

Physical Activity Level and Dietary Intake among Military Cadets

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Abstract:

Background and Aim: Nutritional status is important for all individuals especially in the military unit where intense energy and physical strength is required in maintaining energy balance and operational performance. Unfortunately, there is lack of research regarding category of military in training and diet quality and its association with physical activity.

Methods: A convenience sample of male cadet trainees (n=47) and female cadet trainees (n=36) completed a validated demographic questionnaire, food frequency questionnaire (FFQ) and international physical activity questionnaire (IPAQ). The FFQ assessed eating patterns of cadet trainees while IPAQ assessed their physical activity level. Statistical analysis included one-way ANOVA and Post-Hoc test.

Results: The average difference in the number of fruits is significantly different, with Post-Hoc assessment indicating cadets consume higher than the other two groups (p=0.010). Next, it is revealed that all activities between female cadet trainees are significantly different (p=0.010, p=0.092, p=0.008 and p=0.04 respectively) with female cadet trainees having the highest average vigorous activities.

Conclusion: The present study showed that further improvements and attention on dietary intake of cadet trainees particularly vegetable, fruits, calories, sugar and fat intake are necessary. Educational campaign on healthier food selection should be initiated at the university or training level.

Keywords: Military cadet, physical activity level, energy intake

1. INTRODUCTION

Determining the nutritional status and energy expended from physical activity is an important factor in the evaluation of food requirements. Equilibrated consumption of food is important to maintaining good health. A person's development and maturity will complete in early adulthood if the follow a balanced diet and a healthy lifestyle. Those aged 19 to 26 are those who reach the age group who are vulnerable to chronic illnesses. The stress on food intake is therefore important to maintain physical fitness, develop body strength and also to avoid excessive weight gain (1).

Previous studies by Rashid (1) have shown that environmental factors affect the lifestyle of university students, leading some of the young aged students to face problems of overweight and obesity. The university setting is the perfect educational tool for young adult students so that they can continue to follow a balanced lifestyle. Students at university are often faced with stress in that areas, such as personal, family, social and even financial pressures. For active students, particularly those participating in military training, these issues should be addressed in conjunction with the many challenges in their academics. Both of these issues and difficulties affect the eating patterns and their health status, and this can indirectly impact their academic performance (1).

Sports practices and daily exercise are healthy lifestyles which can influence an individual's dietary habits. Sports and exercise have many benefits, and one of them is to reduce the risk of various diseased. Physical exercise is of interest to

university students in particular. Physical exercises can improve body health and brain well-being (1).

During these few decades, the relationship between energy expenditure from physical activity and energy intake from food has become a significant research. This suggests that it is crucial to examine whether the effects of various forms of physical activity and food consumption are associated. Long-term evaluation of the patterns of food consumption and physical activity is therefore important. Research on the lifestyle of university students serving in uniformed bodies, such as military training, is therefore very necessary to provide an indication of their physical activity's nutritional status, time and energy use (1).

Nutritional status, energy expenditures of students participating in military training uniformed bodies will be measured in this study. At the same time, a link was established between the nutritional condition of these students and their physical activities.

There is insufficient literature to guide of physical activity dosing outside of the competitive athletic settings. A study by Segre, E.M. (2) determined the physical activity exposure sustained by service members based on self-report data and compared these values with the upper limit of safe exercise exposure. Results based on a review of the presently obtainable literature, aerobic exercise exposure less than 700 to 1,100 MET-hours/year (metabolic equivalent-hours per year) is not associated with inferior clinical outcomes. A military service member needs 600 to 700 MET-hours/year

to minimally pass the physical fitness test. However, many military members are training in excess of this minimum, with typical exposures between 900 and 2,400 MET-hours/year (2).

A scientific challenge to find the dietary requirements of military personnel has been the exact assessment of energy expenditure. A gold standard approach for assessing total energy expenditure has been the intake-balance method, where total energy expenditure is estimated from food intake and alterations in body composition. This method requires a quite long evaluation period and precise determination of energy intake and change in body energy stores. The factorial technique, another classic way to evaluate total energy expenditure, involves recording the type and duration of all physical activities and calculating total energy costs using published literature values for each definite or comparable activities. However, this approach can be inaccurate (3).

Optimal nutrient intake through diet is an important component of any individual but especially in a military environment due to extreme physical and mental demands on each personnel. An observational and intervention study done by Rebecca A. Collins (4) in 2020 in her research paper to determine the most common and effective method of assessing dietary intake among military and veteran population. The most frequent method used to assess dietary intake was food frequency questionnaires (FFQ) followed by 24-hour recalls and food records (4).

2. METHODOLOGY

This is a retrospective observational study done using secondary data from the stratified random sampling technique.

