

AWAL MAIL BERITA KEUANGAN OLAHRAGA SELEB LIFESTYLE LAINNYA... yahoo/mail Tingkatkan 6

Amerta Nutrition Universi... Tambah kata kunci Lanjutan

Tulis ← Kembali ↶ ↷ → Arsipkan Pindahkan Hapus Spam ... ↑ ↓ × 15 16 17

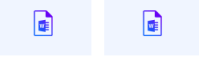
Article Submission Yahoo/Email M...

**Amerta Nutrition Universitas Airlangga** <amertanutr@fkm.unair.ac.id>  
Kepada: agoharim@yahoo.com Sen, 21 Feb jam 14.32 ☆

Yth. Ago Harlim

Selamat siang. Terima kasih telah mensubmit artikel di Amerta Nutrition. Artikel Saudara dengan judul "Relationship of Carbohydrate, Protein, and Fat Consumption to Obesity Incidence in 2014 UKI Faculty of Medicine Students" dinyatakan "Ditolak" dikarenakan artikelnya belum sesuai dengan GFA. Berikut file terlampir template original artikel dan artikel yang sudah diberikan komentar. Silahkan diperbaiki kembali apabila sudah selesai bisa disubmit ulang di OJS amerta. Terimakasih

Best Regard,  
**Amerta Nutrition**  
Department of Health Nutrition  
Faculty of Public Health, Universitas Airlangga  
Kampus C Jalan Mulyorejo, Surabaya, East Java, Indonesia  
Telp. 031-5920948, Fax 031-5924618  
website: <http://e-journal.unair.ac.id/index.php/AMNT>  
Email: [amertanutr@fkm.unair.ac.id](mailto:amertanutr@fkm.unair.ac.id)  
[Unduh semua lampiran sebagai file zip](#)



AWAL MAIL BERITA KEUANGAN OLAHRAGA SELEB LIFESTYLE LAINNYA... yahoo/mail Tingkatkan 6

Amerta Nutrition Universi... Tambah kata kunci Lanjutan

Tulis ← Kembali ↶ ↷ → Arsipkan Pindahkan Hapus Spam ... ↑ ↓ × 15 16 17

Article Submission Yahoo/Email M...


**Amerta Nutrition Universitas Airlangga** <amertanutr@fkm.unair.ac.id>  
Kepada: agoharim@yahoo.com Sel, 1 Mar jam 16.05 ☆

Yth. Ago Harlim,

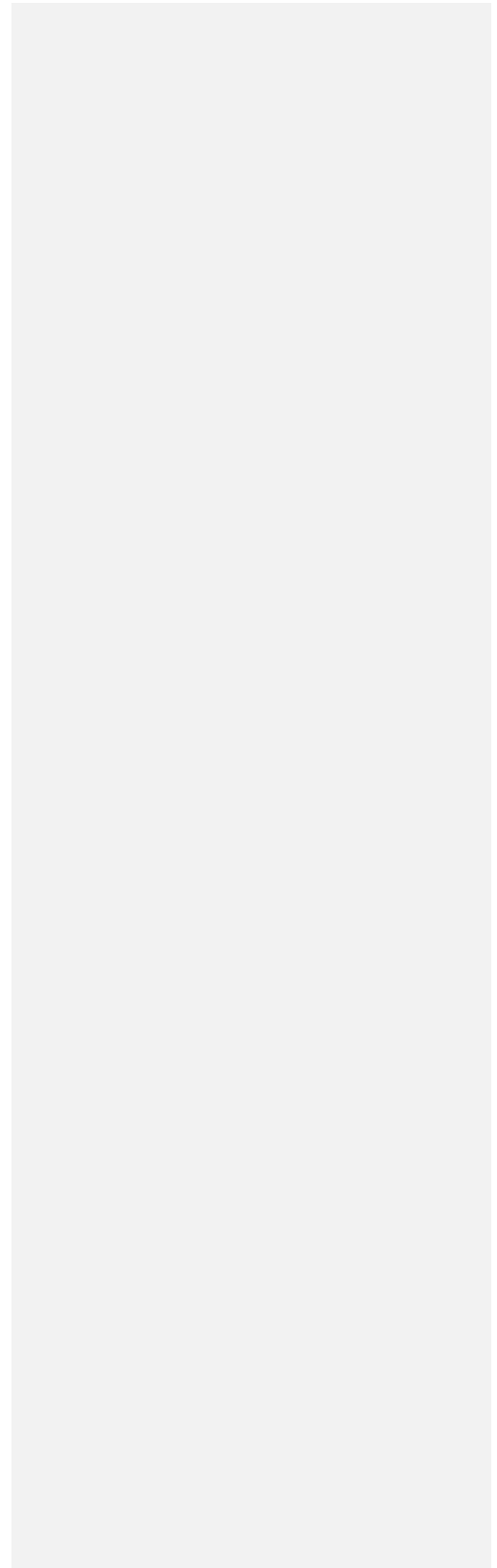
Selamat siang. Terima kasih telah mensubmit artikel di Amerta Nutrition. Artikel Saudara dengan judul "Relationship of Carbohydrate, Protein, and Fat Consumption to Obesity Incidence in 2014 UKI Faculty of Medicine Students" dinyatakan "Ditolak" dikarenakan hasil turnitin 25% (Batas similarity index Amerta Nutrition adalah 20%) . Berikut file hasil turnitin. Silahkan diperbaiki kembali apabila sudah selesai bisa disubmit ulang di OJS amerta.

Terimakasih atas kerjasamanya

Best Regard,  
**Amerta Nutrition**  
Department of Health Nutrition  
Faculty of Public Health, Universitas Airlangga  
Kampus C Jalan Mulyorejo, Surabaya, East Java, Indonesia  
Telp. 031-5920948, Fax 031-5924618  
website: <http://e-journal.unair.ac.id/index.php/AMNT>  
Email: [amertanutr@fkm.unair.ac.id](mailto:amertanutr@fkm.unair.ac.id)



Relationshi... .pdf  
1.7MB



AWAL MAIL BERITA KEUANGAN OLAHRAGA SELEB LIFESTYLE LAINNYA... yahoo/mail

Amerta Nutrition Universi... Tambah kata kunci Lanjutan

Tulis

Email Masuk 999+  
Belum Dibaca  
Berbintang  
Draft 41  
Ter kirim  
Arsip  
Spam  
Sampah  
Lebih sedikit  
Tampilan Sembunyikan  
Foto  
Dokumen  
Langganan  
Folder Sembunyikan  
+ Folder Baru  
New

← Kembali ↶ ↷ → Arsipkan Pindahkan Hapus Spam ...

Amerta Nutrition Universitas Airlangga <amertanutr@fkm.unair.ac.id>  
Kepada: agoharlim@yahoo.com  
Sen, 28 Mar jam 14.00 ☆

Yth. Ago Harlim

Selamat siang. Artikel saudara berjudul "**Relationship between Carbohydrate, Protein, and Fat Consumption with Obesity Incidence in 2014 UKI Faculty of Medicine Students**" telah mendapatkan feedback dari Reviewer A. Kami sudah mengecek kembali perbaikan dari author. Mohon untuk mengupload kembali file yang sudah direvisi oleh Reviewer A dengan tetap mencantumkan komentar reviewer dan langsung menjawab komentarnya sehingga memudahkan reviewer untuk mengecek kembali perbaikannya. Terlampir contoh perbaikan artikel.

Terima kasih atas kerjasamanya.

Best Regard,  
Amerta Nutrition  
Department of Health Nutrition  
Faculty of Public Health, Universitas Airlangga  
Kampus C Jalan Mulyorejo, Surabaya, East Java, Indonesia  
Telp. 031-5920948, Fax 031-5924618  
website: <http://e-journal.unair.ac.id/index.php/AMNT>  
Email: [amertanutr@fkm.unair.ac.id](mailto:amertanutr@fkm.unair.ac.id)

Contoh Arti... .pdf  
us 218

AWAL MAIL BERITA KEUANGAN OLAHRAGA SELEB LIFESTYLE LAINNYA... yahoo/mail

Amerta Nutrition Universi... Tambah kata kunci Lanjutan

Tulis

Email Masuk 999+  
Belum Dibaca  
Berbintang  
Draft 41  
Ter kirim  
Arsip  
Spam  
Sampah  
Lebih sedikit  
Tampilan Sembunyikan  
Foto  
Dokumen  
Langganan  
Folder Sembunyikan  
+ Folder Baru  
New

← Kembali ↶ ↷ → Arsipkan Pindahkan Hapus Spam ...

Accepted Manuscript 6 Yahoo/Email M... ☆

Amerta Nutrition Universitas Airlangga <amertanutr@fkm.unair.ac.id>  
Kepada: agoharlim@yahoo.com  
Rab, 18 Mei jam 13.39 ☆

Yth. Ago Harlim

Selamat siang. Izin mengonfirmasi bahwa artikel saudara dengan ID #34106 berjudul "**Relationship between Carbohydrate, Protein, and Fat Consumption with Obesity Incidence in 2014 UKI Faculty of Medicine Students**" dinyatakan **Diterima** oleh Section Editor Jurnal Amerta Nutrition. Oleh karena itu, mohon untuk mengirimkan dan mengupload kembali artikel terakhir yang sudah fix dan sesuai dengan revisi dari Reviewer melalui email dan website Amerta Nutrition untuk keperluan turnitin kedua. Silakan mengonfirmasi kembali melalui email jika sudah di upload.

Terima kasih atas kerjasamanya.

