significant difference with the normal (35.1%). Al-Haifi and colleagues (23) revealed that being physically active was associated with lower BMI, thus providing support for the role of physical activity in the maintenance of body weight and prevention of obesity. These findings are consistent with findings from other studies showing that engaging in physical activity can assist in healthful weight-control behaviours (24-26).

In the current study, 84.3% of sufficiently active and 77.4% of insufficiently active participants learnt about injury prevention in physical exercise at school in the previous year. Another study showed that physically inactive adolescents were less likely to participate in intramural/house league sports, school team sports and individual physical activities outside school compared to their physically active counterparts (17). For Taiwanese adolescents, physical education lessons seem to have a strong influence on popular types of physical activity. Gordon-Larsen & colleagues in their study also found important associations between participation in school physical education with activity patterns of adolescents (27).

Comparison of physical activity across the studies, used diverse definitions or dimensions and guidelines on physical activities resulting in varying analysis procedures. Some studies only measured certain types of activities, whereas others were more comprehensive. Müller stated that in-school physical activity can cause immense differences in the results leading to inaccurate conclusions (19). Australian Physical Activity Guideline for Adolescents recommends 60 minutes or more of MVPA every day and few other recommendations give five days per week. However, strict interpretation of 'every day' would be quite unreasonable (28).

The current study assessed the physical activity pattern only among schooling adolescents. However, the patterns related to non-schooling adolescents may be different from school going adolescents. This was not accounted for due to feasibility constraints. Further, it is not possible to eliminate recall bias when assessing past physical activity behaviour.

## Conclusions and Recommendations

Only 33.1% of adolescents were sufficiently active. Males were more sufficiently active than females. Schools provide knowledge on benefits of physical activities and prevention of injuries for majority of adolescents. Policy decisions should be taken and implemented efficiently to promote physical activities in school settings to prevent especially non-communicable diseases.

### Public health implications

Majority of the school children are not engaged in physical activities as recommended. Health promotional activities with required environment can be targeted for school children for improving physical activity within and out of school hours.

## Author Declarations

**Competing interests:** The authors declare that they have no competing interests.

**Ethics approval and consent to participate:** Ethics Review Committee of the Sri Lanka Medical Association granted ethics clearance. Informed written consent was obtained from parents and school children prior to data collection. Permission was obtained from the provincial director of Western Province, district and zonal directors of education, school principals in Kalutara District.

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**Author contribution:** IG participated in designing the study, coordinated data collection, performed the statistical analysis and drafted the first version of the manuscript. CA participated in the design of the study, performed the statistical analysis, interpreted the data and helped to draft the manuscript. AL participated in the design of the study. All authors read and approved the final manuscript.

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