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Original Research

PREVALENCE AND RISK FACTORS OF UNDERWEIGHT FOR ADOLESCENT IN INDONESIA: A CROSS-SECTIONAL FROM GLOBAL SCHOOL-BASED STUDENT HEALTH SURVEY 2015

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ABSTRACT
Objective: The aim of this study was to estimate the prevalence and risk factors of underweight among adolescents in Indonesia in 2015.
Methods: Cross-sectional data were analyzed from 7643 school-going adolescents from Indonesia, the "Global School-Based Student Health Survey (GSHS)" in 2015. Bodyweight was inspected by self-reported weight and height and the standards of child body mass index from WHO. The data were analyzed by univariate, bivariate, and associations with underweight were assessed using multinomial logistic regression analysis.
Results: The prevalence of adolescents was found that 3002 (39.3%) were underweight in Indonesia, 2015. Sex of the adolescent who has high risk underweight was female (AOR=1.72, 95% CI=1.57-1.90) with an age range of 10-15 years old (AOR=2.37, 95% CI=2.09-2.69). Alcohol use (AOR=0.73, 95% CI=0.60-0.89) and drug use (AOR=1.82, 95% CI=1.01-3.04) were risk behavior factors for underweight among adolescents in Indonesia.
Conclusion: High prevalence of underweight for adolescent were identified in Indonesia. Several correlates were identified which can help to adjust interventions from the government to the adolescent in each province.

Keywords: adolescents, nutrition, underweight, Indonesia

BACKGROUND

At present, the problem of nutrition, namely underweight adolescents, receives less attention, especially in the community because they think that when they can do activities it means that they are in a healthy condition and people rarely consult regarding their nutritional status, even though knowing the nutritional status of adolescence is crucial, because a person's nutrition-related habits begin in adolescence, and carry over to adulthood (Damayanti, 2019) Underweight in adolescents results in a higher risk of infectious diseases, while adolescent girls

of childbearing age cause several health problems such as anemia, complications in childbirth, premature birth, stunted intrauterine growth, the most fatal is death (Catalano & Shankar, 2017). Underweight is a key indicator of children's health, and this applies to adolescence as well. Globally, the prevalence of underweight in adolescents is less than 2 SD of the median (BMI) body mass index (healthy nutritional status: BMI z score> -2 and BMI z score <+1) according to age and sex, whichever is the prevalence hasn't changed much in the last 3 years (Abarca-Gómez et al., 2017). Based on the Global School-Based Student Health Survey, about 4% of girls aged 13-15 are underweight in the world (Kusumawardani et al., 2015). Meanwhile, data from the United Nations Children's Fund states that around 6% in the world and 10% in Indonesia, children aged 5-19 years are malnourished (thin and very thin). Other data states that around 9% in the world and 12% in Indonesia are adolescents. women are underweight (UNICEF, 2019).

The current condition of Indonesia is experiencing three burdens of nutritional problems (triple burden), namely stunting, wasting and obesity as well as deficiency of micronutrients such as anemia. Riskesdas 2018 data shows that around 25.7% of adolescents aged 13-15 years and 26.9% of adolescents aged 16-18 years have a short and very short nutritional status. In addition, there were 8.7% adolescents aged 13-15 years and 8.1% adolescents aged 16-18 years with thin and very thin conditions (Kementerian Kesehatan Republik Indonesia, 2018). Other data from the Global Nutrition Report states that in Indonesia the nutritional status of children and adolescents aged 5-19 years by sex is around 36% male adolescents and 30.7% female adolescents with underweight conditions (Report, 2018).

There are often malnutrition problems with underweight adolescents in society, many factors that influence it, such as gender, sexual behavior, food consumption, drug use, and parental education. The results of a study conducted by Ismail et al. (2020) in Rural Tanzania stated that female adolescents are at risk of being underweight compared to boys. Underweight nutritional status in adolescent girls is at risk of experiencing Chronic Energy Deficiency (KEK) which later has the risk of giving birth to babies with underweight conditions (Damayanti, 2019). Meanwhile, sexual behavior is related to whether or not a teenager has had sexual intercourse, the results of research by Daba, Shaweno, Belete, and Workicho (2020) state that sexual behavior of female adolescents is 2.5 times more at risk of experiencing underweight compared to boys. Berhe, Kidanemariam, Gebremariam, and Gebremariam (2019) research shows that early adolescence (10-14 years), maternal educational status (without formal education) are significant factors that adolescents are underweight.