Best Regard,  
Amerta Nutrition  
Department of Health Nutrition  
Faculty of Public Health, Universitas Airlangga  
Kampus C Jalan Mulyorejo, Surabaya, East Java, Indonesia  
Telp. 031-5920948, Fax 031-5924618  
website: <http://e-journal.unair.ac.id/index.php/AMNT>  
Email: [amertanutr@fkm.unair.ac.id](mailto:amertanutr@fkm.unair.ac.id)

Ago Harlim <agoharlim@yahoo.com>  
Kam, 19 Mei jam 15.23 ☆

34106 / Harlim et al. / Relationship between Carbohydrate, Protein, and Fat Consumption with Obesity Incidence in 2014 UKI Faculty o [Library](#)

Workflow **Publication**

Submission **Review** Copyediting Production

Round 1


**Notifications**

[\[AMNT\] Editor Decision](#) 2022-05-25 02:22 AM


**Reviewer's Attachments** [Q Search](#)

Pedoman Persy....docx Show

**Reviewer's Attachments** [Q Search](#)

 137033	Article Text, 34106-136219-2- RV 1.docx	March 12, 2022	Article Text
--------------------------------------------------------------------------------------------	-----------------------------------------	----------------	--------------

**Revisions** [Q Search](#) [Upload File](#)

 137831	Article Text, nutrisi journal , prot dengan obesitas 20:3:22 (no comment).docx	March 29, 2022	Article Text
--------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------	----------------	--------------

**Review Discussions** [Add discussion](#)

Name	From	Last Reply	Replies	Closed
No Items				

**Amerta Nutrition**

← Back to Submissions

34106 / Harlim et al. / Relationship between Carbohydrate, Protein, and Fat Consumption with Obesity Incidence in 2014 UKI Faculty o [Library](#)

Workflow **Publication**

Submission Review **Copyediting** Production

**Copyediting Discussions** [Add discussion](#)

Name	From	Last Reply	Replies	Closed
<a href="#">Copyediting</a>	—	2022-03-31 04:58 PM	0	<input type="checkbox"/>

**Copyedited** [Q Search](#)

167591 adm 16 6. 34106\_Des 22\_Ago Harlim clean.docx August Article Text

**Amerta Nutrition**

← Back to Submissions

34106 / Harlim et al. / Relationship between Carbohydrate, Protein, and Fat Consumption with Obesity Incidence in 2014 UKI Faculty o [Library](#)

Workflow **Publication**

Submission Review **Copyediting** Production

**Production Discussions** [Add discussion](#)

Name	From	Last Reply	Replies	Closed
<a href="#">Proofreading</a>	—	2022-03-31 04:58 PM	0	<input type="checkbox"/>

## **Hubungan Asupan Karbohidrat, Protein, dan Lemak dengan Kejadian Obesitas pada Mahasiswa Fakultas Kedokteran UKI 2014**

### **Relationship between Carbohydrate, Protein, and Fat Consumption with Obesity Incidence in 2014 UKI Faculty of Medicine Students**

#### **ABSTRAK**

**Latar Belakang:** Obesitas adalah penimbunan lemak yang berlebihan di dalam tubuh. Konsumsi karbohidrat, protein, dan lemak berlebih dapat meningkatkan resiko obesitas. Hal ini terjadi ketika ada ketidakseimbangan antara jumlah energi yang masuk melalui makanan dengan jumlah energi yang keluar.

**Tujuan:** Penelitian ini bertujuan untuk mengetahui hubungan antara asupan karbohidrat, protein, dan lemak dengan kejadian obesitas pada mahasiswa Fakultas Kedokteran Universitas Kristen Indonesia tahun 2014.

**Metode:** Metode penelitian yang digunakan adalah analitik kuantitatif dengan desain studi *case control*. Jumlah sampel yang diambil sebanyak 68 orang. Teknik analisis menggunakan SPSS dengan uji *Chi-square* dan regresi logistik.

**Hasil:** Sebanyak 27.9% siswa mengalami obesitas, dimana 33.3% adalah laki-laki dan 25.5% adalah perempuan. Berdasarkan hasil analisa bivariat, terdapat hubungan antara kejadian obesitas dengan konsumsi protein ( $p=0,048$ ) dan konsumsi lemak ( $p=0,035$ ) sementara tidak ada hubungan antara obesitas dengan asupan karbohidrat ( $p=0,373$ ).

**Kesimpulan:** Konsumsi protein dan lemak berhubungan bermakna dengan insiden obesitas pada mahasiswa kedokteran Universitas Kristen Indonesia ( $p<0.05$ ), sedangkan konsumsi karbohidrat tidak berhubungan bermakna dengan insiden obesitas ( $p>0.05$ ).

**Kata Kunci:** Obesitas, Karbohidrat, Protein, Lemak

**Commented [DELL1]:** conclusions can be rearranged by concluding the results of the research as a whole, not rewriting the research results

**Commented [DELL2]:** alphabetical order

#### **ABSTRACT**

**Background:** Obesity is an excessive fat accumulation in the body. Excessive consumption of carbohydrates, protein, and fat can increase the risk of obesity. It occurs when there is an imbalance between the energy number that goes through food and the energy that comes out through physical activity.

**Objectives:** This study aims to know the relationship between carbohydrate, protein, and fat consumption and obesity among the 2014 UKI Faculty of Medicine Students.

**Method:** This study is analytical observational research with a case-control design. The samples are 68 students from batch 2014. The data is analysed by SPSS using Chi-square and logistic regression.

**Results:** A total of 27.9% of students were obese, of which 33.3% were male and 25.5% were female. Based on the results of bivariate analysis, There is a relationship between obesity and protein consumption ( $p=0,048$ ) and fat consumption ( $p=0,035$ ), while there is no correlation between incident obesity and carbohydrate consumption ( $p=0,373$ ).

**Conclusions:** It is known that the variables of protein consumption and fat consumption are significantly related to the incidence of obesity in 2014 UKI Faculty of Medicine Students ( $p<0.05$ ). However, the variable of carbohydrate consumption was not significantly related to the incidence of obesity in students of the 2014 UKI Faculty of Medicine Students ( $p>0.05$ ).

**Keywords:** Obesity, Carbohydrate, Protein, Fat

## INTRODUCTION

Obesity is an abnormal or excessive accumulation of fat in the body and poses a health risk. "Excess body fat can increase the risk of hypertension, cardiovascular disease, stroke, type 2 diabetes mellitus, some types of cancer, including breast, colon, prostate, pancreatic, and kidney cancers, and conditions such as obstructive sleep apnoea and osteoarthritis".<sup>1,2</sup> The overweight and obesity which is highly increased has been recognised as a global problem by the World Health Organization (WHO) and is a primary problem in developing countries. Increasing income, urbanisation and changing lifestyles clearly show that developing countries face the same problem of being overweight and obese.<sup>3</sup> The BMI classification from the Indonesian Ministry of Health, a person is obese if the BMI calculation result is  $> 27.0$ . In the BMI classification, a person with a BMI value of 25.0-27.0 is said to have a lighter weight level. Normal body weight has a BMI value of 18.5-25.0. A BMI value below 18.5 is said to be underweight. Based on WHO data, "in 2014, there were  $>1.9$  billion adults ( $\geq 18$  years) worldwide overweight, 600 million of whom were obese. As much as 39% of the world's population aged 18 years are overweight, in which 38% are men, 40% are women".<sup>4</sup> Meanwhile, 13% of the world's population aged 18 years are obese, of which 11% are male, and 15% are female.<sup>5</sup> The prevalence of obese adults is 15.4% of the entire population of Indonesia. 15.4% of the total obese population, 19.7% are adult men, and 32.9% are adult women. In the same year in the DKI Jakarta area, the total obese male adult population was 15.8%, and the obese adult female population was 26.2%.<sup>6</sup>

It is accepted globally that the cause of the obesity is the imbalance between expenditure and energy intake, besides, it is related to the dietary intake and lifestyle. Overeating energy from carbohydrates and fats and excess protein can lead to overnutrition problems, seen in obesity. The habit of consuming unhealthy snacks with high-calorie content without consuming moderate vegetables and fruit as a source of fibre increases the risk of obesity.<sup>7</sup> In addition, consumption of food containing many artificial sweeteners, such as soda, could also increase the risk of obesity.<sup>8</sup> Restaurants that serve fast food are increasingly widespread and easy to find, so this high-calorie food is the choice of most people today because of its easy and fast access. A study conducted in Brunei Darussalam found that "most university students had poor eating habits (skipped breakfast, frequent snacking, fried food consumption at least three times per week and low intake of daily fruits and vegetables), and those with overweight/obesity had a significantly higher frequency of visits to fast food restaurants".<sup>9</sup> Medical students are commonly known to experience challenging and stressful learning environment, hence it might affect their day to day routine, which includes choice of food. Among Indian medical students, "BMI was significantly associated with evening and night time fast food eating, along with less physical activity and intake of soft drinks".<sup>10</sup>

Based on the data above, it is noted that many adults are obese. The authors are interested in researching the relationship between carbohydrate, protein and fat consumption on obesity in the in 2014 UKI Faculty of Medicine Students.

Based on the background described above, the formulation of the problem in this study is how is the relationship between carbohydrate, protein and fat consumption on the incidence of obesity in 2014 UKI Faculty of Medicine Students?

In general, this study is aimed at determining whether there was a relationship between carbohydrate, protein and fat consumption on the incidence of obesity in 2014 UKI Faculty of Medicine Students.

