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ORIGINAL ARTICLE

Correlation between food preferences and nutritional intake in food service at KH Mas Mansur Student Dormitory of Universitas Muhammadiyah

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Abstract

Background: Having good nutritional knowledge is not enough to form a healthy diet in students, it needs to be supported by a good consumption environment, such as food service in dormitories. Providing healthy food and having good preferences needs to be conducted to increase students' food intake.

Objective: The purpose of this study was to see how the correlation of food preferences in the dormitory with the amount of nutrient intake in students who lived in the KH dormitory

Methods: This study used an analytic observational design with a cross sectional approach. The subjects of this study were students who lived in dormitories with a total population of 365 students. Data collection was carried out by direct interview method with a 24-hour recall form instrumen for 3 days.

Results: The results of the correlation test showed that food preferences in the dormitory were positively correlated with total energy (p=0.032) and protein (p=0.012) intake. There was no correlation between food preferences in the dormitory with intake of fat and carbohydrate.

Conclusion: This study showed that the better the students' preferred food in the dormitory, the higher the amount of energy and protein intake. The results of this study was limited to the relationship of food preference factors to student food intake, so it is still necessary to conduct further studies on other internal and external factors that are also related to the level of student intake. Thus the amount of intake obtained by students living in dormitories can be maximised.

Keywords: food service, food preference, nutrition intake

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Introduction

Based on data from *Badan Pusat Statistik Indonesia* (BPS Indonesia), the student population is increasing every year. It is known that in 2022 the population reach 9.23 million students. [1] This population is part of the young adult population and has a risk of nutritional problems that need adequate attention.[2] In the young adult age range, students experience a transition in life from adolescence to adulthood. Students begin to

experience several changes and adjustments to social, psychological, and biological interactions in the environment. These situations can lead to changes in unbalanced consumption behavior. [3],[4] Therefore, it is important to make efforts to improve healthy eating patterns in order to meet the nutritional needs of students and establish healthy eating habits that continue into adulthood.[5] This is also to reduce the burden of chronic diseases that continue to increase in the long term.[6]

College students are part of a nutritionally vulnerable group. This is triggered by inadequate food intake and lack of control over food. Students are more likely to consume food that is easily accessible and in a short time, causing the formation of the habit of consuming fast food, eating at restaurants / food stalls.[7] This phenomenon is increasing because it is supported by the increasing number of fast food stalls and high-energy foods/ drinks.[8] Based on research conducted in 2020 by Tambun et al.[9] at Sebelas Maret University Surakarta (UNS) on food consumption in migrant students showed that students' energy intake was still relatively low, this was indicated by the average value of Total Energy Consumption (TKE) of 74.6%. In addition, other research conducted in 2018 by Nurkhopipah et al.[10] on the undergraduate student population of Sebelas Maret University Surakarta showed that almost half of the student sample (44.95%) had poor eating habits.

Nutritional knowledge is significantly associated with healthy eating, but knowledge about healthy eating alone cannot guarantee adherence to a healthy diet.[3] The environment may influence the availability and access of food consumption among students. Therefore, in order to improve nutritional knowledge, it is also important to improve the environmental sector that can provide convenience and affordability of healthy foods. By changing environmental factors, it will be able to influence the consumption habits of students.[11]

One approach to influencing the food consumption environment on campus can be accomplished by organising meals in student dormitories.[11] Student dormitories with food service can better support the nutritional adequacy of students compared to dormitories without food service,[12] However the organising of meal is not enough if it does not pay attention to the elements of nutritional fulfilment, good management and good acceptance (preferences) by students. Therefore, it is important to consider students' preferences for food, as well as see the amount of intake consumed by students, so that they can see how much the food preferences affect the nutritional intake of students in the dormitory.

One of the internal/individual factors that can determine a person's food consumption is food preference. A good preference level for a food can enhance the level of food intake. A person will tend to prefer consuming preferred foods (with greater quantity and frequency) compared to foods that are not preferred.[13] The higher a person's level of food preference, the higher the level of satisfaction with food consumption.[14] Therefore, it is recognised that the preferences towards a food will affect the amount of food intake that is consumed, as well as describing the level of satisfaction of the individual.

KH. Mas Mansur Student Dormitory is a student dormitory of Universitas Muhammadiyah Surakarta which is equipped with food service. This dormitory accommodates students from various study programmes and semester grades. This dormitory is conventionally service-oriented. So that the implementation of this food is specifically only for student of the dormitory. The food service system in this dormitory is carried out from Monday to Friday by serving two main menus a day, than besides consuming food from the dormitory, students can also consume food outside the dormitory to fulfill their daily nutrition needs.

