International Journal of Advance Research in Nursing

Correlational study to identify the barriers to physical activity and healthy diet among adolescents in selected school of Kashmir with a view to develop a lifestyle modification programme

[1]Masood Ahmad Sheikh and [2]Dr. S Victor Devasirvadam

[1] Ph.D., Nursing Research Scholar, Professor cum Principal DBU Mandi Gobindgarh Punjab, India
[2] Ph.D., Nursing, Professor cum Principal DBU Mandi Gobindgarh, Punjab, India

Abstract

Modifiable physical activity, sedentary and diet behaviours are associated with morbidity and mortality, and it is a national priority to improve these behaviours in all populations, including among adolescents. Expert groups have recommended 60 minutes/day of moderate to vigorous physical activity for youth, yet data based on objective measures suggest that only 30% of teenagers meet this guideline. Adolescents view television for less than 2 hours a day. The Centers for Disease Control and Prevention estimates that only 15% of adolescents aged 12–19 years meet the <30% of energy recommendation for total fat intake, and 7% of adolescents meet the <10% of energy recommendation for saturated fat intake. Data from CDC's 2003 Youth Risk Behaviours survey indicated that fewer than 22% of high school students consumed the recommended 5 or more servings/day of fruits and vegetables. Meeting the public health recommendations for these four health risk behaviours is expected to improve quality of life and reduce considerably the incidence of obesity and several chronic diseases. Despite extensive evidence about the high prevalence of risk behaviours, little is known about the relationship among these behaviours, such as their clustering patterns, especially in adolescents. There is some evidence that diet and physical activity behaviours tend to cluster among individuals. Improved understanding of behavioral clustering could inform strategies for multiple risk factor interventions. Identifying characteristics of adolescents most likely to have multiple risk behaviours could lead to more targeted intervention strategies. Based on the problem selected and objectives of the study, descriptive research design was selected to identify the barriers of physical activity among adolescents in a selected school Kashmir with a view to develop a lifestyle modification programme. Sixty subjects were selected in selected area of Kashmir by non-probability sampling technique for this study. Self-structured checklist was used for data collection and was analysed by descriptive and inferential statistics using chi-square and t-test. The findings revealed that there was moderate positive correlation (r = 0.78 and P= 0.978) between barriers to physical activity and healthy diet among adolescents in selected school of Kashmir. The findings also revealed that there was statistically significant association between barriers to physical activity and healthy diet with these variables (educational status, fathers education and source of information) whereas no significant association was found between barriers to physical activity and healthy diet with these variables (age, type of family, area of residence and mothers education) at ($p<0.05$).

Keywords: Identify barriers, Physical activity, healthy diet, adolescents, school and life style

Introduction

In the recent decades, overweight and obesity have been highly prevalent among children and adolescents populations, and moreover, it has proved to be a major challenge of global health. The related data indicated that it was expected that the global obesity of children and adolescents would increase by 60% in the future 10 years, and the total number would reach 250million by 2030, which would undoubtedly put great pressure on the world public health system. With the improvement of social development and economic level, the lifestyle and dietary pattern of Chinese adolescents have undergone tremendous changes. In the recent 40 years, the height and weight of Chinese teenagers has presented an upward trend, at the same time, the overweight and obesity rate of teenagers has also continued to rise. According to Report on Nutrition and

Chronic Diseases of Chinese Residents, the overweight and obesity rate of children and adolescents aged 6 to 17 in China has reached 19%, and the growth rate of children's overweight and obesity from 2002 to 2012 was 3.44 times that of adults. Obesity has seriously affected the physical and mental health development of children and adolescents. Overweight and obesity in adolescence would significantly increase the morbidity rate of metabolic disorders, insulin resistance and diabetes, cardiovascular disease, nonalcoholic steatohepatitis, musculoskeletal and psychological disorders. In the meanwhile, it was significantly associated with the health status in their adulthood periods. In view of the complexity and long-term properties of overweight and obesity in the process of occurrence and development, as well as the immaturity of adolescents' physical and mental development, improving lifestyle-related behaviours and

