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The Relationship between the Pattern of Fast Food Consumption and the Frequency of Online Food Ordering with Central Obesity in High School Students in Yogyakarta

Hubungan Pola Konsumsi Makanan Cepat Saji dan Frekuensi Pemesanan Makanan Online dengan Obesitas Sentral pada Siswa SMA di Yogyakarta

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ABSTRACT

Background: Adolescents are at risk of experiencing health problems, one of which is central obesity. The factor that can affect central obesity is the consumption of fast food. Easy access to fast food via online food delivery during the COVID-19 pandemic.

Objectives: Analyzed the relationship between the frequency of fast food consumption and the frequency of online food ordering with central obesity in high school students in Yogyakarta City.

Methods: The study sample size was 219 people from 8 senior high schools. The sampling technique used multistage sampling. Collecting data on sample characteristics, frequency of fast food consumption, and online food ordering using Google Forms, abdominal circumference measurements were carried out directly using Medline. Data analysis used Chi-Square and Fisher Exact test.

Results: Most of the sample were women (60.3%), aged <17 years (64.4%), with income <IDR 1,000,000 (90.9%), and physical activity <30 minutes/day (79.9%). Frequency of consuming fast food frequently (≥3 times/week) (81.3%) and frequency of online food rarely ordering (<3 times/week) (71.7%). Bivariate analysis showed that there was no relationship between the frequency of fast food consumption and online food ordering with central obesity ($p>0.05$), and there was a relationship between fast food energy intake and central obesity ($p<0.05$). Multivariate analysis showed a relationship between fast food energy intake and central obesity ($p<0.05$).

Conclusions: There was no relationship between the frequency of fast food consumption and online food ordering with central obesity in high school adolescents in Yogyakarta City.

INTRODUCTION

Central obesity is obesity caused by the presence of excess fat stored in the abdominal region or abdomen. Central obesity assessed using abdominal circumference indicators or pelvic waist circumference ratios can predict cardiovascular disease compared to measurements with Body Mass Index (BMI) in general obesity[1]. Furthermore, central obesity is associated with an increased risk of non-communicable infections, such as cancer, hypertension, type II diabetes mellitus, coronary heart disease, and stroke. The results of previous studies showed that samples with central obesity had a higher risk of developing type II diabetes mellitus[2] and hypertension[3] than those not centrally obese.

The prevalence rate of obesity tripled in 2020 worldwide. More than two billion adults had overweight nutritional status, and 650 million people were obese in 2016. Meanwhile, the latest data from 2019 shows 38.2 million children worldwide with healthy obesity. Likewise, with children and adolescents, one in five elementary school children and one in seven Indonesian teenagers are obese. Meanwhile, in the age group of ≥ 15 years, the prevalence of central obesity in Indonesia reached 31.0% in 2018. The majority is said to have increased compared to 2013, which was 26.6%[4]. Yogyakarta City has a significant obesity incidence of 15.82% in the age range of 15 to 24 years, the highest of any area in Indonesia[5].

Obesity has a meaningful cause, namely energy imbalances in and out[6]. Other central obesity risk factors are age, gender, smoking habits, alcohol consumption habits[7], physical activities such as riding a vehicle to school, increased sedentary lifestyle[8,9], and consumption of fast food or junk food[10]. Previous studies have found that consuming fast food with a frequency of more than three times per week leads to central obesity[11]. There are differences with the results of other studies, namely

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between the consumption of Western fast food and obesity and central obesity[12]. In previous studies, the frequency of fast-food consumption was assessed using the Food Frequency Questionnaire (FFQ). In this study, the frequency of fast-food consumption assessment used the Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ), which can assess the fast-food diet related to the type, frequency, and amount of fast food.

