http:// ijp.mums.ac.ir
Original Article (Pages: 8537-8547)

The Prevalence of Obesity, Technological Device Usage, Physical Activity and their Relationship with Spirometry Indicators among Children in Isfahan City, Iran

Rohola Shirzadi[1], Farzad Masiha[2], Safoura Navaei[1], Hosein Rafiemanesh[3], Zakieh Ostad-Ahmadi[4], Emad Bahraminia[5], Seyed Hossein Mirlohi[1], Seyed Javad Sayedi[6], Gholamreza Azizi[7], *Mohammadreza Modaresi[1]

[1]Pediatric Respiratory and Sleep Medicine Research Center, Children's Medical Center, Tehran University of Medical Sciences, Tehran, Iran. [2]Department of Pediatrics, Mazandaran University of Medical Sciences, Sari, Iran. [3]Student Research Committee, School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran. [4]Iranian Center of Excellence in Health Management, School of Management and Medical Informatics, Tabriz University of Medical Science, Tabriz, Iran. [5]Division of Allergy and Clinical Immunology, Department of Pediatrics, Tehran University of Medical Sciences, Tehran, Iran. [6]Department of Pediatrics, School of Medicine, Mashhad University of Medical sciences, Mashhad, Iran. [7]Non-Communicable Diseases Research Center, Alborz University of Medical Sciences, Karaj, Iran. [8]Research Center for Immunodeficiencies, Pediatrics Center of Excellence, Children's Medical Center, Tehran University of Medical Sciences, Tehran, Iran.

Abstract

***Background*:** The decrease in physical activities following increased usage of computer and digital games has led to serious health consequences in children. This study investigates the prevalence of obesity, cellphone and computer usage and physical activity levels and their relationship with spirometry indicators in Iranian children.

***Materials and Methods*:** This is a cross-sectional study during 2013 to 2014 on high-school students in Isfahan, Iran. Sample size determined 1,690 students and sampling performed from 10 girls and 10 boy's high schools, based on multi-staged cluster randomized scheme. A research-made questionnaire was developed to complete by students interview and also contact with teachers and parents and measuring height and weight by researchers. If the asthma was probable (based symptoms and examined by physician) the spirometry was performed.

***Results*:** Overall 1,622 high-school students with the average age of 12.9 (± 1.1) years were recruited. Prevalence of obesity and overweight were significantly higher in boys ($P<0.05$). The prevalence of obesity was 9.5% in boys and 5.3% in girls, and sever underweight was 4.2% and 2.5%, respectively. Cell phone, computer, and digital game usage were significantly higher for boys ($P<0.05$); while watching television (TV) was not ($P=0.400$). Of total, 423 students (26.1%) witch asthma was probable and the average of FVC and FEV1 was significantly higher in boys than girls ($P=0.001$).

Conclusion: The overall prevalence of obesity in 12 to 14-year-old students was more than 7% and its prevalence was influenced by physical activity. Spirometry indicators were correlated with physical activity and lifestyle.

Key Words: Lifestyle, Obesity, Physical activity, Students, Spirometry.

*Please cite this article as: Rohola Shirzadi, Farzad Masiha, Safoura Navaei, Hosein Rafiemanesh, Zakieh Ostad-Ahmadi, Emad Bahraminia, et al. The Prevalence of Obesity, Technological Device Usage, Physical Activity and their Relationship with Spirometry Indicators among Children in Isfahan City, Iran. Int J Pediatr 2018;6(11):8537-47.DOI:**10.22038/ijp.2018.32467.2863**

Corresponding Author:

Mohammadreza Modaresi, Address: Children's Medical Center Hospital, 62 Qarib St., Keshavarz Blvd., Tehran 14194, Iran.
Email: mr-modaresi@sina.tums.ac.ir
Received date: Feb.23, 2018; Accepted date: Mar. 22, 2018

1- INTRODUCTION

Obesity as a serious health problem has escalated in school-aged children nowadays (1, 2). The decrease in physical activities level following increased usage of computer and digital games on one hand, and commute to school by automobile has led to serious health consequences in school-aged (i.e. 10-16 years old) children (3). It is estimated that 0.5 to 1% of children gain excessive fat annually, amongst them 32% and 8% of them will become over weighted and obese; respectively (4). Obesity in children causes a multitude of health problems such as cardio-vascular diseases, hypertension, stroke, diabetes, metabolic syndrome, respiratory disorders, and some types of cancers (5). It is reported that 16.9% of U.S.A adolescents in 2007 to 2018 had a body mass index (BMI) equal or more that the 95th percentile (6). The relationship between obesity in adolescent and adulthood is now well-established (7).

