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Original Article

Caloric consumption of the diet and energy requirement of military personnel in the recruitment stage, Chorrillos – 2022

Consumo calórico de la dieta y requerimiento energético del personal militar en la etapa de reclutamiento, Chorrillos – 2022

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ABSTRACT

The Peruvian Army is a military institution whose objective is to control, guard, defend the national territory and participate in economic and social development. For this reason, the military requires an adequate diet to carry out these vital activities. The objective of the research is to determine the relationship between the caloric intake of the diet and the energy requirement of military personnel in their recruitment stage in Lima. It is a quantitative, descriptive and cross-sectional study. There is a sample of 80 soldiers. The sample is non-probabilistic and by convenience. The 100 % of the evaluated sample is male and their age is between 18 and 30 years old. 95 % of the sample has a high caloric intake (3 400 kcal to 2 900 kcal). 100 % of the sample presented an average total energy expenditure (TEE) in the range of (2 756.92 kcal to 2 928.42 kcal). In relation to the GET of the predictive equation of Harris Benedict 50 % presented a high energy expenditure (3 400 kcal to 2 900 kcal), with respect to Miffling 85 % a medium energy expenditure (2 899 kcal to 2 400 kcal) and with Cunningham a medium energy expenditure (2 899 kcal to 2 400 kcal), presenting in all these a significance level ($p<0.05$) performed by the chi-square test for both variables evaluated. It is concluded that the total energy intake presents a relationship with the three predictive equation formulas, but in the case of HB it overestimates the GET. While for this age group, the Miffling and Cunningham formulas would be recommended for their estimation of GET.

Keywords: Caloric intake, diet, energy requirement, military personnel, physical exertion.

RESUMEN

El ejército del Perú es una institución castrense cuyo objetivo es controlar, vigilar, defender el territorio nacional y, de igual manera, participar en el desarrollo económico y social. Por consiguiente, los militares requieren una dieta adecuada para realizar estas

vitales actividades. El objetivo de la investigación fue determinar la relación entre el consumo calórico de la dieta y el requerimiento energético del personal militar en su etapa de reclutamiento en Lima. Se cuenta con una muestra de 80 soldados en su etapa de reclutamiento de la compañía de construcción y vivienda N° 512 del Ejercito del Perú ubicada en Chorrillos, Lima. El 100 % de la muestra evaluada fue de sexo masculino y tienen una edad entre 18 a 30 años. El 95 % de la muestra tiene un consumo calórico alto (3 400 kcal a 2 900 kcal). El 100 % de la muestra presentó un gasto energético total (GET) promedio en el rango de (2 756,92 kcal a 2 928,2 kcal). Con relación al GET de la ecuación predictiva de Harris Benedict presentó el 50% un gasto energético alto (3 400 kcal a 2 900 kcal), con respecto a Miffling 85 % un gasto energético medio (2 899 kcal a 2 400 kcal) y con Cunningham un gasto energético medio (2 899 kcal a 2 400 kcal), presentando en todos estos un nivel de significancia ($p<0,05$) realizado por la prueba de chi cuadrado para ambas variables evaluadas. Se concluye que el consumo energético total presenta una relación con las tres fórmulas de ecuaciones predictivas, pero en el caso de HB sobreestima el GET. Mientras que para este grupo etario se recomendaría las fórmulas de Miffling y Cunningham para su estimación del gasto energético total (GET).
Palabras clave: Ingesta calórica, dieta, requerimiento energético, personal militar, esfuerzo físico.

INTRODUCTION

This study provides scientific information which will serve as data for future studies, as the findings confirm the importance of a good diet in its correlation with the physical and academic activity of the population studied. Furthermore, it is feasible that the personnel that make up the various army battalions throughout Peru require a basic training stage which leads to 3 months of confinement in the initial stage of their military preparation process; Therefore, during this period these individuals are subject to a diet provided by the units where they serve (MINDEF, 2023). In addition, it is possible to know if the studied population experiences changes in its body composition; If so, we recommend actions to improve their diet and ensure that it meets their needs. This research is necessary since it benefits students, professionals and those interested in topics related to the caloric requirement and nutritional contribution of diets. It helps them explore more about how to develop strategies for an adequate diet for military personnel, taking the Construction and Housing Company N° 512, stationed in Chorrillos, as a case of study with the purpose of recommending energetic diets mainly in their recruitment stage.

