

# Analysis of Overnutrition Determinants among High School Students in Jakarta

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**Abstract-** This study is conducted to find the determinants of over-nutrition status among high school students in Jakarta. This study is a quantitative study using cross-sectional design. This study is using secondary data which collected in 2019 with total sample of 130 respondents. In this study, nutrition status is dependent variable while breakfast habits, energy, carbohydrates, protein, fat intake, physical activities, and gender as independent variables. Data used are in the form of questionnaire results, 24h-food recall interviews, body weight and height measurements. Data are analyzed using chi square. Study result shows 26.9% students are over-nutrition. Bivariate analysis result shows that there is no significantly relationship between nutrition and breakfast habits, energy, carbohydrates, protein, fat intake, physical activities, and gender. However, in this study shows a tendency that over-nutrition is higher on students who did not have breakfast, high protein intake, high on fat, and male. To prevent over-nutrition the school and community health center can give education related to balanced nutrition especially for male students. The school makes a policy for the supply of healthy balance nutrition foods in the school canteen.

**Index Terms-** Overnutrition, Student, Fat Intake, Breakfast Habits

## I. INTRODUCTION

Nutrition problems are more covering overweight and obesity. Over-nutrition is a condition of abnormal or exaggerated fat accumulation [1]. Someone who had over-nutrition will face various health risk such as dyslipidemia, hypertension, cardiovascular disease, diabetes, fatty liver, and several kinds of cancers [2], [3]. Adolescents who had over-nutrition have 30%-50% higher risk of suffering metabolic syndrome in adulthood [4]. Other health risk related to over-nutrition on adolescent is decreasing cognitive function [5] such as decreased memory capacity [6], decreased ability to make decision [7], as well as an increase in impulse or unplanned actions without thinking of the consequences [8]. Study conducted by Meo in 2019 shows that adolescents with over-nutrition have lower cognitive function than adolescents with normal nutrition status.

According to WHO, nutrition prevalence in children and adolescents group has increased drastically from 4% in 1975 to more than 18% in 2016. In South-east Asia over-nutrition prevalence on children and adolescents in the age of 10-19 years old have increased from 7,6% in 2015 to 8,1% in 2016 [9]. The

Result of Basic Health Research on 2018 shows that in Indonesia over-nutrition prevalence on adolescents in the age of 16-18 years old is recorded on 13,5% and DKI Jakarta is a province with the highest over-nutrition prevalence in Indonesia with 21,1% [10].

Bad eating pattern within a certain period will increase the risk of someone to experience over-nutrition, including skipping breakfast in the morning [11], [12]. In Indonesia it is recorded the prevalence of adolescents who did not used to have breakfast by 59% [13]. There is finding showing that the habit of skipping breakfast is contributed in body weight gain, this is related to the change in appetite that increasing by noon [14], [15]. Study in Malaysia on over-nutrition adolescents shows that those who have a habit of skipping breakfast have higher prevalence than those who routinely eat breakfast [16].

Energy intake and macro nutrients have influence on the nutrition status of someone. Study in 1999 adolescents in Poland shows that 21.8% adolescents with over body weight will eat one or two times more than those with normal body weight [17].

One of the main factors that cause over-nutrition is lack of physical activities. On 2010, globally 81% adolescents in the age of 11-17 years old are not active enough [18]. Study on adolescents in China shows over nutrition on male has twice greater prevalence of 15.5% than 8.4% on female, this is due to female adolescents tend to lose weight more often through dieting [19].

Adolescent time is important period and become one of the fastest phases in human development. The changes related to the bad eating pattern in the adolescent time become a risk factor that has consequences towards health not only in the adolescent time but also in adulthood and the entire lifetime [20]. This study is conducted to examine the relationship between breakfast habits, energy intake, carbohydrate intake, protein intake, fat intake, physical activities, and gender and over-nutrition among high school students of SMAN 39 Jakarta.