The respondents were students from National Defence University of Malaysia (NDUM). Sample size was determined using Raosoft software and the minimum sample size were 486 respondents. Out of 486 respondents, 216 is female cadet trainees and the remaining 270 is male cadet trainees. Then the students were divided equally into three subcategories which are cadets, civilians and athletes. For female cadet trainees, 72 respondents from each subcategory is selected meanwhile for male, 90 respondents are selected for each subcategory. The inclusion criteria for these respondents include students of NDUM who registered full-time and they need to agree to take part in this study. They are excluded in this study if they meet one of these conditions; suffering from mental problems or any chronic or life-threatening disease that requires special diet. The respondents were given the demographic questionnaire before assessing the Body Mass Index (BMI) dietary intake, physical activity level and quality of life.

Electronic weighing scale was used to obtain the respondent's weight while stadiometer is used to measure the respondent's height. Then, the BMI of the respondents is calculated using the BMI formula which is weight divided by height square. The cut off points for BMI is obtained using the WHO BMI classifications.

Food Frequency Questionnaire (FFQ) is given to provide information on the type of foods consumed as well as the overview of their dietary patterns within the previous month. The respondents were asked about the type and frequency of

the food consumption. The type of food is classified according to their major macronutrient contents such as carbohydrate, protein, fat, fruits, vegetables and high sugar food. There are 166 lists of foods in the FFQ. The gram of food eaten per day is obtained using the DietPlus Software.

The level of physical activity is determined using the International Physical Activity Questionnaire (IPAQ). The questionnaire consists of seven questions that asked the frequency of conducting vigorous, moderate, walking and sitting activity within the past seven days and the duration of conducting each activity in a day. The data is then entered in the IPAQ Microsoft Excel sheet to obtain the level of physical activity of the students. The level of physical activity is classified into three categories which are low (<600 MET-minutes/week), moderate (600-2999 MET-minutes/week) and high (>3000 MET-minutes/week).

Before data collection was carried out, ethics approval was needed from the research ethics committee of Universiti Teknologi MARA. The UiTM Research Ethics Committee approved this report with approval code of REC/413/19 and 600-IRMI(5/1/6). Once the ethics have approved, the questionnaires were distributed among participants

One-way ANOVA is used to determine whether there is significant difference of dietary intake and level of physical activity among the cadets, civilians and athletes. P-value of less than 0.05 was regarded as having significant relationship. Post-Hoc test was used for further determination of which two groups having the significant relationship.

3. RESULT AND DISCUSSION

3.1. Results

Table 1 indicates the total respondents, 47 males and 36 females all divided into three categories; cadets, civilians and athletes.

Table 1. Frequency of Cadet Trainees Divided by Gender and Category

Category	Frequency
Male (n=47)	
Cadet	14
Civilian	15
Athlete	18
Female (n=36)	
Cadet	2
Civilian	7
Athlete	27

Table 2 indicates the average intake of energy and macronutrients according to categories of male trainees. There were no significant differences in the intake averages of energy, protein, carbohydrates, fat, fibre, vegetables or sugar. However, the ANOVA test results revealed that the intake of fruits was significantly different where cadets consumed higher the other two categories (p=0.024).

Table 2. Average Intake of Energy and Macronutrient according to student's category of Male Cadet Trainees (n=47)

Nutrient	RNI 2017 Recommendation	Cadet	Civilian	Athlete	p value
Energy (kcal)	2240-2800	3106.8	2938.6	2931.5	0.713
Protein (g)	62	237.5	135.9	119.1	0.202

Carbohydrate (g)	- (50-65% of calories)	401.7	353.4	406.7	0.403
Fat (g)	62-75	100.8	108.4	90.6	0.277
Fibre (g)	20-30	16.8	14.5	16.8	0.559
Fruits (servings)	2	2.8	1.0	1.2	0.024
Vegetables (servings)	3	1.6	1.0	1.6	0.613
Sugar (g)	<10% of calories	171.7	23.7	175.2	0.327

Table 3 indicates the average intake of energy and macronutrients according to categories of female trainees. There were no significant differences in any of the intake averages.

Table 3. Average Intake of Energy and Macronutrient according to student's category of Male Cadet Trainees (n=36)

Nutrient	RNI 2017 Recommendation	Cadet	Civilian	Athlete	p value
Energy (kcal)	1840-2310	2722.4	2528.4	2407.8	0.721
Protein (g)	53	101.2	101.3	94.3	0.926
Carbohydrate (g)	- (50-65% of calories)	391.6	323.9	326.7	0.436
Fat (g)	51-61	73.6	92	79.4	0.986
Fibre (g)	20-30	23.7	14.1	16.8	0.419
Fruits (servings)	2	2.5	1.5	2	0.076
Vegetables (servings)	3	2.5	1	2	0.261
Sugar (g)	<10% of calories	162.7	126	108.1	0.134

Table 4 indicates the physical activity level (MET – minutes/week) according to categories of male trainees. There were no significant differences in any of the physical activity level between males.

