KESMAS, Vol.10, No.2, September 2016, pp. 138~ 144
ISSN: 1978 - 0575

NUTRITIONAL STATUS, NUTRIENT INTAKES AND PHYSICAL ACTIVITY IN RELATION TO PHYSICAL FITNESS

Mustakim*, Kusdinar Ahmad
Faculty of Medicine and Health, University of Muhammadiyah Jakarta
Jalan K.H. Ahmad Dahlan Cirendeu Ciputat, +6221-74701362
E-mail: mustakim.sp76@gmail.com

Abstract

The study focused on the physical fitness of Senior High School's students at Sragen, Central Java in 2010. The purpose of this study was to determine the relations between nutritional status, nutrient intakes, and physical activity to physical fitness measured by fitness test using Indonesia's Physical Fitness Test for aged 16-19 years minus pull-up test. This study was a cross-sectional design. The data was collected from 198 Senior High School's students at Sragen; Central Java aged 16-19 years. The result showed that 63.6 percentage of respondent belonged to the weak condition. Sports activity and sex were significantly related to physical fitness. The researcher suggests that students should keep their sports activity goes on in the regular and active condition especially for female students.

***Keywords**: physical activity, nutritional status, nutrient intake, fitness*

1. Introduction

Fitness is critical to the health of teenagers. If teenagers maintain their fitness, the cardiovascular system will function and maintain optimally [1]. Lack of fitness less will reflect shortcomings in the ability to work, both old and durability for work or job performance [2]). A cross-sectional study conducted on 421 black and white students of high school in the Augusta, Georgia, USA shows that students who did physical activity with viable in large quantities have a better fitness (endurance cardiorespiratory) and percent body fat lower than those not working [3]). A study fitness conducted in second-grade female students of vocational school(SMK) Pangudi Luhur Tarcisius using the Harvard Step Test showed that the status of fitness as much as 78.1% at fewer criteria, 15.6% are in the middle standards, and 6.3% at both criteria [4]. In addition, research conducted among female adolescents aged 18-19 years in the Faculty of Public Health shows that based on the norms fitness test 86.7% female students classified as not fit while based on the median value of the pulse after the test 54.7% classified as unfit [5].

According to the results of a study on the fitness conducted on Local Government Nursing Academy student Serang, Banten, there was a significant relationship between nutritional statuses (BMI) to fitness, a group with normal BMI have a better fitness than other [6]. Meanwhile, in a study conducted at Ministry of National Education (MONE) of women aged 19-52 years there was a significant relationship between percent body fat to fitness (as measured by VO_{2max}) [7]. A cross-sectional study conducted on children in Sweden and Estonia aged 9-10 years suggests that there was a positive correlation between physical activity and fitness (endurance cardiorespiratory)[8].

In relation to nutrient intakes, results of a study conducted on the participants in the aerobic gymnastics gymnasium Kartika Dewi stated that there was a significant relationship between energy intakes with heart-lung fitness level [9]. Besides that, a study conducted in children and adolescents in Colombia showed that there was a

significant relationship in adolescent males than females between protein C-reactive to fitness, but this relationship inverse proportionally [10]. Another study suggests that there was a significant association between intake of micronutrients to fitness in adolescent and adult women. This study evaluated from the intake of fruits as well as analysis of beta carotene and alpha-tocopherol in the blood. The results show that there was a positive correlation to the fitness (VO_{2max}) [11].

Based on the previous description, the fitness levels were still low, especially in the senior high school's students (SMA). Therefore, the research aims to determine the relation between nutritional status, nutrient intake and physical activity to the fitness on selected senior high school's student in Sragen, Central Java.

2. Research Method

This study wasa quantitative study employed cross-sectional design. Population target of this study wa entire students of senior high s schools in Sragen, Central Java. The group is also selected to be a population study. In the selection of these samples, researchers used multistage random sampling methods where researchers choose a sample stratification preceded by an accredited school. The next stage was calculating the number of samples required in this study. The calculation of sample size for the proportion of the population was done by using the formula hypothesis testing different proportions and obtained a sample of at least 198.

Data to be collected include the status of fitness, BMI status (weight and height), and the percent of body fat, physical activity (exercise and leisure time) as well as the intake of energy, protein, vitamin A, vitamin B, iron / Fe, copper / Cu, and Magnesium / Mg. Data on the fitness retrieved by performing a series of tests using Indonesia physical fitness without pull-up tests such as sprinting 60 m, jump up and run a long distance (1000 meters for the women's 1,200 meters for men), the result will be converted, IMT data collection was done by measuring height and weight while the percent of body fat was measured by using the tool Bioleletrical Impedance Analysis (BIA). Meanwhile, data on physical activity and nutrition were collected by questionnaire physical activity and 24 hours dietary food recall by each respondent.