MATERIALS AND METHODS

Data collection

Permission was requested from this military unit (Construction and Housing Company No. 512) in which the sample would be conducted, to carry out this research with the corresponding personnel. After approval by the entity, the project was executed, selecting the sample in order to carry out the weighing and shaping of the personnel, consult eating habits, and know their daily routine, creating a 24-hour reminder. The portions of each individual dish were weighed and the leftovers were classified using a graph.

Finally, data collection occurred within a period of 10 days from 6:00 AM to 6:00 PM.

Data collection for soldiers

The HUAWEI body fat scale was used, which has a capacity of up to 150 kg. The subject stood on the center of the scale, facing forward and upright, wearing as little clothing as possible and in some cases sports clothing was worn. The scale display was set to 0.00 kg so that the subject could step on it and the weight was as indicated. The subject took off his shoes and stood on the scale upright and facing forward without moving. Once the weight was displayed, a photo was taken of the results of the application to which the scale was connected, and data was recorded. After weighing, the subjects were measured using the stadiometer standardized by the National Center for Food, Nutrition and Healthy Living (CENAN) on a surface such as a wall, ensuring that it was fixed Subjects removed their shoes and any hair accessories. The left hand was placed on the subject's neck to ensure proper posture for accurate measurements.

Food data collection

The CARMY Ek2151h scale was used to weigh each food and drink. First, the scale was tared to zero and the steel bowls and steel cup, where the food was served, were weighed in order to subtract the weight of the food, then each food and portion was weighed in the bowl and thus record the weight of each food.

Information processing

The collection of basic data information necessary to determine the calculation of the energy requirement was carried out. The anthropometric evaluation was carried out by applying the evaluation protocol of the CENAN technical guide for the anthropometric nutritional evaluationof adults (weight, height and BMI) using a wooden measuring rod standardized by CENAN (Esenarro *et al.*, 2012), a digital scale with a resolution of 0.1 g HUAWEI body fat scale. Variables, including height, weight, and physical activity level of the military personnel were used to calculate the Basal Metabolic Rate (BMR) based on the Harris-Bennedict, Mifflin-St. Jeor and Cunningham predictive equations. Total Energy Expenditure (TEE) was calculated by multiplying BMR by the Physical Activity Factor, and macronutrient distribution was determined following WHO recommendations (WHO , 2020) or an adult person for proteins, lipids and carbohydrates. Afterwards, the analysis was carried out for the caloric consumption variable, where the daily menu of the staff was evaluated, entering the kitchen to see the preparation of the food, then each food corresponding to breakfast, lunch and dinner was weighed for 3 days in a proposed week for information collection. With this, the macronutrients and calories of the ration dish served corresponding to the days were obtained. The direct weighing method was used. To do this, we entered the kitchen and requested a sample of breakfast, lunch and dinner servings of what military personnel would consume each day, using the CARMY Ek2151h food scale with a resolution of 0.1 g. measuring cups and spoons. With respect to foods that are cooked, the auxiliary food table from cooked to raw was used (MINSA, 2013). These data were then uploaded and digitized

in a database to have their actual energy and macronutrient quantification of the diet of military personnel. Finally, in the quantification of energy consumption, a weighing format was used for each food that served as a guide to evaluate consumption in the 3 meal times through the graphs.

Statistical data processing and analysis

All the data obtained were downloaded into a MICROSOFT 365 Excel format, which were processed in the statistical package SPSS version 25, for the analysis of the variables. Descriptive statistics were carried out through frequencies (percentages) and means with standard deviations for the sociodemographic variables and variables evaluated in the study. Then the Kolmogorov test of normality was determined (n = 80) for both study variables, resulting in non-parametric results. Therefore, in the inferential statistics for the categorical variables (calorie consumption and energy expenditure) of the study, the chi-square statistical test was used with a p value < 0.05 level of significance to see the relationship between both variables.

RESULTS AND DISCUSSION

The purpose of this research is to analyze the caloric consumption of the diet and energy requirements of the target population in order to obtain a deeper and more specific panorama.

To achieve this objective, a meticulous monitoring and study was carried out that involved the collection of data relevant to the topic and its subsequent statistical analysis.