Based on the information above, the researcher is interested in seeing how the relationship between the level of food preference in student dormitories and the level of intake of calories (energy), protein, fat, and carbohydrates in the food served in the dormitory KH Mas Mansur UMS.

Methods

This type of research is quantitative research with a cross sectional design. This study was conducted in the area of Universitas Muhammadiyah

Surakarta, namely in the KH Mas Mansur student dormitory located on Kartasura, Sukoharjo, Central Java, Indonesia. The Data collection was carried out in March 2023. The population of students in the dormitory is 365 students, consists of 157 men and 208 women. In the dormitory building, the students are spread over two buildings (male dormitory and female dormitory) and each building consists of four floors of dormitories. From this population, the sample size was calculated using the Slovin method and obtained from as many as 83 research subjects, then the sample was taken using proportional random sampling technique. The inclusion criteria in this study were students aged 18-25 years, had lived in the dormitory for at least 3 months, in good health, not taking medication and not running a special diet programme. While the exclusion criteria are suffering from chronic diseases.

The independent variable in this study is food preference in the dormitory and the dependent variable is the level of nutrient intake food dormitory (total energy, protein, fat and carbohydrate intake). Data collection of food preferences in the dormitory was carried out using the hedonic test method with a linkert scale (1-5).[15] The assessment was conducted on all menu items served in one day and each menu item served was rated on a linkert scale (1-5), and the results of the assessment were recorded in the form food recall 24 hours. This assessment was conducted for 3 days randomly from Monday to Friday. Then from the assessment data collected, calculations were made to be able to see the accumulation of food preference evaluations in one day. The formula used for accumulating students' food preferences is based on the calculation below:

$$\%food\ preferences = \frac{(\text{total score} - \text{minimum score})}{(\text{maximum score} - \text{minimum score})} x100\%$$

Description:

Total score : Is the overall result of the scoring of all food items that are served

Minimal score : Is the minimum score (1) summed as many food items are assessed.

Maksimal score: Is the maximum score (5) summed up as many food items are assessed

Data on total energy, protein, fat and carbohydrate intake were obtained through interviews using the 24-hour food recall method. Data collection of each element (energy, protein, fat, and carbohydrates) was carried out in 3 days. Determination of the day of data collection was carried out randomly by the researcher in the range of Monday to Friday. The data from the 24-hour food recall interview was then inputted into the Nutrisurvey application in order to determine the amount of energy, protein, fat and carbohydrates. Then to find out the level / amount of nutrient intake, it is needes to be compared with the Recommended Dietary Allowance (RDA). Then the level / amount of nutrient intake will be obtained in the form of %.

All data obtained were analysed to determine the relationship between variables using the Pearson product moment correlation statistical test (α=0.05) with the help of SPSS 25 software. This study has obtained an ethical eligibility test from the Health Research Ethics Commission of Dr. Moewardi Hospital Number 321/III/HREC/2023.

Results

The food service in the KH Mansur student dormitory is a conventional food service that is administered directly by the dormitory with the system is service oriented. This system does not serve the generally in public, but specifically to particular consumers, in this case students who live in the KH Mas Mansur dormitory. The food service system is not organised to serve students' intake needs in a day, but only serves two main menus so with this system to fulfill their daily needs, students also consume food from outside the dormitory. Student food services can be accessed from Monday to Friday and with canteen operating time is from 06.30-20.00. The food service uses a weekly menu cycle system and there are also some menus that use a monthly cycle. The food distribution system is self-service, so the portioning is done directly by the students. The size

of the food portioning will certainly affect the intake of nutrients / food. So that the size of the amount of nutrient / food intake depends on the portioning and student preferences.

Table 1. Characteristics of Research Subjects

Category	Frequency	
	N	%
Gender		
Male	35	42,2
Female	48	57,8
Faculty		
Health	11	13,3
Non-health	72	86,7
Dormitory Food Preferences		
Low (<37%)	0	00,0
Medium (37-77%)	46	55,4
High (>77%)	37	44,6

Table 1 presents data on the characteristics of the research subjects. Based on gender, there were more female subjects than male. There were 48 female respondents (57.8%) while 35 male respondents (42.2%). When viewed based on faculty distribution, most respondents were in the non-health faculty category with a total of 72 subjects (86.7%) while the health faculty was only a small proportion, as many as 11 subjects (13.3%). In addition, when viewed from food preferences in the dormitory, most were in the moderate category, as many as 46 people (55.4%), and the remaining 37 people (44.6%) were in the high preference category. No students were found in the category of low food preference rating in the dormitory.

