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Correlation between nutritional adequacy, Fe content, body fat percentage, and muscle mass percentage with physical fitness

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Abstract: This study aims to determine the correlation between nutritional adequacy, Fe content, body fat percentage, and muscle mass percentage with physical fitness in football athletes. Adequacy of nutrients (energy, protein, fat, protein and Fe) was obtained with a 2×24 hour recall. The Fe content value of Fe was measured using the cyanmethemoglobin method and sTfR was measured using the ELISA method. The percentage of fat and muscle was obtained by using a Bioelectrical Impedance Analysis tool. Physical fitness was measured using the ACSPFT (Asian Committee on Standardization of Physical Fitness Test) test which includes long jumps, pull-ups, sit-ups, sprints or sprints, shuttle run tests, sit and reach and long runs. The bivariate statistical test used was the Pearson and Rank-Spearman correlation test, while the multivariate test used the Linear Regression test. There was a correlation between carbohydrate adequacy and physical fitness (p = 0.008). Physical fitness related to carbohydrate adequacy was agility and hand muscle strength (shuttle run and pull-up). There was no correlation between adequacy of energy, protein, fat, Fe Content, fat percentage, muscle percentage and physical fitness of athletes. The results of multivariate analysis showed that the most influential on physical fitness was fat adequacy (R_{square}=14,6%).

Keywords: nutritional adequacy, Hb, sTfR, fat percentage, protein percentage, physical fitness

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INTRODUCTION

Achievement in athletes was influenced by several factors, namely physical factors, technical factors and psychological factors (Lilik Sudarwati Adisasmito, 2002; Rusli Lutan, 1988). Physical factors or physical fitness were elements that greatly determine performance in sports (Ali Akbar & Nanang Indardi, 2014; Direktorat Jenderal Bina Kesehatan Masyarakat, 2002; Luxbacher J, 2004). In soccer, the physical component or physical fitness that what was needed was flexibility, agility, agility, aerobic and anaerobic endurance, muscle strength and speed (Djoko Pekik Irianto, 2004; Syafrizar & Wilda W, 2009; Thomas Battinelli, 2000). One of the factors that can affect the physical fitness of athletes was the intake of nutrients, both macronutrients and micronutrients (Brylinsky CM, 2004; Direktorat Jenderal Bina Kesehatan Masyarakat, 2002; Joanne Adamidou & Jenna A Bell-Wilson, 2006). False One micronutrient that affects physical fitness was Fe. Fe has an important role in the process of respiration in the body, both at the tissue and cellular level. One of the main functions of Fe was to form hemoglobin. Hemoglobin was a major constituent molecule of red blood cells that acts as a transporter of oxygen and carbon dioxide at the tissue level (CJ Caspersen et al., 1985).

The state of decreasing the number of red blood cells and hemoglobin levels in athletes will cause disturbances in oxygen transportation, so that it will reduce aerobic work capacity and athletes will easily experience fatigue during the match (Fink HH & Mikesky AE, 2017; Hergenroeder AC & Klish WJ, 1990). Fe deficiency followed by anemia or not in athletes will cause disturbances to the body's physiology, especially in muscle function and maximum work capacity (Intan Galih Cornia & Merryana Adriani, 2018). Fe deficiency in athletes can occur due to training loads that were too heavy, increased Fe expenditure through sweating, hemolysis of red blood cells due to impact on the feet, an increase in the need for Fe due to increased production of red blood cells associated with increased physical health of athletes, bleeding in the digestive tract or intake of foods that contain less Fe (Hergenroeder AC & Klish WJ, 1990; Karinta Ariani Setiaputri et al., 2017).

In addition to the intake of nutrients, the physical fitness of an athlete was also influenced by the physical condition of the athlete himself. The biggest factor that affects the physical condition of an athlete was the condition of body composition (Ali Akbar & Nanang Indardi, 2014). Body composition was one of the determinants of athlete performance and athlete performance was one of the determinants of victory in a match (Brylinsky CM, 2004; Widiastuti, 2011). Assessment of body composition was useful for monitoring the effects of training and was a part of physiological monitoring as part of the assessment of athlete fitness. Body composition can affect an athlete's aerobic endurance, speed, balance and power (Justinus Lhaksana, 2011). Previous studies have shown that athletes with better muscle mass have a shorter time to do the 100 m sprint. Supported by other studies which state that there was a significant correlation between percent body fat, BMI and VO2max with 5 km running performance. Percentage of body fat was the most influential variable on 5 km running performance (Anastasia Masithoh et al., 2018; Refiana Putri Sukmajati, 2015).