In general, teenagers have a very varied diet and eat in small amounts of both portions and types of food every meal[13]. Teenagers also tend to follow trends such as fast-food consumption without paying attention to nutritional content[14]. During the COVID-19 pandemic, fast food consumption increased 1-2 times/week (43.6%), reaching 40.6% in Indonesia[15]. Access to fast food has become more accessible during the COVID-19 pandemic with the existence of online food ordering or delivery services. The average frequency of food purchases through online food ordering by consumers is 2.6 times per week, an increase of 20.0% compared to purchases before the COVID-19 pandemic. As many as 89.5% of the sample had ordered fast food online, and 52.3% had ordered fast food more than once/per week[16]. In Indonesia, adolescents consume fast food at breakfast (18%), lunch (37%), and dinner (45%) during the COVID-19 pandemic[15]. Previous research examined the correlation between obesity and fast-food consumption, where obesity was assessed using BMI indicators or so-called general obesity[17]. BMI is used to examine the nutritional status of adults aged >18 years[4]. Previous research has examined food orders through online delivery applications conducted on adult women and adolescents using the Food Frequency Questionnaire (FFQ) method, so they are not still at the stage of knowing the frequency of eating. They cannot see the amount of sample intake. Therefore, researchers chose an indicator of abdominal circumference measurement to analyze the relationship between the frequency of fast-food consumption and online food ordering and central obesity in high school students in Yogyakarta City. This study aimed to investigate the relationship between the frequency of fast-food consumption and the frequency of online food ordering with central obesity in high school students in Yogyakarta City.

METHODS

This type of research was observational with a cross-sectional design. This research was conducted in eight selected high schools from 40 high schools in Yogyakarta City in May-July 2022. According to previous studies, the eight selected high schools were obtained from the calculation results, namely the selection of clusters as much as 20% of the total cluster[18]. The research variable consists of central obesity as a dependent variable, the frequency of fast-food consumption and the frequency of online food ordering as an independent variable, energy intake of fast food as an intermediate variable, physical activity as an external variable, and age, sex, and income as a disturbing variable.

The population of this research was 16,651 high school students in Yogyakarta City[19]. The sample size was determined based on the estimation of different proportions in two sample groups (Lemeshow, 1990)[20] with a p-value=15.827, d=0.05, and a confidence level of 95%. Based on the sample size calculation formula, this study required a minimum sample size of 202.2 (rounded to 202 people). The sample size was added to 10% of the minimal sample size to replace incomplete data. The minimum sample size of the study was 222 people. After collecting the data, the number of samples filled in the data was 219 people. Therefore, the sample size of this study was 219 people.

The study subjects were selected using multistage sampling, a process using two or more different sampling methods[18]. This sampling technique was selected because the population was considered heterogeneous and large, so a gradual process was carried out for sample collection to obtain a representative sample. The sampling techniques used were a combination of random cluster sampling, stratified random sampling, and simple random sampling.

The stages drawing of the sample went through three stages. First, sample selection using the cluster random sampling technique. The technique was chosen because researchers could not identify every individual in the population. The subjects of the study were high school students in Yogyakarta City. Cluster in the form of a Senior High School in Yogyakarta City. There are 40 high schools in Yogyakarta City[18]. The number of clusters was 20% of the total high schools in Yogyakarta City. The cluster technique obtained eight selected high schools: SMA Sang Timur, SMAN 9 Yogyakarta, SMAN 5 Yogyakarta, SMAN 6 Yogyakarta, SMAN 8 Yogyakarta, SMAN 4 Yogyakarta, SMA 2 BOPKRI, and SMAN 3 Yogyakarta. The number of subjects from those high schools was 5,330 people. Second, sample selection using a stratified random sampling technique. The use of this technique was due to the population being considered heterogeneous. In each selected high school cluster, strata were made based on the total number of students in each selected high school. Subjects were drawn from each stratum according to the population. A sampling of the number of samples in each stratum with a proportionate stratified random sampling technique. It was because the number of subjects in each stratum is different, e.g., how to take samples in each SMA:

$$\text{Ni: } \frac{Ni}{N}\ x\ n$$

$$\text{SMA Sang Timur: } \frac{117}{5330}\ x\ 222 \\ : 4{,}8 \approx 5$$

Third, simple random selection of samples. After the stratification stage, the sampled subjects were selected randomly using random numbers. However, some high schools could not provide a list of students'

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names, so the research subjects involved are students who meet the research criteria. The exclusion criteria for this study were students who were not willing to be research subjects, pregnant students, and students with a history of illness.

