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The Relationship Between Fried Food Consumption, Alcohol Consumption, and Nutritional Knowledge of "Isi Piringku Model T" with the Incidence of Overweight in 19-44 years Adult in Indonesia

Hubungan antara Konsumsi Makanan yang Digoreng, Konsumsi Alkohol, Pengetahuan Gizi "Isi Piringku Model T" dengan Kejadian Overweight pada Dewasa Usia 19-44 Tahun di Indonesia

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Abstract: *The prevalence of overweight in Indonesia increased very quickly from 8.6% in 2007 to 11.5% in 2013, and increased to 13.6% in 2018. This research aims to determine the relationship between fried food consumption patterns and consumption patterns. alcohol, and nutritional knowledge of "Isi Piringku Model T" with the incidence of overweight at the age of 19-44 years in Indonesia. Respondents in this study numbered 581 from all over Indonesia and were aged 19-44 years. The sampling technique was non-random sampling technique with consecutive sampling method. This research uses a cross sectional research design. The data collection instrument uses a questionnaire via Google Form. Data were analyzed using descriptive statistical analysis and Chi Square test. The results showed that the type and frequency of fried food consumption, status, frequency, amount of alcohol consumption, and nutritional knowledge of "Isi Piringku Model T" showed a relationship that was not statistically significant (p>0.05). Based on the research results, it can be concluded that there is no significant relationship between consumption of fried foods, alcohol consumption, nutritional knowledge of "Isi Piringku Model T" and the incidence of overweight in adults aged 19-44 years in Indonesia.*

Key word: Overweight, Fried Food, Alcohol, Isi Piringku Model T

1. INTRODUCTION

Based on The Regulation of The Minister of Health of The Republic of Indonesia Number 41 of 2014 concerning Guidelines for Balanced Nutrition, the Body Mass Index (BMI) classification for Indonesian in the overweight category is 25.0-27.0 $^{kg}/_{m^2}$. Overweight is a public health problem that still requires treatment because it is ranked fifth in causes of death in the world (1). According to WHO, more than 1.9 billion adults aged over 18 years in the world are overweight. The impact of adults who will be overweight is estimated to increase to 2.7 billion people in 2025 if this nutritional problem is not well addressed (2).

Overweight that occurs during childhood and adolescence influences the incidence of obesity in adulthood, it has risk of developing several degenerative diseases such as hypertension, obstructive sleep apnea, heart attack, stroke, and type 2 diabetes mellitus (3,4,5). Several risk factors can increase a person's experience of being overweight including diet, hereditary history, lifestyle, psychological, environmental, individual biological factors which can influence energy intake and expenditure,

consumption of foods high in fat, alcohol consumption, and nutritional knowledge (6-11). Individuals in adolescence, early adulthood and late adulthood tend to choose unhealthy behavior, for example when adopting irregular eating patterns, lack of physical activity, smoking habits and alcohol consumption habits, thereby increasing health risks (12,13). Papalia & Feldman stated that being overweight is a factor in the occurrence of chronic disease in most young adults (14).

Consuming foods high in fat over a long period of time and excessively increases the risk of becoming overweight and increasing body weight (9,15). Based on The Ministry of Health of the Republic of Indonesia data, proportion of habitual consumption of fatty foods/ cholesterol/ fried food one to six times per week in the population over 3 years old in Indonesia is 45% (16). Around 70% of overweight subjects had excessive fat intake. Consuming fried foods more than 67 grams/day can increase the risk of hypercholesterolemia (17). Nisak and Mahmudiono stated that there is a relationship between daily and weekly fried food consumption patterns and the incidence of overweight (18). Another research stated that the source of fatty foods often consumed by overweight subjects was the oil used to prepare side dishes and fried foods such as *bakwan*, fried-tofu and fried-*tempeh* (19).

