AN OVERVIEW OF OBESITY RISK FACTORS IN THE STUDENTS OF POLTEKKES KEMENKES TASIKMALAYA

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Abstract

The risk factors of adolescent obesity are caused by macronutrient intake, diet and eating habits, physical activity, genetics, knowledge, attitudes, and psychological. This study aimed to determine obesity risk factors for students of Poltekkes Kemenkes Tasikmalaya. This descriptive research studied on 100 students. Obesity is determined by BMI, while body fat composition is determined by the bioimpedance analysis method. Intake and diet were measured through interviews, using a 24-hour recall form, an FFQ questionnaire, and a PGS instrument. Physical activity was measured using the IPAQ form. Knowledge and attitudes are determined by interviews, using knowledge and attitudes instruments. The data were analyzed descriptively. Food intake data were processed using Nutrisurvey 2007 for Windows. BMI showed 64% belong to the obesity 1. The average of body weight was 73.96 Kg ± 11.89. The incidence of obesity occurs a lot during adolescence and college (70%), 48% have obese parents, and 42% have obese siblings. The average body fat was 32.84% ± 5.59 and the average visceral fat was 9.57 ± 4.72. Fat and carbohydrate intake and energy were 100% less than DV, while protein intake was 85% less than DV. The diet of carbohydrate and vegetable sources was less than normal, while protein and fruit sources tend to be normal. Physical activity was low with 46%. The average knowledge score was 75.1% ± 12.98, and the average attitude score was 78.2% ± 14.17.

Keywords: Physical Activity; Intake; Obesity; Knowledge; Diet

1. Introduction

Obesity is one of the nutritional problems in Indonesia with long-term consequences such as increase in morbidity and mortality. Obesity in adolescents may be caused by changing lifestyle, including excessive diet of macronutrient sources accompanied by lack of physical activity, genetics, damage to the hypothalamus, emotional/psychic imbalances, and the environment (Salam 2010; Rafiony et al. 2015; Hendra et al. 2016). This results in accumulation of fat in adipose tissue accompanied by weight gain above ideal body weight (IBW). Obesity could be the reason for complications that lead to disability or death, such as diabetes mellitus, hypertension, dyslipidemia, cardiovascular disease, and stroke (Mahan & Raymond 2017).

The Ministry of Health of the Republic of Indonesia (2013), in the Basic Health Research reports, mentioned that the prevalence of obesity in adolescents in Indonesia was 19.7% for men and 32.9% for women. In West Java, it increased from 14.4% in 2011 to 19.5% in 2013. The verdict of obesity in Asian ethnicities in general and Indonesian

people in particular is stated by a body mass index (BMI) of more than 25 (Weisell 2002).

Obesity can be passed down from family as a genetic factor, but it is largely caused by environmental factors. Intake of food with excessive energy density is a problem that can cause overweight and obesity (Mahan & Raymond 2017). Intake of food sources of macronutrients and excessive diet cause an energy imbalance in the body, leading to obesity. Consumption of fast food and soft drinks is an additional factor that can cause obesity (Rafiony et al. 2015). An active lifestyle may lead to irregular meal timings and skipping breakfast. Breakfast with sufficient energy will meet the nutritional needs to maintain metabolism and productivity. A person who regularly skips breakfast is more likely to consume more food at another meal later in the day, resulting in excess energy.

The burgeoning technology and practical lifestyles, including in terms of information technology and transportation, have reduced social activities and exercises. Communication now largely transpires through social media, traveling by car is

preferable to traveling on foot and free time is spent more watching television or playing games (Mahan & Raymond 2017). Sleep deprivation can cause disturbances to hormones that regulate hunger and appetite. Appetite-regulating hormones will increase and cause excessive energy intake. Sleep deprivation may trigger stress, causing the body to release hormone cortisol which will stimulate insulin to maintain blood glucose stability. Prolonged stress will increase cortisol levels and lead to changes in appetite.

This study aimed to identify the risk factors for obesity in students of Poltekkes Kemenkes Tasikmalaya.