The purpose of this study was to determine the correlation between nutritional adequacy, Fe content, body fat percentage, muscle mass percentage and physical fitness in soccer athletes at the Terang Bangsa Soccer School Semarang.

METHOD

This research was an observational study with a cross sectional approach and analyzed by analytical descriptive. The research was conducted at the Terang Bangsa Football School Semarang. Hemoglobin examination and sTfR examination were carried out at the GAKI Laboratory of the Diponegoro National Hospital. The number of samples in this study amounted to 27 respondents. Calculation of the number of samples in this study did not use the sample calculation formula, because when this research was running, the Covid-19 disaster occurred, so the title and method in this study changed, the sample used used a number of samples from previous studies, namely 27 respondents.

Adequacy of nutrients (energy, protein, fat, protein and Fe) was obtained with a 2×24 hour recall. The Fe content value of Fe was measured using the cyanmethemoglobin method with 3 ml blood collection and sTfR was measured using the ELISA method with 30 ml blood collection. Hemoglobin levels and sTfR values were analyzed at the GAKI Laboratory of the National Hospital of Diponegoro University. The percentage of fat and muscle was obtained using the Omron Karada Scan HBF 375 Bioelectrical Impedance Analysis tool. Physical fitness was measured using the ACSPFT (Asian Committee on Standardization of Physical Fitness Test) test which includes long jumps, pull-ups, sit-ups, sprints or running fast, shuttle run test, sit and reach and long run. Each athlete did a physical fitness test 2 times and the time interval between each test was 5 minutes.

The data will be analyzed by statistical test using SPSS version 22. Each data was analyzed to see normality using the Saphiro Wilk Test. Bivariate analysis was used to determine the correlation between the independent variables (hemoglobin level, sTfR value, nutrient adequacy, body fat percentage, and muscle mass percentage) and the dependent variable, namely physical fitness. For the distribution of normal data using the Pearson Correlation Test, for the distribution of abnormal data using the Spearman Rank Correlation Test. Multivariate analysis using Linear Regression Test for variables with p values <0.25.

RESULT AND DISCUSSION

This research was conducted at the Terang Bangsa Football School Semarang with 27 respondents. The respondent's characteristic data consisted of Body Mass Index (BMI), physical activity, physical fitness, energy adequacy, protein adequacy, fat adequacy, carbohydrate adequacy, Fe adequacy, Fe content, muscle mass percentage, and body fat percentage.

Table 1. Responden Characteristic

Characteristics	N	%	Mean±SD	Min-max
Body Mass Index				
Underweight (<18,5)	4	14,3		
Normal (18,5-22,9)	16	57,1		
Overweight (23-24,9)	5	17,9	21,19 ± 2,52	16,27-25,95
Obesitas 1 (25-29,9)	2	7,1		
Obesitas 2 (≥30)	0	0		
Physical Activity				
Mild (1,0-1,59)	2	7,1		
Moderate (1,6-1,89)	25	89,3	1,71 ± 0,066	1,59-1,87
Severe (1,9-2,49)	0	0		
Physical Fitness				
Pull-up			13,66 ± 6,40	3-30
Sit-up			45,55 ± 7,95	35-60
Sprint			1,36 ± 0,17	1,02-1,75
Long jump			278,69 ± 6,35	268,50-292,50
Long run			3,43 ± 0,56	2,56-4,53
Shuttle Run			10,70 ± 0,43	10,12-11,84
Sit and Reach			23,59 ± 2,30	20-27
Energy Adequacy				
Severe Deficit (<70%)	1	3,7		
Moderate Deficit (70-79%)	7	25,9		
Mild Deficit (80-89%)	14	51,9	83,53 ± 6,47	68,84-93,49
Normal (90-119%)	5	18,5		
Above Demand Rate (≥120%)	0	0		
Protein Adequacy				
Severe Deficit (<70%)	0	0		
Moderate Deficit (70-79%)	0	0		
Mild Deficit (80-89%)	3	11,1	118,21 ± 17,41	82,13-148,93
Normal (90-119%)	10	37,0		
Above Demand Rate (≥120%)	14	51,9		
Fat Adequacy				
Severe Deficit (<70%)	2	7,4		
Moderate Deficit (70-79%)	2	7,4		
Mild Deficit (80-89%)	7	25,9	91,57 ± 13,02	63,63-119,88
Normal (90-119%)	15	25,9		
Above Demand Rate (≥120%)	1	3,7		
Carbohydrate Adequacy				
Severe Deficit (<70%)	13	48,1		
Moderate Deficit (70-79%)	9	33,3		
Mild Deficit (80-89%)	5	18,5	70,30 ± 11,15	46,50-87,77
Normal (90-119%)	0	0		
Above Demand Rate (≥120%)	0	0		
Fe Adequacy				
Severe Deficit (<70%)	3	11,1		
Moderate Deficit (70-79%)	2	7,4		
Mild Deficit (80-89%)	8	29,6	94,04 ± 21,08	50,00-149,09
Normal (90-119%)	12	44,4		
Above Demand Rate (≥120%)	2	7,4		
Fe content				
Soluble Transferin Reseptor			14,74 ± 11,29	9,00-62,60
Hemoglobin			14,36 ± 0,81	12,40-16,70
Muscle Mass Percentage			41,88 ± 5,05	29,70-49,50
Body Fat Percentage			13,74 ± 4,91	5,30-24,00

