RELATIONSHIP OF ENERGY AND NUTRIENTS ADEQUACY ON NUTRITIONAL STATUS OF FOOTBALL PLAYERS AGED 9-12 YEARS

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Abstract
Accomplishment of nutrient need indigenous to food is primary factor that constitute optimizing athlete performance. Nutrient intake can provide energy for the athlete's body during the competition and also required for rapid recovery during the rest periods. The aim of this study was to analyze the relationship of energy and nutrient intake on nutritional status of football player aged 9-12 years old in Sinar Harapan Football School (FS), Tulangan, Sidoarjo. This correlation descriptive study using cross sectional design on 21 major players of football team from Sinar Harapan FS, Tulangan, Sidoarjo (there was one subject resigned because of illness and one other person was dropped out because did not follow 24-hours recall twice). Subjects were measured their body weight and height to estimate Body Mass Index (BMI) for age as an indicator of nutritional status. Subject also measured their intake as well as the percentage of energy and nutrients (carbohydrate, protein, and fat) adequacy using multiple 24-hours recall (three days non-consecutive). The resulting indicates that the percentage of energy and fat adequacy of football players of Sinar Harapan FS, Tulangan, Sidoarjo are associated with BMI for age significantly ($r=0.623$; $p=0.004$ and $r=0.609$; $p=0.006$). It can be concluded that the football players of Sinar Harapan FS, Tulangan, Sidoarjo whose energy and fat intake meets the daily needs then their optimal BMI for age can be achieved.

Keywords : intake, athletes, nutrition, adolescent

INTRODUCTION

Football was one of team sports that required good endurance, muscle strength, speed and agility. In addition to requiring some special skills, other movements made during football games such as running, kicking, jumping, and short sprinting also needed high energy. An football athlete could achieve their best performance through good management, especially the management of diet and nutritional status (Supriyono, 2012).

The fulfillment of nutrient needs indigenous from food was the primary factor underlying the optimalization of athletes performance. An athlete required many indigenous nutrients from food to meet their high energy needs during the game. Nutrient intake were prepared for providing energy for the athlete's body so that the performance could be increased during the game. Nutrients were also needed for rapid recovery during the rest periods (Ilyas,2004; Taiyeb, 2009). Nutritional status was a description of person's or a group

of people health condition based on the consumption, absorption, and utilization of nutrients in the body (Dieny, 2014).

Sinar Harapan is one of Football Schools (FS) located in the Tulangan Sub-District, Sidoarjo Regency. Sinar Harapan FS had some young football athletes categorized by aged groups, from school-age to adolescent. While, this could support the development of football in Indonesia, because the athletes who had been trained from an early age could produce more mature performance quality and more ready to compete both in national or international football game. Sinar Harapan FS had earned several achievements at the Provincial level, such as won the Rungkut FC Cup III Trophy of Football Tournament for 11years-old group in 2015. This condition was underlying a study related to the relationship between the level of food adequacy on nutritional status. Therefore, that should be conducted a study that examines the relationship of the percentages of energy and nutrients adequacy on nutritional status of football players aged 9-12 years in Sinar Harapan FS, Tulangan, Sidoarjo.

THEORETICAL

Football was one most popular team sports in the world. Football contributed mostly to the development of lifestyle in community, because it could improve the public health status. By exercising football, people could obtain some positive values in life, such as teaming up, adding friends, improving the physical fitness, social skills, emotional and mental, as well as entertaining (Muhyi, 2008).

Nutritional status was a description of person's or a group of people health condition based on the consumption, absorption, and utilization of nutrients in the body (Dieny, 2014). Assessment of nutritional status could be done using measurement of human body dimensions and compositions directly, such as using Body Mass Index (BMI) as an indicator. As for knowing the nutritional status of children aged 5-18 years, the assessment using BMI for aged old used as indicator (Direktorat Bina Gizi, 2011).

