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A study on physical activity by a need-based curriculum for students in a rural area of West Bengal

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Abstract:

BACKGROUND: Students must be made aware about the essentiality of optimum level of physical activity and the fact that it is the key to good health and an important technique to prevent and control a lot of noncommunicable diseases including depression and other related mental ill-health.

MATERIALS AND METHODS: It was an institution-based intervention study among 187 Madrasah students of classes VII and VIII, conducted in five-phase assessment of the training needs of Madrasah students on different aspects of healthy lifestyle, development of a need-based module to be used by teachers to impart training of students through classroom setting, training of teachers to use the module to train students, training of students by the trained teachers in classroom setting, and evaluation of effectiveness of the training module.

RESULTS: The mean pretest knowledge score in study Madrasah was 2.64 ± 1.35 (Mean \pm SD) and post test score was 4.13 ± 0.88 (Mean \pm SD). In paired *t*-test, *t*-value was 13.54 and $P < 0.05$ with effect size of 1.370 (Cohen's *d*). Practice related to the mean score in pretest was 2.38 ± 1.08 and posttest score was 2.73 ± 1.03 . In paired test, *t*-value was 6.25 and $P < 0.05$ with effect size of 0.458 (Cohen's *d*).

CONCLUSIONS: The study revealed the effectiveness of training by teachers using the module developed by the researcher to address significant changes in lifestyle-related issues.

Keywords:

Curriculum, healthy lifestyle, noncommunicable disease, physical activity

Introduction

A healthy lifestyle which is formed during the processes of socialization is composed of lifelong personal habits.^[1] When a healthy lifestyle is adopted, a more positive role model is provided for other member in the community, particularly students.^[2]

Physical activity reduces the risk of fatal diseases through its effects on lipid profile, blood pressure, steroid hormones, body weight, and insulin resistance. Physical activity also reduces stress, anxiety, and depression.^[3] With the advent of television,

computer, and the mobile phone, physical inactivity is prevalent enormously in the younger generation, causing more harm than good. Each and every child must be made aware about the essentiality of optimum level of physical activity and the fact that it is the key to good health and an important technique to prevent and control a lot of noncommunicable diseases (NCDs) including depression and other related mental ill health.

Even though there has been much improvement in the treatment of NCDs and in the pharmacological control of many of the risk factors of NCDs, from a public health point of view, the greatest potential for

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prevention is influencing the risk factor in the population through general lifestyle changes, notably in diet, physical activity, and addiction habits.^[3]

The Physical Activity Guidelines for Americans states that children and adolescents should perform moderate-to-vigorous physical activity at least 60 min/day to obtain health benefits. Nearly 35% of participants obtained 60 min/day physical activity, higher among boys (44%) than among girls (26%) in 9th to 12th graders by the US Youth Risk Behavioral Surveillance System.^[4] Annually, 1.6 million deaths are due to insufficient physical activity.^[5]

As per WHO standards, more than two-thirds of physically inactive adolescents aged 11–17 years are in India.^[6] Attendance in physical education (PE) classes decreased from 42% in 1991 to 25% in 1995 and remained at that level until 2013 (29%).^[7]

There is undoubtedly a need for education on healthy lifestyle regarding nutrition, physical activity, and addiction right from childhood. It is also obvious that schools are expected to play a proactive role by imparting training to their students about the lifestyles for good health and better future.

Programs to influence healthy dietary behavior and physical activity of population have to adopt a life cycle approach. Interventions for child and adolescent health, in schools, for example, should emphasize not only on present nutritional status of the beneficiaries, but also on the establishment of healthy habits conducive to the prevention of NCDs and maintenance of good health throughout life.^[3,8-13]

School-based educational interventions aiming at health promotion and risk reduction can play an important role in improving the NCD risk factor-related knowledge and practices of the students. To be effective and sustainable, trainers for such school-based training programs should be the teachers of the schools. Hence, an intermediate step of such training programs would be orienting and educating teachers using predeveloped structured training contents.