Adolescent nutritional adequacy will be fulfilled if the diet is diverse and nutritionally balanced, proper menu modification is required for various food preparations by taking into account the amount and nutritional needs of adolescents (Damayanti, 2019). Consumption of inappropriate food will actually affect the nutritional status of adolescents, research conducted by Hendra, Suhadi, Virginia, and Setiawan (2019) related to the food preferences chosen by adolescents, namely chicken (37.2%), which is the main food while vegetables (16.1%) were only chosen by a small proportion of teenagers. In fact, vegetables are one type of food that is included in the four pillars of the principle of balanced nutrition. This is also supported by research by Cahyaning, Supriyadi, and Kurniawan (2019) which states that consumption patterns ($p = 0.000$) have a significant relationship with nutritional status in adolescent boys.

Other factors such as individual hygiene, smoking behavior, wealth status, psychological disorders, alcohol consumption can affect underweight in adolescents. Individual hygiene in adolescents generally includes routine brushing, washing hands before and after eating, washing hands after using the toilet using soap. The low level of individual hygiene is also supported by research by Demilew and Emiru (2018), which showed low results in the practice of washing hands before and after eating in adolescents. Fang (2019) states that BMI in adolescents is related from not smoking to

smoking behavior 12 years later for adolescent girls but not for boys. Adolescent BMI is also positively related to smoking frequency among female smokers. Global Youth Tobacco Survey Collaborating Group (2003) which was conducted on 9,992 grade 7 to 12 students in the age range of 13-15 years stated 19.2% of students, with 35.6% male students and 3.5% female students already using tobacco products. Meanwhile, 18.8% students, with 35.5% male students and 2.9% students already consuming cigarettes, it means that the consumption rate of cigarette consumption in adolescents is quite alarming (Global Youth Tobacco Survey Collaborating Group, 2003).

Another study by Maehara et al. (2019) found that wealth status was also associated with malnutrition in adolescents. In line with research conducted by Amha and Girum (2018), wealth status is associated with malnutrition in adolescents, especially girls. Education about diet needs to be done, especially for adolescents who are underweight, research conducted by Zahtamal and Munir (2019) states that 54.5% of adolescents who are underweight after being given education have increased their knowledge and awareness about underweight conditions. The selection of the right media for educational facilities for underweight adolescents is also important. There are differences in the effectiveness of pictorial media and question and answer lectures on changes in eating behavior, physical activity and sleep patterns of underweight adolescents (Zahtamal, Nurlisis, Rany, & Septiani, 2019).

The phenomenon of underweight in adolescents needs special attention, considering that the health of adolescents is important in the life cycle of life, especially considering the burden incurred is very comprehensive, ranging from health, economic, social and environmental burdens not only for adolescents themselves but also for others. Based on the description above, it is necessary to conduct a more in-depth study considering that there are many factors that have not been studied related to the causes of underweight in adolescents. This study was conducted to determine the prevalence and risk factors for underweight adolescents in Indonesia based on the 2015 Global School-Based Student Health Survey data.

METHODS

Samples

The original survey was the cross-sectional Global School-based Student Health Survey Indonesia (GSHS Indonesia). It is an open-access raw data from: https://www.who.int/ncds/surveillance/gshs/datasets/en/. A cluster sampling design in two stages (schools and classrooms) in order to yield nationally representative samples of school children in middle schools in Indonesia were used in the GSHS.

Trained survey administrators supervise students completing self-contained questionnaires. The Ministry of Education, the national ethics committee, schools, parents, and students agreed before filling out the questionnaire. The study was conducted according to established ethical standards (1964 Declaration of Helsinki and subsequent amendments).

Measures and Data Analysis

The GSHS measure was formed in this survey consisting of topics ranging from demographic information to substance use behavior. Underweight was explained, "as less than -2SD from the median for BMI by age and sex". Adequate physical activity was explained as "at least 60 min of moderate to vigorous-intensity physical activity daily".

Differences in proportions were examined with Chi-square statistics. Multi-logistic regression was tested to assess the associations between risk factors with underweight adolescents. Variables that were found statistically significant in bivariate analyses were later belonging to the multivariable model. P values < 5% were considered significant. SPSS version 15.0 was used to analyze the data.

RESULTS

Table 1 Sample characteristics and underweight status of middle school children in Indonesia, 2015

Variable	Frequency	Percent
Underweight		
No	4641	60.7
Yes	3002	39.3
Age		
11 – 15 years old	6014	78.7
16 – 18 years old	1629	21.3
Sex		
Female	4521	59.2
Male	3122	40.8
Food consumption		
Good	2450	32.1
Poor	5193	67.9
Hygiene personal		
Good	7405	96.9
Poor	238	3.1
Psychological disorder		
No	6256	82.0
Yes	1378	18.0
Smoking behavior		
No	982	12.8
Yes	6661	87.2
Alcohol use		
No	7047	92.2
Yes	596	7.8
Drugs use		
No	7575	99.1
Yes	68	0.9
Sexual behavior		
No	7309	95.6
Yes	334	4.4
Physical activity		
Yes	1974	25.8
No	5669	74.2
Family relationship		
Good	4677	61.2
Poor	2966	38.8
Total	7643	100

Table 2 Associations with underweight prevalence in school going adolescents from Indonesia, 2015

Variable	Underweight				P value	OR (95% CI)
	No		Yes			
	n	%	n	%		
Age						
16 – 18 years old	1233	75.7	396	24.3	0.0001	2.38 (2.1 – 2.7)
11 – 15 years old	2408	56.7	2606	43.3		
Sex						
Female	2971	65.7	1550	34.3	0.0001	1.7 (1.5 – 1.8)
Male	1670	53.5	1452	46.5		

Table 2 (Cont.)