Table 4. Physical Activity Level according to Category of Male Cadet Trainees

Category	Mean Vigorous Activity MET – minutes/week	Mean Moderate Activity MET – minutes/week	Mean Walking MET – minutes/week	Mean Total MET – minutes/week
Cadet	1212.0	630.0	836.6	2678.6
Civilian	820.0	82.5	259.9	1162.4
Athlete	1444.0	416.0	400.1	2260.2
p-value	0.425	0.395	0.263	0.407

Table 5 indicates the physical activity level (MET – minutes/week) according to categories of female trainees. All of the physical activity level between female trainees were significantly different.

Table 5. Physical Activity Level according to Category of Female Cadet Trainees

Category	Mean Vigorous Activity MET – minutes/week	Mean Moderate Activity MET – minutes/week	Mean Walking MET – minutes/week	Mean Total MET – minutes/week
Cadet	2160.0	120.0	462.0	2742.0
Civilian	1500.0	420.0	185.6	2118.0
Athlete	1906.7	228.0	265.1	2652.4
p-value	0.010	0.092	0.008	0.04

3.2. Discussion

This study revealed the average energy intake were higher compared to local studies conducted among military cadet trainees in public universities. Rashid (1) found the mean energy intake among trainees was 2589 kcal/day which was 517.8 kcal less than the average intake of male cadets of this study. Aside from that, a study by Noh, Shuhaimi and Nor (5) reported a mean energy intake of 2865 kcal/day for male athletes as compared to 2931.5 kcal/day of this study.

The acquired average carbohydrate intake among participants were all within recommended intake of 50%-65% of total energy intake and also matched a study conducted by Rashid (1) and Verma (6). In previous studies however, there were reports of carbohydrates consumption below recommendation of 6-8g/kg/day and 5-7g/kg/day by Military Dietary Reference Value (MDRV) from sports nutrition guidelines (7-9). Energy and carbohydrates restriction may be intended in athletes in order to attain required body composition in the past but consumption below recommendation may affect exercise performance in trainees especially in high intensity training. Increased carbohydrates intake or intakes within recommendation would give the glucose availability to delay exhaustion and overall develop better physical performances in athletes (10) which can also prove beneficial for trainees with high intensity training (11).

The acquired average protein intake from the study among male cadets and male civilians exceeds RNI recommendation. Members of the military need optimal protein to perform intense training regime thus having the Military dietary reference intake (MDRIs) to provide suitable guidelines. The increased intake of protein up to 1.2g/kg/day can help maintain optimal metabolic functions, support muscle mass increment and (7-8) (12). Conversely, a study by Phillips and Van Loon (13) concluded protein intake more than 2.0g/kg/day is not beneficial as it reduces intake of carbohydrates and increases fat consumption. However, in a current study by Vyas, N. (14) revealed active military members were having low-to-adequate protein which was different from this study. Reports have also emerged claiming that new protein recommendations have been implied and are not reflected by MDRIs (15).

The average fruit intake of male cadets was above the recommended two servings of fruits in a day (12) as compared to male civilians, male athletes and all female categories. As for vegetable intake, the average intake of vegetable for all six categories were below the recommended three servings per day (12). In comparison with a study by Forsys-Donahue, K.L. (13) which reported 95% of the US army in one army installation had adequate to high fruit and vegetable intake. The study also showed significance between fruit and vegetable intake and behavioural health revealing army units with low fruit and vegetable intake were more likely to be positive for depression and anxiety (13).

The physical activity level for all the male categories did not show any significant differences. However, for the female category, the post hoc test in this study revealed a significance between the category and physical activity level. In general, cadets spend many hours on physical training and unarmed combat as the high physical activity level was to be expected (11) compared to other local universities which mostly had low physical activity levels (16). Compared to an overseas study, 52% of Ecuador students were classified as having moderate physical activity level, 45.3% of them had low

physical activity level and the remaining 2.7% had high physical activity level (17). In contrast to another study by Meza and Lopez (18) reported high physical activity level among university student athletes (82.3%) regardless of physical activity constraints due to the Covid-19 pandemic.

The significance in these results however do not reflect on the other gender meaning there was no significance in male categories regarding physical activity levels. Also, such results were obtained due to a small sample size compared to other studies therefore statistically weak in relevance. There was also inadequate previous research regarding the variables of this study investigating their significance. Compared to an Iranian study for naval units, their macronutrient intake was all within recommendation however there were deficiency in intake of dairy, fruits and vegetables. Additionally, their diets lacked micronutrients and they were biochemically deficient in calcium, vitamin A, zinc, omega 3 and vitamin C (18). This displayed the importance of proper food intake within recommendation for cadets, civilians and athletes.