Central obesity is measured by the abdominal circumference indicator in centimeters (cm). Measurement of abdominal circumference through the midpoint on the last rib and the apex of the pelvis or parallel to the navel. The enumerator was beside the subject and attached the midline to the navel without pressing it and categorizing the central obesity variables into two, namely not central obesity (male abdominal circumference < 90 cm and female < 80 cm) and central obesity (male abdominal circumference ≥ 90 cm and female ≥ 80 cm)[4].

Fast food consumption frequency is the amount of sample fast food consumption in the last 1-month before data collection. The frequency of fast-food consumption is assessed by the Semi-Quantitative - Food Frequency Questionnaire (SQ-FFQ) method. The SQ-FFQ questionnaire contains a list of types and frequencies of fast food. The frequency of consumption is assessed daily, weekly, and one month. If the sample consumes at least one type of fast food ≥ 3 times/week or ≥ 3/7, it is said to be frequent, and if the sample consumes < 3 times/week or < 3/7, then it is rare. For example, if there are five types of fast food consumed 2x/week, then 2/7 + 2/7 + 2/7 + 2/7 + 2/7 = 10/7 it falls into the category of frequent.

The frequency of online food orders is the number of food orders made by research samples through online applications (Gofood, Grabfood, Shopeefood) in the last 1-month before data collection. The frequency of online food ordering is categorized as < 3 times/week (rarely) and ≥ 3 times/week (often)[21]. Fast food energy intake is the amount of energy food consumed by research samples from each type of fast food. It is calculated by multiplying the number of times a person eats fast food by the weight of fast food eaten each time (in grams) and then analyzing the results with a nutrition program. For example, sausages are eaten three times a week weighing 50 grams, then the consumption of sample sausages is (3/7) x 50 g = 21.42 g with an energy of 95.3 kcal. The sample's energy intake is grouped based on energy adequacy according to the Recommended Dietary Allowances (RDA). Fast food energy intake is categorized into < 80% RDA, 80-110% RDA, and >110% RDA[22].

Physical activity is a sports activity carried out by a research sample during the last 1-month before data collection. Physical activity is categorized as ≥30 minutes/day and <30 minutes/day[23]. The sample was categorized into < 17 years and ≥ 17 years. Income is the pocket money of research samples derived from parents or personal income in the last 1-month before data collection. Revenue is categorized into < IDR 1,000,000 and ≥ IDR 1,000,000[24]

Data collection was carried out in two ways. First, via Google Forms for semi-structured questionnaires and SQFFQ. Secondly, through direct curling of the abdominal circumference. Data filling through Google Forms was carried out in schools at the same time as the abdominal circumference data were collected directly. Filling out the Google form was accompanied by researchers and enumerators to ensure the sample filled the data correctly. Before taking data, screening was carried out first on the sample. The screening was conducted to ensure the selected sample met the research criteria. Data collection started with screening, so the screening was carried out at the same time as data collection. If the sample met the research criteria, it could be continued for data collection. A semi-structured questionnaire was used to collect data on sample characteristics, online food ordering[25,26], physical activity[27], and income. SQFFQ was used to collect data on the frequency of food consumption and food samples by modifying fast-food types from previous studies[27]. The abdominal circumference was measured directly using Medline to determine central obesity. Researchers and three enumerators carried out the collection of research data. The research enumerator was a Department of Nutrition, STIKes Panti Rapih Yogyakarta student in their second and third year. Before collecting data, the enumerator is trained to use a research questionnaire and abdominal circumference to get the same understanding as the researcher.

Data analysis is carried out in univariate, bivariate, and multivariate. The univariate analysis illustrates the distribution of research variables in frequency and percentage. Bivariate analysis using the Chi-Square test and Fisher Exact test. Chi-Square test to analyze the relationship of frequency of fast-food consumption, online food ordering, physical activity, income, and sex with central obesity. The Fisher Exact test was used to analyze the relationship between fast food energy intake and central obesity because the analysis could not be performed using the Chi-Square test. Logistic Regression Test was used in multivariate analysis, namely, to analyze the relationship between variables, which in bivariate analysis results have a p-value of <0.25. The level of meaningfulness was expressed in p-values <0.05 on a double-sided hypothesis test with a 95% confidence interval. IBM SPSS Statistics version 21 software was used to look at the data.