environments has been a scientific method characteristic with safety and economy. Under the described background, many studies have been conducted in the aspect of the interaction between overweight and obesity with a variety of lifestyle factors such as physical exercise, sedentary behaviour, eating habits and sleep duration. The results illustrated that lifestyle had a direct impact on adolescent overweight and obesity. In addition, health-risk behaviours are not isolated as a major contributor to overweight obesity in adolescents, and these behaviours may gradually stabilize or increase further in adulthood. Therefore, assessing the lifestyle characteristics of adolescents can identify important factors that contribute to obesity, thereby determining their risk of overweight obesity and developing interventions. In addition, it can also provide a reference for determining the clinical manifestations of cardio metabolic diseases and the clinical manifestations in the subclinical inflammatory process.

In the current status, limited to objective conditions and reality, most studies put more emphasis on the impact of a single behavioural factor on overweight and obesity in adolescents. Although the related factors have been controlled, the explanatory power for complicated interactions was limited. It has been demonstrated that when a single negative health behaviour and various positive health behaviours occurred simultaneously, lifestyle behaviours were not necessarily associated with negative health outcomes. In fact, human behaviour is inherently multivariate and interactive. For example, physical activity, sedentary behaviours, and eating habits may behave in more complex ways, with cumulative effects on obesity development in adolescents. In this regard, cluster analysis and other "individual-centered" research paradigms were employed to analyze the lifestyles of adolescents, so as to restore the daily lifestyle more comprehensively. Current research has focused on clustering analysis of physical activity, sedentary behaviour and eating behaviour in adolescents. Other components of lifestyle, such as sleep habits and health awareness, are also significant variables affecting adolescent obesity, so future research should be analyzed from a multifactorial perspective of adolescent lifestyle behaviour. In addition, the vast majority of such surveys were conducted in high-income countries, with a lack of research in middle- and low-income countries. The lifestyle patterns that lead to adolescent obesity are more complex, and are significantly related to factors such as race, culture, and social psychology, and more research support is still needed.

A study on the prevalence of infant obesity among Spaniards, carried out by the Spanish Agency for Food Safety and Nutrition, called ALADINO (Alimentación, Actividad Física, Desarrollo Infantil y Obesidad) with the participation of 7,923 school children aged 6 to 10 for the 2010-2011 school year, has indicated the prevalence of a26.3% over-weight in boys and 25.9% in girls, and a 22% obesity in boys and 16.2% in girls.

Wandia FB *et al*, conducted study on Prevalence of and factors associated with overweight and obesity among nursery school children aged 3-6 years in eldoret municipality (2014) The objective of this study was to determine the prevalence of overweight and obesity among nursery school children aged 3-6 years in Eldoret Municipality and to identify the associated factors. Cross-sectional study of 320 nursery school children aged 3-6

years was carried out in 20 nursery schools sampled from Eldoret Municipality. Simple random sampling proportionate to each of the schools population size was used to select the children. A child's anthropometric data, which was converted to Weight – for- Height z-scores, was used to determine the prevalence of overweight and obesity. A structured questionnaire was used to collect data. Anthropometric data was analyzed using WHO anthro software for child standards in monitoring and growth. Data was analyzed using SPSS version 12.0 and Epi Info version 3.4.3. Chi-square test of association and logistic regression (binary) was used to determine the significant variables affecting the prevalence of overweight and obesity. All p values <0.05 were considered to be statistically significant. Results indicated that the prevalence of overweight was 13.4% and obesity 6.9%. Type of school, owning television, parent's employment status and mode of transport to school were each independently significantly associated with overweight and obesity of the children. In conclusion, overweight and obesity exist in nursery school children in Eldoret Municipality, Kenya.