With this background, this educational interventional study was conducted to develop and evaluate a need-based training curriculum on healthy lifestyle in terms of physical activity for Madrasah students of rural West Bengal, which can be implemented by trained teachers.

Material s and Methods

It was a school-based, health educational interventional study for Madrasahs students. A prospective study was conducted in the following five phases:

1. Assessment of the training needs of Madrasah students
2. Development of a need-based module to be used by teachers to impart training of students through class-room setting
3. Training of teachers to use the module to train students
4. Training of students by the trained teachers in classroom setting
5. Evaluation of effectiveness of the training module.

All students of classes VII and VIII of the two selected Madrasahs constituted the study population, i.e., complete enumeration method was followed. Health educational intervention was undertaken in one of the two selected Madrasahs, which acted as the study madrasah and the other madrasah (without active intervention) acted as control. A total of 187 students of classes VII and VIII of the two Madrasahs constituted the study population, of which numbers of students (classes VII and VIII) in the study and control Madrasahs were 107 and 80, respectively.

The following two different tools were developed for the study:

- i. Questionnaire used for the assessment of training needs of students and also to evaluate effectiveness of the educational intervention
- ii. Module for imparting training of students through trained teachers. The module was prepared based on the assessment of training needs of the students.

Methodology for the development of tool for the assessment of training needs

A questionnaire was developed to assess baseline knowledge and practice regarding healthy lifestyle of class VII and VIII students of the two Madrasahs. Age/maturity-appropriate knowledge and practice related to lifestyle in terms of physical activity were assessed. The same questionnaire was used to evaluate the effectiveness of the educational intervention.

Draft preparation and finalization of the questionnaire

The researcher under the guidance of departmental faculty and guide/co-guide prepared a draft questionnaire in Bengali language, which contained questions on the background characteristics of the students and knowledge and practice of the students on physical activity. During preparation of the draft, syllabuses of biology/PE of different boards such as West Bengal Board, CBSC, ICSC, NCERT, and Madrasah board were consulted. Opinion/suggestions of some senior school teachers of different boards were also collected informally.

- a. The prepared draft was sent to different experts/stakeholders both in different departments within the

institute and outside the institute for their opinion/suggestions and validation of the contents

- b. The draft questionnaire was modified in accordance to the suggestions/comments of the experts in pediatric health and adolescent medicine, expert faculty in community medicine, maternal and child health, biochemistry and nutrition, health promotion and education, and public health administration of All India Institute of Hygiene and Public Health, AIIH and PH, Kolkata; epidemiologists of National Institute of Cholera and Enteric Diseases; and experts from the department of community medicine of some medical colleges in West Bengal.

Taking opinion from the above-mentioned field of experts, scientists, and teachers, the questionnaire was revised. Then, the questionnaire was presented at the Community Medicine Department, AIIH and PH, in the presence of the experts in Community Medicine, Maternal and Child Health, Biochemistry and Nutrition, Health Education, and Public Health Administration of AIIH and PH. Necessary corrections and modifications were made accordingly.

Pretesting was done among 41 students of classes VII and VIII in another Madrasah of the same block.

The questions were arranged in the following three subsections:

1. Background characteristics
2. Knowledge regarding physical activity
3. Practice related to physical activity.

Face validity of each item and content validity of each domain had been checked by experts in child and adolescent medicine, experts from the department of community medicine of some medical colleges in West Bengal, and experts from different departments of AIIH and PH. All efforts were made to keep the questions simple and unambiguous according to the objective of the study.

Methodology for the development of training module

- i. Gap analysis
- ii. Draft module preparation by researcher
- iii. Finalization of the module.

Gap analysis

Difference between desired/and existing knowledge and practice of both the study and control Madrasah students was assessed question wise and domain wise, and misconception or incorrect knowledge was also assessed.