**METHOD**

This study was conducted with a quantitative analytical design with a case-control approach to determine the relationship between carbohydrate, protein and fat consumption on obesity in students of Medical Faculty, Universitas Kristen Indonesia batch 2014. The study was conducted at the Faculty of Medicine, Universitas Kristen Indonesia, Jalan Mayjend Sutoyo No. 2, Cawang, East Jakarta in November 2018. The population of this study was the 2014 UKI Faculty of Medicine Students, which amounted to 210 students. The sample is part of the number and characteristics possessed by the population. The conclusions learned from the sample will be applied to the population. The Slovin formula was used to calculate the total studied samples. The formula found that the sample size needed for the study was 67.75, which was fulfilled to be 68. The data for this study were primary data covering the characteristics of the respondents (age, sex, weight, and height), eating menu & eating frequency, and Body Mass Index (BMI) to see obesity. Then secondary data includes the number of 2014 UKI Medical Faculty students and data on the results of health examinations regarding weight and height, which were just carried out during the survey so that the number of obese and non-obese students is known. The instruments of this research are a list of questionnaires, a 24-hour food recall form, a height measuring instrument (microtome), and a weight scale.

Obesity was assessed by measuring BMI. BMI is the most frequent and practical indicator to measure the population level of adults' overweight and obesity. The BMI value does not depend on age or gender.<sup>7</sup> What is assessed from BMI is the proportion of body weight to height. The BMI formula is:

$$BMI = \frac{Weight (kg)}{Height (m^2)}$$

After measuring weight and height, the measurement results are entered into the BMI formula. The interpretation of BMI results can be seen from the following classification table.

**Tabel 1.** "Classification of BMI

Classification	BMI (kg/m <sup>2</sup> )	
	Principal cut-off points	Additional cut-off points
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
Overweight	≥25.00	≥25.00

**Commented [DELL3]:** Did this study not include physical activity data?

Pre-obese	25.00 - 29.99	25.00 - 27.49 27.50 - 29.99
Obese	≥30.00	≥30.00
Obese class I	30.00 - 34.99	30.00 - 32.49 32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49 37.50 - 39.99
Obese class III	≥40.00	≥40.00

Source: World Health Organization<sup>11</sup>

Data analysis was carried out after all data were collected. The researcher analyzed the data through several stages. First, editing, to check the completeness of the data. Food recall data that has been collected were analyzed through the Nutri Survey 2007 program. Consumption data (carbohydrate, protein, and fat) were categorized into three groups: a) Less, if the consumption level was below 80% of Indonesian recommended dietary allowance (RDA), b) Moderate, if the consumption level was 80 to 120% RDA, and c) High, if the consumption level was more than 120% RDA. All data variables then analysed using the SPSS 24.0 (Statistic Package for the Social Science) program. The analysis technique used was univariate, bivariate, and multivariate analysis. Univariate analysis is used to describe a research result. In this study, univariate analysis consisted of frequency distribution and percentage of respondents' identities such as gender and age, BMI, which were divided into two categories, namely obese and not obese, carbohydrate consumption, protein consumption, and fat consumption. Bivariate analysis was used to analyse two variables that were thought to be related. The statistical test used is the test of Chi-square. If the  $p$ -value  $< 0.05$ ,  $H_0$  is rejected, which means there is a relationship between the two variables. If the  $p$ -value  $> 0.05$ ,  $H_0$  fails to be rejected, which means there is no relationship between the dependent and independent variables.

## RESULTS AND DISCUSSION

The research was conducted at UKI Faculty of Medicine, in February 2018, with the population in this study was batch 2014 students, totalling 210 students. The sample taken for the study amounted to 68 students. Distribution based on the subject's characteristics, including the age and gender of the subject, is presented in Table 2. It shows that most of the respondents in this study were female (69.1%). The highest proportion of respondents in this study were 58.8% (40 people) of 21 years of age, 19 years of age had a proportion of 4.4% (3 people), 20 years of age 16.2% (11 people), and 22 years old as much as 20.6% (14 people).

**Table 2.** Characteristics of Students in the 2014 UKI Medical Faculty

Characteristics	F	%
Gender		
Male	21	30.9
Female	47	69.1
Age		
19 years old	3	4.4

**Commented [DELL4]:** You can add data on the average consumption of carbohydrates, protein and fat of the respondents

**Commented [DELL5]:** Did you mean "n" ?



20 years old	11	16.2
21 years old	40	58.8
22 years old	14	20.6

Table 3 shows that the male and female respondents BMI who have a normal BMI (24%) has a total which is more than respondents who have a BMI of underweight, overweight, and obesity. Even though it has a smaller number, the results of this measurement also show that the problem of BMI status, both less and too much among young adults, is still a problem. This figure is even higher than the 2013 *RISKESDAS*, where the prevalence of BMI in adults (>18 years) is found to be 8.7 per cent underweight, 13.5 per cent overweight and 15.4 per cent obese.<sup>11</sup> The proportion of respondents who are obese is 27.9%, and respondents who are not obese are 72.1%. The obesity prevalence among university students was also higher compared to other Asian countries such as Malaysia (5.2%)<sup>12</sup>, India (10.7%)<sup>13</sup>, and Thailand (13%)<sup>14</sup>. In this study, Males' obesity was higher (33.3%) compare to the female students' obesity (25.5%). This is consistent with a study in university students aged 18 to 22 years population who are from Turkish. It was found that male gender as independent predictor of obesity/overweight, and as much as 78.5% of male students had obesity (BMI  $\geq 25$  kg/m<sup>2</sup>).<sup>15</sup> In private universities, "females were more likely to adopt the vegetarian/low calorie diet than males, while males were more prone to adopt a westernized diet, which is high loadings of fried potatoes and chips, fast foods, carbonated beverages, and desserts with slightly lower but still a positive loading of hot beverages such as coffee, tea".<sup>16</sup>

**Commented [DELL6]:** 24 subject or percent?

The average level of carbohydrate consumption adequacy for three measurements, it was found that for the male and female respondents who were included in the less category had a greater number of 29 people (42.6%), while for the moderate category it was 29 people. Twenty-three people (33.8%) and high categories amounted to 16 people (23.5%). The average level of protein consumption adequacy for three measurements, it was found that male and female respondents belonging to the high category had a greater number of 27 people (39.7%), while for the less category it was 27 people (39.7%). 24 people (35.3%) and the moderate category is 17 people (25.0%). Meanwhile, the average level of fat consumption adequacy for three measurements, it was found that male and female respondents who were included in the High category had a higher number of 33 people (48.5%), while for the Less category there were 21 people (30.9%) and the Moderate category amounted to 14 people (20.6%).

**Commented [DELL7]:** Are these data correct?

**Commented [DELL8]:** What does this sentence mean?

**Commented [DELL9]:** I also do not understand the meaning of this sentence. Please arrange it properly and according to the data in the table.

**Commented [DELL10]:** After this paragraph, additional data can be given in the form of other similar research data regarding the consumption of carbohydrates, proteins, and fats in general students.

Majority of male students consumed less carbohydrate (52.4%), less protein (38.1%), and high fat (57.1%). Meanwhile, female students consume less carbohydrate (38.3%), but had high consumption for protein (42.6%) and fat (44.7%). A study of 231 students from Central Michigan University discovered that both male and female students had high consumption of fat, but female had lower saturated fat intake compared to those of male due to better nutritional knowledge.<sup>17</sup> Moreover, "male students consumed a higher energy content from fat and engaged less often in various healthful eating habits (eg, reading food labels, having breakfast) than female students".<sup>18</sup> Another possible reason is that

“female students pay more attention to their physical appearance and body figure and try to restrict caloric food consumptions than that of males”.<sup>19</sup>

**Table 3.** Body mass index and nutritional intake based on recommended dietary allowance

Variables	Male		Female		Total	
	N	%	N	%	N	%
<b>BMI Status</b>						
Underweight	4	19.1	7	14.9	11	16.1
Normal	7	33.3	17	36.2	24	35.3
Overweight	3	14.3	11	23.4	14	20.6
Obese	7	33.3	12	25.5	19	28
<b>Obesity Status</b>						
Not Obese	14	66.7	35	74.5	49	72.1
Obese	7	33.3	12	25.5	19	27.9
<b>Carbohydrate Consumption</b>						
Less	11	52.4	18	38.3	29	42.6
Moderate	7	33.3	16	34.0	23	33.8
High	3	14.3	13	27.7	16	23.5
<b>Protein Consumption</b>						
Less	8	38.1	16	34.0	24	35.3
Moderate	6	28.6	11	23.4	17	25.0
High	7	33.3	20	42.6	27	39.7
<b>Fat Consumption</b>						
Less	5	23.8	16	34.0	21	30.9
Moderate	4	19.0	10	21.3	14	20.6
High	12	57.1	21	44.7	33	48.5

**Abbreviations:** BMI, Body Mass Index.

The study found no relationship between carbohydrate consumption level with obesity ( $p > 0.05$ ) (Table 4). Research at the East Java Provincial Health Office showed the same results with a  $p$ -value of 0.523.<sup>20</sup> Based on the theory, excessive consumption of carbohydrates will cause obesity. Carbohydrates consumed will be broken down into glucose. If the body no longer needs glucose, excess glucose will be stored in glycogen in the liver and fat. When needed, for example, in a state of hypoglycemia, glycogen will be broken down through the process of gluconeogenesis. The study results were different from the theory because the respondents did not fill out the complete food recall questionnaire completely. On the other hand, several studies have shown a significant relationship between carbohydrate consumption and obesity, as conducted by Grace Duma<sup>21</sup> and Rian Diana et al.<sup>22</sup> “Moderate low-carbohydrate diet (M-LCD) has shown significant effect on obesity status after three months intervention and decrease in carbohydrate intake (g/day) and %carbohydrate were correlated with decrease (%) in visceral adipose tissue (VAT), and the correlations were significant in men even after adjusting for age and changes in energy intake in multiple regression analysis”.<sup>23</sup>