Food preference is an assessment of the level of like or dislike for a food (12). **Table 2** shows the mean value of food preference assessment by students, which is a percentage of 73.44%. The percentage value of food preference is included in the low category if it is <37% and is said to be high if >77%. When this value is categorised in the food preference assessment category, this value falls into the moderate preference category (37-77%).

Table 2 shows that the average level of food energy intake in the dormitory is 64.60% RDA. The highest percentage of macronutrient adequacy is carbohydrates with an acquisition of 68.38% RDA, then protein intake is 56.86% RDA, and the lowest level of fat intake is 55.59% RDA. When viewed from the percentage of fulfilment of student intake needs, from two times serving the main menu by organising food in the dormitory, the contribution to student food intake is said to be sufficient if the percentage of intake is obtained at 60-70% of the RDA. Based on the average results of the acquisition of food intake figures in the dormitory, energy and carbohydrate intake are sufficient, while protein and fat are still insufficient.

The intake of students from outside the dormitory obtained an average energy of 28.39%, protein 20.66%, fat 32.04% and carbohydrates 28.35%. The provision of meals in the dormitory meets the intake needs of 60-70% RDA, so to meet the amount of food intake obtained from outside the dormitory in the range of 30-40% RDA. When viewed from the average acquisition of food intake outside the dormitory, it can be said that fat intake is appropriate, while energy, protein and carbohydrate intake is still considered insufficient.

When viewed based on the accumulated value of food intake in the dormitory and food outside the dormitory, it can see the level a day of nutritional adequacy of students. By the accumulation of food in the dormitory and outside the dormitory, it can see the adequacy of energy and macronutrients of students. The average student energy adequacy is 91.80%, protein is 76.69%, fat is 86.05% and carbohydrate is 95.63%. Nutritional adequacy is said to be normal if it can be fulfilled as much as

Tabel 2. Preference Score and Nutritional Intake

Variable	*Mean±SD*		
	Food in dormitory	Food outside dormitory	Total
Dietary energy intake (%RDA)	64,60±12,11	28,39±11,91	91,80±17,05
Dietary protein intake (%RDA)	56,86±09,41	20,66±11,68	76,69±13,79
Dietary fat intake (%RDA)	55,59±11,7	32,04±16,76	86,05±20,15
Dietary carbohydrate intake (%RDA)	68,38±16,14	28,35±12,39	95,63±21,34
Food preferences (%)	73,44±14,41	-	-

(90-119%RDA), severe deficit (<70%RDA), moderate deficit (70-79%RDA), mild deficit (80-89%RDA) and excess (≥120%RDA). Based on these mean values, it can be seen that the adequacy of energy and carbohydrates is in the normal category, protein is in the moderate deficit category, and fat is in the mild deficit category.

preferences are the level of likes and dislikes towards a food, so that preferences can affect food consumption including the selection of diet frequency, nutrient intake, and food adequacy of a person.[20] Increased food preferences will increase the size of a person's meal, so the higher the food preference, the higher the portioning that is carried

Table 3. Relationship between food preferences in dormitories and nutritional adequacy

Variabel	r	*p-value*
Dietary energy intake level in the dormitory (%RDA)	0,235	0,032*
Dietary protein intake level in the dormitory (%RDA)	0,274	0,012*
Dietary fat intake level in the dormitory (%RDA)	0,200	0,070
Dietary carbohydrate intake level in the dormitory (%RDA)	0,207	0,060

** Significant relationship if p value <0.05 (Pearson Product Moment analysis test)*

Table 3 presents data from the statistical analysis of the correlation between food preferences and macronutrient adequacy. Based on the table, it can be seen that food preferences have a significant correlation in energy (p=0.32) and protein (p=0.012), while there is no correlation between food preferences in the dormitory with the level of fat and carbohydrate intake.

Discussion

The Correlation between Food Preferences and Dietary Energy Adequacy in Dormitories

Based on **Table 3**, it is evident that food preferences are related to the level of energy intake of students (p=0.032). So it can be seen that the higher the preference for food in the dormitory, the higher the energy intake of students. Energy intake is the total of macronutrient components in food that are supplied to the body, including carbohydrates, protein and fat.