Preparation of draft and finalization of the module

A need-based module on physical activity was prepared based on gap analysis in Bengali language by the researcher under the guidance of the departmental faculty and guide/co-guide. Opinion/suggestions of some senior school teachers of different boards were also collected informally.

- a. The prepared draft was sent to the following group of experts/stakeholders, both within the institute and outside the institute for their opinion/suggestions
 - i. Faculty of the Departments of Community Medicine, Maternal and Child Health, Biochemistry and Nutrition, Health Promotion and Education, and Public Health Administration of AIIH and PH, Kolkata
 - ii. Experts in pediatric health and adolescent medicine of medical colleges
 - iii. Medical officer cum in-charge of School Health, AIIH and PH, Kolkata
 - iv. Senior scientist/epidemiologist of National Institute of Cholera and Enteric Diseases
 - v. Experts from the department of community medicine of different medical colleges in West Bengal
 - vi. School teachers.
- b. Then, the contents of the questionnaire were presented at the Community Medicine Department of AIIH and PH, in the presence of the faculty/experts from the departments of Community Medicine, Maternal and Child Health, Biochemistry and Nutrition, Health Promotion and Education, and Public Health Administration of AIIH and PH. Necessary corrections and modifications were made accordingly. Teachers of the study Madrasah were oriented by the researcher to impart lifestyle-related training to their students using the module.

This was a part of the study named “a study to develop and evaluate a need-based curriculum on healthy life style for students of Madrasahs in a rural block of Hooghly district West Bengal.”

Ethical approval

Ethical clearance from the Institutional Ethics committee of All India Institute of Hygiene and Public Health was obtained.

Statistical analysis

Data were compiled on Microsoft Excel worksheet. Statistical Package for Social Sciences (SPSS-version 16.0) and online MedCalc were used for the analysis. For a correct response, a score of 1 was given and for an incorrect answer or don't know, a score of 0 was given. Descriptive data were analyzed as frequency, percentage, means, SD, etc., and presented in tables and diagrams.

Categorical characteristics were compared between groups with the use of Chi-square tests. Z test of proportion was done to test if there was any significant difference in proportions of a particular matter. Normally distributed continuous variables evaluated with the use of *t*-test. To assess the effect of intervention among the students of the study Madrasah, Mc-Nemar, Chi-square test, and paired *t*-test were done for comparison of means before and after the intervention. For the entire statistical test applied, $P < 0.05$ was considered as statistically significant.

Results

There is no statistically significant difference in background characteristics of the students of study and control Madrasahs except in the proportion of students in classes VII and VIII.

On assessment of the existing knowledge (pretest) regarding the importance of physical activity, 43.9% students in the study Madrasah and 32.5% in the control Madrasah believed that physical activity or playing had no effect on our health. Surprisingly, about 13.1% students in the study Madrasah and 22.5% in the control Madrasah responded that physical activity or playing outdoor games is bad for health. Nearly 38.3% of the students in the study Madrasah and 50% in the control Madrasah stated that physical activity or playing diverts mind from study. Only 43.1% of the students in the study Madrasah and 33.8% in the control Madrasah were physically active for at least 60 min for at least 5 days in the last 7 days [Table 1].

Majority of the students (79.1%) don't have knowledge that physical activity or playing has effect on your body. Nearly 49.2% of the students don't have knowledge that physical activity or playing prevents many diseases. Almost 36.9% of the students don't have knowledge that physical activity or playing is bad for health. Only 39.0% of the students became physically active for at least 60 min in the last 7 days. Nearly 25.7% of the students spend more than 5 h by sitting and watching television and playing computer games during a typical or usual day [Table 2].