## II. MATERIAL AND METHOD

This study is a quantitative study with cross-sectional study design. The purpose of this study is to look at the description and determinant of over-nutrition. Data used in this study is secondary data from previous study "Cardiorespiratory Fitness Status Differences Based on Nutritional Status, Physical Activity and Other Factors on SMAN 39 Jakarta Students in 2019". The study used the total sample for research. Research location is at SMAN 39 Jakarta. There are 131 available samples

on secondary data, but only 130 samples used that match the sample criteria in this research.

Dependent variable is over-nutrition. Nutrition status is determined using Body Mass Index (BMI) by Age index. Body mass index is a person's weight in kilograms divided by the square of height in meters. Data used is the respondents' z-score value of anthropometry measurement calculation result, based on gender, and age. The measurement result classified to 2 groups namely over-nutrition (BMI by Age > +1 SD) and no over-nutrition (BMI by Age ≤ +1 SD).

Independent variables are breakfast habits, energy intake, carbohydrate intake, protein intake, fat intake, physical activities, and gender. Data regarding breakfast habits is the frequency of breakfast in a week. It grouped into not always have breakfast if the answer is never and 1-4 times a week and grouped into always have breakfast if the answer is 5 times or more in a week. Data regarding energy intake, carbohydrate intake, protein intake, and fat intake is obtained through single 24-h food recall filling. The grouping of intake variable by comparing energy intake, carbohydrate intake, protein intake, and fat intake with Recommended Daily Allowance (RDA) Indonesia 2019 based on gender and age of the respondents and classified to high category (> 100% of RDA Indonesia) and not high category (≤ 100% of RDA Indonesia)

Data regarding physical activities is score results from filling in the Physical Activity Questionnaire for Adolescents (PAQ-A) independently by the respondents. The result from this questionnaire filling is the average that calculated from the sum of the scores of each question. The questions adapted in primary research consisted of 6 questions with each question score of 1-5. The sum of scores from question 1 to 6 is then averaged. Then, data grouped into two categories namely less (< 3) and enough (≥ 3). Lastly, data regarding gender obtained from the respondent's identity in questionnaire.

Data analysis used in this study is univariate and bivariate data analysis. Univariate analysis used to look at the prevalence from each variable measured in the study, both independent and dependent variables. The result of univariate analysis is in the form of frequency distribution of dependent variable which is over-nutrition and independent variables which are breakfast habits, energy intake, carbohydrate intake, protein intake, fat intake physical activities, and gender. Bivariate analysis used to analyze the relation between independent variable and dependent variable. The test used in bivariate analysis is chi square statistic test by comparing between the observed frequency and expected frequency. Relation will deem significant if p-value is ≤ 0.05 and not significant if p-value is > 0.05.

### III. RESULTS

The study is conducted on the students of SMAN 39 Jakarta. Number of samples in this study is 130 respondents. Below table is the table contained the result of univariate analysis of dependent and independent variables.

Table I: Result of Univariate Analysis

Variable	Amount (n)	Percentage (%)
<b>Overnutrition Status</b>		
Overnutrition	35	26,9

Not overnutrition	95	73,1
<b>Breakfast Habits</b>		
Not Always	71	54,6
Always	59	45,4
<b>Energy Intake</b>		
High	7	5,4
Not High	123	94,6
<b>Carbohydrate Intake</b>		
High	6	4,6
Not High	124	95,4
<b>Protein Intake</b>		
High	31	23,8
Not High	99	76,2
<b>Fat Intake</b>		
High	37	28,5
Not High	93	71,5
<b>Physical Activity</b>		
Less Active	109	83,8
Active	21	16,2
<b>Gender</b>		
Male	51	39,2
Female	79	60,8

Table I shows, from the total of 130 respondents there are 26.9% respondents experienced over-nutrition and 73.1% did not experience over-nutrition. Based on the result of univariate analysis, 54.6% were not always have breakfast, 5.4% were high energy intake, 4.6% were high carbohydrate, 23.8% were high protein intake, 28.5% were high fat intake, 83.8% were less active, 39.2% were male and 60.8% were female.