The average energy intake for the three evaluation days was approximately 2 981 calories, indicating that the diet provided sufficient energy to meet the energy needs of military personnel in training during that period. However, it must be taken into account that eachindividual has different energy requirements based on their age, sex, level of physical activity and calories than those provided in the diet evaluated. In the same study by García & De Torres (2016) they are in favor because it mentions that the consumption of a normal ration for soldiers is 3 000 calories, which provides

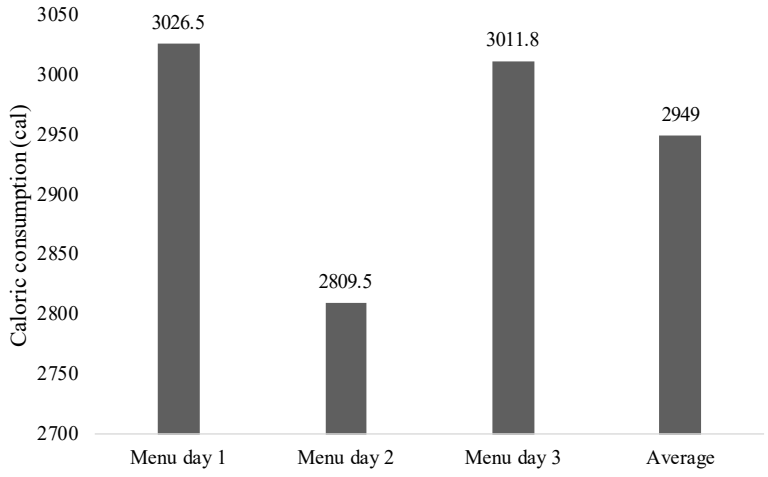

Figure 1. Distribution of caloric consumption of the average diet

sufficient energy for the activities carried out by soldiers.

Research supports the results, as the average is 2 981 calories, which is within the range.

If we compare day two with day one, we can see that there is a difference in the distribution of calories at breakfast and dinner. Accordingly, day two has more calories at breakfast and fewer calories at dinner compared to day one. By comparing the three days in question, patterns in energy distribution can be identified. This is because the meal that changes is lunch, while breakfast and dinner are the same in the 3 days García & De Torres (2016) mention in their research two types of rations for the soldiers of Spain, which is the normal ration that is divided into breakfast with 600 calories, lunch with 1 400 calories and dinner with 1 000 calories, which is equivalent to 3 000 calories, while in the

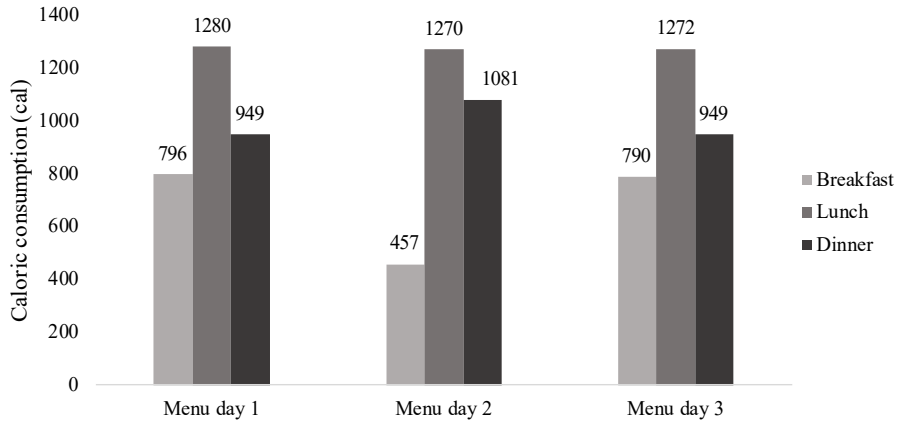

Figure 2. Distribution of kilocalories of the diet on day 1, 2 and 3 with the three daily meals

active ration it is divided into breakfast with 600 calories, sandwich with 250 calories, lunch with 1 400 calories, snack with 250 calories and dinner with 1 000 calories, which gives a sum of 3 500 calories. If compared with the results of our research we can affirm that the menus of the three days are more similar, not equal, and are within the range.