Long-term health consequences of obesity impose the highest burden of it, due to its start in physical growth period (8). This necessitates the investigation of obesity in children in more details. On the other hand, teenagers tend to use electronic devices such as cellphones, TV, and computer games more frequently which influence their physical activity level. Teenagers are more likely to get exposure to TV programs (9). Moreover, technology utilization could have some effects on the quantity and quality of sleep, which is a risk factor for attention deficiency (10-13). Aggression is more common among teenagers who use internet communication frequently (14, 15). Frequent usage of computer games and TV could also influence on physical health by causing headache, myalgia, fatigue, and sleep disorders (10, 16). Computer and digital games would definitely destroy physical activities. An investigation of the global trends of physical activity in 105 countries showed that 80.3% of teenagers in the age of 13-15 do not have sufficient physical activity (2, 17, 18). Respiratory function is a strong prognostic of mortality and morbidity. Factors such as age, weight, and physical activity level can change respiratory function. Muscles regulate the aerial ventilation through physical activity (19). The present study aimed to investigate the epidemiologic aspects and prevalence of obesity, cellphone and computer usage and lifestyle factors on physical activity levels and their relationship with spirometry indicators among children in Isfahan city, Iran.

2- MATERIALS AND METHODS

2-1. Method

This is a cross-sectional study during 2013 to 2014 on high-school students aged 12-14 years, in Isfahan city, Iran. According to the last research in Isfahan city and assumed 10% of asthma prevalence in children, precision 1%, confidence interval 95% and design effect 10%, the at-last sample size is 1,690 person. Students from ten random cluster of girl schools and ten random cluster of boy schools were selected based on multi-staged cluster randomized sampling scheme. This sampling scheme included schools as strata, and after defining sampling frame the total schools were set as clusters. At the final stage, students were selected randomly within each cluster. An appropriate questionnaire was developed by researcher to complete by students, teachers or parents contacts.

Only in cases with parents was contacted that there was no possibility to receive information from the student and the teacher. Data collection have 3 steps: one, interview with student for demographic information including age, gender, as well as physical activity, commute modalities, usage of cellphone, computer, TV, and digital games and measuring height and weight by researcher; step two, the

questionnaire contains the three-international standard ISSAC modules asking about symptoms of asthma, eczema and allergic rhinitis. The questionnaires will be filled by students, teachers or parents; step three, the questionnaire will be evaluated carefully by researcher and we will select the students with positive answer questions related to symptoms of asthma and examined by physician. If the asthma is probable the spirometry will be performed. Body mass index (BMI) for age and sex calculate base on World health organization (WHO) Reference (2007) (20), and number (%) of BMI category presented for obesity, overweight, normal, thinness and sever thinness based on age-sex Z-score. WHO developed the Growth Reference Data for 5-19 years old; it is a reconstruction of the 1977 National Center for Health Statistics (NCHS)/WHO reference and uses the original National Center for Health Statistics (NCHS) data set supplemented with data from the WHO child growth standards sample for young children up to age five. Pulmonary function test (PFT) was evaluated, by medical student with trained to perform a bronchoscopy, according to the American Thoracic Society recommendations, using a computerized pneumotachograph (Jaeger, Wurzburg, Germany) in students. FEV1, FVC, FEV1/FVC and maximal mid-expiratory flow (MMEF25-75%) were recorded for each tested patient.