In the study Madrasah, there were statistically significant differences in knowledge regarding physical activity among the students before and after intervention. No observable difference was found in the control Madrasah physical activity-related knowledge. In the study Madrasah, there were statistically significant differences in practices regarding physical activity in the last 7 days among the students before and after intervention except for walking or riding bicycle to reach or return from

Madrasah though there was improvement of practice. This is expected as the number of students who use to walk or use bicycle for coming school remain same from the period of initial and final assessment after competition of training. In the control Madrasah, there were no statistically significant differences in practice regarding physical activity in the last 7 days among the students of classes VII and VIII in the 1st and 2nd assessment [Table 3].

The mean pretest knowledge score in the study Madrasah was 2.64 ± 1.35 and posttest score was 4.13 ± 0.88 . The calculated *t*-value was 13.54 and $P < 0.05$ with an effect size of 1.370 (Cohen's *d*). Practice related to the mean score in pretest was 2.38 ± 1.08 and post test score was 2.73 ± 1.03 . The calculated *t*-value was 6.25 and $P < 0.05$ with an effect size of 0.458 (Cohen's *d*).

In the control Madrasah, the mean pretest knowledge score was 2.46 ± 1.25 and the posttest score was 2.45 ± 1.21 . The calculated *t*-value was -0.07 and $P = 0.94$ with an effect size of 0.008 (Cohen's *d*). Practice related to the mean nutrition score in pretest was 2.21 ± 1.06 and post test score was 1.98 ± 1.09 . The calculated *t*-value was 0.63 and $P = 0.53$ with an effect size 0.018 (Cohen's *d*), which is depicted in Figure 1.

Discussion

The present study showed that only 43.1% of the students in the study Madrasah and 33.8% in the control Madrasah were physically active for at least 60 min for at least 5 days in the last 7 days. Nearly 15.9% of the students in the study Madrasah and 15% in the control Madrasah were not physically active for a single day. Almost 6.5% of the students in the study Madrasah and 7.5% in the control Madrasah were not walking or riding bicycle to reach or return from Madrasah in the last 7 days.

A systematic review done by Moraes *et al.* in Brazil^[14] found that the prevalence of indoor physical activity varied from 18.7% to 90.6%, with a median of 79.7%.

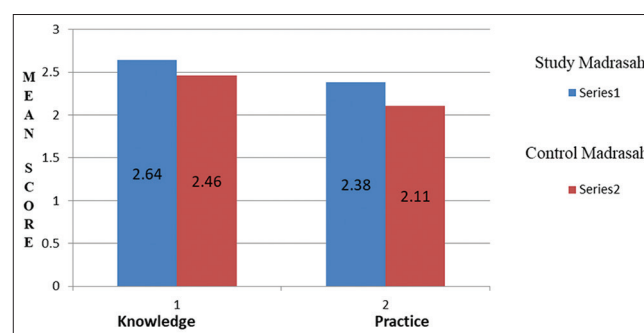


Figure 1: Bar diagram showing comparison of mean scores of baseline knowledge related to physical activity and addition of study and control Madrasahs

Table 1: Comparison of baseline knowledge and practice regarding physical activity of the students of the study and the control Madrasah (n=187)

Items	Baseline correct response, n (%)		Z test of proportion
	Study Madrasah (n=107)	Control Madrasah (n=80)	
Knowledge			
“Physical activity or playing has no good or bad effect on our health” - true/false/don't know	20 (18.7)	19 (23.8)	0.3972
“Physical activity or playing prevents many disease” - true/false/don't know	50 (46.7)	45 (56.3)	0.1998
“Physical activity or playing refreshes your mind” - true/false/don't know	90 (84.1)	64 (80.0)	0.4681
“Physical activity or playing is bad for health” - true/false/don't know	74 (69.2)	44 (55.0)	0.0470
“Physical activity or playing divert mind from study” - true/false/don't know	49 (45.8)	25 (31.3)	0.0454
Practice (7-day recall)			
Physically active such as playing outdoor game, walking, and swimming for a minimum of 60 min per day?	46 (43.0)	27 (33.7)	0.1983
Walking or riding bicycle to reach or return from Madrasah?	83 (77.6)	33 (41.3)	0.0001
Whether attended last PE class?	52 (48.6)	36 (45.0)	0.6265
Average time spend on watching television, playing computer Games or other indoor activities per day?	74 (69.2)	65 (81.3)	0.0614