The research was done after getting a permit for an ethics test and a permit from high schools. With the number 1485/KEP-UNISA/VI/2022, the Ethics Commission of Aisyiyah University in Yogyakarta gave a permit for an ethics test. Before collecting data, samples willing to be the subject of the study fill out a research approval sheet (informed consent) containing the research objectives and procedures. The sample provided signatures as evidence of availability following the study.

RESULTS AND DISCUSSION

Normality tests were performed at the beginning of data analysis with the Kolmogorov-Smirnov test for variables with a ratio data scale, i.e., fast food energy intake, stomach circumference, income, and age. The analysis showed that the abdominal circumference, income, age, and energy intake data were not normally distributed (p<0.05). Sample characteristics include age, gender, class, and income. The features of the sample are presented according to the distribution of data. Fast food energy intake, abdominal circumference, income, and

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age are abnormally distributed, so the variables are presented in the median, minimum, and maximum values. The characteristics of the sample, namely gender and class, are shown in the form of frequency and percentage. The features of the study sample are presented in Table 1. Variables of physical activity, central obesity, frequency of fast-food consumption, frequency of online food ordering, and energy intake of fast food are presented in Table 2.

Table 1. Frequency distribution of characteristics of high school students in Yogyakarta City

Characteristics	Median	Minimum	Maximum	n	%
Gender					
Men				87	39.7
Women				132	60.3
Class					
10				20	9.1
11				168	76.7
12				31	14.2
Age	16	14	18		
<17 years				141	64.4
≥17 years				78	35.6
Income (IDR)	400,000	50,000	3,000,000		
<1,000,000,00				199	90.9
≥1,000,000,00				20	9.1
Total				219	100.0

Table 1 shows that most of the sample were women (60.3%), were in class 11(76.7%), and were less than 17 years old (64.4%) with a significant income of < IDR 1,000,000. The median value of the sample age is 16 years, the minimum age of the sample is 14 years, and the maximum age is 18 years. The median value for sample income is IDR 400,000, with a minimum income value of IDR 50,000 and a maximum income value of IDR 3,000,000.

Table 2. Univariate analysis of abdominal circumference, frequency of fast food consumption, frequency of online food ordering, fast food energy intake, and physical activity of high school students in Yogyakarta City

Variables	Median	Minimum	Maximum	n	%
Abdominal circumference (cm)	73.5	57.5	120		
Central obesity				173	79.0
Non-central obesity				46	21.0
Frequency of fast food consumption					
<3 times/week (rare)				41	18.7
≥3 times/week (often)				178	81.3
Frequency of online food ordering					
<3 times/week (rare)				157	71.7
≥3 times/week (often)				62	28.3
Fast food energy intake (kcal)	641.6	231.9	2,214		
Fast food energy intake (%)	28.0%	10.7%	87.1%		
<80% RDA				215	98.2
80-110% RDA				4	1.8
>110% RDA				0	0
Physical activity					
≥30 minutes/day				44	20.1
<30 minutes/day				175	79.9
Total				219	100.0

cm (centimeter); kcal (kilocalories); RDA (Recommended Dietary Allowances)

Based on Table 2, more than 70% of the samples were not centrally obese (79.0%), consumed fast food in the often category (≥3 times/week) (81.3%), placed online food orders in rare categories (< 3 times/week) (71.7%), had fast food energy intake in the <80% RDA category (98.2%), and performed physical activity in the <30 minutes/day (79.9%). An overview of the frequency of fast-food consumption is presented in Figure 1.