Food consumption						
Good	1496	61.1	954	38.9	0.695	1.02
Poor	3145	60.6	2048	39.4		(0.9 – 1.1)
Hygiene personal						
Good	4512	60.9	2893	39.1	0.043	1.32
Poor	129	54.2	109	45.8		(1.02 – 1.71)
Psychological disorder						
No	3806	60.8	2459	39.2	0.939	1.01
Yes	835	60.6	543	39.4		(0.9 – 1.13)
Smoking behavior						
No	580	59.1	401	40.9	0.269	0.9
Yes	4061	61.0	2600	39.0		(0.81 – 1.06)
Alcohol use						
No	4253	60.4	2794	39.6	0.025	0.82
Yes	388	65.1	208	34.9		(0.7 – 0.8)
Drugs use						
No	4608	60.8	2967	39.2	0.052	1.65
Yes	33	48.5	35	51.5		(1.02 – 2.66)
Sexual behavior						
No	4458	61.0	2851	39.0	0.027	1.29
Yes	183	54.8	151	45.2		(1.04 – 1.61)
Physical activity						
Yes	1203	60.9	771	39.1	0.837	1.01
No	3438	60.6	2231	39.4		(0.9 – 1.12)
Family relationship						
Good	2885	61.7	1792	38.3	0.032	1.11
Poor	1756	59.2	1210	40.8		(1.01 – 1.22)

Table 3 Multiple Logistic regression of between dependent variable with underweight prevalence of adolescent in Indonesia, 2015

Variable	B	OR	95% CI	P value
Female	0.543	1.72	1.56 – 1.90	0.0001
11 – 15 years old	0.861	2.37	2.09 – 2.68	0.0001
Food consumption: Poor	0.019	1.02	0.92 – 1.13	0.716
Hygiene personal: Poor	0.190	1.21	0.93 – 1.58	0.164
Psychological disorder: No	-0.039	0.96	0.85 – 1.09	0.541
Smoking behavior: Yes	-0.116	0.89	0.77 – 1.03	0.108
Alcohol use: Yes	-0.311	0.73	0.60 – 0.89	0.002
Drugs use: Yes	0.529	1.7	1.01 – 2.88	0.050
Sexual behavior: Yes	0.111	1.12	0.88 – 1.41	0.352
Physical activity: No	0.020	1.02	0.92 – 1.14	0.720
Family relationship: Poor	0.056	1.06	0.96 – 1.17	0.259

DISCUSSION

The purpose of this study was to estimate the prevalence of underweight among adolescents in Indonesia in 2015. Of the 7643 respondents in school adolescents, it was found that 3002 (39.3%) were underweight. This prevalence is higher than several other countries in ASEAN such as Malaysia (7.3%) (World Health Organization, 2012), Cambodia (14.2%) (World Health Organization, 2013a), and Vietnam (16.4%) (World Health Organization, 2013b). This means that the prevalence of underweight in Indonesia is higher than other countries in the ASEAN region. This is probably because teenagers prefer to skip breakfast before leaving

for school, or are bored with the food provided or even food is not available due to economic factors. Several studies have stated that the risk factors for underweight in developing countries include socioeconomic status, poverty, low parental education levels, maternal knowledge about nutrition, family income, infectious diseases, and poor housing (Ndukwu, Egbuonu, Ulasi, & Ebenebe, 2013; Wolde, Berhan, & Chala, 2015).

The prevalence of underweight was significantly higher in adolescent boys than girls at school age, as was also previously found in low- and middle-income countries (Manyanga, El-Sayed, Doku, & Randall, 2014). This finding is in stark contrast to other studies in that while girls are more likely to be underweight than boys from low-income families in Korea (Kim, 2012), women have a higher prevalence and chance of being underweight than men (Al Kibria, 2019).

Older adolescents (16-18 years) in this study reduced the risk of underweight, this is likely due to more physical activity at school. Previous research has suggested that sports in health education in schools should be implemented (Lavelle, Mackay, & Pell, 2012), because exercise can help reduce underweight and thus increase normal weight among school children (Lee & Ham, 2015).