The average nutritional status of the respondents as seen from the Body Mass Index was 21.19 kg/m^2 which was included in the normal category. There were only two respondents who have obesity nutritional status and one of them was a goalkeeper. The average value of physical activity that has been calculated by the PAL table was 1.71 which was in the moderate category. Physical activities such as football training were carried out by respondents 3 times a week with a duration of 3 hours. The routine activities carried out were school from 07.00 to 14.30. On other days when not exercising, some respondents did other activities such as resting by relaxing, doing additional exercises and playing volleyball together.

The average result of measuring the strength of the hand muscles with the respondent's pull-up test was 13.66 times, while the average result of the measurement of the abdominal muscle strength of the respondents using the sit-up test was 45.55 times. The average respondent's speed measurement results were 1.36 seconds, the respondent's explosive power measurement using the long jump test was 278.69 meters, the respondent's respiratory endurance measurement was 3.43 minutes, the respondent's agility measurement was 10.70 seconds and the average the respondent's flexibility measurement was 23.59 cm.

Table 1 shows that the average respondent's energy adequacy was 83.53% which was in the category of mild deficit, while the average protein adequacy of the respondents was 118.21% which was in the normal category. The average respondent's fat adequacy was 91.57% in the normal category, the respondent's average carbohydrate adequacy was 70.30% in the moderate deficit category and the respondent's average Fe adequacy was 94.04% in the normal category.

The respondent's food intake has been regulated by the school, the system of giving in a day was 3 meals and one snack with a total energy of 1900 calories. Respondents obtained heavy meals in the morning before going to school, during the day at school and in the afternoon after training, while snacks were given once during the day in the form of bread or bananas. Respondents were not given additional supplements from school, there was only one respondent who took additional supplements in the form of protein milk.

Fe content was described by the value of Soluble Transferrin Receptor (sTfR) and hemoglobin levels in respondents. The normal sTfR concentration was about 1.0-2.9 g/ml. The limit value for sTfR levels was to indicate an early sign of intracellular Fe deficiency if the sTfR level was > 2.5 g/ml (Abdul Khanis, 2010; Ahluwalia N, 1998; Bambang S, 2006; M. Nur, 2014). Other sources say that the normal value of sTfR was 0 ,83-2,76 mg/L (Schumacher YO et al., 2002). If using Hemoglobin as a parameter to measure Fe content, the respondent was declared anemic if the age of 12-14 years the hemoglobin level in the blood was below 12.0 g/dL and if Respondents aged 15 years and over were said to be anemic if the hemoglobin level was below 13.0g/dL (WHO, 2011). The Soluble Transferrin Receptor values of respondents in this study were all normal. It was obtained from the results of the study that the lowest value of Soluble Transferrin Receptors in respondents was 9 g/L while the highest value was 62.6 g/L with an average of 14.74 g/L. Hemoglobin Levels Respondents in the study were all normal or not anemic. The respondent's average hemoglobin level was 14.36 g/dL and the lowest respondent's hemoglobin level was 12.40 g/dL.

