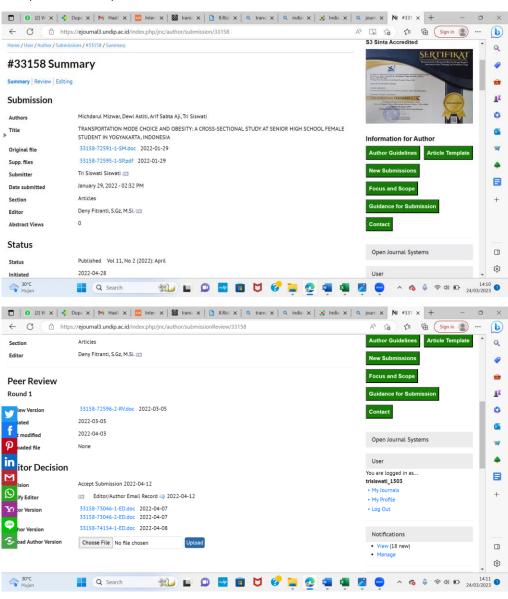Korespondensi : Transportation Mode

TRANSPORTATION MODE CHOICE AND OBESITY: A CROSS-SECTIONAL STUDY AT SENIOR HIGH SCHOOL FEMALE STUDENT IN YOGYAKARTA, INDONESIA

ABSTRACT

Background: The prevalence of obesity has increased worldwide. Indonesia has also experienced a similar rising trend in obesity, especially in adolescents. The current phenomena is shifting mode of transportation from active to passive.

Objective: This study aims to determine the correlation between transportation mode and obesity in high school adolescents in Yogyakarta, Indonesia.

Methods: A cross-sectional study was created and a total of 238 subjects of this study which were adolescent girls in class XI from all high schools/equivalents in Bantul was recruited. Data were collected in February-May 2017. Data characteristics, duration and mode of transportation were collected during the study a structured questionnaire. In addition, body mass index measurement was assessed to determine obesity status of female students. A logistic regression analysis was performed using SPSS version 20.0.

Results: Subjects who used passive transportation mode had a risk of having obesity (OR 5.63, 95% CI: 1.71-8.52). Furthermore, passive transport duration >15 minutes increased the risk of obesity (OR 2.51, 95% CI: 1.07-5.99), while active transport >15 minutes was a protective factor (OR: 0.21 95% CI: 0.19-0.89).

Conclusions: There are correlation between the type and duration of the transportation mode used with obesity in adolescent girls.

Keywords: Obesity; transportation; adolescent girls; high school students; Indonesia

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Comment [MOU1]: Harap dibaca author guidelines JNC.

Sesuaikan dengan format abstrak JNC:
Latar belakang (*Background*)
Tujuan (*Objective*)
Metode (*Methods*)
Hasil (*Results*)
Simpulan (*Conclusion*)

Sudah diperbaiki

Comment [MOU2]: Bukan 'aims' tapi 'objectives'. Harap dibaca author guidelines JNC

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BACKGROUND

The prevalence of obesity has shown an increasing trend worldwide. It was reported that in 2020 the prevalence of adult overweight (BMI>25) and obesity (BMI>30) reached more than 2 billion (39% of adult global population) and 600 million respectively.[1] In Indonesia, based on the Basic Health Research (Riskesdas) surveys, the prevalence of central obesity at the age of 15 years and over in Indonesia continues to increase from year to year; where the obesity prevalence in 2007, 2013 and 2018 were 18.8%[2], 26.6%[3] and 31%[4], respectively. While the prevalence of obesity at age ≥15 years in Yogyakarta in 2007, 2013 and 2018 were 18,3%[5], 26,6%[6],and 32,4%[7] respectively.

Overweight and obesity have increased the burden of public health problems[8]. Consistently, overweight and obesity have increased the risk of diabetes mellitus, cardiovascular disease, stroke and cancer[9,10]. Therefore, the increasing prevalence of obesity has a significant effect on public health problems and the nation's economic development[11]. On the other hand, obesity is a preventable diasease[12] through improving healthy living behaviour, including having adequate physical activity [13,14].

Adequate physical activity is important for maintaining ideal body weight[15], improves child's cognitive function and performance at school[14], improve physical fitness and build up muscle mass [16], provide greater opportunities for a healthy life and having a job in the future, and reduce the risk of physical and psychosocial comorbidities in latter age[17]. School-age children/adolescents (12-18 years) have various alternatives to support their mobilization from home to school or vice versa. In addition, trend analysis shows that technological, economic and social development affects people physical activity, creating a shift in the utilization of active transportation modes, such as walking or cycling, to passive transportation, such as riding a motorbike or car. Many studies showed that passive transportation associated with high of body fat[18] and obesity[19].