The correlation between food preferences in dormitories and energy adequacy is in line with research conducted in 2013 by Sutyawan & Setiawan [17] on high school students living in student dormitories and as well as research in 2017 by Tinah [19] on Polytechnic students living in dormitories. The results of both studies show that the level of preference for food served by the food provider is related to energy adequacy. This is certainly in line with the theory stating that food out and will also increase the amount of energy intake.[14]

If viewed from the overall average energy adequacy of students who live in dormitories, it can be seen that the nutritional adequacy of students is still in the good category, this is marked by the average acquisition of energy intake of 91.80%RDA. Furthermore, when comparing with previous research conducted in 2020 by Tambun et al. [9] on UNS migrants who did not live in dormitories, it was classified as low, which is 74.6%. Than as well as the results of research conducted on students of UIN Walisongo Semarang in 2021 by sholicah[21] found that 72.72% of students had deficiency in energy intake. Therefore, the provision of food in the dormitory and good eating preferences can lead to better energy intake adequacy.

The correlation between food preferences and the level of energy intake indicated the importance of attention from food service organisers to the preferences of the menu served to students. So that in pursuing to meet the adequacy of students, it is necessary to get good food preferences. The organising of meals in dormitories with two main meals can contribute to energy adequacy of 60-70% of the RDA. Based on the data obtained, the average student adequacy of food in the dormitory is 64.60%RDA. This indicates that the food service in the dormitory is in the normal range, but this percentage can still be optimised to reach the maximum percentage.

Food preferences in dormitories are an important factor in the energy intake of students. So that the organised food needs to pay attention to the acceptance of food in the dormitory. However, there are also other factors that can also affect the nutritional intake of students, including the composition of food components and menu preparation.[22]

The correlation between food preferences and dietary protein adequacy in dormitories

Based on **Table 3**, it is determined that food preference in dormitories is related to students' protein intake (p=0.012). This indicates that the higher the preference for food in the dormitory, the higher the protein intake of students. Similar research has been conducted in 2013 by Sutyawan & Setiawan [17], with the subject of student senior high school who living in student dormitories. The study proved the similar result that the level of food preference in dormitories is related to protein intake, which can be explained by the relationship between protein and umami flavour in food.

Umami flavours tend to indicate the existence of proteins or amino acids.[23] Umami compounds in foods include free amino acids, nucleotides, peptides, organic acids and their derivatives. They can enhance the flavour of food, such as regulating sweetness, enhancing saltiness and suppressing sourness and bitterness.[24, 25] Umami flavour is commonly found in protein-containing foods such as fish, chicken, shrimp, mushrooms. With a high food preference, it can be associated with protein source foods in the diet.

Proteins are comprised of 20 different amino acids. Most proteins contain glutamate. Glutamate is the major umami flavour component in most proteins. Glutamate is a precursor to protein and a component of protein hydrolysates, so the umami flavour is a signal of the existence of protein in food [26]. However, some high-protein foods do not have a strong umami flavour. The umami flavour quality can be perceived by humans because of the easily digestible proteins that are formed due to cooking or fermentation.[27]

The impact of umami taste sensitivity on food behaviour relates to an individual's ability to perceive taste stimulation. Umami flavour sensitivity is associated with preference, acceptance and food intake. The association may be influenced by the palatability of the individuals. Palatability is one of the mechanisms of increasing liking or preference produced by umami compounds.[28]

Food materials that contain protein tend to deliver umami flavour into foods. Umami flavour increases the palatability of food, which subsequently increases food acceptance, and influences food intake.[23] The umami flavour can provide an appetite for food, which tends to indicate the existence of protein, so the high preference for food in the dormitory can be associated with the existence of protein nutrients in food. The higher the level of liking for food, the higher the nutrients in the food consumed.

There is a relationship between food preferences and protein intake in the food service in the dormitory, it can be concluded that with a mean scoring of food preferences of 73.44%, where this figure is included in the moderate category (37-77%), it was achieved a mean value of protein intake of 56.86% RDA, this figure is lower than the target adequacy of the food service in the dormitory which is 60-70%RDA. So that the organisation of food in the dormitory can strive to increase food preferences in the dormitory in order to increase the adequacy of student protein intake.

Next, it is seen that the mean protein intake obtained from outside the dormitory is 20.66% RDA. When the two are summed up, the total value of the adequacy of student protein intake is 76.69% RDA. From this figure, it is known that the adequacy of protein intake of students living in dormitories is in the category of moderate deficit (70-79% RDA). Something similar happened in another study in 2021 conducted by Patimbano et al.[29] in Public Health students at Sam Ratulangi University Manado, many students were found having an insufficient level of protein intake, which was 66.1%. In addition, another similar study in 2020 conducted by Cholidah et al.[30] on medical students at Mataram University found that some students (51.14%) were also found were also found having inadequate protein intake.