Body composition measured was percent muscle and percent fat. The categories of body fat percentage for men were athletic (5-10%), good (11-14%), acceptable (15-20%) and obese (>24%). (Jeukendrup A and Gleeson M 2010) Percent category muscle mass in men was high (>44%), normal (40-44%), low (<40%) (Janssen I A N et al., 2000; Latifah Nandita Nury et al., 2019). From table 1, it can be concluded that the average percentage of the respondent's muscle mass was 41.88, which was included in the normal category. for the average body fat percentage of respondents was 13.74, in the good category.

Table 2. Correlation of Nutrient Adequacy with Physical Fitness

Variabel	R	Sig.
Energy Adequacy*	-0,238	0,232
Protein Adequacy*	-0,149	0,459
Fat Adequacy*	0,382	0.050
Carbohudrate Adequacy**	-0,499	0,008
Fe Adequacy*	-0,231	0,245

*****Pearson Test
**Spearman Rank Test

Based on the table above, it can be concluded that energy adequacy, protein adequacy, fat adequacy and Fe adequacy were not related to physical fitness. This was evidenced by the p value> 0.05. It was stated that there was no correlation between energy intake and protein intake with physical fitness in taekwondo athletes and in football athletes (Elok Dwi Anggitasari et al., 2019; Intan Galih Cornia & Merryana Adriani, 2018). Other studies also state that there was no significant correlation between energy adequacy and physical fitness in swimming athletes (Karinta Ariani Setiaputri et al., 2017). Based on the results of the analysis of the data obtained, the average energy adequacy of the respondents was a mild level of deficit. Sufficient energy was needed by athletes to maintain body tissue mass, body immune system, reproductive function, and to maintain optimal athlete performance. The physical activity that athletes do was heavier. Especially if the athlete was a student, the energy needs were much greater because the athlete was still in his teens which was the period of optimal growth and the most productive phase in the development of the athlete's motor skills. school, taking part in extracurricular activities and other activities outside of school. This high energy requirement was not supported by the availability of sufficient food. The athlete's dormitory provides food with a total of 1900 calories of energy per day. This was one of the causes of the respondent's energy adequacy deficit. Good nutritional status was needed to maintain fitness and health, assist growth and support athletic achievement development. A person's Body Mass Index (BMI) greatly determines a person's ability to carry out sports activities (Elok Dwi Anggitasari et al., 2019).

While the adequacy of carbohydrates was related to physical fitness, as evidenced by the value of $p<0.05$ ($p = 0.008$) and the value of $r = -0.499$, which means that there was a negative correlation between carbohydrate adequacy and the respondent's physical fitness. So it can be said that the smaller the percentage of carbohydrate adequacy, the higher the respondent's physical fitness. The correlation between carbohydrate adequacy and physical fitness can occur when the body consumes excessive carbohydrate sources without adequate physical activity, so carbohydrates in the body will be stored in the form of fat reserves. Excess fat in the body will be able to increase body mass, which will affect the speed of athletes, besides a high percentage of fat in the body will increase the temperature in the body so that the body will get tired easily (Refiana Putri Sukmajati, 2015).

Based on table 3, it can be seen that there was a correlation between energy adequacy and the shuttle-run as evidenced by the values of $p = 0.024$ and $r = 0.434$, which means that there was a positive correlation, namely the better the energy adequacy, the better the shuttle-run score for the respondents. There was also a correlation between carbohydrate adequacy and the shuttle-run as evidenced by the values of $p=0.003$ and $r=0.552$, which means that there was a positive correlation, namely the better the carbohydrate adequacy, the better the shuttle-run score for the respondents. There was a correlation between carbohydrate adequacy and pull-ups as evidenced by the value of $p = 0.031$ and $r = -0.416$, which means that there was a negative correlation, namely the lower the carbohydrate adequacy, the better the pull-up score on the respondents.