An athlete's nutritional status could be influenced by energy and nutients intake over a period of time significantly. The results of a study conducted on 131 young football athletes in Young Athletes Dormitory Ragunan, Indonesia Ministry of Youth and Sport, Jakarta, Indonesia and Football School ASIFA-Aji Santoso International Football Academy, Malang, Indonesia showed that intake of energy, protein, fat, and carbohydrate significantly influenced body weight, Basal Metabolic Rate (BMR), Body Mass Index (BMI), and muscle arm (Penggalih et al, 2017). Papadopoulou (2015) in his study stated that low intake of energy and nutrients could have a negative impact such as decreased performance and health status of athletes.

MATERIALS AND METHOD

This correlational descriptive study used cross sectional design which was done on December, 2nd 2016. Located in Sinar Harapan FS, Tulangan, Sidoarjo, this study selected as many as 21 male students aged 9-12 years who fit the criteria as subject from 24 major players of the football team. As for the implementation, there was one person resigned because of illness and one other person was forced to drop out for not following 24-hours recall interview twice. Therefore, the number of subjects in this study was only 19 football players (Notoatmodjo, 2003; Hidayat, 2007; Nursalam, 2003; Saryono, 2008; Sugiyono, 2012).

Sosio-Demographic Characteristics

Socio-demographic data were obtained from the interview using questionnaire containing the data describing the subjects characteristics include name, age, date of birth, and subject address.

Determination of Nutritional Status

The determination of nutritional status using BMI for age anthropometric index because the subject were children aged 9-12 years. Body weight was weighed using GEA Medical Electric Personal Scale Type BR-9807 (0.1 kg precision level), and height was measured using a stature meter (0.1 cm precision level). The results then used to calculate the BMI using the formula:

$$BMI = \frac{Body\ Weight\ (kg)}{Height\ (m)^2} \quad (1)$$

The results of these calculations related to age parameters, then assessed using z-score and categorized into five groups, severe thinness (< -3SD); thinness (> -3 s/d < -2 SDs); normal (> -2 s/d 1 SD); overweight (> 1 s/d 2 SDs); and obesity (> 2 SDs) (Kepmenkes RI, 2011).

Assessment of Food Intake

Food intake was obtained from interview with subjects using multiple 24-hours recall questionnaire (three days non-consecutive).The results of the interview then converted into calories and grams of macro nutrients (carbohydrate, protein, and fat), then compared with the Recommended Dietary Allowance (RDA) for boys aged 9-12 years and multiplied by 100% using the formula:

$$Intake\ (\%) = \frac{daily\ intake}{RDA}\ x\ 100\% \quad (2)$$

As for the percentage of adequacy was categorized into deficit (< 80% RDA); adequate (80-110% RDA); and excessive (>110% RDA) (WNPG, 2012).

Table 1. Subject Characteristics by Age, Body Weight, Height, and Body Mass Index

No.	Characteristic (n=19)	Mean + SD	Min	Maks
1.	Age (year)	10,0 + 1,02	9,0	12,0
2.	Body weight (kg)	28,7 + 5,59	19,5	40,0
3.	Height of body (cm)	132,2 + 9,13	113,5	148,0
4.	Body Mass Index (BMI) (kg/m2)	16,3 + 2,05	12,6	20,4

Data Analysis

All data were analyzed using SPSS 16 for Windows. Data of subjects's age, nutritional status (BMI for age), and percentage of energy nutrients (carbohydrate, protein, and fat) adequacy analyzed descriptively. Data analysis then continued with bivariate analysis using correlation test to assess relationship of the percentage of energy and nutrients adequacy with nutritional status (BMI for age). The statistical test was used the non-parametric bivariate correlation test, that was Spearman's Correlation Test with significance level (α) 0,05. The correlation test result were significant if p-values<0.05 were obtained (Uyanto, 2009).

RESULTS AND DISCUSSIONS

Subject Characteristics

The resulting shows that most subjects aged 10 years (36.8%). It also known that body weight, height, and BMI for age from 19 subjects aged years are highly varied (Table 1). As for the results on nutritional status of the subjects show that most of the major player of Sinar Harapan FS football team have normal nutritional status (z-score BMI for age between ≥ -2 to 1 SD).

