International Journal of Community Medicine and Public Health
*Kurdaningsih SV et al. Int J Community Med Public Health. 2016 Mar;3(3):630-635*
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20160623

**Research Article**

# Physical activity and sedentary lifestyle towards teenagers' overweight/obesity status

**Septi Viantri Kurdaningsih, Toto Sudargo, Lely Lusmilasari***

School of Nursing, Faculty of Medicine, Universitas Gadjah Mada, Indonesia

**Received:** 20 December 2015
**Revised:** 20 December 2015
**Accepted:** 11 January 2016

***Correspondence:**
Dr. Lely Lusmilasari,
E-mail: lely_psik@ugm.ac.id



## ABSTRACT

**Background:** The prevalence of obesity and overweight that caused by genetic factor and environment factors, like physical activity and sedentary lifestyle, increased continually, not only in children and teenagers who live in developed countries, but also in developing countries. Aim of this research was to understand the relation of physical activity and sedentary lifestyle towards teenagers' overweight/obesity status of State Senior High School in Yogyakarta City, Indonesia.
**Methods:** This research was an observational research using cross-sectional method. Samples in this research were 184 State Senior High School students in Yogyakarta between July-August 2015 with proportional stratified random sampling method. Data was analyzed using chi-square test and multiple logistic regressions.
**Results:** There was relation between physical activity and overweight/obesity ($p<0.001$), also between sedentary lifestyle and overweight/obesity ($p<0.001$). Analysis result of multiple logistic regressions showed that dominant factors in this research were family income, parents' overweight history, physical activity, and sedentary lifestyle with $p<0.001$ and R square 0.539.
**Conclusions:** Overweight/obesity in teenagers could be caused by the decreased physical activity and the increased sedentary lifestyle, and aggravated by family income and parents' overweight history. Follow up research must be done using cohort study design with bigger samples.

**Keywords:** Overweight, Physical activity, Sedentary lifestyle

## INTRODUCTION

The increasing prevalence of obesity and overweight in children and teenagers became one of global epidemic health problems, especially in developed and developing countries. WHO (World Health Organization) in 2014 reported that more than 1.9 billion of adults and teenagers in the world experienced overweight, and 600 million of them got obesity.[1] Obesity became a serious disease because it could cause other disease complications such as diabetes mellitus, hypertension, sleep apnea syndrome, metabolic changes, intracranial hypertension, and precocious puberty.[2]

Overweight and obesity in teenagers could be caused by several factors. Factors that contributed to overweight and obesity were genetic factor and environment factors (sedentary lifestyle, physical activity, socioeconomic status, nutritional status).[3] This finding was parallel to research from Hadi in 2004 which explained that factor importantly contributed to increased bodyweight and the incidence of overweight and obesity in teenagers was decreased physical activity.[4]

The continued development of today's technology, people are increasingly experiencing a decrease in physical activity.[5] Based on research Ortega et al that the child and

teenagers who do more physical activity lower risk of becoming overweight and obesity. Teenagers today to spend more time at home than to be walking and cycling.[6]

Changes in lifestyle with eating disorders and decreased physical activity showed changes become sedentary lifestyle.[7] Sedentary lifestyle is a lifestyle lazing or less mobile.[8] This causes the incoming energy intake only slightly used that is stored as body fat. This lifestyle has a greater likelihood to become obesity in teenagers.[9]

## METHODS

This study was an observational research with cross-sectional method. Samples in this research were 184 teenagers aged 16-18 years old that studied in State Senior High School in Yogyakarta City, Indonesia between July-August 2015 using proportional stratified random sampling method. IPAQ (International Physical Activity Questionnaire) was used to assess respondent's physical activity. Sedentary lifestyle questionnaire constructed based on literature searching and some modifications adopted from ASAQ (Adolescents Activity Sedentary Questionnaire).[10]

Data was analyzed using chi square test and multiple logistic regressions to identify which variable that was really dominant related to overweight/obesity in research subjects

## RESULTS

Results of the study are the result of data analysis of univariate, bivariate and multivariate analyzes that have been done.