2-2. Statistical Analysis

Descriptive analysis was expressed as frequency (number and percentage), mean ± standard deviation (SD), percentile, median (IQR), trimmed mean and Huber's M-estimator, as appropriate. A trimmed mean is a method of averaging that removes a small designated percentage of the largest and smallest values before calculating the mean. After removing the specified observations, the trimmed mean is found using a standard arithmetic averaging formula. The use of a trimmed mean helps eliminate the influence of data points on the tails that may unfairly affect the traditional mean. M-estimation is one of the robust techniques to resist outliers. Because of its good statistical properties and relatively low computing effort, the M-estimator plays an important role in robust estimation. Huber's M-estimator is probably the most famous M-estimator. Chi-square tests were used for 2 × 2 comparison of categorical variables, whereas t-tests and one-way ANOVA and nonparametric equivalent of there were used to compare numerical variables. Pearson's correlation coefficient was calculated for assessment of correlation between variables. Shapiro-Wilks test used for check of normality assumption for variable; so according to establishment of assumptions was done parametric or nonparametric test. Statistical analyses were performed using the SPSS software package, version 22.0 (SPSS Inc., Chicago, IL, USA) and P-Values of less than 0.05 were considered statistically significant.

3- RESULTS

Overall 1,622 high-school students (aged 12-14 years) with the average age of 12.9 (± 1.1) years were recruited, of them 51.7% were boy. The weight of the sample ranged between 15 to 156 kilograms with the average of 46.5 (±14.5); and the height ranged between 49 to 186 centimeters with the average of 154.7 (±12.8). The prevalence of obesity was 9.5 in boys and 5.3 in girls, the prevalence of sever underweight was 4.2 and 2.5%, respectively. BMI for girls were more likely to fall into normal range, and the prevalence of obesity and overweight were significantly higher in boys ($P<0.05$) (**Table.1**) (*please see the table at the end of paper*). The proportion of commute modalities including car, walking, and bike was 66.1%, 7.1%, and 26.8% for boys; and 69.3%, 30.7%, and null for girls,

respectively. There was no statistically significant difference between type of commute modalities and BMI categories (P> 0.05).

3-1. Usage of cellphone, computer, TV, and digital games

Overall, 725 (44.7 %) students had at least one-minute phone talk during the day with the average of 47 minutes; 59.2% and 9.4% of students had less than 20 minutes and more than 2 hours a day phone call; 52.8% of students had personal computers and the average time of computer usage was 1-2 hours a day; also 65.6% of students played digital games amongst whom 29.6% played all the week days and 63.2% played three days or less. The average of time game playing was 96 minutes and 25% (n=194) of students played for more than 120 minutes; 95.3% (n=1027) of students watched TV each day, 84.1% (n=864) watched TV the whole week and the average time for watching TV was 160 minutes; while 25% (n=257) of students watched more than 180 minutes. Cell phone, computer, and digital game usage were significantly higher for boys while watching TV was not (**Table.2**) (*please see the table at the end of paper*).

3-2. Physical activity

Among 1,443 students, 724 (50.2%) walked in leisure times, amongst them 67.4% for three days or more and 31.8% all the week days. The average of walking was 67.7 minutes; and students without walking in free time have higher obesity and overweight (P=0.036). Among 1,428 students, 58.2% (n=831) of them had medium physical activity which 65.7% (n=546) had three days or less and the average was 65.0 minutes. Among 1,444 students, 55.9% (n=807) had at least 10 minutes high aerial physical activity such as running, biking, and swimming which 64.7% of them had three days or less and with the average of 73.9 minutes. Aerial activities yielded significant differences among boys and girls; while walking and medium activity did not significant differences (**Table.2**) (*please see the table at the end of paper*). There was a significantly inverse correlation between aerial activities and BMI (P=0.004, r= -0.105); however, there was no statistically significant association between medium activity and BMI (P> 0.05)

3-3. Spirometry indicators

A total of 423 (26.1%) were found to have respiratory symptoms (asthma is probable). FVC and FEV1 percent measurements for 423 students have an average of 79.29 ($\pm$19.32), and 84.85 ($\pm$21.06), respectively. The average of FVC and FEV1 was significantly higher in boys than girls (2.68 and 2.35 for boys vs. 2.35 and 2.01 for girls, respectively) (P=0.001). FVC and FEV1 percent indicators also showed a significant positive correlation with age, weight, and moderate activity and aerobic exercise Time (**Table.3**) (*please see the table at the end of paper*).