The shift in the transportation modes of choice has emerged in several countries such as the United States[13,14], California[15], and several other countries, including Indonesia. But, In Indonesia the report of student using mode transportation is still very rare. In Bogor in 2018 reported that only 10% student chose to walk and 15% used public transportation when going school[20]. According to our observation, In Yogyakarta adolescents or students can use motor vehicles freely because there is no

prohibition nor bus school available, So far the phenomena of using active transportation was rare although close distance between school and their home.

As the prevalence of overweight and obesity in Indonesia rises, active transportation is a suitable strategy to eradicate obesity, improve physical fitness, build good habits and cheap transportation[18,21]. Several studies have shown that active transportation is associated with increased opportunities for physical activity, increased energy expenditure and improved health status[8]. This study aims to determine the relationship between moda transportation and obesity in high school adolescents in Yogyakarta, Indonesia.

METHOD

Study Design

This study was a cross-sectional study in Bantul, was a district with a high prevalence of obese women in DI Yogyakarta. Random class was carried out with all female students in class XI from all high schools/equivalent, both public and private schools as study population. In total, there were 5.577 female students[22]. The number of samples was determined by the Lemeshow formula [23] (Fig 1), with the proportion of female obesity on was set at 17.7%[6]. In the end, a total of 238 female students was included in this study. The sample formula was as detail in Figure 1.

$$n = \frac{N\ Z^2_{1-\alpha/2}\ P\ (1-P)}{(N-1)\ d^2 + Z^2_{1-\alpha/2}\ P\ (1-P)}$$

Fig 1. Sample formula

Data Collection

The 238 participants origin form 27 senior high school were selected using the probability proportional to size sampling (PPS) technique. The variable of interest includes the type of transportation mode (active transportation, e.g., bicycles, or passive transportation, e.g., cars, motorbikes, and public transportation), the duration of the trip to/from home to school (≤

15 and >15 minutes)[24], and obesity status by calculating BMI (Obese= z-score >2 SD; Not obese= z-score ≤2 SD)[25]. Respondent's characteristics and transportation data were collected using a structured questionnaire. In addition, nutritional status data were observed using a Camry EB9003 digital weight scale with an accuracy of 0.1 kg and microtoise with an accuracy of 1 mm. Data were collected in February-May 2017. Data was noemal distribution tested using Kolmogorov-Smirnov. Moreover, normal categoric data analysis to determine the correlation of transportation modes and nutritional status was performed by employing a logistic regression test using SPSS software.

Ethical Clearance

This study has obtained ethical approval from the Ethical Committee of Alma Ata University (No. KE/AA/II/53/E.C./2017). All participants of the study provided written informed consent prior to enrollment in the study.

RESULTS

Subjects Characteristics

The number of subjects aged 15-16 years and 17-18 years is equal (50%). Most of the subjects come from families where fathers have middle school education (39.1%) and mothers with primary education (37.9%). In addition, most fathers work as private-sector workers or self-employed (39.9%) and mothers as housewives (48.7%) (Table 1).

Obesity and Transportation Mode Used by Study Participants

Obesity prevalence and transportation mode and duration were showed in Table 2. The prevalence of obesity in adolescent girls in this study was 18.8%. The study of participants who used active and passive transportation was active (47.5%) and passive (52.5%). The transportation duration of the students was mostly had passive mode (52.9%).

Correlation between transportation mode with obesity in adolescent

The results of the data analysis found that participants who used passive transportation had a risk of obesity of 5.63 or equal to 6 times higher that students who had

active transportation mode. Study participants with passive transport duration >15 minutes were 2.5 times more likely to have obesity (p=0,027; OR (CI 95%) = 2.5 (1.1-5.9)). On the other hand, having active transport >15 minutes is a significant protective factor for obesity (p=0,041; OR (CI 95%) = 0.2 (0.2-0.9)) (Table 3).

DISCUSSION

Adolescence (15 to 20 years) is one of the stages of growth and consolidation of development.[26] At this stage, they characterized by shifting of developmental and behavioural from childhood to have more mature and behavioural independence[27]. However, in most cases, someone's behaviour during adolescence tends to persist in adulthood, which might affect their health status throughout their lives [28]. Currently, the number of adolescents in Indonesia is approximately 30% of the total population[29]. Therefore, the health status of Indonesian people in the future depends on adolescents' health behaviour today[30]. Moreover, unhealthy behaviour and wrong eating patterns will become a state burden concerning increasing the prevalence of non-communicable diseases[17,28]. In this study, most adolescents came from parents with secondary and tertiary education, with the father's occupation being mostly formal workers. These are structural factors related to health outcomes, including the health of family members[31]. In addition, parents who are highly educated will have the opportunity to get better jobs with adequate income so that they are able to provide better facilities to their children [31,32].