2. Methods

This study was designed as a descriptive study to highlight the phenomenon existing in the population (Sastroasmoro & Ismael 2011). The study population was students of Poltekkes Kemenkes Tasikmalaya with obesity status. The sampling technique used was purposive sampling, with criteria such as students of Poltekkes Kemenkes Tasikmalaya who were willing to take part in research, were actively studying in the Cilolohan and Tamansari campuses, and were not undergoing internships. The number of samples was 96 people, rounded up to 100 people to anticipate drop-outs.

The instrument used was a questionnaire. Characteristics of respondents consist of age, gender, and family history taken using a questionnaire; Body weight and body fat composition were taken using a digital tread scale with Karada scan with an accuracy of 0.1 ounces from the Omron brand, microtoise with an accuracy of 0.1 mm from the One Touch brand; Food intake data were taken using a 24-hour food recall questionnaire dan dietary habit data were taken using a diet questionnaire. Determination of meal portions was done using a food photo book. Intake data were processed using Nutrisurvey 2007 for Windows; Measurement of average physical activity was carried out using the IPAQ questionnaire (IPAQ, 2005); and Measurement of attitudes and knowledge was carried out using an attitude and knowledge questionnaire. The data were analysed univariately.

3. Results and Discussion
Respondent Characteristics

25% of the respondents were male while the remaining 75% were female. The proportion of the results of this study is close to the prevalence of adolescent obesity in Indonesia reported in the 2013 Basic Health Research, which was 19.5% for men and 32.9% for women. Gender appears to be a significant risk factor for obesity.

There are some differences between men and women in the distribution of adipose tissue fat. Men showed a larger distribution of visceral fat stores, while women had a larger distribution of subcutaneous fat stores. The difference is attributable to a number of factors, where genetic history contributes about 30% to the distribution of fat stores in adipose and subcutaneous tissue, while other factors are food intake and hormonal (Zore et al, 2018).

The hormonal system in both men and women has an effect on the regulation of fat stores. Estrogen in women is thought to play an important role in the distribution of body fat. Estrogen receptors (ER) which are expressed in peripheral tissues such as adipose tissue affect fat tissue storage and inflammation. An increase in estrogen will promote the accumulation of fat storage in the subcutaneous tissue, while a decrease in estrogen will increase visceral fat storage. Progesterone and androgen receptors (PR and AR), like ER, are also expressed in adipose tissue. Subcutaneous fat tissue has higher concentrations of ER and PR than AR, because estrogen suppresses the AR mechanism. On the other hand, visceral fat tissue has higher AR concentrations than ER and PR (Brown et al, 2010).Overall, the respondents' age ranges fall into the category of late teens or young adults. The incidence of obesity in adolescents is quite high, and if no control or intervention is carried out, it can trigger various degenerative diseases in adulthood. Obesity has comorbidities with metabolic syndrome (MetS) in all ethnic groups and age groups (Ramírez-Vélez et al, 2017).

The respondent nutritional status is divided into two groups, namely type 1 obesity (IMT≥25) and type 2 obesity (IMT≥30) according to the standards for Asia Pacific (Weisel, 2002). The results of IMT determination clearly excess fat storage in adipose tissue (adiposity). Excess body fat is a risk factor for the development of MetS which is characterized by the incidence of high blood pressure, hyperglycemia, dyslipidemia. Although BMI is the most frequently used method to determine obesity, it cannot be used to distinguish between lean body mass and body fat mass, thus in the determination one might find someone with a high BMI (≥25) because they have large bones and muscle composition but low body fat. In this study body fat measurement was carried out using bioimpedance analysis which can be used to determine body fat distribution (Ramírez-Vélez et al, 2017).

The history of the highest incidence of obesity was indicated by the adolescent phase (52%) and college (18%). The adolescent phase in women is the maturation phase of the reproductive organs and is closely related to hormonal changes. High production of the hormone estrogen is closely related to the distribution of body fat storage in the subcutaneous area, so women have a higher risk of obesity than men (Brown et al, 2010).