Alice park conducted study on lack of exercise as deadly as smoking (2012) states that About 5.3 million of the 57 million deaths worldwide in 2008 could be attributed to inactivity, the new report estimates, largely due to four major diseases: heart disease, Type 2 diabetes, breast cancer and colon cancer. The study finds that if physical inactivity could be reduced by just 10%, it could avert some 533,000 deaths a year; if reduced by 25%, 1.3 million deaths could be prevented. Say we got everyone off the couch and eliminated inactivity altogether: the life expectancy of the world's population would rise by about 0.68 years (more, if you discount those who were already active), comparable to the effect of doing away with smoking or obesity.

National Sample Survey Organization (NSSO) 2005 reported that the survey released by the Delhi government, people living in Delhi spend Rs. 371, on an average, on processed food and beverages per month. They spend Rs. 290 on vegetables and around one-third of it on fruits. The total value of junk food consumed in India in 2003 was about Rs. 41,000 crore; of which, rural areas accounted for a little over Rs. 22,000 crore, as published in an article in news paper by Sudhanshu Ranade in Business Line on July 13th 2005. Naturein 2007 states that preventable diseases caused mainly due to smoking, poor diet as junk food consumption and lack of exercise could kill millions in developing world in the next 10 years.

Beets M W, Beighle A, *et al*, A meta- analysis has summarized the research conducted to date regarding the effectiveness of after school programme in increasing physical activity of adolescents. Databases, journals and review articles were searched for articles published between 1980 and February 2008. Of the 797 articles found, 13 unique articles describing findings from 11 after-school interventions were reviewed. Analysis of the review revealed that after- school programmes can improve physical activity levels and other health related aspects among adolescents.

Rao D R, Vijayapushpam T, *et al*, A study was conducted at four secondary schools of Hyderabad, India in 164 adolescent girls belonging to eighth grade to assess dietary habits and nutrition knowledge levels of the adolescents girls from different schools and to study the efficacy of two different nutrition educational tools in improving their

nutritional knowledge in the classroom setting. In total, two interventions 1. Traditional method using print media such as folders leaflets and charts. 2. Audio- visual CD were carried out in a classroom setting for the experimental group. FFQ data on dietary consumption of adolescent girls revealed more consumption of aerated drinks, bakery items, fast foods and less consumption of millets irrespective of their socio- economic conditions. However, consumption of vegetables, green leafy vegetables and fruits was moderate. A significant improvement in the nutrition related knowledge was observed among the experimental group after intervention 1 and 2 as compared to the baseline data. However, no significant difference in the improvement of nutritional knowledge levels was observed with the second intervention over the first intervention as already the children in the experimental group gained knowledge through print media. Education on ill effects of aerated drinks, fast foods and the importance of nutrition during the adolescents phase should be emphasized in future programmes.

Objectives of the study
▪ To assess the barriers of physical activity and healthy diet among adolescents.
▪ To find the correlation between barriers to physical activity and healthy diet among adolescents.
▪ To find the association of barriers to physical activities and healthy diet among adolescents with selected socio demographic variables.

Materials and Methods
A correlational research study was conducted to identify the barriers to physical activity and healthy diet among adolescents in selected school of Kashmir with a view to develop a lifestyle modification programme. Only sixty subjects were selected by non-probability convenient sampling technique. The tool consisted of demographic variables, self- structured Observational checklist for data collection. Prior to data collection informed consent was obtained from the participants. The data was analysed by using descriptive and inferential statistics.

Results

Table 1: Frequency and percentage distribution of Study subjects according to their age. n =60

Age in years	Frequency	Percentage (%)
13yrs	16	26
14yrs	17	28
15yrs	15	25
16yrs	12	20

The data presented in table 1 showed that majority of school going children 17(28.33%) belong to the age of 14years, 16(26.66%) belong to 13years of age, 15(25%) belong to 15 years of age and 12(20%) belong to 16 years of age.

Table 2: Frequency and percentage distribution of Study subjects according to educational status. n =60

Standard of Study	Frequency	Percentage
8th	20	33
9th	20	33
10th	20	33

The data presented in table 2 depicted that equal number 20(33.33%) of adolescents were belonged to 8th, 9th and 10th standard respectively.