In this study, 18.8% of adolescent girls were obese. This prevalence is lower than the results of the Riskesdas survey in Indonesia in 2018, which was 31%. However, obesity in adolescents needs to be considered and prevented, considering the increasing trends. Obesity in adolescence has a higher risk to the early development of non-communicable diseases, such as glucose intolerance, cardiovascular disease, stroke, kidney disease and its

Comment [i-[13]: Ada informasi yang tidak disampaikan..mengapa pembahasan tidak mencoba mengkaitkan moda transportasi dengan aktivitas fisik? Penggunaan moda transportasi 15 menit itu apakah bisa disetarakan dengan aktivitas fisik rendah? Bagaimana dengan prinsip obesitas dan sedentary life style?

dibawah

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Penelitian cross sectional sehingga tidak mengamati kondisi sebelumnya

Ketika hanya berpijak pada durasi 15 menit/ hari? Apakah itu relevan untuk disandingkan dengan penyebab obesitas?

Dibawah

complications[9,10]. Obesity in adolescent girls can also develop into glucose intolerance at childbearing age and pregnancy[33].

Transportation mode to school is related to vehicle ownership, costs, distance and travel time, comfort, taste, or lifestyle. Teenagers' choice to use active transportation to school can help control their ideal body weight, increase energy expenditure, improve physical fitness[3,11,15], reduce sources of pollutants[33], and save fuel costs and health care costs due to obesity due to lack of physical activity[34].

The results of this study found that there was a relationship between passive transportation and obesity in adolescents, with a risk of 5.63 times. In addition, the duration of passive transportation >15 minutes increases the risk of obesity by 2.53 times. On the other hand, a female adolescent who chooses active transportation to school with a duration of > 15 minutes will be protected from the risk of obesity. Pathway of active transport with lower risk of obesity and body fat composition as a small increases of level daily physical activity[35]. Physical activity potentially increases by an active mode transportation. Study in low-middle income countries showed that active transport for 5 minutes only increment the accumulative of physical activity and lowering risk of obesity[18].

This study finding is in line with research in 12 countries that active transportation were more at risk of developing obesity[35], Another study in Sweden that looked at the relationship between modes of transport for work and obesity found that the use of motorized transport >15 minutes was associated with obesity[24]. On the other hand, active transportation from home to school and vice versa is recommended to increase energy expenditure for female adolescents as early prevention to obesity. This study includes all female adolescents in high school/equivalent in Bantul to represent the diversity of characteristics. With a large number of subjects, this study allows suppressing bias. However, the cross-sectional study design has

a weakness in making a causal inference. Besides that, this study does not observed variables such as intake, physical activity, genetics and others related with obesity.

CONCLUSION

The use of passive transportation mode is associated with an increased risk of obesity. In addition, the transportation duration to school is also associated with an increased risk of obesity. Currently, a new student admission are based on zonation, so a specific policy could be considered in the mode and duration transportation in the students to prevent an increasing obesity prevalence in Yogyakarta, of course this also need support by safe cycling and pedestrian traffics for students.

ACKNOWLEDGEMENT

We want to thank the Dinas Pendidikan dan Olahraga Kabupaten Bantul, all high school/equivalent in Bantul, and all respondents who have participated in this research.

CONFLICT OF INTEREST

There is no conflict of interest.

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Table 1. Study Subject's Characteristics

Characteristics	n	%
Age		
15	2	0.8
16	117	49.2
17	117	49.2
18	2	0.2
Father's education		
Primary	76	31.9
Middle	93	39.1
Tertiary	69	29.0
Mother's education		
Primary	90	37.9
Middle	89	37.4
Tertiary	59	24.8
Father's Occupation		
Farmers	79	33.2
Private workers	95	39.9

Characteristics	n	%
Civil servant	36	15.1
Others	28	11.8
Mother's Occupation		
Housewife	116	48.7
Farmers	41	17.2
Private workers	49	20.6
Civil servant	22	9.2
Others	10	4.2

Table 2. Obesity prevalence, and transportation mode and duration

Characteristics	n	%
Obesity		
Yes	44	18.8
No	194	81.2
Transportation Mode		
Active	112	47.5
Passive	126	52.5
Duration of transportation status		
Passive		
> 15 minutes	57	45.2
≤ 15 minutes	69	54.8
Active		
> 15 minutes	48	42.9
≤ 15 minutes	64	57.1

Table 3. Correlation analysis on transportation mode with obesity in adolescent

	Obese		Non-obese		*p*-value	OR (CI 95%)
Mode	n	%	n	%		
Active	14	30.9	98	55.2	0.001	1
Passive	30	69.1	96	49.5		5.6 (1.7 – 8.5)
Duration						
> 15 minutes	15	68.2	42	42.0	0.027	1
≤ 15 minutes	7	31.8	62	58.0		2.5 (1.1-5.9)

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Sudah siperbaiki

Comment [MOU21]: Yang mana reference nya? Active atau passive? Sudah diperbaiki

Comment [MOU22]: Yang mana reference nya? < 15 atau > 15? Sudah diperbaiki