4- DISCUSSION

We studied the students of high-school students (838,574 boys, and 783,426 girls) to find the relationship of obesity, cellphone and computer usage, and lifestyle with spirometry indicators. We found that obesity was more prevalent among boys. In a study conducted in U.S.A the prevalence of obesity in boys aged 12-19 was higher than girls with the same age range (21). Alblooshi et al. also showed that obesity is more prevalent among boys such a way that almost one fourth of children aged 11 to 14 years old were obese or extremely obese, and 10% of boys and 3% of girls in 15-18 years old were extremely obese (22). Another study in Portugal also reported that the prevalence of obesity is higher among teenage boys while for the underweight the inverse was true. The authors concluded that underweight gets more common with

increase in age and obesity is a usual event for girls after 14 years and boys after 16 years old (23). We calculated the average of 46.5 for weight and 154.7 for height. A study in Sweden reported the average weight and height of 65 and 173.1 for teenagers (24). BMI was more frequent in normal range in girls whereas another study in US found that abnormal increase in BMI observed more frequently in boys (6). Most of the students used car to commute to school with more proportion for girls. Although using bike or walk for commute would increase physical activity and hence decrease BMI, we could not find any distinctive results. We found that 52% of students used personal computers with the average of 133 minutes. 65.6% of students used digital games less than three days a week. A study on Portuguese teenagers showed that 31.2% of them used computer during weekdays and 53.6% of them during weekends (25).

We found that 47.9% of students used computes 1-2 hours during week. Medium usage of computer does not have any adverse effects on skills and social communications of students (26). However, different studies have shown that various outcomes such as depression (27), obesity, sleep and Sight disorders (10-13), and so low self-esteem, anxiety and mental disorders can happen due to the overuse of computers (28-30). Some studies, however, have reported no physical consequences. Rita Cerutti et.al for example reported that there is no relationship between over usage of cellphones and computers and internet and headache (31). Our results confirmed a significant difference of computer and digital games between boys and girls. Seven hundred twenty-five students in our sample had at least one-minute phone call per day; while 60% of them had less than 20 minutes call per day, which was significantly higher for boys. We did not investigate the time elapsed for social medias. Most of the students watched TV during a day with the average of 169 minutes. 65.6% of teenagers in Portugal also reported watching TV during a day and watching more than three hours in weekends (25). We also reported that 50.2% of students were walking in leisure times with most of them had more than three days of week with the average of 67 minutes. We did not find any significant relationship neither between walking and BMI nor between walking and gender of the person. Also, 1,217 of 1,428 individuals had medium physical activity with an average of 65 minutes in three days a week or less. Physical activity had no association neither with BMI nor with and gender. Out of 1,444 students, 807 had high aerial physical activity. There was a statistically negative association between aerial activities with BMI and gender. A study on British teenagers showed that high physical activity in ages 11-12 and 15-16 decreases and sedentary behaviors increases, especially in girls (32).

It is well-established that over watching TV, and over usage of computer and digital games can increase weight. Decreasing such factors could have a tremendous health effects on teenagers life (27). Finally, we investigated the relationship of spirometry indicators with age, weight, and time of aerial physical activity. We found higher values of FVC and FEV among boys, which were significant. Moreover, FVC and FEV percent indicators had a statistically positive association with age, weight, and physical activity. Dickman et al. reported that pulmonary function increases following increasing in age and reaches in its peak in age of 18 years and decreases after that in boys, whereas this process takes place in the age of 16 for girls and remains plateau afterwards (33). Another study in Brazil found that boys aged 11 to 15 with physical activity had perfect FVC and FEV values while it was not true for

girls. This study highlighted that physical activity during early teenage might increase pulmonary function in boys during the whole adolescent (33). Overall, increase in physical activity can be effective in teenager's pulmonary function (19, 34-37). On the other hand, a study in Germany did not find any significant association between physical activity and active life style with spirometry indicators (38).