3. Results and Analysis

The number of respondents who follow a fitness test consists of 121 female students and 77 male students. All of the respondents who follow a fitness test found 63.6% (126 people) classified in unfit conditions and respondents were classified into fit condition as much as 36.4% (72 people). All of the nutritional status variable that is the Body Mass Index (BMI) and Percent Body Fat majority dominated by the standard categories, namely 63.6% and 93.9%. For physical activity, sports activity variable respondents were in the inactive category and leisure time activity 58.1% are in the active category.

Nutrient intake variable of energy and protein that were in less category, 75.3% and 68.7%. While nutrient intake variable of micronutrients vitamin A, vitamin B, Fe, Cu and Mg are almost a majority in the poor category. Variables that significantly is associated with fitness was sports physical activity and sex. As for the macronutrient and micronutrient intake variable and nutritional status, there is no meaningful relationship.

Based on the results of the fitness test showed 63.6% of senior high school's student was in unfit condition. It is not much different from the preliminary survey also revealed that the results of the fitness test produce more groups in inadequate condition with the numbers 56.25%. A study attempting to link between fitness with a BMI in Africa region to 4599 students aged 12-15 years using a series of fitness tests

showed that students with normal BMI will likely deliver a fitness test scores better than BMI with overweight criteria [12]. This provides information that a person with normal BMI would be fitter The relationship between the nutritional status of the body mass index and percent body fat to fitness status based on a standard fitness test scores in this study showed no significant relationship. A study conducted in Maputo, Mozambique with 2316 the children and adolescents aged 6-18 years stated that the group nutrition (overweight) been modest in most of the fitness test. Meanwhile, compared with the normal group, the group of malnutrition (underweight) worse in tests of strength, just as good in the aspect of flexibility and agility, but it is better in cardiovascular endurance [13]. Meanwhile, as with BMI, the relationship of nutritional status percent body fat also does not have a meaningful relationship to fitness. It is inversely proportional to the research conducted on 75 female students of the undergraduate nutrition program in 2009 which showed that the percent of body fat is no more 3.33 times larger, enabling them to be fit in comparison to the better criteria [14]. This result is also being reinforced by a study on 80 obese adolescents in Georgia, that fitness is inversely related to body fat percent [15].

The relationship between sports activity to fitness status based on a standard fitness test scores in this study showed significant relationship. These results are consistent with studies in Georgia, the US, conducted on 421 students black and white of senior high school with an average age of 16 years showed that the group is doing physical exercise at a high-intensity relative will be fitter [16]. Physical activity is one of the aspects that influence a person's fitness level. This statement is consistent with the report that physical exercise is one of the things that retard aging characterized by a decrease in aerobic capacity and muscle strength which will reduce the level of fitness [17]).

The relationship between leisure time activity to fitness there is no significant association. This result is different from the theories that explained that physical activity is one aspect that determines a person's fitness [17]. Based on the statement that physical activity affects the nutritional status (body fat)[16]. Also, an increasing in physical activity will affect body fat in children and adolescents with normal weight [8]. This suggests that physical activity has a significant effect on nutritional status.

The relationship between gender and fitness status based on the results of the fitness test scores in this study stated that there is a significant relationship. This is consistent with the cross-sectional study conducted in the students black and white aged 16 years in the Augusta, Georgia, USA. In these studies, there is a value measured by the moderate and severe physical exercise where groups of men have a higher value than those of women [16].

Results were also consistent with the theory expressed that in young adolescents aged 10 to 12 years there has been no significant difference between the fitness of men and women, but after a few years ahead of men will tend to be more stronger than females throughout the ages [17]. From theory and research results of the student groups are encouraged to improve physical exercise further to improve and maintain the condition of fitness.

The relationship between energy intake to fitness status based on the results of the fitness tests in this study showed no significant relationship. The results of this study is different from the research conducted that the energy intake affects the total amount of physical activity that have an impact on a person's fitness level of the individual [18]. Moreover, a study conducted on participants in the aerobic gymnastics gymnasium Dewi stated that there is a significant relationship between energy intake with heart-lung fitness level [9]

The relationship between protein intake levels to fitness status based on the standard fitness test scores in this study shows that there is a relationship which is almost significant. This is consistent with the results of studies conducted in children

and adolescents in Colombia that showed a significant association between protein C-reactive with fitness where a person who had a protein intake less will be fitter than someone with adequate protein intake. The research above was also supported by the results of research conducted in Georgia, USA on 80 obesity teenagers and children which state that there is an inverse relationship between fitness to protein intake levels almost significant ($p = 0.063$). This study showed that little protein intake can carry on improving fitness [10].