The correlation between food preferences and dietary fat and carbohydrate intake levels in dormitories

Table 3 shows that there is no relationship between food preference and fat (p=0.70) and no relationship between food preference and carbohydrate (p=0.60). Both p values showed p>0.05. This shows that the value of food preference in KH Mas Mansur dormitory is not related to the level of fat and carbohydrate intake. However, this study found a relationship between preference and energy intake, where energi intake is the total amount intake of fat, carbohydrate and protein.

The existence of a relationship between food preferences with energy, but there is no relationship between preferences with fat and carbohydrates can be due to the composition of nutrients in each food that students consume differently. In addition, the amount of energy in a food depends on the nutrient content of protein, fat and carbohydrates. When properly digested in the body, one gram of protein provides about 4 kcal of energy; one gram of fat provides about 9 kcal of energy; and one gram of carbohydrate provides about 4 kcal of energy.[31]

Food materials can be categorised as sources of carbohydrates, fat or protein. There are some foods that are sources of carbohydrates such as rice, flour, sweet potatoes, sugar. In addition, there are also sources of protein such as eggs, meat, fish, nuts. While sources of fat such as fish, eggs, meat, soya, fried foods and foods processed with oil. It can be said that each food has its own nutritional value. Thus there is a possibility that someone consumes the same energy but with a different macronutrient composition. So that the amount of fat and carbohydrate intake depends on the type of food consumed by students. Although students consume food on the same day and with the same food menu presentation, there is a possibility that they consume fat and carbohydrate intake with different compositions. It depends on the food chosen and the portioning conducted.

The absence of a relationship may be because of other factors that influence food preferences. It is known that there is a significant relationship between food preferences and genetic variants. The existence of genetic variants makes each individual have certain preferences and tendencies towards sweet and fatty foods.[32] Moreover, genetic factors in umami flavour sensitivity are also related to, socio-demographics and individual status. These factors lead to the different umami flavour sensitivities of foods.[24] Furthermore, the intensity of sweet and salty flavours can also indicate the presence of certain nutrients in foods. Carbohydrates (mono and disaccharides) are associated with sweet flavour intensity, while fat, protein, energy and sodium are associated with salt flavour intensity.[25]

Another possible reason is that the researcher also found a wide variety of portioning done by students. There is no standard measurement in portioning. It all depends on the portioning carried out by students, because the provision of food in the KH Mas Mansur student dormitory with a self-service system. Students do their own portioning, so this can lead to different sizes of menu items taken by each student. This difference can lead to a comparison of the different amounts of macronutrient intake in students.

Another possible factor is that there were findings during data collection where students gave a good preference value for a food in the dormitory but did not consume the food because they did not want to consume the food and there were also those who said because the food did not match with other foods. For example, in the dormitory there is a menu of krispy chicken and clear vegetables. Both get a good preference value but do not take clear vegetables because it is not suitable when consumed with krispy chicken because it can eliminate the krispy texture of the chicken. So that the compatibility in the preparation of the menu needs to be arranged properly.

In this study, it can be seen that students who live in the KH Mas Mansur student dormitory which is equipped with a food service system obtain a mean fat intake adequacy of 86.05%RDA with a category included in a slight deficit (80-89%RDA) and carbohydrate intake adequacy of 95.63%RDA including in the normal category (90-119%RDA). When compared to research in 2021 conducted by Patimbano et al.[29] on Public Health

students at Sam Ratulangi University Manado, it was found that most of the adequacy of students' fat and carbohydrate intake was still classified as insufficient with a total percentage of students of 75.4% and 84.7%. This shows that to meet the intake needs of students not only considers providing access to consumption for students but also from internal and external factors.

Conclusions

In this study, it can be seen that the average value of food preferences in the dormitory is in the moderate category. The result of this study is that there is a relationship between food preferences in the dormitory with the level of energy and protein intake, but there is no relationship with the level of fat and carbohydrate adequacy. So it can be concluded that in the implementation of food in the KH Mas Mansur student dormitory, if the higher the assessment of student preferences for food in the dormitory, the more energy and protein adequacy in students will increase, so that the organizers of meals in the dormitory must continue to make efforts to increase preferences for food in the dormitory in order to further increase the adequacy of energy and protein intake. As for further research to be able to see the relationship to other external and internal factors that can affect the adequacy of student intake.

Conflict of interest

The authors declare that there is no conflict of interest.

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