Table 3: Frequency and percentage distribution of Study subjects according to type of family. n = 60

Type Of Family	Frequency	Percentage
Nuclear	26	43
Joint	33	55
Extended	1	1

The data presented in table 3 revealed that majority of the adolescents belong 33(55%) to joint family, 26(43.34%) belong to nuclear family and only 01 (1.67%) belong to extended family.

Table 4: Frequency and percentage distribution of study subjects according to source of information regarding physical activity. n = 60

Source of information	Frequency	Percentage
Parents	37	61.67
School	2	3.34
Media	18	30
Peer groups	3	5

The data presented in table 4 showed that most of the adolescents 37(61.67%) had source of information regarding physical activity through parents, 18 (30%) had information through media and 03(5%) gained through peer groups.

Table 5: Frequency and percentage distribution of Study subjects according to their educational status of father. n = 60

Education Of Father	Frequency	Percentage
Illiterate	0	0
Primary school	4	6
Middle school	7	11
High school	8	13
Higher secondary	25	41
Graduation and above	16	26

The data presented in table 5 depicted that most of fathers 25(41.67%) had higher secondary education, 16 (26.67%) were graduates and above, 08(13.3%) had high school education, 07 (11.67%) had middle school education and only 04 (6.66%) had primary school education respectively.

Table 6: Frequency and percentage distribution of Study subjects according to education of mother. n = 60

Education of Mother	Frequency	Percentage
Illiterate	0	0
Primary school	7	11
Middle school	10	16
High school	17	28
Higher secondary	15	25
Graduation and above	11	18

The data presented in table 6 depicted most of the mothers 17(28.33) had high school education, 15(25%) had higher secondary education, 10(16.67%) had middle school education, 11(18.3%) were graduates and above and only 07 (11.67%) were educated till primary school.

Table 7: Frequency and percentage distribution of study subjects according to area of residence. n = 60

Residential Area	Frequency	Percentage
Urban	49	81.67
Rural	11	18.34
Total	**60**	**100**

The data presented in table 7 showed that depicts that majority of adolescents 49(81.67%) reside in urban area while 11(18.34%) reside in rural area.

Table 8: Frequency and percentage distribution of study subjects according to item wise analysis of the personal barriers to physical activity among school going children.

	Content	01		02		03		04		05	
		n	%	n	%	n	%	n	%	n	%
1.	I don't feel like to exercise due to my academic responsibilities.	25	41.6	08	13.3	07	11.6	02	3.33	18	30
2.	I feel less motivated to exercise.	04	6.66	03	5	21	35	22	36.6	10	16.6
3.	I find it hard to stick to a routine of exercise due to academic responsibilities.	30	50	04	6.66	02	3.33	10	16.6	14	23.3
4.	I always feel too tired after exercising.	03	05	02	3.33	04	6.66	30	50	21	35
5.	I feel embarrassed to exercise.	05	8.33	01	1.66	09	15	19	31.6	26	43.3
6.	I don't get enough exercise because i have never learned the skills for any sport.	18	30	02	3.33	04	6.66	23	38.3	13	21.6
7.	Non – availability of playgrounds near home.	08	13.3	09	15	02	3.33	30	50	11	18.3
8.	I don't have the peer group to play with.	05	8.33	03	5	10	16.6	20	33.3	22	36.6
9.	I have less energy to do any exercise.	19	31.6	02	3.33	04	6.66	17	28.3	18	30
10.	I experience pain while doing exercise.	10	16.6	04	6.66	06	10	22	36.6	18	30
11.	Exercise makes me perspire excessively.	26	43.3	12	20	02	3.33	15	25	05	8.33
12.	Exercise irritates me.	04	6.66	02	3.33	04	6.66	17	28.3	33	55

The data presented in table 8 showed most of the school going children 43.3% agreed that exercise makes them perspire excessively, 41.6% agreed that they don't feel like to exercise due to their academic responsibilities, 50% agreed that it is hard to stick to a routine of exercise due to academic responsibilities, 15% strongly agreed that there is non-availability of play grounds near home.