In the Harris-Bennedict equation it has the highest average, followed by Mifflin and ending with Cunningham. These differences may be due to the different equations and factors considered in each formula, such as age, sex, weight, height, and physical activity level. Based on the averages obtained, we can affirm that soldiers in the recruitment stage could require an average caloric intake in the range of 2 756.92 to 2 928.42 calories, depending on the formula used. However, it is important to keep in mind that these figures are approximations and may vary depending on the individual characteristics and physical activity levelof each soldier. The study by Jagim *et al*. (2018) made a comparison with five equations for predicting energy expenditure in male and female athletes. Regarding male athletes, in HB's formula the energy expenditure was 2 139 calories, Mifflin's was 1 987 calories, and Cunningham was of 2 240 calories, the authors mention that all the equations

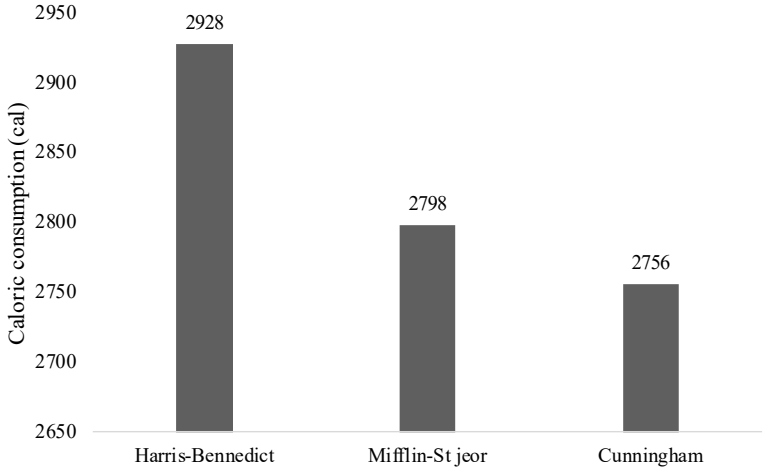

Figure 3. Average energy distribution of the three formulas for energy expenditure Total

overestimate the REE in athletes of both sexes, however the Cunningham equation is the one with the least difference in women (165 kcal/day) and the smallest squared error (110 kcal/day). day), while Harris Benedict presents the lowest mean square error (284 kcal/day) in men.

Likewise, Mifflin overestimates the GER/GEB for women. The authors mention that Harris is usually more accurate for males, while Cunningham is for females, and Mifflin is not the best option for predicting RMR in athletes. The authors support our research since we could affirm that the Harris Benedict formula is the closest to giving us an adequate result compared to the study in question.

The alternative hypothesis is accepted because the p value is less than 0.05, rejecting the null hypothesis. The chi-square test was used in order to evaluate the relationship between caloric consumption and total energy expenditure estimated with the Harris-Benedict formula. Consequently, a significant relationship was found between caloric intake and GET, supported by the chi-square values obtained (64.800 for caloric intake and 61.250 for GET) with

Table 1.

Chi-square test of the variables caloric consumption and energy expenditure with the Harris-Bennedict equation.

	Caloric consumption	Energy expenditure
Chi-square	64.800	61.250
gl	1	1
Asymptotic sig.	0.000	0.000

a degree of freedom of 1 and a significance of p = 0.000. Furthermore, the assumption of the test was not broken, because there were no expected frequencies less than 5.

In summary, caloric consumption significantly affects the GET calculated using the HB formula in the sample studied. Fernandez *et al*. (2012) conducted a study on 32 healthy volunteers, 40.6 % of whomwere men and the average age was 35.7 years. in which the authors found that the difference was statistically significant in the estimation of GET between SWA and HB, with a difference of 351.9 kcal/ day (p = 0.001). The correlation (look for the test of normality) between both methods, measured by the Intraclass Correlation Coefficient (ICC), was 65.0 %

($p < 0.001$). Both studies have a significant correlation between caloric consumption and energy expenditure. In addition, predictors of total energy expenditure in the studied population were identified. both studies provide relevant information in their respective contexts. Our study contrasts with that of Carrasco *et al*. (2002) because they made a comparison of the resting energy expenditure estimated by the Harris-Benedict formula (GERe) and the measured resting energy expenditure (GERm) in a population of 441 men, which indicates that the REE estimated by Harris-Benedict overestimates the measured REE by an average value of 153 kcal/day in men. The correlation between the H/B-GERm difference and the GERm was ($r= -0.25$) in men, which indicates a negative correlation and the p value > 0.005, implying that it is not significant in the men. men. While in our study a significant relationship is observed between caloric intake and REE calculated using the Harris-Benedict formula, these discrepancies are due to the characteristics of the sample and the methodology used in both studies.