**Table 4.** Relationship between carbohydrate, protein, and fat consumption level with obesity incidence in 2014 UKI Medical Faculty Students

Consumption Level	BMI				Total	%	$p$ -value
	Not Obese	%	Obese	%			
<b>Carbohydrate</b>							
Less	19	65.5	10	34.5	29	100.0	0.373
Moderate	19	82.6	4	17.4	23	100.0	
High	11	68.8	5	31.2	16	100.0	

Protein							
Less	20	83.3	4	16.7	24	100.0	0.048
Moderate	14	82.4	3	17.6	17	100.0	
High	15	55.6	12	44.4	27	100.0	
Fat						100.0	
Less	18	85.7	3	14.3	21	100.0	0.035
Moderate	12	85.7	2	14.3	14	100.0	
High	19	57.6	14	42.4	33	100.0	

**Abbreviations:** BMI, Body Mass Index.

In this study, protein was significantly correlated with protein intake ( $p < 0.05$ ). As much as 42.4% of obese students had high protein intake. Theoretically, protein consumption, especially animal protein, can be a risk factor for obesity. Animal protein contains high levels of fat, cholesterol, and sugar. So that excessive consumption and lasts for a long time will increase the risk of obesity. A study conducted in "1804 adolescents aged 12.5 to 17.5 years from 10 cities in Europe (Stockholm, Athens, Heraklion, Rome, Zaragoza, Ghent, Lille, Dortmund, Vienna, and Pecs) found that BMI and body fat percentage were positively associated with energy percentage of animal protein".<sup>24</sup> It should be emphasized, nevertheless, that "their average total protein intakes exceeded the World Health Organization (WHO) recommendations (10.0 – 15.0% of the total energy intake) and the estimated average requirements (EAR) and population reference intake (PRI) of the European Food Safety Authority (EFSA)".<sup>24</sup> Significant positive associations between intakes of total protein, animal protein, branched-chain amino acids (BCAAs), and sulfur-containing amino acids (SCAAs) with general body adiposity which indicated by body-mass-index-for-age z-scores (BMIz). "Animal protein and SCAAs were also associated with central obesity which indicated by waist-to-height ratios (WHtR). Total and animal protein and BCAA and SCAA were also significantly associated with fat mass".<sup>25</sup> A study in Belgium showed "that in males aged  $\geq 15$  years, animal protein intake was positively associated with BMI and waist circumference".<sup>26</sup> Meat consumption of  $\geq 1$  kg for 28.5 months could increase the risk for weight gain.<sup>27</sup> In a randomized controlled lifestyle intervention, reducing the consumption of red meat could lower the mean BMI value among Chinese students.<sup>28</sup> Among females, "those who consume more eggs tended to consume more red meat and higher energy and protein intake, resulting in the significant dose-response relationships between egg consumption and overweight with excessive body fat/central obesity. It was notably that every 10 g/day increment of egg reduces 23% risk overweight and central obesity and overweight and excessive body fat".<sup>29</sup>

Fat intake was also correlated with obesity in university students ( $p < 0.05$ ), in which almost a half of obese students consume more than 120% RDA of fat. It is inline with a study conducted that showed a relationship between fat consumption and obesity with a Chi-square analysis value of  $p = 0.001$ .<sup>20</sup> A study that analyzing the effect of "different amount of fat intake to body fatness (body weight, body mass index, or waist circumference) further supported this finding and the study showed that diets lower in total fat were associated with lower relative body weight by 1.6 kg, lower body mass index ( $-0.51$  kg/m<sup>2</sup>), and lower waist circumference by 0.3 cm".<sup>30</sup> "High intake of dietary saturated fatty acids (SFA) and low intake ratio of polyunsaturated fatty acids (PUFA) to SFA ( $< 0.38$ ) could increase the risk of having a BMI  $\geq 25$  kg/m<sup>2</sup>, which is overweight

according to WHO indicator, and being abdominally obese".<sup>31</sup> Frequent consumptions of meat (>3-4 times a week) and eggs (>once a day) were "associated with a significantly higher risk of obesity/overweight owing to the associated higher intake of total fat, saturated fat, and total calories. High intake of total fat and saturated fat might be the main cause of increased risk for central obesity".<sup>15</sup> High energy % of saturated fat could lead to increased risk of obesity in Bahraini children.<sup>32</sup> Compared with carbohydrates that use 23% of energy to be converted into fat stores in adipose tissue, fat only requires 3% of energy. Therefore, fat consumption tends to cause obesity more quickly than carbohydrates and protein.<sup>33</sup>

## CONCLUSION

After all of the data were analyzed, then it comes to the conclusion. From the result found it is known that the variables of protein consumption and fat consumption are significantly related to the incidence of obesity in the 2014 UKI Faculty of Medicine Students ( $p < 0.05$ ). However, the variable of carbohydrate consumption was not significantly related to the incidence of obesity in students of the 2014 UKI Faculty of Medicine Students ( $p > 0.05$ ). Detection of the nutritional status of adolescents and adults can be carried out periodically at schools or campuses for all adolescents and students to prevent undernutrition and overnutrition in adolescents and young adults due to incorrect consumption of carbohydrates, fats, and proteins. The campus must provide counselling about the importance of adequate nutrition and activity or other risk factors that cause obesity to prevent increased obesity rates among productive age. Providing the material included in the lecture module and counselling about the importance of nutritional intake or other risk factors that cause obesity to prevent the increase in obesity rates among productive age.

**Commented [DELL11]:** Has this suggestion been discussed in the result and discussion section? If it is, please indicate it and if it cannot, be discussed first before including it in the conclusion.

## CONFLICT OF INTEREST AND FUNDING DISCLOSURE

All authors have no conflict of interest in this article. This research has no any funding source.

## REFERENCES

1. Piché, M.-E., Poirier, P., Lemieux, I. & Després, J.-P. Overview of Epidemiology and Contribution of Obesity and Body Fat Distribution to Cardiovascular Disease: An Update. *Prog. Cardiovasc. Dis.* **61**, 103–113 (2018).
2. WHO. *Noncommunicable Disease: Country Profiles 2018*. World Health Organization (2016) doi:10.1002/9781119097136.part5.
3. Mary, S. & Stoler, A. Does Agricultural Trade Liberalization Increase Obesity in Developing Countries? *Rev. Dev. Econ.* **25**, 1326–1350 (2021).
4. Ajayi, I. O. *et al.* Urban-rural and Geographic Differences in Overweight and Obesity in Four Sub-Saharan African Adult Populations: A Multi-Country Cross-Sectional Study. *BMC Public Health* **16**, 1126 (2016).
5. Haththotuwa, R., Wijeyaratne, C. & Senarath, U. Worldwide Epidemic of Obesity. in *Obesity and Obstetrics* 3–8 (Elsevier, 2020). doi:10.1016/B978-0-12-817921-5.00001-1.
6. Arundhana, A. I., Utami, A. P., Muqni, A. D. & Thalavera, M. T. Regional Differences in Obesity Prevalence and Associated Factors among Adults: Indonesia Basic Health Research 2007 and 2013. *Malays. J. Nutr.* **24**, (2018).
7. Daud, N. M. *et al.* Knowledge, Attitude and Practice Regarding Dietary Fibre Intake among Malaysian Rural and Urban Adolescents. *Malays. J. Nutr.* **24**, 77–88 (2018).