Table 9: Frequency and percentage distribution of study subjects according to item wise analysis of the perceptual barriers to physical activity among school going children.

	Content	01		02		03		04		05	
		n	f	n	f	n	f	n	f	n	f
1.	I feel demotivated to exercise due to less involvement of my parents in physical activity.	17	28.3	21	35	12	20	02	0.03	08	13.3
2.	My parents give academic success more importance to exercise.	10	16.6	21	35	13	21.6	04	6.66	02	3.33
3.	I am not interested in exercising.	03	5	08	13.3	07	11.6	22	36.6	20	33.3
4.	Exercise keeps me away from spending time with my friends.	08	13.3	04	6.66	11	18.3	23	38.3	14	23.3
5.	My friends do not encourage me to exercise.	17	28.3	18	30	02	0.03	15	25	08	13.3
6.	Exercise decreases my academic performance.	09	15	08	13.3	04	6.66	27	45	12	20
7.	Exercise decreases my muscle strength.	11	18.3	07	11.6	05	8.33	16	26.6	21	35
8.	I think people in exercise clothes looks funny.	04	6.66	15	25	05	8.33	22	36.6	14	23.3
9.	I think that intermittent exercise do not benefit for me.	25	41.6	06	10	02	0.03	14	23.3	13	21.6
10	My physical appearance alters after doing exercise.	16	26.6	06	10	08	13.3	07	11.6	23	28.3
11.	Exercise increases feelings of stress and tension for me.	04	6.66	02	0.03	02	0.03	19	31.6	33	55
12.	I don't exercise as my friends are also not exercising.	19	31.6	06	10	03	5	06	10	26	43.3

The data presented in table 9 majority of the school going children 41.6% agreed that intermittent exercise do not benefit for them, 31.6% agreed that they don't want to do exercise as their friends are also not exercising, 28.3% agreed that their friends doesn't encourage them to do exercise as well as they feel demotivated to exercise due to their less involvement of their parents in physical activity, 35% strongly agreed that their parents give academic success more importance to exercise, 21.6% of respondents are uncertain that their parents give academic success more importance to exercise, 45% of them disagreed that exercise decreases their academic performance, and 55% strongly disagreed that exercise increases feelings of stress and tension for them.

International Journal of Advance Research in Nursing

Table 10: Frequency and percentage distribution of study subjects according to item wise analysis of the time constraints barriers to physical activity among school going children.

Content		01		02		03		04		05	
		n	f	n	f	n	f	n	f	n	f
1.	Exercise takes too much of my time.	11	18.3	06	10	02	3.33	14	23.3	27	45
2.	I have no leisure time to exercise because of my busy lesson schedule.	16	26.6	15	25	07	11.6	11	18.3	11	18.3
3.	I have no leisure time to exercise because of my social responsibilities.	04	6.66	14	23.3	12	20	11	18.3	19	31.6
4.	I have no leisure time to exercise because of my family responsibilities.	01	1.66	02	3.33	08	13.3	30	50	19	31.6
5.	My parents emphasize on giving more time to studies rather than exercising.	13	21.6	09	15	05	8.33	13	21.6	20	33.3
6.	Exercise facilities do not have convenient schedules for me.	06	10	13	21.6	08	13.3	18	30	15	25

The data presented in table 10 most of the school going children i.e. 26.6% agreed that they have no leisure time to exercise because of their busy lesson schedule, 21.6% agreed that their parents emphasize on giving more time to studies rather than exercising, 18.3% are agreed that exercise takes too much of their time, 25% strongly agreed that they have no leisure time to exercise because of their busy lesson schedule, 23.3% also strongly agreed that due to their social responsibilities they have no leisure time to exercise, 20% uncertain that they have no leisure time to exercise due to their social responsibilities, 30% disagreed that exercise facilities do not have convinent schedules for them, 31.6% of the respondents strongly disagreed that they have no leisure time to exercise due to their social and family responsibilities and 33.3% strongly disagreed that their parents emphasize on giving more time to studies rather than exercising.