Changes in food consumption patterns have created conditions of energy deficiency and have also led to excess energy intake (Darling, Fawzi, Barik, Chowdhury, & Rai, 2020). Nutrition and substance use (consumption of soft drinks, consumption of fast food, consumption of adequate fruit) are associated with underweight and excess weight (Pengpid & Peltzer, 2016). However, in this study did not find this correlation. Consumption of soft drinks, consumption of fast food, consumption of fruit is not related to body weight. Possible cause is low food intake below the RDA. This low level of intake contributes to the high prevalence of underweight children (Syahrul et al., 2016).

Personal hygiene is an indirect factor that contributes to underweight problems (Marshak, Young, Bontrager, & Boyd, 2017; Purba, Sunarsih, & Trisnainy, 2020). This study obtained data that there is a relationship between personal hygiene and the incidence of underweight ($p = 0.043$). Poor personal hygiene (washing hands with soap before eating and after going out of the toilet) will increase the risk of diarrhea. Diarrhea will affect the body's ability to absorb nutrients properly. Digestive tract disorders due to diarrhea also disrupt the absorption of nutrients and the utilization of carbohydrates, fats and proteins (Barasi, 2009). The overall personal hygiene practices reported in this study were similar to previous studies among different population groups (Hossain, Ahmed, Hossain, & Sikder, 2018).

It is estimated that around 30% of teenagers in the world report being victims of bullying in the past month (Elgar et al., 2015) Bullying victims have been associated with a variety of external symptoms, such as psychology disorder, tobacco use, alcohol use, drug use, injury, and poor hygiene behavior (Pengpid & Peltzer, 2019). However, there was no relationship between technology disorders and the incidence of underweight in this study. Previous research has suggested that bullying is positively and significantly correlated with all adverse health or psychological problems except physical inactivity and underweight (Méndez, Ruiz Esteban, & Ortega, 2019; Pengpid & Peltzer, 2019).

There is a perception that smoking can reduce weight for reasons such as decreased appetite and calorie intake, increased metabolism, and reduced fat accumulation. This may be due to nicotine's effect on the brain's regulation of appetite and energy expenditure (Stadler et al., 2014). Various studies linking smoking and body weight have produced conflicting results. Similar to this study, it was stated that the smoking habit in the household was not significantly related to nutritional status (Purba et al., 2020). In contrast, other studies suggest smoking is correlated with a lower BMI in adults (Baum, 2009; Mackay, Gray, & Pell, 2013).

The amount and frequency of alcohol consumption were found to be correlated with BMI (Nies, Sun, Kazemi, Carriker, &

Dmochowski, 2012). Excessive alcohol consumption of young adults worldwide is a major global public health problem, while an increase in the number of people who are overweight and obese among young people is a growing concern (Peltzer et al., 2014). This study is in line with previous research which states that there is a relationship between alcohol consumption and underweight (Francisco, Assumpção, Borim, & Malta, 2019). Evidence suggests that alcohol use, especially binge drinking, can increase the risk of accidents, violence and have harmful consequences for the digestive system, such as gastritis, diarrhea, and poor nutrient absorption, which can further exacerbate weight loss / malnutrition in adults (Thorley et al., 2015).

Like nicotine and alcohol use, research on illicit drug use is said to affect appetite and body weight (Barry & Petry, 2009). The literature shows that there is a higher prevalence of underweight patients among injecting drug users, so there is a coherent picture of the association between drug use and BMI (McIlwraith et al., 2014). This study states that there is a significant relationship between the use of illegal drugs and underweight. Previous researchers stated that being thin and using illegal drugs by injection would increase the seriousness of health risks. For example, people who are underweight tend to experience nutritional deficiencies that can lower their immune systems, increasing their vulnerability and ability to recover from infection; and this is especially important when the infection is associated with injection drug use (Ritz & Gardner, 2006).

Malnutrition in adolescence leads to delayed and stunted growth, developmental impairment, and an increased risk of infectious diseases. Health behaviors associated with eating patterns and physical activity that have been established so far will continue into adulthood (Dobner & Kaser, 2018). Physical activity was recommended to protect against being underweight and from being overweight or obese in several previous studies (Mistry & Puthussery, 2015). However, this relationship was not found in this study. The majority of respondents (74.2%) did not do physical activity in the last week, did not walk or ride a bicycle when going to / from school, did not attend sports lessons, so that their activities were only sitting for a long time, watching TV and playing games with> 8 hours. Previous research has suggested that getting more exercise is associated with less body weight (Potter, Pederson, Chan, Aubut, & Koval, 2004).

Limitation of the Study

The GSHS data conducted nationally was cross-sectional so that no causal finding can be made. Because of self-reported weight and height assessments, the underweight may have been under-or overestimated in this study.

CONCLUSION

A high prevalence of underweight found among in-school adolescent in Indonesia. The study recognized several factors, which perhaps considered in programs designed to prevent and treat underweight for adolescent in Indonesia.

Declaration of Conflicting Interest

The authors declare that they have no problem anything in this study.

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