8. Li, X. *et al.* Quantification of artificial sweeteners in alcoholic drinks using direct analysis in real-time QTRAP mass spectrometry. *Food Chem.* **342**, 128331 (2021).
9. C.Y., T., S.R., A. & D.S.Q., K. Dietary habits and lifestyle practices among university students in universiti Brunei Darussalam. *Malaysian J. Med. Sci.* **25**, 56–66 (2018).
10. Shah, T. *et al.* Assessment of obesity, overweight and its association with the fast food consumption in medical students. *J. Clin. Diagn. Res.* **8**, CC05-CC7 (2014).
11. National Institute of Health Research and Development. *National Report on Basic Health Research 2013. National Institute of Health Research and Development Ministry of Health Republic of Indonesia* (2013) doi:1 Desember 2013.
12. Gopalakrishnan, S., Ganeshkumar, P., Prakash, M. V. S., Christopher & Amalraj, V. Prevalence of overweight/obesity among the medical students, Malaysia. *Med. J. Malaysia* **67**, 442–444 (2012).
13. Pengpid, S. & Peltzer, K. Prevalence of overweight/obesity and central obesity and its associated factors among a sample of university students in India. *Obes. Res. Clin. Pract.* **8**, e558–e570 (2014).
14. Pengpid, S. & Peltzer, K. Prevalence of overweight and underweight and its associated factors among male and female university students in Thailand. *HOMO* **66**, 176–186 (2015).
15. Gunes, F. E., Bekiroglu, N., Imeryuz, N. & Agirbasli, M. Relation between eating habits and a high body mass index among freshman students: A cross-sectional study. *J. Am. Coll. Nutr.* **31**, 167–174 (2012).
16. Salameh, P. *et al.* Assessment of dietary intake patterns and their correlates among university students in Lebanon. *Front. Public Heal.* **2**, 1–12 (2014).
17. Yahia, N., Brown, C. A., Rapley, M. & Chung, M. Level of Nutrition Knowledge and Its Association with Fat Consumption among College Students. *BMC Public Health* **16**, 1–10 (2016).
18. Kin-Kit Li *et al.* An Examination of Sex Differences in Relation to the Eating Habits and Nutrient Intakes of University Students. *J. Nutr. Educ. Behav.* **44**, (2012).
19. Subhaluksuksakorn, P., Sinjariyanon, W. & Pimsaran, R. Gender Difference in Underweight, Overweight and Obesity among First-Year Students of Suranaree University of Technology in 2015. *J. Med. Assoc. Thai.* **99**, S24–S29 (2016).
20. Hadi, A. J. *et al.* Consumption Pattern and Nutrition Conseling Roles on Obesity of Integrated Primary School Students. *Unnes J. Public Heal.* **8**, (2019).
21. Hutahaean, G. D. M. Correlation between Meal Pattern and Physical Activity with Obesity among 5th and 6th Grade Students at Shafiyatul Amaliyyah Elementary School. (University of Sumatra Utara, 2013).
22. Diana, R., Yuliana, I., Yasmin, G. & Hardinsyah. Risk Factors of Overweight among Indonesian Women. *Indones. J. Nutr. Food* **8**, (2013).
23. Sasakabe, T., Haimoto, H., Umegaki, H. & Wakai, K. Association of decrease in carbohydrate intake with reduction in abdominal fat during 3-month moderate low-carbohydrate diet among non-obese Japanese patients with type 2 diabetes. *Metabolism* **64**, 618–625 (2015).
24. Lin, Y. *et al.* Dietary animal and plant protein intakes and their associations with obesity and cardio-metabolic indicators in European adolescents: The HELENA cross-sectional study. *Nutr. J.* **14**, 1–11 (2015).
25. Segovia-Siapco, G. *et al.* Animal Protein Intake Is Associated with General Adiposity in Adolescents: The Teen Food and Development Study. *Nutrients* vol. 12 (2020).
26. Lin, Y. *et al.* Plant and animal protein intake and its association with overweight and obesity among the Belgian population. *Br. J. Nutr.* **105**, 1106–1116 (2011).
27. Schlesinger, S. *et al.* Food Groups and Risk of Overweight, Obesity, and Weight Gain: A Systematic Review and Dose-Response Meta-Analysis of Prospective Studies. *Adv. Nutr.* **10**, 205–218 (2019).
28. Xu, F. *et al.* Effectiveness of a Randomized Controlled Lifestyle Intervention to Prevent Obesity among Chinese Primary School Students: CLICK-Obesity Study. *PLoS One* **10**, e0141421 (2015).
29. Liu, R., Zhao, Y., Li, Q., Dang, S. & Yan, H. Body Fat Mass, Fat Distribution and Egg Consumption: a Population-Based Study in Chinese Adults: Egg consumption and Body Fat in Rural Chinese. *J. Am. Coll. Nutr.* **39**, 528–536 (2020).
30. Hooper, L., Abdelhamid, A., Douthwaite, W., Skeaff, C. M. & Summerbell, C. D. Effect of reducing total fat intake on body weight: systematic review and meta-analysis of randomised controlled trials and cohort studies. *BMJ* (2012).
31. Phillips, C. M. *et al.* High Dietary Saturated Fat Intake Accentuates Obesity Risk Associated with the Fat Mass and Obesity-Associated Gene in Adults. *J. Nutr.* **142**, 824–831 (2012).
32. Gharib, N. & Rasheed, P. Energy and macronutrient intake and dietary pattern among school children in Bahrain: a

cross-sectional study. *Nutr. J.* **10**, 62 (2011).

33. AlOudat, M., NorbertMagyar, LíviaSimon-Sarkadi & Lugasi, A. Nutritional Content of Ready-to-Eat Meals Sold in Groceries in Hungary. *Int. J. Gastron. Food Sci.* **24**, (2021).

## Hubungan Asupan Karbohidrat, Protein, dan Lemak dengan Kejadian Obesitas pada Mahasiswa Fakultas Kedokteran UKI 2014

### Relationship between Carbohydrate, Protein, and Fat Consumption with Obesity Incidence in 2014 UKI Faculty of Medicine Students

#### ABSTRAK

**Latar Belakang:** Obesitas adalah penimbunan lemak yang berlebihan di dalam tubuh. Konsumsi karbohidrat, protein, dan lemak berlebih dapat meningkatkan resiko obesitas. Hal ini terjadi ketika ada ketidakseimbangan antara jumlah energi yang masuk melalui makanan dengan jumlah energi yang keluar.

**Tujuan:** Penelitian ini bertujuan untuk mengetahui hubungan antara asupan karbohidrat, protein, dan lemak dengan kejadian obesitas pada mahasiswa Fakultas Kedokteran Universitas Kristen Indonesia tahun 2014.

**Metode:** Metode penelitian yang digunakan adalah analitik kuantitatif dengan desain studi *case control*. Jumlah sampel yang diambil sebanyak 68 orang. Teknik analisis menggunakan SPSS dengan uji *Chi-square* dan regresi logistik.

**Hasil:** Sebanyak 27.9% siswa mengalami obesitas, dimana 33.3% adalah laki-laki dan 25.5% adalah perempuan. Berdasarkan hasil analisa bivariat, terdapat hubungan antara kejadian obesitas dengan konsumsi protein ( $p=0,048$ ) dan konsumsi lemak ( $p=0,035$ ) sementara tidak ada hubungan antara obesitas dengan asupan karbohidrat ( $p=0,373$ ).

**Kesimpulan:** Insiden obesitas pada mahasiswa kedokteran UKI angkatan 2014 disebabkan oleh tingginya konsumsi lemak dan protein, bukan karena konsumsi karbohidrat.

**Kata Kunci:** Karbohidrat, Lemak, Obesitas, Protein

#### ABSTRACT

**Background:** Obesity is an excessive fat accumulation in the body. Excessive consumption of carbohydrates, protein, and fat can increase the risk of obesity. It occurs when there is an imbalance between the energy number that goes through food and the energy that comes out through physical activity.

**Objectives:** This study aims to know the relationship between carbohydrate, protein, and fat consumption and obesity among the 2014 UKI Faculty of Medicine Students.

**Method:** This study is analytical observational research with a case-control design. The samples are 68 students from batch 2014. The data is analyzed by SPSS using Chi-square and logistic regression.

**Results:** A total of 27.9% of students were obese, of which 33.3% were male and 25.5% were female. Based on the results of bivariate analysis, there is a relationship between obesity and protein consumption ( $p=0,048$ ) and fat consumption ( $p=0,035$ ), while there is no correlation between obesity incidence and carbohydrate consumption ( $p=0,373$ ).

**Conclusions:** The incidence of obesity in UKI Medicine Students batch 2014 was caused by the high consumptions of fat and protein. It was not caused by the consumption of carbohydrate.

**Keywords:** Obesity, Carbohydrate, Protein, Fat

Commented [MOU12]: conclusions can be rearranged by concluding the results of the research as a whole, not rewriting the research results

Commented [MOU13R12]: done

Commented [MOU14]: alphabetical order

Commented [MOU15R14]: done

Commented [MOU16]: done

#### INTRODUCTION

Obesity is an abnormal or excessive accumulation of fat in the body and poses a health risk. "Excess body fat can increase the risk of hypertension, cardiovascular disease, stroke, type 2 diabetes mellitus, some types of cancer, including breast, colon, prostate, pancreatic, and kidney cancers, and conditions such as obstructive sleep apnoea and osteoarthritis".<sup>1,2</sup> The overweight and obesity which is highly increased has been recognized as a global problem by the World Health Organization (WHO) and is a primary problem in developing countries. Increasing income, urbanization and changing lifestyles clearly show that developing countries face the same problem of being overweight and obese.<sup>3</sup> The BMI classification from the Indonesian Ministry of Health, a person is obese if the BMI calculation result is  $> 27.0$ . In the BMI classification, a person with a BMI value of 25.0-27.0 is said to have a lighter weight level. Normal body weight has a BMI value of 18.5-25.0. A BMI value below 18.5 is said to be underweight. Based on WHO data, "in 2014, there were  $>1.9$  billion adults ( $\geq 18$  years) worldwide overweight, 600 million of whom were obese. As much as 39% of the world's population aged 18 years are overweight, in which 38% are men, 40% are women".<sup>4</sup> Meanwhile, 13% of the world's population aged 18 years are obese, of which 11% are male, and 15% are female.<sup>5</sup> The prevalence of obese adults is 15.4% of the entire population of Indonesia. 15.4% of the total obese population, 19.7% are adult men, and 32.9% are adult women. In the same year in the DKI Jakarta area, the total obese male adult population was 15.8%, and the obese adult female population was 26.2%.<sup>6</sup>

It is accepted globally that the cause of the obesity is the imbalance between expenditure and energy intake, besides, it is related to the dietary intake and lifestyle. Overeating energy from carbohydrates and fats and excess protein can lead to overnutrition problems, seen in obesity. The habit of consuming unhealthy snacks with high-calorie content without consuming moderate vegetables and fruit as a source of fibre increases the risk of obesity.<sup>7</sup> In addition, consumption of food containing many artificial sweeteners, such as soda, could also increase the risk of obesity.<sup>8</sup> Restaurants that serve fast food are increasingly widespread and easy to find, so this high-calorie food is the choice of most people today because of its easy and fast access. A study conducted in Brunei Darussalam found that "most university students had poor eating habits (skipped breakfast, frequent snacking, fried food consumption at least three times per week and low intake of daily fruits and vegetables), and those with overweight/obesity had a significantly higher frequency of visits to fast food restaurants".<sup>9</sup> Medical students are commonly known to experience challenging and stressful learning environment, hence it might affect their day to day routine, which includes choice of food. Among Indian medical students, "BMI was significantly associated with evening and night time fast food eating, along with less physical activity and intake of soft drinks".<sup>10</sup>

Based on the data above, it is noted that many adults are obese. The authors are interested in researching the relationship between carbohydrate, protein and fat consumption on obesity in the in 2014 UKI Faculty of Medicine Students. Based on the background described above, the formulation of the problem in this study is how is the relationship between carbohydrate, protein and fat consumption on the incidence of obesity in 2014 UKI Faculty of Medicine Students?