5- CONCLUSIONS

The overall prevalence of obesity in 12 to14 year-old students, more than 7% that obesity in boys was almost twice as girls. The student's average usage of computer was between 1 to 2 hours in day. The prevalence of computer games was more than 65% and the prevalence daily play computer game was 30%. More than 60% of students had moderate or severe physical activity and obesity was prevalent in student without physical activity. Spirometry indicators also showed a positive correlation with age, weight, and moderate activity and aerobic exercise Time. Daily time (minute) usage of computer use, gaming and aerobic activity were significantly difference in gender.

6- ABBREVIATION

FEV1: The forced expiratory volume in one second.

FVC: Forced Vital Capacity.

FEV1/FVC: The FEV1/FVC ratio is the amount of forced expiratory volume in one second divided by all of the air exhaled during a maximal exhalation (Forced vital capacity).

7- CONFLICT OF INTEREST: None.

8- REFERENCES

1. Gallus S, Odone A, Lugo A, Bosetti C, Colombo P, Zuccaro P, et al. Overweight and obesity prevalence and determinants in Italy: an update to 2010. European journal of nutrition. 2013;52(2):677-85.

2. Nejadsadeghi E, Sadeghi R, Shojaeizadeh D, Yekaninejad MS, Djazayeri A, Majlesi F. Influence of lifestyle factors on Body Mass Index in preschoolers in Behbahan city, southwest Iran, 2016. Electronic physician. 2018;10(4):6725.

3. Shadloo B, Farnam R, Amin-Esmaeili M, Hamzehzadeh M, Rafiemanesh H, Jobehdar MM, et al. Inclusion of gaming disorder in the diagnostic classifications and promotion of public health response: Commentary to the "Scholars' open debate paper on the World Health Organization ICD-11 Gaming Disorder proposal": A perspective from Iran. Journal of behavioral addictions. 2017;6(3):310-2.

4. Lobstein T, Baur L, Uauy R. Obesity in children and young people: a crisis in public health. Obesity reviews. 2004;5(S1):4-85.

5. Must A, Strauss RS. Risks and consequences of childhood and adolescent obesity. Int J Obes Relat Metab Disord. 1999;23 Suppl 2:S2-11.

6. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. Jama. 2012;307(5):483-90.

7. Ochiai H, Shirasawa T, Nishimura R, Morimoto A, Shimada N, Ohtsu T, et al. Relationship of body mass index to percent body fat and waist circumference among schoolchildren in Japan-the influence of gender and obesity: a population-based cross-sectional study. BMC Public Health. 2010;10(1):493.

8. Mahmudi A, Tajedini F, Ranjbar H, Moghimi DB. Determinants of overweight and obesity in the middle school students of Pakdasht city, Tehran province. 2014.

9. Mills KL. Effects of Internet use on the adolescent brain: despite popular claims, experimental evidence remains scarce. Trends in cognitive sciences. 2014;18(8):385-7.

10.Thomée S, Härenstam A, Hagberg M. Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults-a prospective cohort study. BMC public health. 2011;11(1):66.

11. Van den Bulck J. Adolescent use of mobile phones for calling and for sending text messages after lights out: results from a prospective cohort study with a one-year follow-up. Sleep-New York Then Westchester. 2007;30(9):1220.

12. Van den Bulck J. Text messaging as a cause of sleep interruption in adolescents, evidence from a cross- sectional study. Journal of Sleep Research. 2003;12(3):263-.

13. Punamäki R-L, Wallenius M, Nygård C-H, Saarni L, Rimpelä A. Use of information and communication technology (ICT) and perceived health in adolescence: the role of sleeping habits and waking-time tiredness. Journal of adolescence. 2007;30(4):569-85.

14. Takao M, Takahashi S, Kitamura M. Addictive personality and problematic mobile phone use. CyberPsychology & Behavior. 2009;12(5):501-7.

15. Werner NE, Bumpus MF, Rock D. Involvement in internet aggression during early adolescence. Journal of Youth and Adolescence. 2010;39(6):607-19.

16. Choi K, Son H, Park M, Han J, Kim K, Lee B, et al. Internet overuse and excessive daytime sleepiness in adolescents. Psychiatry and clinical neurosciences. 2009;63(4):455-62.

17. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U, et al. Global physical activity levels: surveillance progress, pitfalls, and prospects. The lancet. 2012;380(9838):247-57.

18. Oja P, Titze S. Physical activity recommendations for public health: development and policy context. EPMA Journal. 2011;2(3):253.

19. Fatima SS, Rehman R, Khan YS. Physical activity and its effect on forced expiratory volume. J Pak Med Assoc. 2013;63(3):310-2.

20. World Health Organization. Growth reference data for 5-19 years. Geneva: WHO. 2007.

21. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. Jama. 2006;295(13):1549-55.

22. Marques-Vidal P, Ferreira R, Oliveira JM, Paccaud F. Is thinness more prevalent than obesity in Portuguese adolescents? Clinical Nutrition. 2008;27(4):531-6.

23. AlBlooshi A, Shaban S, AlTunaiji M, Fares N, AlShehhi L, AlShehhi H, et al. Increasing obesity rates in school children in United Arab Emirates. Obesity science and practice. 2016;2(2):196-202.

24. Ekström S, Kull I, Nilsson S, Bergström A. Web-based self-reported height, weight, and body mass index among Swedish adolescents: a validation study. Journal of Medical Internet Research. 2015;17(3): e73.

25. Paiva T, Gaspar T, Matos MG. Mutual relations between sleep deprivation, sleep stealers and risk behaviours in adolescents. Sleep Science. 2016;9(1):7-13.

26. Subrahmanyam K, Greenfield P, Kraut R, Gross E. The impact of computer use on children's and adolescents' development. Journal of Applied Developmental Psychology. 2001;22(1):7-30.

27. Salmela-Aro K, Upadyaya K, Hakkarainen K, Lonka K, Alho K. The Dark Side of Internet Use: Two Longitudinal Studies of Excessive Internet Use, Depressive Symptoms, School Burnout and Engagement Among Finnish Early and Late Adolescents. J Youth Adolesc. 2017;46(2):343-57.

28. Ji J, Wang S-q, Liu Y-j, He Q-q. Physical activity and lung function growth in a cohort of Chinese school children: a prospective study. PloS one. 2013;8(6):e66098.

29. Berntsen S, Wisløff T, Nafstad P, Nystad W. Lung function increases with increasing level of physical activity in school children. Pediatric exercise science. 2008;20(4):402-10.

30. Holmen T, Barrett-Connor E, Clausen J, Holmen J, Bjermer L. Physical exercise, sports, and lung function in smoking versus nonsmoking adolescents. European Respiratory Journal. 2002;19(1):8-15.

31. Cerutti R, Presaghi F, Spensieri V, Valastro C, Guidetti V. The Potential Impact of Internet and Mobile Use on Headache and Other Somatic Symptoms in Adolescence. A Population- Based Cross- Sectional Study.

Headache: The Journal of Head and Face Pain. 2016;56(7):1161-70.

32. Brodersen NH, Steptoe A, Boniface DR, Wardle J. Trends in physical activity and sedentary behaviour in adolescence: ethnic and socioeconomic differences. British Journal of Sports Medicine. 2007;41(3):140-4.

33. Dickman ML, Schmidt CD, Gardner RM. Spirometric Standards for Normal Children And Adolescents (Ages 5 Years through 18 Years) 1, 2. American Review of Respiratory Disease. 1971;104(5):680-7.

34. Gámez-Guadix M. Depressive symptoms and problematic Internet use among adolescents: Analysis of the longitudinal relationships from the cognitive–behavioral model. Cyberpsychology, Behavior, and Social Networking. 2014;17(11):714-9.

35. Lam LT, Peng Z-W. Effect of pathological use of the internet on adolescent mental health: a prospective study. Archives of pediatrics and adolescent medicine. 2010;164(10):901-6.

36. Smith MP, von Berg A, Berdel D, Bauer C-P, Hoffmann B, Koletzko S, et al. Physical activity is not associated with spirometric indices in lung-healthy German youth. European Respiratory Journal. 2016:ERJ-01408-2015.