The relationship between the intake of vitamin A status with fitness status based on the standard fitness test scores in this study shows that there is no significant relationship. This study gives a different result with a cohort study in Pennsylvania, the USA on 86 women aged adolescents who stated that there is a positive correlation between β-carotene derived from vitamin A with fitness [11]. These results also inversely theoretically where it is stated that a deficiency of vitamin A can affect the performance of physical activity [19]

The relationship between the intake of B vitamin status with fitness status based on the standard fitness test scores in this study shows that there is no significant relationship. This study is different from other studies conducted in older women by Winters et.al. (1992). They stated that riboflavin has a significant relationship to physical exercise. Based on the theory that describes the function of fitness-related vitamin B, vitamin B have some influence on physical activity and performance in athletes. In the vitamin B6, if there is a deficiency of it will reduce endurance athletes that depend on to oxygen. Then deficiency of vitamin B2 will affect physical performance because riboflavin helps in the synthesis process of flavoproteins deeper in the muscles [19].

The relationship between iron intake (Fe) with fitness status based on a standard fitness test scores in this study shows that there is no significant relationship. This study is different from the theory that iron (Fe) has a critical function for someone who did aerobic exercise is as durability. This is because Fe has a primary function as a means of transport and utilization of oxygen so it is an advisable to insufficient intake of Fe [19]. Also, iron also has a major role in giving the optimal appearance for athletes and iron deficiency for athletes is an unusual thing to happen, the female athletes also often advisable to add iron without seeing statutes of hematological parameters [20].

The relationship between copper (Cu) intake with fitness status based on a standard fitness test scores in this study shows that there is no significant relationship. Based on existing theory, copper (Cu) has a function as metalloenzyme and work adjacent to the iron in oxygen metabolism. Also, copper (Cu) also have roles in the internal respiration in mitochondria as oxidative enzymes work. Some studies told that after weight physical exercise on cardiorespiratory power, serum Cu in athletes decreased so that Cu in athletes is recommended to higher consumption than it should be [19].

The relationship between nutrient intake of magnesium (Mg) with fitness status based on a standard fitness test scores in this study shows that there is no significant relationship. Based on the theory that there is no magnesium plays a major role in various physiological processes, such as a person's physical activity, including neuromuscular, cardiovascular and hormonal function. Magnesium also regulates the synthesis of proteins and other components such as 2,3-DPG which plays an important role in the metabolism of oxygen optimally, glutasi and antioxidants [19].A report indicates that magnesium supplementation can increase strength and improve exercise performance [21]. However, this statement is still unclear whether the improvement in the appearance associated with magnesium deficiency or pharmacological effect [22]. A longitudinal monitoring of the diet during exercise showed that physically active people also consume enough magnesium [23].

Discussion on the analysis of research on the nutritional status and nutrient intake showed only one nutrient intake almost has a significant relation, which is

proteins. As for the rest, there is no significant relationship between nutritional status and nutrient intake to fitness standards based fitness test scores. Such conditions can occur due to several possibilities. Among of them is indeed no significant relationship between the variables studied. Other factors that may affect the results of research that is not known and due to a measurement error or the number of samples that may be too little. In this case, subsequent research to find significance relation is needed. Real improvement to the measurement of nutritional status, nutrient intake or physical activity and fitness test maybe can help to improve in the next study.

4. Conclusion

The study concluded that there were 63.6 % of respondents were in unfit condition. Sports activity and gender variable have a significant relationship to fitness. Sports activity status of student senior high school in Sragen regency should be strived always to be in a state of active, especially women student. This can be achieved by continuing to effectively utilize the available hours of exercise through activities like soccer, volleyball, basketball or badminton, etc. Sports activity can be enhanced through regular competitions between classes or schools so that student will have more passion for exercise. In addition, other factors such as the provision of facilities, sports figure or idol may increase the likelihood of student to be active in sports activity.

Less criteria dominate the intake of nutrients such as vitamin B, iron and magnesium in the student. The number of respondents who are less reached more than 80%. The student should increase the intake of nutrients such as iron (Fe) and magnesium (Mg) so that the status of nutrient intake can be improved. Fe can be obtained from foods such as cereals, nuts, eggs, green vegetables, fruits while Mg can be obtained from foods such as green vegetables, mashed cereals, grains, and beans, meat, milk, chocolate. The student should also maintain a proper nutritional intake of other macro-nutrients and micronutrients that play a role in the maintenance of the nutrition so that it will have an impact on the fitness status.

Study on the fitness at the senior high school students should follow the guidelines set by the Ministry of National Education subsection Recreation and Physical Fitness Center has been tested for validity and reliability by using Indonesian Physical Fitness Test for Teens 16-19 years (Batteries Tests). In addition, the same study regarding fitness should make gender as a buffer variable and try to connect between the visceral fat fitness. Then it should use more sophisticated methods of measurement regarding nutrition and physical activity so that it has a higher accuracy than this study.