**Table 1: Participants' background.**

| Variable | Nutritional status | | | | OR | 95% CI | p-value |
|---|---|---|---|---|---|---|---|
| | Normal (n=92) | | Overweight/obesity (n=92) | | | | |
| | N | % | n | % | | | |
| **Age** | | | | | | | |
| Mid adolescence | 77 | 53.1 | 68 | 46.9 | 1.812 | 0.879-3.733 | 0.104 |
| Late adolescence | 15 | 38.5 | 24 | 61.5 | | | |
| **Sex** | | | | | | | |
| Man | 52 | 60.5 | 34 | 39.5 | 2.218 | 1.228-4.004 | 0.008* |
| Female | 40 | 40.8 | 58 | 59.2 | | | |
| **Father's education** | | | | | | | |
| Low | 2 | 28.6 | 5 | 71.4 | 0.387 | 0.073-2.046 | 0.444 |
| High | 90 | 50.8 | 87 | 88.5 | | | |
| **Mother's education** | | | | | | | |
| Low | 2 | 66.7 | 1 | 33.3 | 2.022 | 0.180-22.698 | 1.000 |
| High | 90 | 49.7 | 91 | 50.3 | | | |
| **Father's occupation** | | | | | | | |
| Does not work | 4 | 40 | 6 | 60 | 0.652 | 0.178-2.390 | 0.747 |
| Work | 88 | 50.6 | 86 | 49.4 | | | |
| **Mother's occupation** | | | | | | | |
| Does not work | 41 | 47.1 | 46 | 52.9 | 0.804 | 0.450-1.435 | 0.460 |
| Work | 51 | 52.6 | 46 | 47.4 | | | |
| **Family income** | | | | | | | |
| Low | 28 | 30.4 | 9 | 9.8 | 4.035 | 1.779-9.149 | <0.001* |
| High | 64 | 69.6 | 83 | 90.2 | | | |
| **Family outcome** | | | | | | | |
| Low | 15 | 48.4 | 16 | 51.6 | 0.925 | 0.427-2.003 | 0.844 |
| High | 77 | 50.3 | 76 | 49.7 | | | |
| **History of overweight parents** | | | | | | | |
| Yes | 29 | 29.9 | 68 | 70.1 | 0.162 | 0.086-0.308 | <0.001* |
| No | 63 | 72.4 | 24 | 27.6 | | | |

*Significant at p<0.05

Table 1 shows that the distribution characteristics of the respondents in teenagers' normal nutritional status and the nutritional status of teenagers with overweight/obesity. There is no significant relationship (p>0.05) based on the distribution of age, father's education, mother's education, father's occupation, mother's occupation, and family expenses. This means that the distribution of age, father's education, mother's education, father's occupation, mother's occupation, family spending on group of teenagers' normal nutritional status and teenagers' nutritional status overweight/obesity is the same. Distribution characteristics of the respondents showed a significant relationship between the two groups, namely gender, family income and parental history of obesity (p<0.05).

The respondents who have a heavy physical activity but normal nutritional status of 70 people (79.5%) and who have physically strenuous activity but the nutritional status of overweight/obesity as many as 18 people (20.5%). Results of statistical test showed that there is a relationship between physical activity with overweight/obesity with p-value <0.05. More results are shown in Table 2.

**Table 2: Analyses of the relationship of physical activity with overweight/obesity (n=184).**

| Variable | Nutritional Status | | | | OR | 95% CI | p-*value* |
|---|---|---|---|---|---|---|---|
| | Normal | | *Overweight*/obesity | | | | |
| | n | % | n | % | | | |
| **Physical Activity** | | | | | | | |
| Vigorous | 70 | 79.5 | 18 | 20.5 | 0.076 | 0.038-0.154 | <0.001* |
| Moderate | 22 | 22.9 | 74 | 77.1 | | | |