College period is identified as a busy period full of assignments, causing sleep deprivation in the majority of the respondents. Sleep deprivation can cause disturbances to hormones that regulate hunger

and appetite. Appetite-regulating hormones will increase and cause excessive energy intake. Sleep deprivation may trigger stress, causing the body to release hormone cortisol which will stimulate insulin to maintain blood glucose stability. Prolonged stress will increase cortisol levels and lead to changes in appetite. Intake of food with excessive energy density is a problem that can cause overweight and obesity (Mahan & Raymond, 2017).

Most of the respondents have parents with a history of obesity (48%) and siblings who also suffer from obesity (42%). Genetic factors are one of the risk factors for obesity that cannot be avoided, although genetic factors are strongly influenced by environmental factors (Mahan & Raymond 2017). Genetic carriers may become dormant at first, and become active if upon the presence of environmental factors in the form of intake or activity that support it. Obesity can be avoided or prevented from an early age by providing intake and instilling dietary habits that are in accordance with the needs and familiarizing children with physical activity.

Table 1. Frequency Distribution of Respondent Characteristics

Variable	Total	%
Gender		
Male	25	25%
Female	75	75%
Total	100	100%
Age		
17	8	8%
18	24	24%
19	39	39%
20	28	28%
21	1	1%
Total	100	100%
Nutritional Status	64	64%
Obesity 1	36	36%
Obesity 2		
Anthropometry	Average	SD
Weight	73.96 Kg	± 11.89
Height	159 Cm	± 6.79

Table 2. History of Obesity

Variable	Number	%
Occurrence Phase		
Toddlerhood	17	17%
Childhood	12	12%
Adolescence	52	52%
College	18	18%
Others	1	1%
Total	100	100%
Parents		
Obese	48	48%
Not Obese	52	52%
Total	100	100%
Siblings		
Obese	42	42%
Not Obese	58	58%
Total	100	100%

Table 3. Body Fat Composition Measurement

Variable	Total	%
% Fat (32.84% ± 5.59)		
Normal		
Male (% fat >10%)	2	2%
Female (% fat >20%)	3	3%
High		
Male (% fat >20%)	11	11%
Female (% fat >30%)	32	32%
Very High		
Male (% fat ≥25%)	12	12%
Female (% fat ≥35%)	40	40%
Total	100	100%
Obesity		
Male (% fat > 25)	12	14%
Female (% fat > 27)	75	86%
Total	87	100%
Visceral Fat (9,57 ± 4,72)		
Normal	58	58%
High	28	28%
Very High	14	14%
Total	100	100%
Subcutaneous Fat		
% WB	29.45 %	± 7.56
% Trunk	25.78 %	± 6.39
% Arm	42.67 %	± 11.22
% Leg	41.99 %	± 10.85

Table 4. Macronutrient Intake

Category	Intake							
	E	%	P	%	L	%	KH	%
Poor	100	100%	85	85%	100	100%	100	100%
Normal	0	0	15	15	0	0	0	0
Excessive	0	0	0	0	0	0	0	0
Total	100	100%	100	100%	100	100%	100	100%

Source: Research data of Asep AS, Tri Kusuma Agung

Description

E	: Energy	L	: Fat
P	: Protein	KH	: Carbohydrate

Table 5. Respondent Dietary Habit

Variable	Number	%
Rice/Substitute		
Inadequate	57	57%
Normal	43	43%
Excessive	0	0%
Total	100	100%
Animal Food		
Inadequate	7	7%
Normal	93	93%
Excessive	0	0%
Total	100	100%
Vegetable Food		
Inadequate	3	3%
Normal	97	97%
Excessive	0	0%
Total	100	100%
Vegetables		
Inadequate	86	86%
Normal	14	14%
Excessive	0	0%
Total	100	100%
Fruits		
Inadequate	25	25%
Normal	72	72%
Excessive	3	3%
Total	100	100%
Eating before sleep		
Yes	60	60%
No	40	40%
Total	100	100%
Eating when emotional		
Yes	64	64%
No	36	36%
Total	100	100%