In general, this study is aimed at determining whether there was a relationship between carbohydrate, protein and fat consumption on the incidence of obesity in 2014 UKI Faculty of Medicine Students.

## METHOD

This study was conducted with a quantitative analytical design with a case-control approach to determine the relationship between carbohydrate, protein and fat consumption on obesity in students of Medical Faculty, Universitas Kristen Indonesia batch 2014. The study was conducted at the Faculty of Medicine, Universitas Kristen Indonesia, Jalan Mayjend Sutoyo No. 2, Cawang, East Jakarta in November 2018. The population of this study was the 2014 UKI Faculty of Medicine Students, which amounted to 210 students. The sample is part of the number and characteristics possessed by the population. The conclusions learned from the sample will be applied to the population. The Slovin formula was used to calculate the total studied samples. The formula found that the sample size needed for the study was 67.75, which was fulfilled to be 68. The data for this study were primary data covering the characteristics of the respondents (age, sex, weight, and height), eating menu & eating frequency, and Body Mass Index (BMI) to see obesity. Then secondary data includes the number of 2014 UKI Medical Faculty students and data on the results of health examinations regarding weight and height, which were just carried out during the survey so that the number of obese and non-obese students is known. The instruments of this research are a list of questionnaires, a 24-hour food recall form, a height measuring instrument (microtome), and a weight scale.

Obesity was assessed by measuring BMI. BMI is the most frequent and practical indicator to measure the population level of adults' overweight and obesity. The BMI value does not depend on age or gender.<sup>7</sup> What is assessed from BMI is the proportion of body weight to height. The BMI formula is:

$$BMI = \frac{Weight (kg)}{Height (m^2)}$$

After measuring weight and height, the measurement results are entered into the BMI formula. The interpretation of BMI results can be seen from the following classification table.

**Tabel 1.** "Classification of BMI

Classification	BMI (kg/m <sup>2</sup> )	
	Principal cut-off points	Additional cut-off points
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
Overweight	≥25.00	≥25.00
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	≥30.00	≥30.00

**Commented [DELL17]:** Did this study not include physical activity data?

**Commented [MOU18R17]:** We only measured BMI status

**Commented [MOU19R17]:**

Obese class I	30.00 - 34.99	30.00 - 32.49 32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49 37.50 - 39.99
Obese class III	≥40.00	≥40.00

Source: World Health Organization<sup>1</sup>

Data analysis was carried out after all data were collected. The researcher analyzed the data through several stages. First, editing, to check the completeness of the data. Food recall data that has been collected were analyzed through the Nutri Survey 2007 program. Consumption data (carbohydrate, protein, and fat) were categorized into three groups: a) Less, if the consumption level was below 80% of Indonesian recommended dietary allowance (RDA), b) Moderate, if the consumption level was 80 to 120% RDA, and c) High, if the consumption level was more than 120% RDA. All data variables then analyzed using the SPSS 24.0 (Statistic Package for the Social Science) program. The analysis technique used was univariate, bivariate, and multivariate analysis. Univariate analysis is used to describe a research result. In this study, univariate analysis consisted of frequency distribution and percentage of respondents' identities such as gender and age, BMI, which were divided into two categories, namely obese and not obese, carbohydrate consumption, protein consumption, and fat consumption. Bivariate analysis was used to analyze two variables that were thought to be related. The statistical test used is the test of Chi-square. If the  $p$ -value  $< 0.05$ ,  $H_0$  is rejected, which means there is a relationship between the two variables. If the  $p$ -value  $> 0.05$ ,  $H_0$  fails to be rejected, which means there is no relationship between the dependent and independent variables.

## RESULTS AND DISCUSSION

The research was conducted at UKI Faculty of Medicine, in February 2018, with the population in this study was batch 2014 students, totaling 210 students. The sample taken for the study amounted to 68 students. Distribution based on the subject's characteristics, including the age and gender of the subject, is presented in Table 2. It shows that most of the respondents in this study were female (69.1%). The highest proportion of respondents in this study were 58.8% (40 people) of 21 years of age, 19 years of age had a proportion of 4.4% (3 people), 20 years of age 16.2% (11 people), and 22 years old as much as 20.6% (14 people).

**Table 2.** Characteristics of Students in the 2014 UKI Medical Faculty

Characteristics	n	%
Gender		
Male	21	30.9
Female	47	69.1
Age		
19 years old	3	4.4
20 years old	11	16.2
21 years old	40	58.8
22 years old	14	20.6

**Commented [DELL20]:** You can add data on the average consumption of carbohydrates, protein and fat of the respondents. The data will be on table 3

**Commented [MOU21R20]:** done

**Commented [DELL22]:** Did you mean "n" ?  
Yes it should be n

**Commented [MOU23R22]:** done

Table 3 shows that the male and female respondents BMI who have a normal BMI (24 subjects) has a total which is more than respondents who have a BMI of underweight, overweight, and obesity. Even though it has a smaller number, the results of this measurement also show that the problem of BMI status, both less and too much among young adults, is still a problem. This figure is even higher than the 2013 *RISKESDAS*, where the prevalence of BMI in adults (>18 years) is found to be 8.7 per cent underweight, 13.5 per cent overweight and 15.4 per cent obese.<sup>11</sup> The proportion of respondents who are obese is 27.9%, and respondents who are not obese are 72.1%. The obesity prevalence among university students was also higher compared to other Asian countries such as Malaysia (5.2%)<sup>12</sup>, India (10.7%)<sup>13</sup>, and Thailand (13%)<sup>14</sup>. In this study, Males' obesity was higher (33.3%) compare to the female students' obesity (25.5%). This is consistent with a study in university students aged 18 to 22 years population who are from Turkish. It was found that male gender as independent predictor of obesity/overweight, and as much as 78.5% of male students had obesity (BMI  $\geq 25$  kg/m<sup>2</sup>).<sup>15</sup> In private universities, "females were more likely to adopt the vegetarian/low calorie diet than males, while males were more prone to adopt a westernized diet, which is high loadings of fried potatoes and chips, fast foods, carbonated beverages, and desserts with slightly lower but still a positive loading of hot beverages such as coffee, tea".<sup>16</sup>

**Commented [DELL24]:** 24 subject or percent?  
There is no % only 24 subject

**Commented [MOU25R24]:** Done, it should be subjects

The average level of carbohydrate consumption adequacy for three measurements, it was found that for the male and female respondents who were included in the less category had a greater number of 29 people (42.6%), while for the moderate category it was twenty-three people (33.8%) and high categories amounted to 16 people (23.5%). The average level of protein consumption adequacy for three measurements, it was found that male and female respondents belonging to the high category had a greater number of 27 people (39.7%), while for the less category it was 24 people (35.3%) and the moderate category is 17 people (25.0%). Meanwhile, the average level of fat consumption adequacy for three measurements, it was found that male and female respondents who were included in the High category had a higher number of 33 people (48.5%), while for the Less category there were 21 people (30.9%) and the Moderate category amounted to 14 people (20.6%). In this study, we found high average level of fat consumptions in male and female, however in other similar study found the male were particularly more prone to adopt high calories meals than female<sup>16</sup>

**Commented [DELL26]:** What does this sentence mean?  
29 people deleted and no dot

**Commented [MOU27R26]:** done

**Commented [DELL28]:** I also do not understand the meaning of this sentence. Please arrange it properly and according to the data in the table.  
There was double rewrite, We already repair it

**Commented [MOU29R28]:** done

**Commented [DELL30]:** After this paragraph, additional data can be given in the form of other similar research data regarding the consumption of carbohydrates, proteins, and fats in general students.