Consumption of alcoholic drinks can increase energy intake in obese groups.[10] Proportion of population aged over 10 years old with consumption of heavy alcoholic drinks in Indonesia is 0.8%. Alcohol consumption is said to be excessive if the consumption is more than 5 standard units for men and more than 4 standard units for women. Moderate consumption of alcoholic drinks can actually improve health-related quality of life (20). Nutritional knowledge is supported due to adequate education which forms attitudes, creates habits and implementation in the use of food ingredients, as well as eating patterns with attention to quality and health (21). The research results show that individuals with high nutritional knowledge can understand the impact and factors causing overweight (11). Information from the Ministry of Health invites the Indonesian population to adopt a balanced nutritional diet in one meal specifically for obese people through the slogan "*Isi Piringku Model T*". The results of research conducted by Veronica *et.al* stated that there was an increase in knowledge regarding balanced nutrition after the post-test was carried out from 11.63% to 93.02% (22).

2. METHODS

This research method is quantitative research using a cross sectional design where the researcher collects data on the independent variable and dependent variable only once and at one time. The dependent variable studied was the incidence of overweight. The independent variable was the consumption pattern of fried foods, pattern alcohol consumption, and nutritional knowledge of "*Isi Piringku Model T*".

Overweight is defined as excess weight with a risk of having a body mass index (BMI) range of 25.1-27.0 kg/m2. BMI is measured through body weight data in kilograms and height body in meters. Consumption of fried foods was grouped into types of fried-food consumption and frequency of fried-food consumption. The type of fried-food consumption is defined as the habit of consuming food processed with oil, including types of fried-food in the last week. Types of fried food consumption are divided into three groups, such as animal source protein (fried-chicken, fried-squid, offal, fried-fish), plant-based protein (fried-tempeh, fried-tofu, fried-peanuts) and fried-carbohydrates/

vegetable/ processed flour (*bakwan*, rissoles, spring-rolls, fried-potatoes, fried-bananas, crackers, fried-eggplant). Frequency of consumption of fried-food is defined as the habit of consuming food processed with oil including frequency/ amount of fried food consumed in the last week. This consumption frequency is divided into three groups, namely never, rarely (less than 7 times per week) and often (7 times or more per week).

Alcohol consumption is divided into three groups, including consumption status, frequency of alcohol consumption, and amount of alcohol consumption. Alcohol consumption status is defined as the habit of consuming alcoholic drinks in the last month. Frequency of alcohol consumption is defined as the frequency of consuming alcoholic drinks in the past week. Total alcohol consumption is defined as the number of alcoholic beverages consumed based on portions per standard unit of alcoholic beverage. Beverage standard terms describe intensity alcohol consumption can be calculated from the type and volume of alcoholic beverages consumed. One standard drink on average contains 14 grams of pure ethanol which is found in: ***low alcohol content source*** (for example beer) 285-330 ml (1 glass of beer/ small bottle/ cans), ***moderate alcohol content source*** (for example white wine, champagne, sparkling wine) 120 ml (1 glass of wine), ***high alcohol content source*** (such as whiskey, vodka, tequilla) 30 ml (1 shot), ***traditional transparent alcoholic source*** (such as cap Tikus, sopi, ciu) 100 ml (1/2 drinking glass)), ***traditional feculent alcoholic source*** (such as saguer, laro) 200 ml (1 drinking glass), and ***blended-alcoholic source*** (such as *oplosan*) 20% or more (1 glass, 200 ml). The amount of alcohol consumption is divided into 3 groups such as never consuming, moderate light consumption (less than 1 serving per day or less than 21 grams per day), and heavy consumption (more than equal to 1 serving per day or more than equal to 21 grams per day).

Nutritional knowledge of "*Isi Piringku Model T*" is defined as information regarding managing food portions for obese sufferers using a closed answer questionnaire using the guidelines "*Isi Piringku Model T*". The knowledge category is divided into two groups, including good (if the answer is correct more than equal to 60%) and poor (if the correct answer is less than 60%).

