

# THE DIFFERENT INTAKE OF ENERGY AND MACRONUTRIENT ON WEEKDAYS AND WEEKEND AMONG ADOLESCENT IN URBAN CITY

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THE DIFFERENT INTAKE OF ENERGY AND MACRONUTRIENT ON WEEKDAYS AND WEEKEND  
AMONG ADOLESCENT IN URBAN CITY

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**ABSTRACT**

*Background* : Prevalence of over nutrition in adolescents has increased every year in the world. Over nutrition in adolescents can impact on metabolic syndrome, mental health problems, and decreased academic achievement. Over nutrition caused by various factors including food intake. During weekends some people use more time to relax and not control their food intake. Increasing food intake on weekends contributed to cause an increasing body weight at the weekends.

*Objective* : To analyze the differences energy and macro nutrient intake during weekdays and weekends in adolescents.

*Method* : The design of this study was cross sectional on students of senior high school aged 16-18 years with total sample was 82 people. Data were obtained using a recall questionnaire to determine food intake and anthropometric measurements of weight and height to determine the nutritional status.

*Results* : In boys and girls there is an increasing of energy and macro nutrients intake on weekends compared to weekdays. A total of 46 students were gain their body weight on the weekend. In girls energy intake increased 35.04 kcal, carbohydrate 11.82 grams, fat 0.03 grams

and protein 3.15 grams. Whereas in boys energy intake increased 34.33 kcal, carbohydrate 11.02 grams, fat 10.25 grams and protein 2.85 grams. The average weight gain in girls was 0.35 kg and 0.31 in boys. Adolescent with the increased of energy intake on weekend risked higher 4.133 to gain the body weight on weekend day

*Conclusion* : To prevent weight gain and over nutrition, adolescents better to pay attention of their food intake on weekends both in terms of quantity and quality.

Keywords: macronutrient, obesity, weekend, weekdays

## **Introduction**

Obesity was a condition that caused a negative effect on health. In the world obesity more common in women with a prevalence 15% and men 11%.<sup>1</sup> Adolescent female had more risk of obesity than adolescent male. Adolescent female saved more excessive energy as stored fat, while adolescent male use excessive energy to synthesize protein. When physical maturity occurs, the number of body fat in adolescent female usually twice more than adolescent male. This accumulation fat occurs in the area around the pelvis, breasts, and upper arms.<sup>2</sup>

Obesity adolescents with BMI above 95 percentile had greater risk of emotional stress compared to their peer who have normal status. Obesity and overweight in adolescents had an impact on the occurrence of metabolic syndrome problems, mental health, and decrease in academic achievement.<sup>3,4,5</sup> Adolescents obese who had a few friends were more likely to isolate themselves from their social environment and had higher risk of depression than normal adolescents.<sup>6</sup>

<sup>19</sup> The NHANES (National Health and Nutrition Examination Survey) data from 2001-2004 and 2009-2012 showed that there was an increased prevalence of over nutrition in <sup>26</sup> children and adolescents aged 2-19 years in United State and Canada from 16.6% to 17.5% and from 12.4% to 13%.<sup>7,8</sup> In Indonesia based on data from the Basic Health Research in 2013 found that prevalence of adolescents with over nutrition aged 16-18 years was 7.3% and prevalence in east java was 8.2%.<sup>9</sup> This research was conducted at 5 Senior High School in Surabaya because

in the previous research study showed a percentage of students who were overweight was 33.1% and obese 8.9%, this percentage value exceeds the value of Province.<sup>10</sup>

Obesity is influenced by many factors, including factors genetic, energy intake, physical activity, environmental and emotional.<sup>11,12</sup> In several literature studies shown that in adolescents male and female there was an increased in energy and macro nutrients intake on weekends compared to weekdays. Longitudinal studies conducted in the United States using NHANES survey data showed that at the weekend the average of total energy intake increased 82 calories higher than weekdays.<sup>13</sup> Protein intake in girls was 10-15% higher on weekends than in weekdays and boys' average protein intake also increased at the weekend. On weekends the average of fat intake for boys was 7-15% higher and in women increases more than 20% compared to weekdays. Whereas carbohydrate intake for girls was increased 12-15% and boys 7% on weekend compared to weekdays.<sup>14</sup>

Longitudinal studies in the United States divided subjects into reducing calories group and increasing physical activity group showed that there was an increases of energy intake and body weight 0.077 kg per week. Although relatively small increasing but could have an impact of 4 kg increases in one year if the pattern of increased food intake on weekend continued.<sup>15</sup> The purpose of this study was to analyze the differences of energy and macronutrients intake during weekdays and weekends in adolescents who live in urban areas.