The alternative hypothesis is accepted because the p value is less than 0.05, rejecting the null hypothesis.

There is a chi-c square value of 64.800 with 1 degree of freedom for the "calorie consumption" variable. The aforementioned value suggests discrepancy between the values perceived in the contingency table. In this sense, the chi-square test yields significant results, with a value that indicates a significant association ($p < 0.05$) between caloric consumption and the GET estimated using the Mifflin-St formula. The previously mentioned evidence that the option of the formula applied has a significant impact on the assignment of the energy group and that the relationship between the GET and caloric consumption is not random. These results are fundamental for the present investigation because they support caloric consumption in the estimation of GET using the Mifflin-St formula. Finally, the chi-square test reveals a significant relationship between caloric intake and GET using the Mifflin-St formula, with a chi-square value that supports this association ($p < 0.05$). In the study by Cruz Marcos et al. (2015) the authors observed that the Mifflin-St equation underestimated resting energy expenditure by 8.6 % in 80 healthy adults from Spain. However, this equation was the one that best fit the sample. Cancello *et al*. (2018) conducted a study in a morbidly obese population where the results show that the Mifflin-St Jeor equation had the best performance in obese patients with ≥3 comorbidities. A possible explanation for the underestimation of REE by the Mifflin equation is that this equation was developedfrom data obtained by indirect calorimetry in healthy subjects with average weight (Mifflin-St *et al.*, 1990).

Table 2.

Chi-square test of the variables caloric consumption and energy expenditure with the Mifflin-St equation

	Caloric consumption	Energy expenditure
Chi-square	64.800	5.000
gl	1	1
Asymptotic sig.	0.000	0.025

The results obtained in our study have limitations and contrast with the 3 mentioned studies on the Mifflin-St Jeor equation because they present different populations and different methodologies.

The alternative hypothesis is accepted because the p value is less than 0.05, rejecting the null hypothesis. The chi square values achieved were 64.800 for caloric consumption and 42.050 for GET, which shows a significant association. This proposes that caloric intake and GET are related and dependent on each other.

Also, the work revealed that no expected frequencies lower than 5 were found, which is essential to guarantee the validity of the results. Furthermore, the asymptotic significance value was 0.000 for both variables, which provides evidence of a significant association. These results imply that the Cunningham formula is appropriate to understand how caloric consumption affects the GET of the evaluated sample.

Table 3.

Chi-square test of the variables caloric consumption and energy expenditure with the Cunningham equation

	Caloric consumption	Energy expenditure
Chi-square	64.800	42.050
gl	1	1
Asymptotic sig.	0.000	0.000

In the article by Kfir *et al.* (2023) compared some of the equations for estimated energy requirement (REE), among them is the Cunningham formula, where 3001 participants from a relatively small sample with a high individual variance from nutrition clinics in Israel participated, which presents a Bland-Altman analysis showing the difference between common prediction equations and measured RMR. The Cunningham equation obtained the greatest difference with a mean deviation of -16.6 % and a LOA (prediction equation) of 95 % from 1.9 to -35.1, which shows a discrepancy between the equations and the measured RMR. Making a comparison with our study, a significant relationship was found between caloric consumption and energy expenditure, which Kfir's study also has two variables and they are related to each other.

Likewise, Kfir's study agrees with the results because the frequencies are less than 5, this suggests that the results are reliable and safe, just like that of the article in question, and in terms of significant statistics, both articles show that there is an association statistically significant between both variables, both from the article in question and from our thesis.

CONCLUSIONS

The caloric consumption of the diet presents a relationship with the energy requirement in military personnel in their recruitment stage. Military personnel have adequate dietary caloric intake during their recruitment stage, but most of their daily caloric intake is based on carbohydrates. Military personnel have an adequate energy requirement in the recruitment stage according to the Mifflin and Cunningham predictive equations, but according to the Harris Benedict equation they overestimate the total energy requirement.

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