The subjects were 581 people taken from all over Indonesia with an age range of 19-44 years who met the criteria. There were 5 data that *dropped out* after *data cleaning* because the data was incomplete. The sampling technique was *non-random sampling* with a *consecutive sampling method* with inclusion criteria being Indonesian citizens aged 19-44 years, while exclusion criteria included women who were pregnant, men and women who were sick and hospitalized (kidney failure, diabetes mellitus, stroke, coronary heart disease, cancer, hypertension) and being treated in a health facility (hospital, clinic, doctor's/ midwife's practice, community health center), and currently undergoing a diet or special medication/ therapy. Subject determination with a consecutive sampling system by selecting subjects who meet the criteria and are included in the study until the minimum required sample size (300) is met.

The research has received a letter of approval to pass ethical review from the Health Research Ethics Commission, Faculty of Health Sciences, Respati University, Yogyakarta with number 171.3/FIKES/PL/VIII/2021 and a research permit from Head of Sekolah Tinggi Ilmu Kesehatan Panti Rapih Yogyakarta with number 1260/STIKes-PR/B/VIII/2021. The research was carried out from August to September 2021 via *an online survey.* The data taken is primary data obtained through questionnaire by distributing *the google form link* to social media. The questionnaire has been tested for

good validity and reliability. To see relationships between variables, bivariate analysis was used with the *Chi-Square test.*

3. RESULTS

Based on Table 1, the results of the bivariate analysis obtained from the Chi-Square test show that there is a statistically significant relationship between the age group 25-29 years (*PR*= 2.19; *p* =0.005; *CI* 95%=1.297-3.729) and 40 -44 years (*PR* = 3.21; *p* = 0.036; 95% *CI* = 1.110- 9.309) with the age group 19-24 years to experience overweight. The 30-34 year and 35-39 year age groups have 2.08 and 1.75 higher odds of being overweight compared to the 19-24 year age group. Gender and last education showed a statistically insignificant relationship with the incidence of overweight (female *PR* = 0.71; *p* = 0.137; *CI* 95% = 0.475-1.080 and secondary education *PR* = 0.89; *p* = 0.649; *CI* 95% =0.599-1.331) .

Table 1 The relationship between age, gender and education and the incidence of overweight in Indonesia

Variables	*Overweight*				*PR*	*p value*	95% *CI*
	No		Yes				
	n	%	n	%			
Age groups (y.o.)							
19-24	352	82,8	73	17,2	1		
25-29	57	68,7	26	31,3	2,199	0,005*	1,297-3,729
30-34	30	69,8	13	30,2	2,089	0,057	1,040-4,199
35-39	11	73,3	4	26,7	1,753	0,311	0,543-5,660
40-44	9	60,0	6	40,0	3,215	0,036*	1,110-9,309
Sex							
Men	149	75,3	49	24,7	1		
Women	310	80,9	73	19,1	0,716	0,137	0,475-1,080
Education Level							
Higher Education (Diplome-Doctoral)	209	78,0	59	22,0	1		
Moderate Education (Senior High School/ below)	250	79,9	63	20,1	0,893	0,649	0,599-1,331

*significancy (*p value*<0,05)

Table 2 showed that the type of fried food consumption showed a relationship that was not statistically significant (*p*> 0.05), the risk *of* overweight in the group consuming protein, especially fried-animal protein source (*PR* = 1.06) was lower than the risk in the group consuming fried-carbohydrates/ vegetables/ processed (*PR* = 1.78). The habits of Indonesian people aged 19-44 years who frequently consume fried-carbohydrates/ vegetables/ processed products in the last week have a 2.4 times higher risk of experiencing overweight compared to those who have never consumed fried-carbohydrates/ vegetables/ processed products in the last week. It means there is no relationship between the frequency of consumption of fried foods and the incidence overweight at the age of 19-44 years in Indonesia (*p*> 0.05).