The result of bivariate analysis between dependent variable (over-nutrition) and independent variable can be seen in below table.

Table II: Result of Bivariate Analysis

Variable	Overnutrition		Not Overnutrition		P-value
	N	%	N	%	
<b>Breakfast Habits</b>					
Not Always	22	31	49	69	0,344
Always	13	22	46	78	
<b>Energy Intake</b>					
High	1	14,3	6	85,7	0,674
Not High	34	27,6	89	72,4	
<b>Carbohydrate Intake</b>					
High	1	16,7	5	83,3	1,000
Not High	34	27,4	90	72,6	
<b>Protein Intake</b>					
High	9	29	22	71	0,943
Not High	26	26,3	73	73,7	
<b>Fat Intake</b>					
High	10	27	27	73	1,000
Not High	25	26,9	68	73,1	
<b>Physical Activity</b>					
Less Active	29	26,6	80	73,4	1,000
Active	6	28,6	15	71,4	
<b>Gender</b>					
Male	15	29,4	36	70,6	0,755

Female	20	25,3	59	74,7	
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Based on the result of bivariate analysis, it can be concluded that there is no significant relationship between over-nutrition with energy intake, carbohydrate intake, protein intake, fat intake, physical activities, and gender. However, there is a tendency that a higher number of students with over-nutrition is found in students who did not have breakfast, high protein intake, high fat, and gender of male.

#### IV. DISCUSSION

In this study it is known that over-nutrition were 26.9%. Based on gender, the percentage of overnutrition in male is higher than female. The number of over-nutrition in SMAN 39 Jakarta is higher compared to the number of adolescent's over-nutrition prevalence in DKI Jakarta which has the highest prevalence of over-nutrition on adolescent in 2018 by 21.2% and if compared to the prevalence of over-nutrition on adolescent in Indonesia with 13.3%. Result obtained in this study is lower if compared to previous study that conducted in SMA Islam Al-Azhar 2 Pejaten Jakarta which was 31.2% [21] and study at SMAS Bunda Mulia which was 35.5% that experienced over-nutrition [22].

This study shows around 54.6% students are not always have breakfast every day and this number is almost similar to the prevalence of adolescent who did not have breakfast habits in Indonesia which were 59% [13]. Bivariate analysis result shows that there is no significant relation between breakfast habits and over-nutrition on students of SMAN 39 Jakarta. Although there is no statistically significant relation, there is a tendency that more students who over-nutrition are those who did not always have breakfast by 31% compared to those who always have breakfast by 22%. This is in line with study by Irdiana (2017) that did not find the relation between breakfast habits and nutrition status in adolescents, however there is a tendency that adolescents who skipping breakfast have the status of over-nutrition. Skipping breakfast will encourage excessive appetite that leads to more snacking and consume more high-energy foods to meet appetite at lunch time and resulted in weight gain [23]–[26]. There is no relationship might happen because the data in this study only measure the frequency of breakfast habit in a week period without paying attention to the type and amount of food consumed at breakfast, so it has not been able to describe breakfast habits of the students.

When consuming excessive energy, the body will metabolize the energy into fat, and the size of fat cells that continue to increase causes weight gain [27]. Study of Lisnawati (2016) on high school adolescent found the relation of energy intake and obesity. As well as the study by Sutrio (2017) shows that those who experience over-nutrition have higher energy intake or not match with the RDA Indonesia. However, the result of this study shows no relation between energy intake and over-nutrition on students of SMAN 39 Jakarta. No relation of energy intake and over-nutrition in this study might be influenced by several possibilities such as the tendency of students with over-nutrition that have adequate energy intake but lack of physical activities. In addition, there is presence of flat slope syndrome

where students with over-nutrition are more likely to reduce the number and type of intake in the interview [28].