Table 6. Respondent Physical Activity

Variable	Average	SD
Physical activity (MET-minutes/week)	824.6	± 768.45
Resting Metabolic Rate (RMR) (ccal)	1514.59	± 223.68
Energy (ccal/week)	995.72	± 918.74
Energy (ccal/day)	124.25	± 131.25
Physical Activity Category	Jumlah	%
Low	46	46%
Moderate	45	45%
High	9	9%
Total	100	100%

Body Fat Composition Measurement

Body fat serves as an energy reserve and protects vital organs. Fat is stored in adipose tissue. Body fat stores are measured in terms of % fat. The distribution of % body fat is also influenced by gender; thus, each category has a different cut off. Visceral fat is fat found in the abdomen and around the internal organs. In the event of excess fat storage (adiposity), ectopic visceral fat to other body organs can occur, triggering inflammation, endothelial disorders, and insulin resistance (Shulman, 2014; Matsuzawa, 2014; Gastaldelli, 2008).

Visceral fat is observed in men, which is expressed in the android type body shape (apple shape). The results showed that of the 25 male respondents, 17 of them were in the high and very high visceral fat categories, while the remaining 8 were in the normal category with values close to the upper threshold. Meanwhile, in female respondents there were 25 people with high and very high visceral fat categories. High visceral fat in women can trigger abnormal hormone production (estrogen, progesterone, LSH, LH) and result in an abnormal menstrual cycle (Samsel et al, 2014; Karina et al, 2017).

Table 7. Respondent Knowledge Rating

No	Question	%
1	The cause of obesity	81
2	Obesity grouping categories	74
3	Balance nutrition	44
4	High-calory food	88
5	High-fat food	82
6	Maximum limit of sugar intake in a day	71
7	Maximum limit of oil usage in a day	39
8	Frequency of a good diet	73
9	Processing methods that increase fat	99
10	Good dietary habits	99

Table 8. Respondent Attitudes

No	Question	%
1	Obese people do not need intervention *	TS = 76
2	To avoid hunger, I will have meal > 3x *	TS = 74
3	The right snack when hungry is fried food *	TS = 77
4	Between breakfast and lunch, I eat fruit **	S = 75
5	Before going to bed, I need to consume milk and cake so that I won't be hungry at night *	TS = 75
6	Obese people don't need to diet because "Big is beautiful"*	TS = 90
7	Physical activity makes me tired and bored *	TS = 65
8	My favorite physical activities are studying and watching TV *	TS = 58
9	Obese people need to jog 15 minutes per day to stay in shape **	S = 96
10	Obese people need to change their diet to stay healthy **	S = 96

Subcutaneous fat is fat stored in adipose tissue under the skin. Subcutaneous fat accumulation can occur in the abdomen (trunk), upper arms (arms), and

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thighs (legs). Accumulation of subcutaneous fat indicates a lack of associated physical activity in these organs or limbs (Liza et al, 2015; Ball et al, 2001; Zając-Gawlak et al, 2017).

Food Intake

The intake of energy, protein and carbohydrates of all respondents (100%) was in the poor category (<90% RDA), while the fat intake of 85% of respondents was in the normal category. This condition may be influenced by the respondent's knowledge about the impact of obesity on health. All respondents are health students so they have been exposed to the importance of maintaining intake to prevent obesity or reducing intake to lose weight. It is corroborated by the knowledge questionnaire results with a correct answer average score of 75.1% (SD ± 12.98). Health or medical students are more likely to be more knowledgeable and better equipped in dealing with obesity (Martins and Norsett-Carr, 2017).

The respondent's food intake was leaning toward inadequate, but the risk factors are closely related to the level of physical activity (Dewi and Mahmudiono, 2013). The physical activity of all respondents was largely in the low and moderate category. Low level of physical activity leads to low energy metabolism; thus, food intake tends to be stored as energy stores and causes obesity.