4 CONCLUSION

Additional enhancements and attention on dietary intake of students predominantly vegetable, fruits, calories, sugar and fat intake are completely compulsory. Informative campaign on healthier food selection, lifestyle and weight management can be commenced at the university level. The awareness of fat and sugar sources should be improved as according to Spronk, Kullen, Burdon, & Connor (20), there are significant positive relations between greater nutrition knowledge and a higher intake of cereals or fish, less intake of sweetened drinks, increase intake of fibre and higher consumption of some core food groups according to dietary guidelines. Further study ought to deliberate using multiple dietary assessment methods, such as the FFQ with Dietary Record to attain a more precise assessment of dietary intake than that of individual methods. Body Fat Percentage (BFP) may also be used to assess the student's body fat and lean mass composition by using BIA or Skinfold Technique (SFT). Besides, the pattern of the mealtime of the students should also be assessed in the future to define whether these students have ordered mealtime or disordered mealtime such as midnight snacking habit.

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REFERENCES

- (1) Rashid, Z. M., *et al.*, "Nutritional Status and Physical Activities among Army Trainees in Public Institutions of higher Education in Malaysia," 511-520, 2011.
- (2) Segre, E. M., "Exercise Dose Associated with Military Service: Implications for the Clinical Management of Inherited Risk for Arrhythmogenic Right Ventricular Cardiomyopathy," *Military Medicine*, E1447-E1452, 2020.
- (3) Tharion, W. J., "Energy Requirement of Military Personnel," *Appetite*, 47-65, 2005.
- (4) Collins, A. P., "Dietary Assessment Methods in Military and Veteran Populations: A Scoping Review," 2020.
- (5) Noh, N. M., *et al.*, "Carbohydrate Intakes and Preferences among Endurance Athletes in Universiti Teknologi MARA Selangor," *Journal of Physics: Conference Series*, Vol. 1496, No. 1, p.012010, IOP Publishing, 2020.
- (6) Verma, S. K., *et al.*, "Energy Expenditure and Nutritional Status of Sailors during One Month of Extensive Physical Training," *Defence Life Science Journal*, 3(3), 216223, 2018.
- (7) Beals, K., *et al.*, "Suboptimal Nutritional Characteristics in Male and Female Soldiers Compared to Sports Nutrition Guidelines," *Military Medicine*, 180(12), 1239-1246, 2015.
- (8) Chapman, S., *et al.*, "Sex Differences in Dietary Intake in British Army Recruits Undergoing Phase One Training," *Journal of the International Society of Sports Nutrition*, 16(1), 59, 2016.
- (9) McCrink, C. M., *et al.*, "An Investigation of Dietary Intake, Nutrition Knowledge and Hydration Status of Gaelic Football Players," *European Journal of Nutrition*, 1-9, 2020.
- (10) Thomas, D. T., *et al.*, "Nutrition and Athletic Performance," *Med Sci Sports Excer*, 48(3), 543-568, 2016.
- (11) Jakiwa, J., Azli, M. S., Zainuddin, A. A., & Atan, S. A. (2020). "Time Spent in Physical Activity and Abdominal Muscle Endurance Level between Cadets and Civilian Students of National Defense University of Malaysia," *Journal of Military Medicine*, 22(8), 873-882.
- (12) Ministry of Health Malaysia, *Recommended Nutrient Intakes for Malaysia*, 2017
- (13) Philips, S. M., *et al.*, "Dietary Protein for Athletes: from Requirements to Optimum Adaptation," *Journal of Sports Sciences*, 29(sup1), S29-S38, 2011.
- (14) Vyas, N., "Comparison of Energy and Nutrient Intake vs. Estimated Needs in Warfighters: and Update," *Sports Nutrition*, 2020.
- (15) Forys-Donahue, K., "The Association between Nutrition and Behavioral Health in a US Army Population," *Army Public Health Center*, 2020.
- (16) Soh, K. G., *et al.*, "Physical Activity and Health Promoting Lifestyle among Bachelor of Nursing Students in Malaysia," *Research Journal of Pharmacy and Technology*, 11(7), 2906-2910, 2018.
- (17) Hernández-Gallardo, D., *et al.*, "Energy Expenditure and Physical Activity in a University Population in the Coastal Region of Ecuador," *Sustainability*, 12(23), 101651, 2020.
- (18) Meza, E. I. A., *et al.*, "Physical Activity in University Student Athletes, Prior and in Confinement due to Pandemic Associated with COVID-19," *Retos: Nuevas Tendencias en Educacion Fisica, Deporte y Recreacion*, (39), 112, 2017.
- (19) Sali, S., "Nutritional Status in Some Iranian Naval Units," *Journal of Military Medicine*, 810-817, 2020.
- (20) Spronk, I., *et al.*, "Systematic Review Relationship between Nutrition Knowledge and Dietary Intake," 1713-1726, 2014.