PE=Physical education

Table 2: Question-wise distribution of difference between the existing and desire knowledge and practice of all the students of two Madrasahs (n=187)

Items	Correct, n (%)	Gap, n (%)
Knowledge		
“Physical activity or playing has no good or bad effect on our health” - true/false/don't know	39 (20.9)	148 (79.1)
“Physical activity or playing prevents many disease” - true/false/don't know	95 (50.8)	92 (49.2)
“Physical activity or playing refreshes your mind” - true/false/don't know	154 (82.4)	33 (17.6)
“Physical activity or playing is bad for health” - true/false/don't know	118 (63.1)	69 (36.9)
“Physical activity or playing diverts mind from study” - true/false/don't know	74 (39.6)	113 (60.4)
Practice		
Physical activity such as playing outdoor game, walking, and swimming for a minimum of 60 min per day?	73 (39.0)	164 (61.0)
Walking or riding bicycle to reach or return from Madrasah?	116 (62.0)	71 (38.0)
Whether attended last PE class?	88 (47.1)	99 (52.9)
Average time spend on watching television, playing computer games or other indoor activities per day?	139 (74.3)	48 (25.7)

PE=Physical education

In all surveys, the prevalence was higher among girls than boys and the developing countries have higher prevalence. A study by Dumith *et al.*^[14] among adolescents from Southern Brazil found that the proportion of adolescents engaging in any leisure time physical activity was 75.6% (87.2% of boys and 64.5% of girls). The prevalence of reaching the recommended level of activity of at least 300 min/week was 48.2%, being higher for boys than girls, and a similar study done by Babey *et al.*^[15] among adolescents in California found that 71% engaged in regular physical activity and 7% were inactive.

In rural South Africa, among adolescents, there was no difference in the time spent walking between the boys and girls who walked (median, interquartile range: 200, 100–300 min/week). Less than 5% of boys and girls reported cycling to and from school by Micklesfield *et al.*^[16]

Majority of the students (51.4% in the study Madrasah and 55% in the control Madrasah) in the present study, did not attend PE class in the last week. Nearly 10.3% of the students in the study Madrasah and 7.5% in the control Madrasah spend more than 5 h and 0.9% students in the study Madrasah spend 7–8 h by watching television and playing computer games during a typical or usual day.

A study done by Chen *et al.*^[17] among adolescents in Taiwan found the prevalence of engaging in any level of physical activity to be 78.2% among adolescents (81% for boys and 75.1% for girls). When the Taiwan Recommendation of Physical Activity was considered, it was found that only 28.4% of adolescents met the recommended level. The mean amount of sedentary time for all respondents was 9.5 h/day, whereas in Nigeria among adolescents, about 37% of the Nigerian

Table 3: Baseline knowledge and practice and change in knowledge and practice with or without intervention among the students of the study and control Madrasahs (n=187)