Dietary Habits

In this study, the researchers used an instrument model that has been modified with balanced nutrition guidelines (Kemenkes, 2014) as a substitute for the food frequency questionnaire (FFQ) method. From the results, it was found that the dietary pattern of carbohydrate sources (rice/substitute) (57%) was less than the balanced nutrition guidelines, and vegetable sources (86%) were less than the balanced nutrition guidelines. The validity and reliability of the results with this new instrument describe a poor food intake (<90% of needs) and is close to the results of the FFQ score, which is 50% less than the median.

The respondent's diet for carbohydrate sources was rather low, although the animal food diet was normal with 93%. Animal food have a fat content (low, medium, and high). The interview results also showed that all respondents like to consume fried food, fast food and junk food. 60% of them consume food before bedtime, so the incoming energy is not expended and instead, stored in adipose tissue and causes overweight or obesity, a habit that is exacerbated by low physical activity. 64% of respondents choose to consume food when they were feeling emotional (sad, angry, happy), causing the intake pattern to increase than on normal days. The intervention of obese respondents with emotional eating cannot be achieved only by relying on food restrictions, but must be combined with psychological interventions and emotional regulation (Van Strien, 2018; Singh, 2014).

Physical Activity

From the results of the study, 45% of respondents had low levels of physical activity and 46% of them had moderate levels. Low physical activity means that the average respondent's daily activity is just walking and no activity. While moderate physical activity can mean that the average respondent does light exercise such as running and gymnastics every day. The results of the conversion of the average MET (metabolic energy turnover) value into energy expenditure per day shows that each respondent's daily activity is equivalent to walking ± 27 minutes from the boarding house to the campus back and forth.

Low physical activity causes energy stores in adipose tissue in the form of visceral fat and subcutaneous fat cannot be used, thus, along with constant food intake, excessive dietary habits, respondents become more prone to obesity. From the questionnaire results, 45% of respondents admitted that physical activity tires and bores them. However, it is not clear what causes physical activity in the study to be in the low and moderate categories. Further studies are needed to identify and control the causes.

Knowledge

The average knowledge of the respondents in this study was in the good category, with a correct answer score of 75.1%. It is expected that adequate knowledge supports obesity prevention and intervention efforts. Health or medical students are more likely to have better understanding in dealing with obesity (Martins and Norsett-Carr, 2017). From the results of the study, we can focus on several topics of knowledge that can be used as materials for intervention or prevention of obesity, such as obesity grouping categories, balanced nutrition guidelines, selection of types of food, and eating frequency.

Knowing the obesity categories will make a person more careful and maintain food intake. One of the easiest methods is to monitor your weight or do a daily weighing. Balanced nutrition guidelines provide information on dietary habits, portions of food needed in a day, guidelines for managing a diet to lose weight, examples of food ingredients, as well as guidelines for consuming a variety of foods (The Ministry of Health of Indonesia).

Attitudes

The most underwhelming attitude statement from the respondents was about physical activity. The majority of respondents stated that physical activity makes them tired and bored. Attitude is not an action, but a predisposition of an action. Poor attitudes can be improved with education and knowledge. High knowledge is expected to provide a change in attitude for the better.

4. Conclusions and Suggestions

The respondents' macronutrient intake was below the requirement according to the 2013 RDA and their dietary habits for carbohydrate and vegetable sources were inadequate according to the 2014 PGS. However, most of them have a habit of consuming

food before bed and emotional eating. Genetic history in parents and siblings may be a risk factor that contributes to obesity. Low physical activity leads to low conversion of energy stores. The average physical activity of respondents for body weight of 73 Kg is equivalent to walking for 27 minutes every day with energy expended being 124.25 ± 131.25. The knowledge and attitudes of the respondents were good, though mode education on the topic is needed.

We suggest that further analysis is needed to determine the relationship or effect of each risk factor bivariately or multivariately. In addition, education for respondents is advised to improve attitudes, knowledge, physical activity, and dietary habits. Further research is also needed to examine the effect of dietary regulation and physical activity programs on body fat composition, clinical conditions, and blood biochemical parameters.

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