It had been mentioned that football was a sport that required good endurance, muscle strength, speed and agility in order to make some movements such as running, kicking, jumping, and short sprinting during the game (Supriyono, 2012). This means that was very important for football athletes to maintain their weight and nutritional status on normal conditions so that they could do many movement without feeling tired. Thakur (2016) mentioned in his study were conducted on *Kabbadi* athletes, that the higher BMI values, the agility and running speed of athletes would be decreased significantly.

Speed could be defined as the amount of movement that could be done or the distance that could be reached by one of the body limb or the entire body of an athlete. As for agility was the ability to make changes quickly in movement from the initial position with balance and precision movement. Speed and agility were a motoric skill that sharpen an athlete's ability to perform a movement (Marković et al., 2005).

The puberty phase in the human life cycle was the most productive phase in developing the motoric skills of an athlete. The main factors that could affect an athlete's motoric skills were body composition and supporting physical condition. BMI was an indicator that could be used to assess body composition and directly related to body weight. The high value of BMI could be attributed to the weight of a

person's body weight. For football athletes, the more their weight would be the greater the burden sustained of their body. This would decrease the performance of football athletes during the game, especially the running speed and agility to seize and dribble. (Thakur, 2016). Body weight was related to speed, strength, endurance, agility and performance. By controlling body weight, then the nutritional status could be maintained under normal conditions so that the performance of athletes could be optimized (Steen, 2000).

The results of the study also indicate that most subjects still show deficit intake of energy, carbohydrate, protein, and fat (73.7%; 94.7%; 57.9%; and 63.2% respectively). It is also known that the overweight subjects tend to still show deficit intake of energy, carbohydrate, protein, and fat (Table 2).

Table 2 Relationship of Percentage of Energy and Nutrients (Carbohydrate, Protein, and Fat) Adequacy with Nutritional Status (BMI for age) of Football Player in Sinar Harapan FS, Tulangan, Sidoarjo

No.	Adequacy of Intake (%)	BMI for age (Z-Score) n=19								Coefficient of Correlation (r)	P-Value[a]
		Severe Thinness		Thinness		Normal		Overweight			
		n	%	n	%	n	%	n	%		
1.	Energy (57,1 ± 23.60)										
	a. Deficit	1	5.3	1	5.3	10	52.6	2	10.5	0.623	0.004*
	b. Adequate	0	0	0	0	4	21.1	1	5.3		
2.	Carbohydrate (165.2 ± 65,07)									0.304	0.206
	a. Deficit	1	5.3	1	5.3	13	68.4	3	15.8		
	b. Adequate	0	0	0	0	1	5.3	0	0		
3.	Protein (75.3 ± 33.61)										
	a. Deficit	1	5.3	0	0	9	47.4	1	5.3	0.396	0.093
	b. Adequate	0	0	0	0	3	15.8	1	5.3		
	c. Excessive	0	0	1	5.3	2	10.5	1	5.3		
4.	Fat (51.9 ± 43.83)										
	a. Deficit	1	5.3	1	5.3	10	52.6	0	0	0.609	0.006*
	b. Adequate	0	0	0	0	1	5.3	2	10.5		
	c. Excessive	0	0	0	0	3	15.8	1	5.3		

[a]Correlation test using Spearman's Correlation Test, signifikan at 0.05
Significancy is showed by notation *

Relationship of Energy and Nutrients Adequacy on Nutritional Status (BMI for age) of Football Player in Sinar Harapan Football School, Tulangan, Sidoarjo

The result of the analysis using Spearman's correlation test indicates that the percentage of energy and fat adequacy related to nutritional status (BMI for age) of football player in Sinar Harapan FS, Tulangan, Sidoarjo ($r=0.623$; $p<0.05$). On the other hand, the percentage of carbohydrate and protein adequacy are known to be unrelated to nutritional status (BMI for age) of football player in Sinar Harapan FS, Tulangan, Sidoarjo (Table 2).