Table 11: Association between the barriers to physical activity and healthy diet with selected socio demographic variables.

Study Variables	Critical Value	Chi-Square	Df	P Value	Remark
Age	12.59	11.121	6	0.63	Not Significant
Education status	9.49	10.16	4	0.02	Significant
Type Of Family	9.49	10.16	4	0.62	Not Significant
Source of information	7.82	72.6	3	0.04	Significant
Area Of Residence	5.99	26.6	1	0.72	Not Significant
Fathers education	6.78	13.20	4	0.03	Significant
Mothers education	5.78	9.20	5	0.81	Not Significant

The data presented in table 11 portrayed that there is statistically significant association between barriers to physical activity and healthy diet with these variables (educational status, fathers education and source of information) whereas no significant association was found between barriers to physical activity and healthy diet with these variables (age, type of family, area of residence and mothers education).

Table 12: Correlation between barriers to physical activity and barriers to healthy diet.

Parameters	Mean	Mean Score%	Sd	Cv	Coefficient Of Correlation	Inference
Physical Activity	123.21	0.0362	1.433	1.16	0.78	Moderate Positive Correlation
Healthy Diet	113.9	335	1.377	1.2		

The data presented in table 12 portrayed that there was moderate positive correlation (r = 0.78 and P= 0.978) between barriers to physical activity and healthy diet among adolescents in selected school of Kashmir. Therefore if the level of physical activity increases among adolescents, the level of physical and psychological growth and development may be increased and if the healthy diet is provided to the adolescents, the chances of minor and major ailments may be reduced to the optimum level.

Conclusion
This study was conducted with the objective based on the problem statement to identify correlation between the barriers to physical activity and healthy diet among adolescents in selected school Kashmir with a view to develop a lifestyle modification programme. The findings also revealed that no significant association was found between barriers to physical activity and healthy diet with these variables (age, type of family, area of residence and mother's education). The findings also revealed that significant association was found between barriers to physical activity with these variables i.e., educational status, Fathers education and source of information at (*p*<0.05).So it indicates that there is need to enhance the awareness programmes regarding barrier to physical activity and healthy diet among adolescents.