**Commented [MOU31R30]:** Done, I will add some other reference

Majority of male students consumed less carbohydrate (52.4%), less protein (38.1%), and high fat (57.1%). Meanwhile, female students consume less carbohydrate (38.3%), but had high consumption for protein (42.6%) and fat (44.7%). A study of 231 students from Central Michigan University discovered that both male and female students had high consumption of fat, but female had lower saturated fat intake compared to those of male due to better nutritional knowledge.<sup>17</sup> Moreover, "male students consumed a higher energy content from fat and engaged less often in various healthful eating habits (eg, reading food labels, having breakfast) than female students".<sup>18</sup> Another possible reason is that

“female students pay more attention to their physical appearance and body figure and try to restrict caloric food consumptions than that of males”.<sup>19</sup>

**Table 3.** Body mass index and nutritional intake based on recommended dietary allowance

Variables	Male		Female		Total	
	N	%	N	%	N	%
<b>BMI Status</b>						
Underweight	4	19.1	7	14.9	11	16.1
Normal	7	33.3	17	36.2	24	35.3
Overweight	3	14.3	11	23.4	14	20.6
Obese	7	33.3	12	25.5	19	28
<b>Obesity Status</b>						
Not Obese	14	66.7	35	74.5	49	72.1
Obese	7	33.3	12	25.5	19	27.9
<b>Carbohydrate Consumption</b>						
Less	11	52.4	18	38.3	29	42.6
Moderate	7	33.3	16	34.0	23	33.8
High	3	14.3	13	27.7	16	23.5
<b>Protein Consumption</b>						
Less	8	38.1	16	34.0	24	35.3
Moderate	6	28.6	11	23.4	17	25.0
High	7	33.3	20	42.6	27	39.7
<b>Fat Consumption</b>						
Less	5	23.8	16	34.0	21	30.9
Moderate	4	19.0	10	21.3	14	20.6
High	12	57.1	21	44.7	33	48.5

**Abbreviations:** BMI, Body Mass Index.

The study found no relationship between carbohydrate consumption level with obesity ( $p > 0.05$ ) (Table 4). Research at the East Java Provincial Health Office showed the same results with a  $p$ -value of 0.523.<sup>20</sup> Based on the theory, excessive consumption of carbohydrates will cause obesity. Carbohydrates consumed will be broken down into glucose. If the body no longer needs glucose, excess glucose will be stored in glycogen in the liver and fat. When needed, for example, in a state of hypoglycemia, glycogen will be broken down through the process of gluconeogenesis. The study results were different from the theory because the respondents did not fill out the complete food recall questionnaire completely. On the other hand, several studies have shown a significant relationship between carbohydrate consumption and obesity, as conducted by Grace Duma<sup>21</sup> and Rian Diana et al.<sup>22</sup> “Moderate low-carbohydrate diet (M-LCD) has shown significant effect on obesity status after three months intervention and decrease in carbohydrate intake (g/day) and %carbohydrate were correlated with decrease (%) in visceral adipose tissue (VAT), and the correlations were significant in men even after adjusting for age and changes in energy intake in multiple regression analysis”.<sup>23</sup>

**Table 4.** Relationship between carbohydrate, protein, and fat consumption level with obesity incidence in 2014 UKI Medical Faculty Students

Consumption Level	BMI				Total	%	$p$ -value
	Not Obese	%	Obese	%			
<b>Carbohydrate</b>							
Less	19	65.5	10	34.5	29	100.0	0.373
Moderate	19	82.6	4	17.4	23	100.0	
High	11	68.8	5	31.2	16	100.0	

Protein							
Less	20	83.3	4	16.7	24	100.0	0.048
Moderate	14	82.4	3	17.6	17	100.0	
High	15	55.6	12	44.4	27	100.0	
Fat						100.0	
Less	18	85.7	3	14.3	21	100.0	0.035
Moderate	12	85.7	2	14.3	14	100.0	
High	19	57.6	14	42.4	33	100.0	

**Abbreviations:** BMI, Body Mass Index.

In this study, protein was significantly correlated with protein intake ( $p < 0.05$ ). As much as 42.4% of obese students had high protein intake. Theoretically, protein consumption, especially animal protein, can be a risk factor for obesity. Animal protein contains high levels of fat, cholesterol, and sugar. So that excessive consumption and lasts for a long time will increase the risk of obesity. A study conducted in "1804 adolescents aged 12.5 to 17.5 years from 10 cities in Europe (Stockholm, Athens, Heraklion, Rome, Zaragoza, Ghent, Lille, Dortmund, Vienna, and Pecs) found that BMI and body fat percentage were positively associated with energy percentage of animal protein".<sup>24</sup> It should be emphasized, nevertheless, that "their average total protein intakes exceeded the World Health Organization (WHO) recommendations (10.0 – 15.0% of the total energy intake) and the estimated average requirements (EAR) and population reference intake (PRI) of the European Food Safety Authority (EFSA)".<sup>24</sup> Significant positive associations between intakes of total protein, animal protein, branched-chain amino acids (BCAAs), and sulfur-containing amino acids (SCAAs) with general body adiposity which indicated by body-mass-index-for-age z-scores (BMIz). "Animal protein and SCAAs were also associated with central obesity which indicated by waist-to-height ratios (WHtR). Total and animal protein and BCAA and SCAA were also significantly associated with fat mass".<sup>25</sup> A study in Belgium showed "that in males aged  $\geq 15$  years, animal protein intake was positively associated with BMI and waist circumference".<sup>26</sup> Meat consumption of  $\geq 1$  kg for 28.5 months could increase the risk for weight gain.<sup>27</sup> In a randomized controlled lifestyle intervention, reducing the consumption of red meat could lower the mean BMI value among Chinese students.<sup>28</sup> Among females, "those who consume more eggs tended to consume more red meat and higher energy and protein intake, resulting in the significant dose-response relationships between egg consumption and overweight with excessive body fat/central obesity. It was notably that every 10 g/day increment of egg reduces 23% risk overweight and central obesity and overweight and excessive body fat".<sup>29</sup>

Fat intake was also correlated with obesity in university students ( $p < 0.05$ ), in which almost a half of obese students consume more than 120% RDA of fat. It is inline with a study conducted that showed a relationship between fat consumption and obesity with a Chi-square analysis value of  $p = 0.001$ .<sup>20</sup> A study that analyzing the effect of "different amount of fat intake to body fatness (body weight, body mass index, or waist circumference) further supported this finding and the study showed that diets lower in total fat were associated with lower relative body weight by 1.6 kg, lower body mass index ( $-0.51 \text{ kg/m}^2$ ), and lower waist circumference by 0.3 cm".<sup>30</sup> "High intake of dietary saturated fatty acids (SFA) and low intake ratio of polyunsaturated fatty acids (PUFA) to SFA ( $< 0.38$ ) could increase the risk of having a BMI  $\geq 25 \text{ kg/m}^2$ , which is overweight

according to WHO indicator, and being abdominally obese".<sup>31</sup> Frequent consumptions of meat (>3-4 times a week) and eggs (>once a day) were "associated with a significantly higher risk of obesity/overweight owing to the associated higher intake of total fat, saturated fat, and total calories. High intake of total fat and saturated fat might be the main cause of increased risk for central obesity".<sup>15</sup> High energy % of saturated fat could lead to increased risk of obesity in Bahraini children.<sup>32</sup> Compared with carbohydrates that use 23% of energy to be converted into fat stores in adipose tissue, fat only requires 3% of energy. Therefore, fat consumption tends to cause obesity more quickly than carbohydrates and protein.<sup>33</sup> In this study, fat and protein consumptions were the etiologies of high incidence of the obesity. Knowledge about type of meals should be known before eating.

Commented [MOU32]: New sentences

## CONCLUSION

After all of the data were analyzed, then it comes to the conclusion. From the result found it is known that the variables of protein consumption and fat consumption are significantly related to the incidence of obesity in the 2014 UKI Faculty of Medicine Students ( $p < 0.05$ ). However, the variable of carbohydrate consumption was not significantly related to the incidence of obesity in students of the 2014 UKI Faculty of Medicine Students ( $p > 0.05$ ). Detection of the nutritional status of adolescents and adults can be carried out periodically at schools or campuses for all adolescents and students to prevent undernutrition and overnutrition in adolescents and young adults due to incorrect consumption of carbohydrates, fats, and proteins. The campus must provide counselling about the importance of adequate nutrition and activity or other risk factors that cause obesity to prevent increased obesity rates among productive age. Providing the material included in the lecture module and counselling about the importance of nutritional intake or other risk factors that cause obesity to prevent the increase in obesity rates among productive age.

Commented [DELL33]: Has this suggestion been discussed in the result and discussion section? If it is, please indicate it and if it cannot, be discussed first before including it in the conclusion.

Commented [MOU34R33]: Done. We add more sentences about this, in the last paragraph of discussion section (new sentences).

## CONFLICT OF INTEREST AND FUNDING DISCLOSURE

All authors have no conflict of interest in this article. This research has no any funding source.

## REFERENCES

1. Piché, M.-E., Poirier, P., Lemieux, I. & Després, J.-P. Overview of Epidemiology and Contribution of Obesity and Body Fat Distribution to Cardiovascular Disease: An Update. *Prog. Cardiovasc. Dis.* **61**, 103–113 (2018).
2. WHO. *Noncommunicable Disease: Country Profiles 2018*. World Health Organization (2016) doi:10.1002/9781119097136.part5.
3. Mary, S. & Stoler, A. Does Agricultural Trade Liberalization Increase Obesity in Developing Countries? *Rev. Dev. Econ.* **25**, 1326–1350 (2021).
4. Ajayi, I. O. *et al.* Urban-rural and Geographic Differences in Overweight and Obesity in Four Sub-Saharan African Adult Populations: A Multi-Country Cross-Sectional Study. *BMC Public Health* **16**, 1126 (2016).
5. Haththotuwa, R., Wijeyaratne, C. & Senarath, U. Worldwide Epidemic of Obesity. in *Obesity and Obstetrics* 3–8 (Elsevier, 2020). doi:10.1016/B978-0-12-817921-5.00001-1.
6. Arundhana, A. I., Utami, A. P., Muqni, A. D. & Thalavera, M. T. Regional Differences in Obesity Prevalence and Associated Factors among Adults: Indonesia Basic Health Research 2007 and 2013. *Malays. J. Nutr.* **24**, (2018).
7. Daud, N. M. *et al.* Knowledge, Attitude and Practice Regarding Dietary Fibre Intake among Malaysian Rural and