*Significant at p<0.05

**Table 3: Analyses of the relationship dimension sedentary lifestyle with overweight/obesity (n=184).**

| Dimension sedentary lifestyle | Nutritional Status | | | | OR | 95%CI | p-value |
|---|---|---|---|---|---|---|---|
| | Normal | | *Overweight*/obesity | | | | |
| | n | % | n | % | | | |
| **Small screen-based recreation** | | | | | | | |
| Low (≤ 2 hours/day) | 60 | 74.1 | 21 | 25.9 | 6.339 | 3.313-12.130 | <0.001* |
| High (>2 hours/day) | 32 | 31.1 | 71 | 68.9 | | | |
| **Education** | | | | | | | |
| Low (≤ 2 hours/day) | 35 | 66 | 18 | 34 | 2.524 | 1.298-4.910 | 0.006* |
| High (>2 hours/day) | 57 | 43.5 | 74 | 56.5 | | | |
| **Travel** | | | | | | | |
| Low (≤ 2 hours/day) | 27 | 71.1 | 11 | 28.9 | 0.327 | 0.151-0.708 | 0.004* |
| High (>2 hours/day) | 65 | 45.5 | 81 | 55.5 | | | |
| **Cultural Activity** | | | | | | | |
| Low (≤ 2 hours/day) | 62 | 73.8 | 22 | 26.2 | 6.576 | 3.441-12.567 | <0.001* |
| High (>2 hours/day) | 30 | 30 | 70 | 70 | | | |
| **Social Activity** | | | | | | | |
| Low (≤ 2 hours/day) | 55 | 70.5 | 23 | 29.5 | 4.459 | 2.376-8.370 | <0.001* |
| High (>2 hours/day) | 37 | 34.9 | 69 | 65.1 | | | |

*Significant at p<0.05

Based on analysis of data obtained strenuous physical activity are mostly done in teenagers as rapid cycling and riding climbs, jogging, playing basketball, and swimming. In addition, regular physical activity is being done is cleaning the bathroom, washing clothes, washing of vehicles (car/motorcycle), the ironing clothes, gardening, playing drums, sweeping and mopping floors.

The analysis showed there is a significant relationship between the dimensions of sedentary lifestyle with overweight / obesity with p <0.05. Results can be seen in Table 3.

Multivariate analysis using multiple logistic regression data analysis to determine which variables are dominant with regard to overweight / obesity in teenagers. From the test results obtained by several bivariate variables eligible to continue in the multivariate analysis, the variables that have a fairly high level of significance (p <0.25). These variables were sex, family income, parental history of obesity, physical activity, and sedentary lifestyle

variables subsequently analyzed using logistic regression to determine which variables are the dominant influences on overweight/obesity. While age, mother's education, father's education, father's occupation, mother's occupation, family expenses / month, are not included in the multivariate analysis.

**Table 4: Multivariate analyses.**

| Variable | OR | CI (95%) | | p-*value* |
|---|---|---|---|---|
| | | Lower | Upper | |
| **Step 2** | | | | |
| **Family income/month** | | | | |
| Low<br>High | 0.080 | 0.022 | 0.290 | 0.001* |
| **History of overweight parents** | | | | |
| Yes<br>No | 6.883 | 2.650 | 17.880 | 0.001* |
| **Physical activity** | | | | |
| Vigorous<br>Moderate<br>Mild | 21.038 | 7.356 | 60.168 | 0.001* |
| **Sedentary lifestyle** | | | | |
| Low (≤8 hours/day)<br>High (>8 hours/day) | 0.086 | 0.028 | 0.259 | 0.001* |
| **$R^2$** | 0.690 | | | |

*Significant at p<0.05

**Table 5: Multivariate analysis relation physical activity and sedentary lifestyle with overweight/obesity (n=184).**

| Variable | OR | CI (95%) | | p-*value* |
|---|---|---|---|---|
| | | Lower | Upper | |
| **Step 1** | | | | |
| **Physical activity** | | | | |
| Vigorous<br>Moderate<br>Mild | 10.948 | 4.980 | 24.065 | <0.001* |
| **Sedentary lifestyle** | | | | |
| Low (≤8 hours/day)<br>High (>8 hours/day) | 0.086 | 0.034 | 0.220 | <0.001* |
| **$R^2$** | 0.539 | | | |

Based on Table 4, the final results of multivariate logistic regression analysis in step 2 shows that the variables that influence overweight/obesity is a history of parental obesity, physical activity and sedentary lifestyle has an effect of 69% of the overweight/obesity. This means that these variables are the dominant factors for overweight/obesity in teenagers.

Based on Table 5, the final results of the multivariate analysis with logistic regression obtained R value Square of 0.539, which means that physical activity and sedentary lifestyle have an influence for 53.9% of the overweight/obesity, while 46.1% are influenced by other factors.