Author's Contribution
Not available

Conflict of Interest

Not available

Financial Support

Not available

References

1. Morgen C, Sørensen T. Global Trends In The Prevalence Of Overweight And Obesity. Nat Rev Endocrinol. 2014;10(9):513-514. DOI: 10.1038/Nrendo.2014.124
2. The Gbd. 2015 Obesity Collaborators. Health Effects Of Overweight And Obesity In 195 Countries Over 25 Years. N Engl J Med. 2017;377(1):13-27. DOI: 10.1056/Nejmoa1614362
3. Duan R, Wang X, Shan S, Zhao L, Xiong J, Libuda L, *et al*. The Chinese Adolescent Cohort Study: Design, Implementation, and Major Findings. Front Nutr. 2021;8:747088. Doi: 10.3389/Fnut.2021.747088
4. Liu D, Zhao Ly, Yu Dm, Ju Lh, Zhang J, Wang Jz, *et al*. Dietary Patterns And Association With Obesity Of Children Aged 6–17 Years In Medium And Small Cities In China: Findings From The Cnhs 2010–2012. Nutrients. 2019;11(1):3. DOI: 10.3390/Nu11010003
5. Bureau Bureau Of Disease Control And Prevention National National Health Commission Of The People's Republic Of China. Report On Nutrition And Chronic Diseases Of Chinese Residents. Beijing: People's Medical Publishing House; c2022. p. 125-126.
6. Bureau Bureau of Disease Control and Prevention National National Health Commission of the People's Republic of China. Report On Nutrition And Chronic Diseases Of Chinese Residents. Beijing: People's Medical Publishing House; c2020.
7. GBD. Risk Factors Collaborators. Global Burden of 87 Risk Factors in 204 Countries and Territories, 1990–2019: A Systematic Analysis for the Global Burden of Disease Study. Lancet. 2019;396(10258):1223-1249. DOI: 10.1016/S0140-6736(20)30752-2
8. Hajhashemy Z, Mirzaei S, Asadi A, Akhlaghi M, Saneei P. Association Of Dietary Insulin Index And Dietary Insulin Load With Metabolic Health Status In Iranian Overweight And Obese Adolescents. Front Nutr. 2022;9:821089. Doi: 10.3389/Fnut.2022.821089
9. Wu Yf, Fan Hy, Chen Yc, Kuo Kl, Chien Kl. Adolescent Tri-Ponderal Mass Index Growth Trajectories and Incident Diabetes Mellitus in Early Adulthood. J Clin Endocrinol Metabol. 2021;106(8):E2919-2927. DOI: 10.1210/Clinem/Dgab235
10. Lindberg L, Hagman E, Danielsson P, Marcus C, Person M. Anxiety And Depression In Children And Adolescents With Obesity: A Nationwide Study In Sweden. Bmc Med. 2020;18(1):30. DOI: 10.1186/S12916-020-1498-Z
11. Pearson N, Griffiths P, Biddle Sjh, Johnston JP, Mcgeorge S, Haycraft E. Clustering And Correlates Of Screen-Time And Eating Behaviours Among Young Adolescents. Bmc Public Health. 2017;17(1):533. DOI: 10.1186/S12889-017-4441-2
12. Mahumud Ra, Sahle Bw, Owusu-Addo E, Chen W, Morton Rl, Renzaho Amn. Association of Dietary Intake, Physical Activity, and Sedentary Behaviours with Overweight and Obesity among 282,213 Adolescents in 89 Low And Middle Income To High Income Countries. Int J Obes. 2021;45(11):2404-2418. DOI: 10.1038/S41366-021-00908-0.
13. Seema S, Rohilla KK, Kalyani CV, Babbar P. Prevalence and Contributing Factors for Adolescent Obesity in Present Era: Cross-sectional Study. J Family Med Primary Care. 2021;10(5):1890-1894. DOI: 10.4103/Jfmpc.Jfmpc_1524_20.
14. Ameryoun A, Sanaeinasa H, Saffari M, Koenig Hg. Impact Of Game-Based Health Promotion Programs On Body Mass Index In Overweight/Obese Children And Adolescents: A Systematic Review And Meta-Analysis Of Randomized Controlled Trials. Child Obes. 2018;14(2):67-80. DOI: 10.1089/Chi.2017.0250
15. Yin K, Peng J, Zhang J. The Application Of Latent Profile Analysis In Organizational Behavior Research. Adv Psychol Sci. 2020;28(7):1056–70. Doi: 10.3724/Sp.J.1042.2020.01056
16. Seghers J, Rutten C. Clustering Of Multiple Lifestyle Behaviours and Its Relationship with Weight Status and Cardiorespiratory Fitness in a Sample of Flemish 11-To 12-Year-Olds. Public Health Nutr. 2010;13(11):1838-1846. DOI: 10.1017/S1368980010000418.
17. Leech RM, Mcnaughton SA, Timperio A. The clustering of diet, physical activity and sedentary behavior in children and adolescents: a review. Int J Behav Nutr Phys Activity. 2014;11(1):4. DOI: 10.1186/1479-5868-11-4.
18. Miranda V, Coimbra DR, Bastos RR. *et al*. Use of latent class analysis as a method of assessing the physical activity level, sedentary behavior and nutritional habit in the adolescents' lifestyle: a scoping review. PLoS ONE. 2021;16(8):e0256069. DOI: 10.1371/journal.pone.0256069