## Methods

This study was an observational study with cross sectional study design. The location of the study was at 5 Senior High School in Surabaya. The study population was adolescents aged 16-18 years both male and female. This study was performed in April - September 2018. Students who were willing to take part in the study will be measured anthropometry body weight using digital scales with a precision level of 0.1 kg, height measurements using a stadiometer with a precision level of 0.1 cm, and filling questionnaires characteristic data. Body weight was measured in morning before starting studied in 3 times. The study did not

conducted during the exam period, students who were athletes and who still programming diet will be excluded from this study. The number of samples in the study was 82 students and randomly selected. Respondents' food intakes were measured using food recall 24 hours in 4 times that were 2 times on weekdays and 2 times on weekend. Food recall data will process using the Nutrisurvey application to determine the amount of energy, carbohydrate, fat, and protein intake. Then the average energy and macronutrients intake on weekdays will be compare to weekend. While the nutritional status of respondents was determined using application of WHO Anthro Plus for aged 6 to 18 using weight, height, and respondent date of birth data.

## Results

From the results of the study on 82 respondents in 5 Senior High School Surabaya, the distribution of nutritional status of respondents who were classified as underweight was 2.4%, normal 69.5%, overweight 9.8% and obesity 18.3%. Table 1 told about the characteristic of respondents showed that most of respondents were in class XI (65.9%), the average age of respondents was  $16.33 \pm 0.47$  years and male adolescent got more average pocket money (Rp. 23094) than female (Rp. 21740).

**Tabel 1.Characteristic of subjects**

Variable	Male	Female	Total
	(n=32)	(n= 50)	(n=82)
	Mean $\pm$ SD	Mean $\pm$ SD	
Aged	16.38 $\pm$ 0.49	16.30 $\pm$ 0.46	16.33 $\pm$ 0.47
Class			
XI	20	34	65.9%
XII	12	16	34.1%
Pocket money	23093.75 $\pm$ 11453.58	21740 $\pm$ 14688.34	22.268.29 $\pm$ 13.459.63
Nutrition status			
> 1SD	19	40	72%
$\leq$ 1 SD	13	10	28%
Physical activities (met)			

Heavy	5	7	14.6%
Light - moderate	27	43	85.4%

**Tabel2. Energy and macronutrient intake on weekdays and weekend**

Food Intake	Male	Female	Total
	(n=32)	(n=50)	(n=82)
	Mean ± SD	Mean ± SD	
<b>Weekdays</b>			
Energy (kkal/ day)	2035.96 ± 141.43	1888.60 ± 115.78	1946.11±144.89
carbohydrate (gr/ day)	229.61 ± 23.89	212.68 ± 29.77	219.29±18.49
Fat (gr/ day)	88.05 ± 14.06	81.71 ± 15.13	84.18±14.35
Protein (g/ day)	78.17 ± 13.48	77.19 ± 16.71	77.57±15.45
Body weight	66,21 ± 16,26	54,57 ± 13,43	59.11 ± 15.58
<b>Weekend</b>			
Energy (kkal/ day)	2070.29 ± 161.10	1923.64 ± 146.19	1980.87±167.46
carbohydrate (gr/ day)	240.63 ± 31.92	224.49 ± 33.85	230.79±33.85
Fat (gr/ day)	85.19 ± 14.06	78.56 ± 15.13	81.15±14.98
Protein (g/ day)	88.42 ± 26.03	77.16 ± 11.28	81.55±2.11
Body weight	66,45 ± 16,28	54,66 ± 13,50	59.26 ± 15.66
<b>Difference in food intake</b>			
Energy (kkal/ day)	34.33 ± 131.60	35.04 ± 132.35	34.76±131.24
carbohydrate (gr/ day)	11.02 ± 41.77	11.82 ± 46.88	11.51±44.69
Fat (gr/ day)	10.25 ± 30.55	-0.03 ± 20.81	3.98±25.39
Protein (g/ day)	-2.85 ± 13.57	-3.15 ± 21.01	-3.03±18.36
Body weight	0,31 ± 0,16	0,35 ± 0,17	0,15 ± 0,36

Table 2 showed that there were differences in energy and macronutrients intake both in male and female adolescent on weekdays and weekends. Overall, the average male adolescent intake was significantly higher than female adolescent, except for protein intake during weekdays. However, it was found that there was no significant difference in changes of food intake between weekdays and weekends in male and female adolescent.

**Table 3: The different of energy and macronutrient intake between weekdays and weekend and the association with weight gain**

The difference of food intake	Weight Gain n (46)	Constant or weight loss n (36)	P value	OR
Energy				
Increased	40	5	0.002*	4.133
Decreased	6	31		
Carbohydrate				
Increased	30	22	0.702	1.193
Decreased	16	14		
Fat				
Increased	22	12	0.186	1.833
Decreased	24	24		
Protein				
Increased	27	16	0.200	1.776
Decreased	19	20		

chi-square test \*significant,  $p < 0.05$

Based on table 3 showed that there was a significant association between increasing energy intake and weight gain on weekends with p value score 0.002 and odds ratio 4.133, it means that respondents who increased intake of energy on weekend 4.133 risked gained their weight on weekends.