The frequency of alcohol consumption in Indonesians aged 19-44 years is more than equal to 3 times per week (*p* =0.29; *CI* 95%=0.549-6.296) and the amount of weight (*p* =0.26; *CI* 95%=0.637- 4,626) had a 1.8 and 1.7 times higher risk of experiencing overweight compared to those who never consumed alcohol. *The p-value* shows that

there is no relationship between status, frequency and amount of alcohol consumption and the incidence *of* overweight (*p*> 0.05). Based on table 4.4. the nutritional knowledge "Isi Piringku Model T " was not related to the incidence of overweight (*p*= 0.419). Indonesian people aged 19-44 years who have a nutritional knowledge score of "Isi Piringku Model T " are classified as poor and have a 1.2 times higher risk of experiencing overweight than those who have a nutritional knowledge score of "Isi Piringku Model T " which is classified as good (*p* =0.41; 0.8-1.7 95% *CI*).

Table 2. Relationship between Fried Food Consumption Patterns, Alcohol Consumption Patterns, and Nutritional Knowledge of "Isi Piringku Model T" with the Incidence of Overweight in Indonesia

Variables	*Overweight*				*PR*	*p value*	95% *CI*
	No		Yes				
	n	%	n	%			
Type of Fried food consumption							
Animal-based protein							
No	4	80,0	1	20,0	1		
Yes	455	79,0	121	21,0	1,064	1,000	0,118-9,605
Plant-based protein							
No	27	84,4	5	15,6	1		
Yes	432	78,7	117	21,3	1,463	0,586	0,551-3,881
Fried-Carbohydrate-based							
No	69	86,2	11	13,8	1		
Yes	390	77,8	111	22,2	1,785	0,117	0,913-3,490
Frequency of Fried food consumption							
Animal-based protein							
Never	4	66,7	2	33,3	1		
Rarely (<7x/week)	320	83,1	65	16,9	0,406	0,274	0,073-2,265
Often (≥7x/week)	135	71,1	55	28,9	0,815	1,000	0,145-4,578
Plant-based protein							
Never	22	81,5	5	18,5	1		
Rarely (<7x/week)	328	80,2	81	19,8	1,087	1,000	0,399-2,957
Often (≥7x/week)	109	75,2	36	24,8	1,453	0,645	0,513-4,118
Fried-Carbohydrate-based							
Never	65	86,7	10	13,3	1		
Rarely (<7x/week)	348	78,6	95	21,4	1,774	0,144	0,878-3,585
Often (≥7x/week)	46	73,0	17	27,0	2,402	0,072	1,009-5,720
Alcohol consumption status							
No	383	78,8	103	21,2	1		
Yes	76	80,0	19	20,0	0,930	0,902	0,538-1,608
Frequency of Alcohol consumption							
Never	383	78,8	103	21,2	1		
<1x/week	55	80,9	13	19,1	0,879	0,814	0,462-1,671
1-2x/week	13	86,7	2	13,3	0,572	0,747	0,127-2,575
≥3x/week	8	66,7	4	33,3	1,859	0,297	0,549-6,296
Amount of alcohol consumption							
Never	383	78,8	103	21,2	1		
Moderate-light	63	82,9	13	17,1	0,767	0,505	0,406-1,449
Heavy ≥1 portion/day	13	68,4	6	31,6	1,716	0,266	0,637-4,626
Nutritional knowledge of "*Isi Piringku Model T*"							
Good (score ≥60)	247	80,5	60	19,5	1		
Poor (score <60)	212	77,4	62	22,6	1,204	0,419	0,807-1,795

p value from Chi-Square

4. DISCUSSION

The results of bivariate analysis from the Chi-Square test show that there is a statistically significant relationship between the age groups for experiencing the incidence of overweight. The 30-34 year and 35-39 year age groups have 2.08 and 1.75 higher odds of being overweight compared to the 19-24 year age group. As you get older, your metabolic ability and muscle function decreases, but the fat content in the body will increase due to the increased accumulation of fat in the body and the influence of an unbalanced diet such as high carbohydrates, high fat and low protein so that obesity increases in adulthood (23).