It is known that the percentage of energy and fat adequacy are related to nutritional status of football player. This can be described that football player whose adequate daily intake of energy and fat can achieve optimal nutritional status. On the contrary, the excessive energy and fat daily intake will increase their body weight so that the higher of BMI value of football player. This result was supported by previous study on school-aged children (10-12 years) in SDN Geluran III, Taman, Sidoarjo mentioned that there was relationship between energy, fat, and potein consumption level on nutritional status (Pondaang and Adriani, 2012).

The relationship of adequacy of energy and fat intake on nutritional status could be positive or negative. The positive relationship means that the higher the percentage of energy and fat adequacy the better the nutritional status, but if the intake became excessive, it would develop into overweight and even obesity. Otherwise, the negative relationship means that the less energy and fat intake then the nutritional status would be develop into malnutrition (Regar and Sekartini, 2013).

Aged 9-12 years was the range of school-aged children. At this age, there would be a rapid physical growth accompanied by high intensity of physical activity. Football athletes in school-aged children would require higher supply of energy and nutrients compared to non-athletes. Therefore, without the fulfillment of adequate energy and nutrients, then the performance of young football athletes in the game would decrease. Inadequate of nutrients intake was associated with low intake of calories. Whereas if nutritional deficiency occurred over a long period of time, young athletes who were still in growth would have a higher risk for developmental and maturation delay during exercise or competition (Daly et al, 2002).

The results of this study also indicate that the percentage of carbohydrate and protein adequacy are not related to the nutritional status of football player. However, the results of this study were consistent with the study conducted on Kokap Junior High School, Kulonprogo, Yogyakarta, showed that there was no relationship between carbohydrate and protein intake with BMI for age (Klau et al, 2013). In contrast to the result of this study, Isdaryanti (2007) mentioned in her study on Ajowinangun I Elementary School, Pacitan that the intake of carbohydrate and protein was related to nutritional status significantly.

Acccording to Table 2, it can be seen that most of the subjects with normal nutritional status still showed deficits in protein and carbohydrate intake. This is associated with the selection of high-fat food ingredients as snacks or main meals based on multiple 24-hours recall data obtained from interviews with subjects. School-aged children prefer to consume snacks rather than consuming food in a complete serving for meals. As for the type of snack that was often consumed was usually some processed food that poor protein but high fat content. In addition, school-aged children also tend to like snacks that are high in simple carbohydrate such as starch. According to the fats obtained fom interviews using 24-hours recall, almost all subjects consumed simple carbohydrate sources from high-flour snacks and high-sugar beverages.

It had been mentioned before that school-aged children tend to had very high activity, especially if the child was a football athlete. Learning activities at school accompanied with high intensity of football exercise schedule would certainly increase their energy need. Carbohydrate as the main energy source for daily physical activity, play an important role for the fulfillment of high energy needs for young football athletes. Unfortunately, the source of carbohydrates used as the body main fuel comes from high simple carbohydrate snacks. In the body, simple carbohydrates were converted into energy quickly and used to perfom daily activities, so that carbohydrate were stored as glycogen even nonsexist. Despite carbohydrate intake can provide enough energy for football player's daily activites, yet had not been able to contribute to body weight alteration, and ultimately, will not affect the alteration of BMI.

CONCLUSION

It can be concluded that the percentage of energy and fat adequacy are proportional to BMI for age nutritional status of football player in Sinar Harapan FS, Tulangan, Sidoarjo. In the other words, football player whose adequate daily intake of energy and fat can achieve optimal nutritional status. On the contrary, the excessive energy and fat daily intake, will increase their body weight so that the higher of BMI value of football player. For further research, there needs to conduct a study that examines about the effect of energy and nutrients intake on the football player's performance in accordance with the position off players in football team in Sinar Harapan FS, Tulangan, Sidoarjo.

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