## DISCUSSION

The research result described that sex factor influenced overweight/obesity in teenagers, especially for female teenagers. Writer assumed that female teenagers tended to do snacking more than male teenagers. This unhealthy meal pattern could cause fat depositions in the body. Therefore, the consumption of high-calories food without accompanied by enough physical activity could cause the body fat minimally got burned. This condition could cause overweight/obesity in teenagers.

Overweight/obesity was not only related to sex factor. Parents factor could also supported the incidence of overweight/obesity in teenagers. Some variables from parents' factor in this research could support overweight/obesity in teenagers. Based on the researchers' analysis, some factors such as family income and parents' overweight history had significant relation toward overweight/obesity in teenagers.

The results are consistent with Muktiarti et al, declares that income parents have a relationship with overweight / obesity. Good family economic conditions make it easier to meet the nutritional needs of the family and socio-economic factors are important in determining the amount and kinds of food available in the household. However, income is a factor not directly affects food consumption and a major determinant of the nutritional status of a person in a state of good or bad.[11]

In this study also found a significant association between physical activities with overweight/obesity. The authors assume that the overweight/obesity in teenagers due to lack of physical activity undertaken by teenagers in Senior High School Yogyakarta. Senior high school teenagers prefer to use motorcycles than cycling or walking to get to school. Besides the many activities outside of school such as extra classes and tutoring to make the activity to be low. This is supported by research Herini stated that the lack of physical activity causes a lot of energy stored as fat, so it tends to people who lack the activity to be obese.[12]

Another study conducted by Mustelin showed that there was a significant relationship between physical activity and obesity in children. Children and adolescents who rarely exercise have an increased risk of obesity by 1:35 times compared with respondents who regularly exercise.[13] In addition, children who did not exercise regularly tend to have a higher energy intake than those who regularly exercise. Food and physical activity may affect the incidence obesity both collectively and respectively. Students who have low physical activity have a risk of 1.7 times to become obesity.[14] This is in line with research Muktiharti et al, Which showed that

physical activity has a relationship with overweight/obesity.[11]

Low physical activity in teenagers resulting in sedentary behavior. This behavior is called sedentary lifestyle which is one of the causes overweigh/obesity in teenagers. Sedentary lifestyle is quite relaxed lifestyle, among others, sitting, lying down, etc. in every day at work (working at the computer, reading, etc.), at home (watching TV, playing games, etc.), travel/transport (buses, trains, motor), but not including bedtime.[15]

Sedentary lifestyle is grouped into five categories based display, education, travel, cultural activities and social events. Screen-based lifestyle includes watching TV/video, use a computer or laptop for fun, and playing mobile phone. The results showed that all of the dimensions of a sedentary lifestyle have a significant association with overweight/obesity.

Results of this study was supported by research Lowry et al, declares that watching television more than two (2) hours per day at risk of overweight/obesity.[16] The same study presented by Gomes et al stating that watching television more than two (2) hours of 1:44 times the risk of overweight / obesity.[17]

Muktiarti states that teenagers after school activities more repeat lessons at school. They spend their spare time with tutoring at school and outside of school. This leads to more passive teenagers in the move because it just sitting and writes as well as pay attention to the teacher's explanation who caused the occurrence of overweight/obesity.[11]

Gordon et al also mentioned that teenagers and the adult who go to school and to work by walking or cycling is not at risk of becoming overweight/obesity. However, teenagers and adults who went by car, motorcycle, and buses can be overweight/obesity. The study also states that only a few people who use bicycles or walk to school or to the office.[18] Walking is good for health because it improves cardiovascular function and reduces the risk of death. Walking can be a means to an active lifestyle that can increase physical activity and reduce the impact obesity.[19]

## CONCLUSION

Overweight/obesity in teenagers could be caused by the decreased physical activity and the increased sedentary lifestyle, and also aggravated by family income and parents' overweight history.

### *Recommendations*

This research explained that the low physical activity and high sedentary lifestyle could increase the risk of overweight/obesity in teenagers. The need of follow up research using better study design, which used cohort study with bigger samples and gold standard (accelerometer) to assess physical activity and sedentary lifestyle complexly, must be accommodated for better research result.