37. Nystad W, Samuelsen S, Nafstad P, Langhammer A. Association between level of physical activity and lung function among Norwegian men and women: the HUNT study. The International Journal of Tuberculosis and Lung Disease. 2006;10(12):1399-405.

38. Ciarrochi J, Parker P, Sahdra B, Marshall S, Jackson C, Gloster AT, et al. The development of compulsive internet use and mental health: A four-year study of adolescence. Developmental psychology. 2016;52(2):272.

Table-1: Distribution of BMI (Z-scores) and prevalence of obesity, overweight, normal, thinness and sever thinness in children in Isfahan city, Iran.

Gender	Age (Year)	Obesity		Overweight		Normal		Thinness		Sever thinness		Total
		Z-scores*	Number (%)	Z-scores	Number (%)	Z-scores	Number (%)	Z-scores	Number (%)	Z-scores	Number (%)	
Boy	10	> 21.4	0 (0.0)	18.5 - 21.4	1 (100)	13.7 - 18.5	0 (0.0)	12.8 - 13.7	0 (0.0)	< 12.8	0 (0.0)	1 (100)
	11	> 22.5	5 (11.1)	19.2 - 22.5	13 (28.9)	14.1 - 19.2	21 (46.7)	13.1 - 14.1	4 (8.9)	< 13.1	2 (4.4)	45 (100)
	12	> 23.6	20 (12.1)	19.9 - 23.6	41 (24.8)	14.5 - 19.9	92 (55.8)	13.4 - 14.5	8 (4.8)	< 13.4	4 (2.4)	165 (100)
	13	> 24.8	16 (9.4)	20.8 - 24.8	38 (22.4)	14.9 - 20.8	95 (55.9)	13.8 - 14.9	12 (7.1)	< 13.8	9 (5.3)	170 (100)
	14	> 25.9	8 (7.3)	21.8 - 25.9	19 (17.3)	15.5 - 21.8	72 (65.5)	14.3 - 15.5	4 (3.6)	< 14.3	7 (6.4)	110 (100)
	15	> 27.0	1 (2.9)	22.7 - 27.0	8 (23.5)	16.0 - 22.7	21 (61.8)	14.7 - 16.0	4 (11.8)	< 14.7	0 (0.0)	34 (100)
	16	> 27.9	0 (0.0)	23.5 - 27.9	0 (0.0)	16.5 - 23.5	1 (100)	15.1 - 16.5	0 (0.0)	< 15.1	0 (0.0)	1 (100)
	Total (n=526)		50 (9.5)		120 (22.8)		302 (57.4)		32 (6.1)		22 (4.2)	526 (100)
Girl	11	> 23.7	3 (9.7)	19.9 - 23.7	4 (12.9)	13.9 - 19.9	23 (74.2)	12.7 - 13.9	1 (3.2)	< 12.7	0 (0.0)	31 (100)
	12	> 25.0	8 (8.1)	20.8 - 25.0	20 (20.2)	14.4 - 20.8	67 (67.7)	13.2 - 14.4	3 (3.0)	< 13.2	1 (1.0)	99 (100)
	13	> 26.2	3 (2.4)	21.8 - 26.2	18 (14.4)	14.9 - 21.8	91 (72.8)	13.6 - 14.9	9 (7.2)	< 13.6	4 (3.2)	125 (100)
	14	> 27.3	5 (4.4)	22.7 - 27.3	12 (10.5)	15.4 - 22.7	90 (78.9)	14.0 - 15.4	4 (3.5)	< 14.0	3 (2.6)	114 (100)
	15	> 28.2	2 (6.7)	23.6 - 28.3	3 (10.0)	15.9 - 23.5	21 (70.0)	14.4 - 15.9	2 (6.7)	< 14.4	2 (6.7)	30 (100)
	Total (n=399)		21 (5.3)		57 (14.3)		292 (73.2)		19 (4.8)		10 (2.5)	399 (100)
P-value**			0.016		0.001		0.001		0.383		0.167	
Total Student (n=925)			71 (7.7)		177 (19.1)		594 (64.2)		51 (5.5)		32 (3.5)	925 (100)

* Body Mass Index (BMI) in kg/m2; ** Test for prevalence different in sex.