## Discussion

Carbohydrate, fat and protein nutrients were source of energy for the body that was needed for daily activities.<sup>16</sup> Consumption excessive macronutrient will be stored in form fat reserves. Excessive accumulation of fat in fat tissue causes individuals being over nutrition. The prevalence of over nutrition (overweight and obesity) in this study was 28% that occur in 20% of female adolescent and 40.6% of male adolescent. The results showed that in adolescent male and female during weekdays there were significant differences in energy, carbohydrate and fat intake. However, on weekend energy and all of macronutrient intake were significant difference. When energy intake greater than the energy released, it causes energy imbalances in the body and can be impact to an increase of body fat mass.<sup>17</sup>

The results of this study show that there was an increased energy intake on weekend both in adolescent male and female with an average increased 35.05 kcal in adolescent female and 34.33 in adolescent male. This was in line with the cross-sectional study in children aged 10 years and over, who showed that intake of energy on weekend increased 8% compared to energy intake during weekdays.<sup>18</sup> Longitudinal studies conducted in America also stated that the average intake energy on weekend increased 82 calories higher than weekdays.<sup>13</sup>

Carbohydrates were the main energy source for the body. Excessive carbohydrate intake will be stored in form of glycogen in liver and muscle tissue, and some of it will be converted into fat and stored in fat tissue.<sup>16</sup> In this study there was an increases carbohydrate intake on weekend 11.82 grams in female adolescent and 11.02 grams in male adolescent. In line with longitudinal studies conducted in high school student in Netherlands stated that carbohydrate intake of female adolescent was 12-15% higher on weekends, while male adolescent increased 7% higher. In male adolescent, carbohydrate intake increases with age, whereas in women decrease with increasing age.<sup>14</sup> In addition, research in Brazil also stated that the contribution of carbohydrates to daily energy intake on average 4% lower on weekdays than on weekends.<sup>18</sup>

Excessive accumulation of fat in fat tissue causes individuals being over nutrition. In this study the average fat intake on weekends increased 3.15 grams in female adolescent and 2.85 grams in male adolescent. Longitudinal research in adolescent high school students in the Netherlands stated that compared to fat intake during weekdays the average fat intake on weekends increased 7-15% in male adolescent and increased more than 20% in female adolescent.<sup>14</sup> In addition, cross sectional studies in Brazil also showed a higher percentage of total fat, saturated fat and trans fat intake on weekends than weekdays. In this study showed that in female adolescent increased of fat intake on the weekend had relation with body weight gain.

Protein was a nutrient that has various important functions in the growth and maintenance of body cells, hormone formation, regulating water balance, antibody formation, transporting nutrients, and energy sources.<sup>16</sup> Excessive protein intake will stored in form of



triglycerides and can cause an increased fat tissue which affected nutritional status.<sup>19</sup> The results of this study showed that the average protein intake at the weekend increased 0.03 grams in female adolescent and 10.25 grams in male adolescent. Longitudinal studies in high school student in Netherlands school also stated that female adolescent have 10-15% higher protein intakes on weekends than on weekdays. Whereas in male adolescent also showed a high average protein intake on weekends. Both on weekdays and weekends, animal protein intake twice more consumed than protein intake from vegetable sources.<sup>14</sup>

In this study, 46 of students gain their body weight over the weekend. Compare to weekdays the average of body weight at the weekend increased 0.35 kg in female adolescent and 0.31 in male adolescent. According to McCarthy, a consistently increase in food intake every weekend has a significant impact on body weight for one year. An increase of 100 kcal every weekend for a year causes an increase of 2 kg of body weight which contributes to an increasing the prevalence of overweight and obesity.<sup>20</sup> Longitudinal studies in America also showed an increase of 0.077 kg in body weight on weekend. Even though it was small, but it has an impact of 4 kg increased body weight in one year if the pattern of increasing intake on weekend continues.<sup>15</sup> This study showed that increasing intake of energy and macronutrients on weekend had an effect on weight gained. Adolescent with the increase of energy intake on weekend risked higher 4.133 to gain the body weight on weekend day

## Conclusion

The result of this study was 28% of respondents were classified as having nutritional status overweight and obesity. Both male and female adolescents had increased energy and macronutrients intake on weekends compared to weekdays. A total of 46 student in this study gained their weight on weekend. Adolescent who increased their intake of energy on weekend 4.133 risked gained their weight on weekend. Adolescents better to pay attention of their quantity and quality food intake on weekends to prevent being over nutrition, and needed further research to see how it relates to gaining weight.

**Conflict of Interest:** The authors confirm that this article content has no conflicts of interest

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