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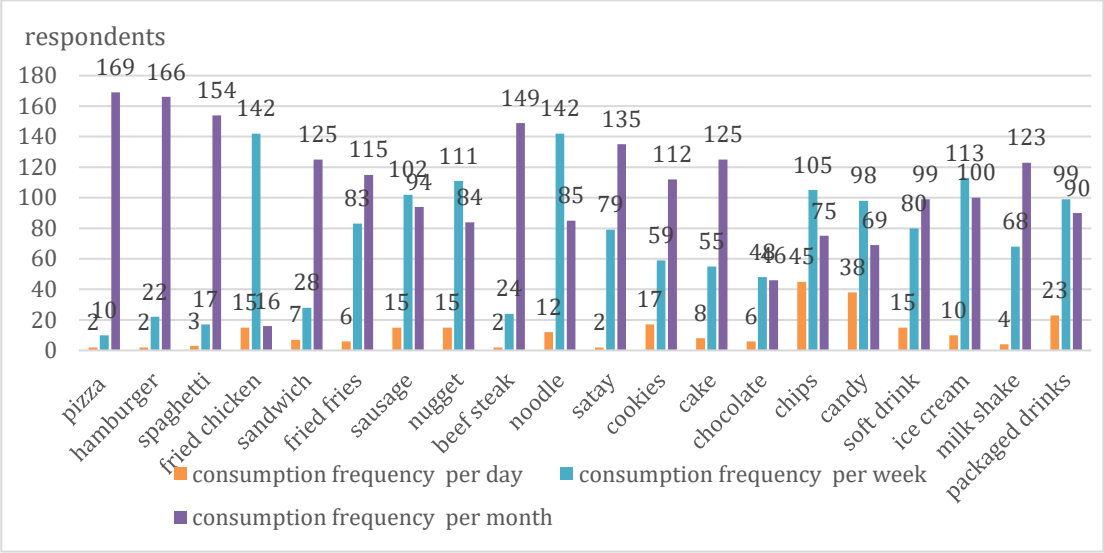

Figure 1. Frequency of fast food consumption among high school students in Yogyakarta City

Based on Figure 1, fast food consumption was successively in monthly, weekly, and daily frequencies. The fast food most consumed by sample-mops consecutively in daily, weekly, and monthly frequency is snacks/snacks/chips, instant noodles and fried chicken, and pizza. Bivariate analysis is used to determine the relationship between research variables. The results of the bivariate analysis are shown in Table 3.

Table 3. Bivariate analysis of relationships between socio-demographic, physical activity, fast food intake, frequency of fast food consumption, and online food ordering with central obesity in high school students in Yogyakarta City

Variables	Central Obesity				Bivariate Analysis		Multivariate Analysis	
	Non-obese (n=173)		Obese (n=46)		PR (CI 95%)	p-value	PR (CI 95%)	p-value
	f	%	f	%				
Gender								
Men	67	77.0	20	23.0	1	0.55[a]	-	
Women	106	80.3	26	19.7	0.8 (0.42 - 1.58)			
Age								
<17 years	107	75.9	34	24.1	1	0.12[a]	-	
≥17 years	66	84.6	12	15.4	0.5 (0.27 - 1.18)			
Income (IDR)								
<1,000,000	158	79.4	41	20.6	1	0.64[a]	-	
≥1,000,000	15	75.0	5	25.0	1.2 (0.44 - 3.74)			
Physical activity								
≥30 minutes/day	37	84.1	7	15.9	1	0.35[a]	-	
<30 minutes/day	136	77.7	39	22.3	1.5 (0.62 - 3.66)			
Fast food energy intake (%)								
<80% RDA	172	80.0	43	20.0	1	0.03*[b]	1	
≥80% RDA	1	25.0	3	75.0	12.00 (1.21-118)		20.5 (1.93-217.69)	0.01
Frequency of fast food consumption								
Rare	29	70.7	12	29.3	1	0.15[a]	-	
Often	144	80.9	34	19.1	0.5 (0.26 - 1.23)			
Frequency of online food ordering								
Rare	125	79.6	32	20.4	1	0.71[a]	-	
Often	48	77.4	14	22.6	1.1 (0.56 - 2.31)			

[a]) Chi-Square test; [b]) Fisher Exact test; *) p-value is significant if <0.05; RDA (Recommended Dietary Allowances); PR (Prevalence Ratio); CI (Confidence Interval)

Table 3 shows no significant association between sex, age, income, physical activity, frequency of fast-food consumption, and frequency of online food ordering with central obesity (p>0.05). Table 3 shows a significant association between fast food energy intake and central obesity (p<0.05). The results of the analysis of the relationship between variables and p<0.25 values in bivariate analysis go to multivariate analysis. In multivariate analysis, data analysis used logistic regression tests with backward elimination methods and

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produced two models. The results of the modeling are shown in Model 2. The results of the multivariate analysis are shown in Table 4.