Table-2: Distribution of daily time usage of cellphone, computer, TV, and digital games and physical activity in children by sex, in Isfahan city, Iran.

	Sex	Mean time	5% Trimmed Mean	Huber's M-Estimator	Min - Max	IQR	Percentiles							P-value
							5	10	25	50	75	90	95	
Mobile Use	Boy (n=348)	46.2	25.5	16.7	1 - 720	25	2	2	5	15	30	90	195	0.015
	Girl (n=377)	47.8	35.9	20.0	1 - 740	55	2	3	5	15	60	142	211	
	Total (n=725)	47.0	30.9	18.1	1 - 740	25	2	3	5	15	30	120	200	
Computer Use	Boy (n=439)	146.6	132.5	121.9	1 - 1200	120	30	35	60	120	180	300	360	<0.001
	Girl (n=355)	118.2	108.6	99.7	1 - 780	90	15	30	60	90	150	240	306	
	Total (n=794)	133.9	121.7	111.6	1 - 1200	120	20	30	60	120	180	270	332	
Gaming	Boy (n=483)	106.6	94.7	89.1	5 - 1800	60	30	30	60	90	120	180	210	<0.001
	Girl (n=293)	78.6	71.9	64.4	3 - 720	90	15	24	30	60	120	150	180	
	Total (n=776)	96.0	86.1	81.6	3- 1800	60	30	30	60	60	120	180	184	
TV	Boy (n=541)	156.7	149.6	141.1	30 - 720	90	60	60	90	120	180	300	330	0.400
	Girl (n=486)	159.5	147.8	137.1	1 - 720	120	45	60	90	120	210	300	379	
	Total (n=1027)	159.6	148.7	139.2	1 - 720	90	60	60	90	120	180	300	360	
Walking in free time*	Boy (n=258)	69.4	59.7	53.8	5 - 480	30	15	20	30	60	60	123	180	0.795
	Girl (n=261)	66.0	59.9	55.0	5 - 360	60	15	20	30	60	90	120	177	
	Total (n=519)	67.7	59.8	54.4	5 - 480	60	15	20	30	60	90	120	180	
Moderate exercise*	Boy (n=326)	66.9	61.0	56.2	6 - 420	60	10	15	30	60	90	120	180	0.565
	Girl (n=203)	62.0	58.3	54.6	10 - 240	60	10	15	30	60	90	120	150	
	Total (n=529)	65.0	59.9	55.6	6 - 420	60	10	15	30	60	90	120	150	
Aerobic activity*	Boy (n=341)	78.9	71.4	66.6	5 - 600	90	10	15	30	60	120	150	180	0.004
	Girl (n=200)	65.4	59.3	54.5	5 - 330	60	10	10	30	60	90	120	180	
	Total (n=541)	73.9	66.9	61.7	5 - 600	60	10	15	30	60	90	146	180	

* All participants who had physical activity not reported their daily time of physical activity.

Table-3: Correlation matrix between spirometry indicators, basic and lifestyle variable in Isfahan city children, Iran.

Variables	1	2	3	4	5	6	7	8
1. %FEV1		0.880**	0.167**	0.156**	0.014	-0.001	0.260**	0.192*
2. %FVC	0.880**		0.118*	0.133*	-0.020	0.000	0.311**	0.199*
3. Age	0.167**	0.118**		0.290**	0.031	-0.039	0.049	0.052
4. Wight	0.156**	0.133**	0.290**		0.052	0.043	0.005	-0.008
5. TV Time	0.014	-0.020	0.031	0.052		0.185**	0.180**	0.098*
6. Walking Time	0.001	0.000	-0.039	0.043	0.185**		0.307**	0.359**
7. Moderate activity Time	0.260**	0.311**	0.049	0.005	0.180**	0.307**		0.648**
8. Aerobic exercise Time	0.192**	0.199**	0.052	-0.008	0.098*	0.359**	0.648**	

*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).
FEV1: The forced expiratory volume in one second; FVC: Forced Vital Capacity.