Knowledge	Study Madrasah (n=107), correct response			Control Madrasah (n=80), correct response		
	Before intervention, n (%)	After intervention, n (%)	P*	1 st assessment, n (%)	2 nd assessment, n (%)	P*
"Physical activity or playing has no good or bad effect on our health" - true/false/don't know	20 (18.7)	60 (56.1)	<0.05	19 (23.8)	19 (23.8)	>0.05
"Physical activity or playing prevents many disease"- true/false/don't know	50 (46.7)	90 (84.1)	<0.05	45 (56.2)	47 (58.8)	>0.05
"Physical activity or playing refreshes your mind"- true/false/don't know	90 (84.1)	104 (97.2)	<0.05	64 (80.0)	63 (78.7)	>0.05
"Physical activity or playing is bad for health"- true/false/don't know	74 (69.2)	98 (91.6)	<0.05	44 (55.0)	42 (52.5)	>0.05
"Physical activity or playing diverts mind from study"- true/false/don't know	49 (45.8)	90 (84.1)	<0.05	25 (31.3)	25 (31.3)	>0.05
Physical activities such as outdoor games, walking, and swimming for a minimum of 60 min per day	46 (43.0)	53 (49.5)	<0.05	27 (33.7)	29 (36.2)	>0.05
Walking or riding bicycle to reach or return from Madrasah	83 (77.6)	85 (79.4)	0.50	33 (41.3)	33 (41.2)	>0.05
Whether attended last PE class	52 (48.6)	64 (59.8)	<0.05	36 (45.0)	32 (40.0)	>0.05
Average time spend on watching television, playing computer games or other indoor activities per day	74 (69.2)	90 (84.5)	<0.05	65 (81.2)	65 (81.3)	>0.05

*McNemar χ^2 . PE=Physical education

adolescents fulfilled the recommended guidelines of 60 min/day of Minimum Vigorous Physical Activity (MVPA). Boys were more physically active than girls to meet the MVPA recommendations (54.3% vs. 45.7%), whereas girls reported significantly more school-based physical activity, home-based physical activity, and light-intensity physical activity than boys in the study done by Oyeyemi *et al.*^[18]

A study done by Kumar *et al.*^[19] found that less than a third of the interviewed participants were engaged in regular moderate-to-vigorous exercise and adequate (at least 1 h) daily physically activity, whereas 45.1% of the adolescents self-reported exercising once or twice a week (n = 320), although only 6.2% of the adolescents self-reported daily exercise by Majid *et al.*^[20] In North India, adolescents that watching television >3 h a day were more malnourished (44%) as compared with those watching <3 h a day (40%). Adolescents walking daily >10 min to school were less malnourished (39.5%) when compared with those walking <10 min daily (44.8%) by Gupta *et al.*,^[21] and 45% of girls in the intervention schools and 36% of girls in the control schools participated in vigorous physical activity in a study by Pate *et al.*^[22]

Conclusions

The training module was developed based on the assessed training needs of the students. Tool (questionnaire) for the assessment of training need and the final module for educational intervention were developed under the guidance of and in consultation with a large number of experts/stakeholders related

to adolescent health and well-being. While preparing the lesson contents, especially while citing examples for better understanding, efforts were made to cite socially and culturally appropriate examples. Similar such training may be conducted among different groups of students in other schools of the state to generate evidence to substantiate the effectiveness of such module-based training to promote healthy lifestyle among students.

As adolescent period is the ideal period to impart life-style related training, it is obvious that vital opportunities are being missed due to lack of need-based training on lifestyle issues for this important population group. Hence, a well-designed, need-based, health educational intervention may play active role in bringing desired knowledge and behavior among the population group.

Posttraining evaluation was done just after 1 month after imparting the training, but due to lack of time, this second postevaluation could not be conducted. Although utmost efforts were taken to obtain correct information from the study participants, the possibility of recall bias or conscious falsification of information provided by the students regarding their sociodemographic profile, physical activity/recreational practices, etc., cannot be ruled out.

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Conflicts of interest

There are no conflicts of interest.