## ACKNOWLEDGEMENTS

I would like to thank the student of state senior high school in Yogyakarta city who participated in this study for their willingness to give their time to complete the questionnaire.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. World Health Organization. Fact Sheet: Obesity and Overweight, 2015. Available from URL: http://www.who.int/mediacentre/factsheets/fs311/en/. Accessed on 10 January 2015.
2. Esposito M, Gallai B, Roccella M, Marotta R, Lavano F, Lavano SM, Carotenuto M. Anxiety and depression levels in prepubertal obese children: a case-control study. Neuropsych dis treat. 2014;101897.
3. Heird WC. Parental feeding behaviour and children's fat mass. The American J Clin Nutr. 2002;75(3):451-2.
4. Oktaviani WD. Hubungan Kebiasaan Konsumsi Fast Food, Aktivitas Fisik, Pola Konsumsi, Karakteristik Remaja Dan Orang Tua Dengan Indeks Massa Tubuh (IMT). 2012.
5. Bandini L, Flynn A, Scampini R. Over nutrition. nutrition and metabolism. Second Edition. Amerika: Wiley-Blackwell, A John Wiley & Sons, Ltd. Publication; 2011:361-369.
6. Ortega FB, Ruitz JR, Sjostrom M. Physical activity, overweight and central adiposity in Swedish children and adolescents: the European youth heart study. Int J Behav Nutr Phys Act. 2007;4(1):61.
7. Proverawati A. Obesitas dan Gangguan Perilaku Makan Pada Remaja. Yogyakarta: Nuha Medika;2010.
8. Rahmadani L, Indriasari R. hubungan aktivitas sedentari dengan kejadian overweight pada remaja di sma katolik cendrawasih Makassar. Skripsi. Makasar: Universitas Hasanuddin; 2014.
9. Lioret S, Maire B, Volatier JL, Charles MA. Child overweight in France and its relationship with physical activity, sedentary behaviour and socioeconomic status. European J Clin Nutr. 2007;61(4):509-16.
10. Hardly LL, Booth ML, Okely AD. The reliability of the adolescent sedentary activity questionnaire (ASAQ). Preventive medicine. 2007;45(1):71-4.
11. Muktiharti S, Purwanto IPRS. Faktor risiko kejadian obesitas pada remaja SMA Negeri 2 dan SMA

Negeri 3 di Kota Pekalongan Tahun 2010. Pena Med J Keseh. 2011;3(1).
12. Manurung NK. Pengaruh Karakteristik Remaja, Genetik, Pendapatan Keluarga, Pendidikan Ibu, Pola Makan dan Aktivitas Fisik Terhadap Kejadian Obesitas di SMU RK Tri Sakti Medan 2008. J Uni Sumatera Utara; 2009.
13. Mustelin L, Silventoinen K, Pietilainen K, Rissanen A, Kaprio J. Physical activity reduces the influence of genetic effects on BMI and waist circumference: a study in young adult twins. Int J Obes. 2009;33:29-36.
14. Huriyati E, Hadi H, Julia M. Aktivitas fisik pada remaja SLTP Kota Yogyakarta dan Kabupaten Bantul serta hubungannya dengan kejadian obesitas. The Indonesian J Clin Nutr. 2004;1(2):59-65.
15. Tremblay MS. Assessing the level of sedentarism. Physical activity and obesity, 2nd edn. Human Kinetics, Champaign, IL. 2010;13-7.
16. Lowry R, Wechsler H, Galuska DA, Fulton JE, Kann L. Television viewing and its associations with overweight, sedentary lifestyle, and insufficient consumption of fruits and vegetables among US high school students: differences by race, ethnicity, and gender. J School health. 2002;72(10):413-21.
17. Gomez LF, Parra DC, Lobelo F, Samper B, Moreno, J, Jacoby E, Borda C. Television viewing and its association with overweight in Colombian children: results from the 2005 National Nutrition Survey: a cross sectional study. Intern J Behav Nutr Phys Act. 2007;4(1):41.
18. Banwell C, Broom D, Davies A, Dixon J. 2012. Weight of modernity: an intergenerational study of the rise of obesity. Springer Sci Busin Med.
19. Clayton SD. The Oxford handbook of environmental and conservation psychology. Oxford University Press; 2012.

**Cite this article as:** Kurdaningsih SV, Sudargo T, Lusmilasari L. Physical activity and sedentary lifestyle towards teenagers' overweight/obesity status. Int J Community Med Public Health 2016;3:630-5.