References

1. Sumosardjuno, S. *Knowledge practices in sports*. Jakarta: PT Gramedia Pustaka Utama, ;1992.
2. Turhayati, E. Related factors to physical fitness in employees of PT Ekspan Nusantara 1999. Thesis Depok. Postgraduate FKM UI; 2008.
3. Gutin, et.al. “Relations of moderate and vigorous physical activity to fitness and fatness in adolescents”. *American Journal of Clinical Nutrition*. 81:746-50.
4. Eliyus, Ali. Survey physical fitness level of pngudi luhur tarcisius Vvocational high school Sstudents Ggrade II 2004-2005. Semarang. Bachelor Program FIK UNNES; 2005.
5. Indrawagita, L. Nutritional Sstatus, Nnutrient Iintake and Pphysical Aactivity in Rrelation to Pphysical Ffitness of Nnutrition Bbachelor Sstudents 2009. Depok. Bachelor Program FKM UI; 2009.
6. Trismanto, A. Nutritional Sstatus and Ppersonal Hhygiene in Rrelation to Pphysical Ffitness of AKPER Pemda Serang Students 2003. Depok. Bachelor Program FKM UI; 2003.

7. Wijayanti, K. Model prediction of VO2max in realction to percent of body fat, waist hip ratio and BMI (Data pemeriksaan kebugaran jasmani PNS Depdiknas Tahun 2005). Thesis Depok. Postgraduate FKM UI; 2006.
8. Ruiz, et.al. " Relations of total physical activity and intensity to fitness and fatness in children : the european heart study". *American Journal of Clinical Nutrition.* 84: 299-303.
9. Fajarwati, S. Energy Iintake in Rrelation to Ccardiorespiratory Ffitness (VO2max) of Kartika Dewi Ggym Aaerobic and Ffitness Ccenter Mmember Yogyakarta. Thesis Yogyakarta. Postgraduate Faculty of Medicine UGM; 2006.
10. Isasi, C, R., et.al." Physical fitness and c-reactive protein level in children and young adults: the columbia university biomarkers study". *American Academy of Pediatrics. 1*11:332-8.
11. Lloyd, et.al. "Fruit composition, fitness, and cardiovascular health in female adolescents: the penn state young womens's health study". *American Journal of Clinical Nutrition.* 67:624-30.
12. Bovet, P., et.al. "Strong inverse association between physical fitness and overweight in adolescents: a large school based survey". *International Journal of Behavioral Nutrition and Physical Activity.* 2007; 4:24.
13. Prista, A., et.al. "Anthropometric indicators of nutritional status: implications for fitness, activity and health in school-age children and adolescents from maputo, mozambique".*American Journal of Clinical Nutrition.* 77:952-9.
14. Indrawagita, L. Nutritional Sstatus, Nnutrient Iintake and Pphysical Aactivity in Rrelation to Pphysical Ffitness of Nnutrition Bachelor Students 2009. Depok. Bachelor Program FKM UI; 2009.
15. Gutin, B, et.al. "Effects of exercise intensity on cardiovascular fitness, total body composition, and visceral adiposity of obese adolescents". *American Journal of Clinical Nutrition.* ; 75:818-26.
16. Gutin, B, et.al. "Relations of moderate and vigorous physical activity to fitness and fatness in adolescents". *American Journal of Clinical Nutrition.*;81:746-50.
17. Astrand, P. "Physical activity and fitness". *American Journal of clinical Nutrition.*; 55: 1231S-6S.
18. Hill, J. O., et.al. "Physical activity and energy requirements". *American Journal of Clinical Nutrition.* (suppl); 62:1059S-66S.
19. Williams, M, H. *Nutrition Ffor Hhealth, Ffitness and Ssport.* New York, USA: McGraw Hill Companies, 2002.
20. Akabas S, R. dan Karen R. Dolins. "Micronutrient requirements of physically active woman: what can we learn from iron". *American Journal of Clinical Nutrition.* 81 (2005): 81: 1246S-51S.
21. Lukaski, Henry C. Aand Forrest H. Nielsen. "Dietary magnesium depletion affects metabolic response during submaximal exercise in postmenopausal women". *Journal of Nutrition.* 132 (2002); 132:930-935.
22. Manore, Melinda M. "Effect of physical activity on thiamine, riboflavin, and vitamin b-6 requirements". *American Journal of Clinical Nutrition.* 72 (2000): ; 72:598S-606S.
23. Lukaski, Henry C. "Magnesium, zinc, and chromium nutriture and physical activity". *American Journal of Clinical Nutrition.* 72 (2000); 72:585S-93S.