References

1. Park K. Park's Textbook of Preventive and Social Medicine. 24th ed. Jabalpur, (MP) India: M/s Banarsidas Bhanot; 2017. p. 13-9.
2. World Health Organization. What is Healthy Life Style. Available from: <http://www.Eru.icp/lvng>. [Last accessed on 2018 Aug 10].
3. World Health Organization. Diet, Physical Activity and Health. Fifty-Fifth World Health Assembly. Provisional Agenda Item 13.11, A 55/16, March 2002. Available from: http://apps.who.int/gb/archive/pdf_files/WHA55/ea5516.pdf. [Last accessed on 2018 Aug 10].
4. Dumith SC, Domingues MR, Gigante DP, Hallal PC, Menezes AM, Kohl HW. Prevalence and correlates of physical activity among adolescents from Southern Brazil. *Rev Saude Publica* 2010;44:457-67.
5. GBD 2015 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2015: A systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016;388:1659-724.
6. World Health Organization. Burden of NCDs and their risk factors in India. (Excerpted from Global Status Report on NCDs-2014). Available from: http://www.searo.who.int/india/.noncommunicable_diseases/ncd_situation_global_report. [Last accessed on 2019 May 19].
7. Centers for Disease Control and Prevention (CDC). Physical Activity Facts. Available from: <https://www.cdc.gov/healthyschools/physicalactivity/facts.htm>. [Last accessed on 2018 Jul 14].
8. WHO. Noncommunicable Diseases. Available from: http://www.who.int/topics/noncommunicable_diseases/en. [Last accessed on 2018 Aug 10].
9. WHO India, Noncommunicable Diseases. Available from: http://www.searo.who.int/india/topics/noncommunicable_diseases/ncd/en. [Last accessed on 2018 Aug 10].
10. Noncommunicable Diseases, Fact Sheet, Updated June, 2017. Available from: <http://www.who.int/mediacentre/factsheets/fs355/en/>. [Last accessed on 2018 Aug 10].
11. World Health Organization-NCD Country Profiles; 2011. Available from: http://www.who.int/nmh/countries/ind_en.pdf. [Last accessed on 2018 Aug 10].
12. Adolescent Health-Healthy People. Available from: <http://www.healthypeople.gov>. [Last accessed on 2018 Aug 10].
13. UNICEF India: The Children Nutrition. Available from: http://www.unicef.org/india/children_2356.htm. [Last accessed on 2018 Aug 10].
14. de Moraes AC, Guerra PH, Menezes PR. The worldwide prevalence of insufficient physical activity in adolescents; a systematic review. *Nutr Hosp* 2013;28:575-84.
15. Babey SH, Hastert TA, Yu H, Brown ER. Physical activity among adolescents. When do parks matter? *Am J Prev Med* 2008;34:345-8.
16. Micklesfield LK, Pedro TM, Kahn K, Kinsman J, Pettifor JM, Tollman S, *et al.* Physical activity and sedentary behavior among adolescents in rural South Africa: Levels, patterns and correlates. *BMC Public Health* 2014;14:40.
17. Chen LJ, Haase AM, Fox KR. Physical activity among adolescents in Taiwan. *Asia Pac J Clin Nutr* 2007;16:354-61.
18. Oyeyemi AL, Ishaku CM, Oyekola J, Wakawa HD, Lawan A, Yakubu S, *et al.* Patterns and associated factors of physical activity among adolescents in Nigeria. *PLoS One* 2016;11:e0150142.
19. Kumar S, Ray S, Roy D, Ganguly K, Dutta S, Mahapatra T, *et al.* Exercise and eating habits among urban adolescents: A cross-sectional study in Kolkata, India. *BMC Public Health* 2017;17:468.
20. Abdul Majid H, Ramli L, Ying SP, Su TT, Jalaludin MY, Abdul Mohsein NA. Dietary intake among adolescents in a middle-income country: An outcome from the Malaysian health and adolescents longitudinal research team study (the MyHeARTs Study). *PLoS One* 2016;11:e0155447.
21. Gupta A, Sharma D, Thakur D, Thakur A, Mazta SR. Prevalence and predictors of the dual burden of malnutrition among adolescents in North India. *Saudi J Obesity* 2014;2:63-7.
22. Park H, Kim N. Predicting factors of physical activity in adolescents: A systematic review. *Asian Nurs Res (Korean Soc Nurs Sci)* 2008;2:113-28.