Table 4. Relationship model of age, energy intake of fast food, frequency of fast food consumption, and frequency of online food ordering with central obesity in high school students in Yogyakarta City

Variables	Model 1	Model 2
Age	0.06	0.06
Fast food energy intake	0.01	0.01
Frequency of fast food consumption	0.07	0.07
Frequency of online food ordering	0.86	-

Based on Table 4, the first model included four variables: age, fast food energy intake, fast food consumption frequency, and online food ordering frequency. The variable frequency of ordering online food is not included in the second model because it has the most significant p-value. Table 4 also shows variables with a p-value of more than α (0.05), i.e., the age variable and frequency of fast-food consumption. That is, it has no influence on the central obesity variable and does not include the final stage of multivariate analysis. Meanwhile, the variable energy intake of fast food has a p-value of less than α (0.05). The results of making the final model of the determining factor can be observed in Table 5.

Table 5. Multivariate analysis of the relationship between fast food energy intake and central obesity in high school students in Yogyakarta City

Variables	B	S.E	Wald	p-value	CI (95%)	PR
Fast food energy intake	3.02	1.20	6.28	0.01*	1.93-217.69	20.5

Logistic Regression test; *) p-value is significant if <0.05; B (Exponent); S.E (Standard Error of Estimation); PR (Prevalence Ratio); CI (Confidence Interval)

Table 5 shows that the fast-food energy intake variable influences the incidence of central obesity (p<0.05). Adolescents with a fast-food energy intake of >80% RDA had a 20.5 times greater risk of being centrally obese than an intake of <80% RDA. The study found no significant association between sex and central obesity. In contrast to the results of previous studies with a significant relationship between sex and central obesity, the female sample was at 1.7 times greater risk of developing central obesity than men[28]. The absence of a link between sex and central obesity in this study can be reviewed from the energy contribution of fast-food samples that show most samples with central obesity have a contribution of energy intake in the category < 80% RDA.

The bivariate and multivariate analyses found no significant association between age and central obesity. The findings in this study are the same as previous studies in adolescents aged 15-17 years in Malaysia[29] but different from the results of other previous studies[30]. Body composition is still challenging to determine in adolescence and will continue to change. The development of puberty is one of the factors for these changes. The development of puberty affects the composition of fats in the body[31]. In addition, adolescence is often synonymous with body image, so adolescents desire to change their bodies by reducing waist circumference and losing weight[32].

The study's bivariate and multivariate analysis found a significant association between fast food energy intake and central obesity, which aligns with the previous research results[33]. Fast food is rated to have a high level of energy density in large portion sizes. Fast food's energy density is two times greater[34] than healthy food's. Excess energy intake can result in overweight and obesity in individuals. Foods with high energy content, e.g., high in fat and sugar and low in fiber, result in energy imbalances in the body[2]. Excess energy intake in individuals, when not balanced with energy expenditure, results in energy balance, leading to positive energy balance. Excess energy is stored in the body as fat in the fatty tissue under the skin and around the abdomen[35].

The results of bivariate and multivariate analysis of the study showed no significant association between the frequency of fast-food consumption and central obesity. These results support the results of the previous study[27]. In addition, the results of this study showed that samples often consumed fast food. Most samples have an intake category of less than 80% RDA and consume different types of fast food in weekly and monthly frequencies. So, fast food intake does not account for much of the daily energy intake. This research also assesses food consumption within only one month.

The bivariate and multivariate analysis results showed no significant association between the frequency of online food ordering and central obesity. The findings of this study support the results of a study conducted on a sample of women aged 20-49 years in Sleman Regency[36]. This study did not examine what types of food the sample ordered, so the energy content of the food ordered could not be known. In addition, samples ordering food online were not studied whether the ordered meal was consumed by the sample itself or consumed with others[36].

CONCLUSIONS

A large section of the study sample often consumed fast food and rarely placed online food orders.

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There was no significant association between the frequency of fast-food consumption and the frequency of online food ordering with central obesity. However, a significant association exists between fast food energy intake >80% RDA and central obesity. Students are expected to reduce the consumption of fast food.

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