Excessive carbohydrate intake continuously causes the glycogen stored in the liver and muscles are full and will further cause lipogenesis or convert glucose into fatty acid and glycerol. This in the end stored as fat. [27], [29]. The result of bivariate analysis in this study shows no relation between carbohydrate intake and over-nutrition on the students of SMAN 39 Jakarta. This study result is supported by study of Wulansari (2017). No relation between carbohydrate intake and over-nutrition in this study might be influenced by the presence of flat slope syndrome.

Excessive protein intake will contribute to the increase of body weight and body fat due to amino acids that are not needed by the body in protein synthesis will be converted to glucose and fatty acid which eventually will be stored as triglycerides [30]. This study result is the opposite of the study by Suryandari (2015) and the study by Sari (2019) that shows the difference in the proportion of protein intake level with obesity. Although there is no significant relationship, there is a tendency that students who over-nutrition are found to have high protein intake compared to low ones. Consuming protein in large number is said to be helpful in suppressing hunger and provide the feeling of satisfaction and full longer when compared to consuming other macronutrients especially carbohydrate, so that consuming more protein may cause a decrease in someone's daily intake [21]. In this study based on inter-independen variable test result obtained the relation of students who have high protein intake also have high energy intake in average, therefore this is suffice to explain the tendency of protein intake and over-nutrition though the result of statistic test shows no significant relationship. There is no significant relationship in this study might be the result of less supportive number of samples.

Fat is the largest energy reserve in the body with every gram energy produces 9 kcal. High concentration of calories on fat turned it into main contributor that can increase body weight [31], [32]. Chi square test result in this study did not find any relationship between fat intake and over-nutrition on the students of SMAN 39 Jakarta. This result is in line with study by Praditasari (2018) and Sari (2019). Although there is no relation statistically, there is a tendency that students who experience over-nutrition are found to have high fat intake compare to those in reverse. There is no significant relationship in this study might be influenced by the presence of flat slope syndrome.

The imbalance energy between excessive energy intake and lack of physical activities leads to the increase of adipocyte or body fat that resulted in weight gain [33]. The result of bivariate analysis in this study shows no meaningful relationship between physical activities and over-nutrition on students of SMAN 39 Jakarta. This result is in line with the result of study by Isnaeni (2015) and Pratiwi (2014). No significant relationship in this study might be the result of the type of assessment of physical activities used that only looking at the general physical activities without paying attention to the aspects of intensity, frequency and duration of the activities [34].

Based on the eating behavior, female pay more attention to the food consumed and its effect on health and weight control. A study shows that female adolescents lose weight more often, so that female limit their intake more and did not rule out the



possibility of male will have higher prevalence on over weight in a certain population [19]. This study result shows that over-nutrition happened more on male than female. This is in line with the study by Pratiwi (2014) that studied about the possibility of obesity on adolescent in High School that obesity is more common in male students with prevalence of 50%. One of the study results on adolescent in China shows that over-nutrition in male has bigger prevalence than on female, it is due to female adolescents tend to lose weight more often through dieting [19].

#### V. CONCLUSION AND RECOMMENDATIONS

There are 26.9% students of SMAN 39 Jakarta who overweight and obesity. Based on the chi-square test, it is known that no significant relationship between breakfast habits, energy intake, carbohydrate intake, protein intake, fat intake, physical activities, and gender with over-nutrition. However, there is a tendency of over-nutrition on the group that did not always have breakfast, high protein intake, high fat intake and gender of male.

For the school, can monitor the nutrition status routinely every 6 months to prevent and control the over-nutrition incidents on the students. Moreover, school can give education on balanced nutrition guidance and the importance of consuming various foods. The education might be held once a month for example in counseling class hours by home-room or counseling teacher through presentation in the form of written pictures or videos containing the balanced nutrition guidance issues and its messages. For community health center, can create a collaboration program with the school to do the nutrition status monitoring every six months and is expected to develop work program that directly involving schools in the form of providing education regarding balanced nutrition guidance so that it will support intervention and hit the target. For other researchers, conduct research on over-nutrition in adolescents with other variables such as parental nutrition status, socio-economic level, sleep duration and other factors with adding more samples.

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