Table 3. Correlation of Nutrient Adequacy with Physical Fitness

Variabel 1	Variabel 2	R	Sig.
Energy Adequacy	***Shuttle run****	**0,434**	**0,024**
	*Pull-up**	-0,240	0,227
	*Sprint**	0,001	0,995
	*Long jump**	-0,033	0,869
	*Sit and reach***	0,190	0,341
	*Sit-up***	-0,202	0,311
	*Long run***	0,075	0,710
Protein Adequacy	*Shuttle run**	0,086	0,669
	*Pull-up**	-0,122	0,543
	*Sprint**	0,002	0,991
	*Long Jump**	0,051	0,800
	*Sit and reach***	-0,047	0,814
	*Sit-up***	-0,227	0,256
	*Long run***	0,023	0,909
Fat Adequacy	*Shuttle run**	-0.093	0,644
	*Pull-up**	0,266	0,180
	*Sprint**	-0,168	0,403

	*Long jump**	0,276	0,164
	*Sit and reach***	0,280	0,158
	*Sit-up***	-0,097	0,629
	*Long run***	-0,166	0,408
Carbohydrate Adequacy	***Shuttle run*****	**0,552**	**0,003**
	Pull-up**	**-0,416**	**0,031**
	*Sprint***	0,127	0,529
	*Long jump***	-0,268	0,177
	*Sit and reach***	0,022	0,912
	*Sit-up***	-0,043	0,830
	*Long run***	0,232	0,244
Fe Adequacy	*Shuttle run**	0,075	0,709
	*Pull-up**	-0,197	0,324
	*Sprint**	-0,159	0,428
	*Long jump**	0,044	0,829
	*Sit and reach***	0,091	0,651
	*Sit-up***	0,092	0,646
	*Long run***	-0,013	0,950

*****Pearson Test
**Spearman Rank Test

Shuttle-run was a test conducted to measure the agility of an athlete. Agility was the ability to move quickly without losing balance (Ngurah Nala, 1998). Agility was closely related to speed, strength, balance and coordination of motion, balance, flexibility, and all other athletic abilities (M Sajoto, 1995). Pull-ups were tests performed to measure hand muscle strength. Muscle strength was defined as the power or muscle tension to do work repeatedly or continuously against resistance in a maximum effort (Thomas Battinelli, 2000). Adequate energy in athletes was very important to be stored in muscles and liver as glycogen. If the glycogen reserves in the body were low, the athlete will experience fatigue because the energy needed has been exhausted (Moehji S, 2003). Carbohydrates were needed by athletes to produce energy. Carbohydrates were able to produce energy-forming basic molecules in a larger quantity and at a faster rate than fat burning. The negative correlation between carbohydrate adequacy and pull-ups (hand muscle strength) was when the body consumes carbohydrate-rich foods. If excessive physical activity was not accompanied by sufficient physical activity, then carbohydrates in the body will be stored in the form of fat reserves. Excess fat in the body will be able to increase body mass, which will affect the speed of athletes, besides a high percentage of fat in the body will increase the temperature in the body so that the body will get tired easily (Refiana Putri Sukmajati, 2015).

Table 4 shows the results of the test of the correlation between Fe content and physical fitness, namely that there was no significant correlation between Fe content, namely hemoglobin and Soluble Transferrin Receptor levels with physical fitness (hemoglobin level $p = 0.295$ and sTfR $p = 0.399$). The results of this study were in line with research conducted by other research, which states that there was no significant correlation between hemoglobin levels and athletes' physical fitness (Anastasia Masithoh et al., 2018). Physical fitness of athletes was not only influenced by hemoglobin levels but also other factors, such as motivation and nutritional intake. The absence of a correlation between Fe content and physical fitness of the respondents could be due to all respondents having Fe content (hemoglobin levels and sTfR values) and good physical fitness. The level of Fe adequacy in the respondents was also mostly in the normal category. A good level of Fe adequacy was because respondents always consume Fe-rich foods in every meal (Arum VM, 2013; Kartika Indaswari Dewi & Bambang Wirjatmadi, 2017).

Table 4. Correlation of Fe content with Physical Fitness

Variabel	R	Sig.
Hemoglobin*	-0,209	0,295
Soluble Transferin Reseptor**	0,169	0,399

*****Pearson Test
**Spearman Rank Test

Fe was very influential on the physical fitness of an athlete. Fe was needed in the process of hematopoiesis (blood formation), namely in the synthesis of hemoglobin (Hb) (Gibney MJ et al., 2009). Hemoglobin levels have an effect of 15.2% on physical fitness (Pretty A & Muwakhidah, 2017). Hemoglobin functions to bind and then carry oxygen to the lungs before being circulated to all body twisues. Oxygen has a role as a fuel that can produce energy to support one's activities (Gibson R, 2005; Ikanov Safitri & Bambang Wirjatmadi, 2020). Decreased oxygen consumption during exercise will cause energy metabolism which will produce lactic acid by-products, if lactic acid accumulates it can accelerate muscle fatigue in athletes (Fink HH & Mikesky AE, 2017; Latifah Nandita Nury et al., 2019).