- Urban Adolescents. *Malays. J. Nutr.* **24**, 77–88 (2018).
8. Li, X. *et al.* Quantification of artificial sweeteners in alcoholic drinks using direct analysis in real-time QTRAP mass spectrometry. *Food Chem.* **342**, 128331 (2021).
  9. C.Y., T., S.R., A. & D.S.Q., K. Dietary habits and lifestyle practices among university students in universiti Brunei Darussalam. *Malaysian J. Med. Sci.* **25**, 56–66 (2018).
  10. Shah, T. *et al.* Assessment of obesity, overweight and its association with the fast food consumption in medical students. *J. Clin. Diagn. Res.* **8**, CC05-CC7 (2014).
  11. National Institute of Health Research and Development. *National Report on Basic Health Research 2013. National Institute of Health Research and Development Ministry of Health Republic of Indonesia* (2013) doi:1 Desember 2013.
  12. Gopalakrishnan, S., Ganeshkumar, P., Prakash, M. V. S., Christopher & Amalraj, V. Prevalence of overweight/obesity among the medical students, Malaysia. *Med. J. Malaysia* **67**, 442–444 (2012).
  13. Pengpid, S. & Peltzer, K. Prevalence of overweight/obesity and central obesity and its associated factors among a sample of university students in India. *Obes. Res. Clin. Pract.* **8**, e558–e570 (2014).
  14. Pengpid, S. & Peltzer, K. Prevalence of overweight and underweight and its associated factors among male and female university students in Thailand. *HOMO* **66**, 176–186 (2015).
  15. Gunes, F. E., Bekiroglu, N., Imeryuz, N. & Agirbasli, M. Relation between eating habits and a high body mass index among freshman students: A cross-sectional study. *J. Am. Coll. Nutr.* **31**, 167–174 (2012).
  16. Salameh, P. *et al.* Assessment of dietary intake patterns and their correlates among university students in Lebanon. *Front. Public Heal.* **2**, 1–12 (2014).
  17. Yahia, N., Brown, C. A., Rapley, M. & Chung, M. Level of Nutrition Knowledge and Its Association with Fat Consumption among College Students. *BMC Public Health* **16**, 1–10 (2016).
  18. Kin-Kit Li *et al.* An Examination of Sex Differences in Relation to the Eating Habits and Nutrient Intakes of University Students. *J. Nutr. Educ. Behav.* **44**, (2012).
  19. Subhaluksuksakorn, P., Sinjariyanon, W. & Pimsaran, R. Gender Difference in Underweight, Overweight and Obesity among First-Year Students of Suranaree University of Technology in 2015. *J. Med. Assoc. Thai.* **99**, S24–S29 (2016).
  20. Hadi, A. J. *et al.* Consumption Pattern and Nutrition Conseling Roles on Obesity of Integrated Primary School Students. *Unnes J. Public Heal.* **8**, (2019).
  21. Hutahaean, G. D. M. Correlation between Meal Pattern and Physical Activity with Obesity among 5th and 6th Grade Students at Shafiyatul Amaliyyah Elementary School. (University of Sumetara Utara, 2013).
  22. Diana, R., Yuliana, I., Yasmin, G. & Hardinsyah. Risk Factors of Overweight among Indonesian Women. *Indones. J. Nutr. Food* **8**, (2013).
  23. Sasakabe, T., Haimoto, H., Umegaki, H. & Wakai, K. Association of decrease in carbohydrate intake with reduction in abdominal fat during 3-month moderate low-carbohydrate diet among non-obese Japanese patients with type 2 diabetes. *Metabolism* **64**, 618–625 (2015).
  24. Lin, Y. *et al.* Dietary animal and plant protein intakes and their associations with obesity and cardio-metabolic indicators in European adolescents: The HELENA cross-sectional study. *Nutr. J.* **14**, 1–11 (2015).
  25. Segovia-Siapco, G. *et al.* Animal Protein Intake Is Associated with General Adiposity in Adolescents: The Teen Food and Development Study. *Nutrients* vol. 12 (2020).
  26. Lin, Y. *et al.* Plant and animal protein intake and its association with overweight and obesity among the Belgian population. *Br. J. Nutr.* **105**, 1106–1116 (2011).
  27. Schlesinger, S. *et al.* Food Groups and Risk of Overweight, Obesity, and Weight Gain: A Systematic Review and Dose-Response Meta-Analysis of Prospective Studies. *Adv. Nutr.* **10**, 205–218 (2019).
  28. Xu, F. *et al.* Effectiveness of a Randomized Controlled Lifestyle Intervention to Prevent Obesity among Chinese Primary School Students: CLICK-Obesity Study. *PLoS One* **10**, e0141421 (2015).
  29. Liu, R., Zhao, Y., Li, Q., Dang, S. & Yan, H. Body Fat Mass, Fat Distribution and Egg Consumption: a Population-Based Study in Chinese Adults: Egg consumption and Body Fat in Rural Chinese. *J. Am. Coll. Nutr.* **39**, 528–536 (2020).
  30. Hooper, L., Abdelhamid, A., Douthwaite, W., Skeaff, C. M. & Summerbell, C. D. Effect of reducing total fat intake on body weight: systematic review and meta-analysis of randomised controlled trials and cohort studies. *BMJ* (2012).
  31. Phillips, C. M. *et al.* High Dietary Saturated Fat Intake Accentuates Obesity Risk Associated with the Fat Mass and Obesity-Associated Gene in Adults. *J. Nutr.* **142**, 824–831 (2012).

32. Gharib, N. & Rasheed, P. Energy and macronutrient intake and dietary pattern among school children in Bahrain: a cross-sectional study. *Nutr. J.* **10**, 62 (2011).
33. AlOudat, M., NorbertMagyar, LiviaSimon-Sarkadi & Lugasi, A. Nutritional Content of Ready-to-Eat Meals Sold in Groceries in Hungary. *Int. J. Gastron. Food Sci.* **24**, (2021).



AWAL MAIL BERITA KEUANGAN OLARHAGA SELEB LIFESTYLE LAINNYA... yahoo/mail

Amerta Nutrition Universi... Tambah kata kunci Lanjutan

Tulis

Kembali

Email Masuk 999+

Belum Dibaca

Berbintang

Draft 41

Terkirim

Arsip

Spam

Sampah

^ Lebih sedikit

Tampilan Sembunyikan

Foto

Dokumen

Langganan

Folder Sembunyikan

Folder Baru

Amerta Nutrition Universitas Airlangga <amertanutr@fkm.unair.ac.id> Kam, 19 Mei jam 15.47 ☆

Kepada: Ago Harlim

Baik. Terima kasih atas konfirmasinya.

Best Regard,  
**Amerta Nutrition**  
**Department of Health Nutrition**  
**Faculty of Public Health, Universitas Airlangga**  
**Kampus C Jalan Mulyorejo, Surabaya, East Java, Indonesia**  
 Telp. 031-5920948, Fax 031-5924618  
 website: <http://e-journal.unair.ac.id/index.php/AMNT>  
 Email: [amertanutr@fkm.unair.ac.id](mailto:amertanutr@fkm.unair.ac.id)

> Tampilkan pesan asli

Amerta Nutrition Universitas Airlangga <amertanutr@fkm.unair.ac.id> Kam, 19 Mei jam 15.58 ☆

Kepada: Ago Harlim

Yth. Ago Harlim

AWAL MAIL BERITA KEUANGAN OLARHAGA SELEB LIFESTYLE LAINNYA... yahoo/mail

Amerta Nutrition Universi... Tambah kata kunci Lanjutan

Tulis

Kembali

Email Masuk 999+

Belum Dibaca

Berbintang

Draft 41

Terkirim

Arsip

Spam

Sampah

^ Lebih sedikit

Tampilan Sembunyikan

Foto

Dokumen

Langganan

Folder Sembunyikan

+ Folder Baru

New

Amerta Nutrition Universitas Airlangga <amertanutr@fkm.unair.ac.id> Kam, 19 Mei jam 15.58 ☆

Kepada: Ago Harlim

Yth. Ago Harlim

Dengan ini kami menyatakan bahwa artikel Anda yang berjudul **"Relationship between Carbohydrate, Protein, and Fat Consumption with Obesity Incidence in 2014 UKI Faculty of Medicine Students"** telah **"DITERIMA"**

Mohon untuk melengkapi persyaratan Letter of Acceptance (LoA) Anda yaitu surat bebas plagiarisme bermaterai, title page, cover letter dan sertifikat etik (persyaratan tersebut dapat di download pada website <http://e-journal.unair.ac.id/index.php/AMNT> ).

Mohon melakukan pembayaran author fee sebesar Rp 1.000.000,- ke Bank BNI dengan No. Virtual Account 9863030300000331. Nama Virtual Account Universitas Airlangga. Mohon disertakan bukti transfer.

Terima kasih atas perhatian dan kerjasamanya. sehat dan semangat selalu. Kami tunggu karya Anda selanjutnya.

Best Regard,  
**Amerta Nutrition**  
**Department of Health Nutrition**  
**Faculty of Public Health, Universitas Airlangga**  
**Kampus C Jalan Mulyorejo, Surabaya, East Java, Indonesia**  
 Telp. 031-5920948, Fax 031-5924618  
 website: <http://e-journal.unair.ac.id/index.php/AMNT>  
 Email: [amertanutr@fkm.unair.ac.id](mailto:amertanutr@fkm.unair.ac.id)

> Tampilkan pesan asli