Tabel 5. Correlation between Body Fat Percentage and Muscle Mass Percentage with Physical Fitness

Variabel	R	Sig.
Body Fat Percentage*	-0,208	0,297
Muscle Mass Percentage**	0,166	0,408

*****Pearson Test
**Spearman Rank Test

Based on the test of the correlation between the percentage of body fat and the percentage of muscle mass with physical fitness, it can be concluded that there was no correlation between the percentage of body fat and the percentage of muscle mass with physical fitness. This was indicated by a significance value of more than 0.05 (percentage of body fat p=0.297 and percentage of muscle mass p=0.408). The results of this study were in line with other research, that there was no correlation between body fat percentage and physical fitness in swimming athletes (Dinda Nurwidyastuti, 2012; Karinta Ariani Setiaputri et al., 2017). There was no correlation between the percentage of body fat and physical fitness because the percentage of fat in most of the respondents was in the very good category and the overall physical fitness of all respondents was also in the category very good. The correlation between the percentage of fat and physical fitness can occur because excess fat in the body will be able to increase body mass, which will affect the speed of athletes, besides a high percentage of fat in the body will increase the temperature in the body so that the body will get tired easily (Refiana Putri Sukmajati, 2015).

Table 6. Simple Linear Regression Analysis

Variabel	Regression coef. (B)	R_{square}	Sig.
Energy Adequacy	-0,861	0,057	0,232
Fat Adequacy	0,686	0,146	0,050
Fe Adequacy	-0,257	0,054	0,245
Carbohydrate Adequacy	1,253	0,056	0,007

From the results of multivariate analysis, it was found that the coefficient of determination (R_{square}) of energy adequacy was 0.057, which means 5.7% of physical fitness was influenced by energy adequacy, while the remaining 94.3% of physical fitness was influenced by other variables not examined in the study. The coefficient of determination (R_{square}) of fat adequacy was 0.146, which means that 14.6% of physical fitness was influenced by fat adequacy, while the remaining 85.4% of physical fitness was influenced by other variables not examined in the study. The coefficient of determination (R_{square}) of Fe adequacy was 0.054, which means 5.4% of physical fitness was influenced by Fe adequacy, while the remaining 94.6% of physical fitness was influenced by other variables not examined in the study. The coefficient of determination (R_{square}) of carbohydrate adequacy was 0.056, which means 5.6% of physical fitness was influenced by carbohydrate adequacy, while the remaining 94.4% of physical fitness was influenced by other variables not examined in the study. It can be concluded that the variable that most influences physical fitness was fat adequacy. There was a correlation between fat adequacy and the physical fitness of football athletes (Asmika et al., 2012; Intan Dwi Sari et al., 2016).

However, fat consumption in athletes should be limited because excess fat in the body will increase body mass, which will affect the athlete's speed, besides a high percentage of body fat will increase body temperature so that the body will get tired easily. The recommended consumption of fat in a day was 8% of the total energy requirement which comes from saturated fat and 3-7% from polyunsaturated fat. Fat was used as a source of energy in physical exercise to increase muscle capacity. Increased fat metabolism during endurance sports such as football has the benefit of protecting glycogen use and improving physical endurance (Djoko Pekik Irianto, 2004; Refiana Putri Sukmajati, 2015; Rhosidatus Salamah, 2019).

CONCLUSION

There was a correlation between carbohydrate adequacy and physical fitness which was indicated by a p value <0.05 (p = 0.008), but there was no correlation between the adequacy of energy, protein, fat and Fe with athletes' physical fitness marked by a p value> 0.005 (p energy =0,232, protein p=0,459, fat p=0,050, and Fe p=0,245). There was no significant correlation between Fe content, namely hemoglobin and sTfR levels with physical fitness, which was indicated by p>0.05 (hemoglobin level p=0.295 and sTfR p=0.399). There was no correlation between the percentage of body fat and the percentage of muscle mass with physical fitness which was indicated by the value of p = 0.297 and p = 0.40. The results of multivariate analysis showed that the most influential on physical fitness was fat adequacy (R_{square}=14,6%).

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