From our results, gender showed a statistically insignificant relationship with the incidence of overweight (women PR=0.71 or 1.4 times lower risk than men; p=0.137; 95% CI=0.475-1.080). The results of other research state that female students are at risk of obesity 7.5 times higher than men. Men tend to only do sports activities without dieting, in contrast to women who do a combination of exercise and diet and medication to control their weight. Other research also states that women tend to be overweight more than men (24-27). More women's activities lower than men because women produce the hormone ghrelin during menstruation (28). Women tend to convert more food into fat, men convert more food into muscle and energy reserves ready for use by the body. Obesity in women Indonesia's reproductive age is characterized by consumption of fried and fatty foods (29).

Prevalence Ratio (PR) value of 1.78 (CI 95%) shows that Indonesian people aged 19-44 years who frequently consume fried-carbohydrates/ vegetables/ processes such as *bakwan*, rissole, spring-rolls, fried-potatoes, fried-bananas, crackers, fried-eggplant (more than 7x/week) have a higher risk of experiencing overweight compared to people who have not consumed it in the last week. Fried foods sold in Indonesia are mixed with wheat flour, such as fried-tofu, *tempeh*, *bakwan*, fried bananas and if consumed excessively, it will cause a risk of increasing body mass index (30). Other research shows that there is a relationship but it is not statistically significant (p value=0.391) between consuming fried foods in high frequency (3-4 times per week) and the incidence of overweight. The risk of obesity is higher in people who consume processed carbohydrates or fried foods with the same frequency (31-32).

The results in this study are different from the other results which showed that there was no difference between the fried-carbohydrate intake of overweight and non-overweight teenagers (33-34). Macronutrients, especially carbohydrate intake, contribute to overweight nutritional status and contribute 4 kcal to food per 1 gram. Excessive carbohydrate consumption will be stored in the form of glycogen and fat if it is not used as energy, then excess fat will be stored in adipose tissue until used by the body. According to Ganong, carbohydrates in the body will undergo hydrolysis and will produce glucose. The glucose molecules are then broken down to produce energy in the form of adenosine triphosphate (ATP) which functions for muscle performance and is an energy source for the central nervous system (brain) (35).

The research results obtained from Indonesians aged 19-44 years who consumed alcohol with a frequency of 3 or more times per week (p=0.29; 95% CI=0.549-6.296) and heavy amounts (p=0.26; 95% CI =0.637-4.626) have a 1.8 and 1.7 times higher risk of experiencing overweight compared to those who never consume alcohol. Yeomans' research states that 1 gram of alcohol contains 7.1 kcal, the effect of which can increase energy and body weight (36). Research conducted by Ohlsson & Manjer states that

consuming 3-4 glasses of alcohol on one occasion is associated with being overweight (37). Consuming alcohol 30 grams per day can increase the risk of central obesity, however if you consume alcohol in moderate amounts of 14-21 grams per day or 1-1.5 servings per day it is still considered normal and can actually improve quality of health-related life (20,38). Alcohol consumption is said to be risky if the consumption is more than 5 portions per day or 50 grams of pure ethanol per day (39).

Based on the research results, it was found that Indonesian people aged 19-44 years with nutritional knowledge scores of the "*Isi Piringku Model T*" classified as poor had a 1.2 times higher risk of experiencing overweight than those whose nutritional knowledge scores of the "*Isi Piringku Model T*" were classified as good (p =0.41; 0.8-1.7 95% CI). The results of research conducted by Sineke et.al stated that there was a relationship between the level of nutritional knowledge and the incidence of obesity (p value=0.048) (40). One of the factors causing overweight is knowledge about nutrition. People who have in-depth and extensive knowledge of nutrition will tend to be selective in choosing the type of food they consume, both in terms of quality, variety and presentation method. A person's lack of nutritional knowledge is likely to have an impact on choosing a nutritious food menu so that they will become overweight (41). Respondents who have excessive eating patterns have a 2.6 times greater risk of being overweight compared to respondents who have good eating patterns (42). "*Isi Piringku Model T*" slogan consists of half a plate for vegetables and fruit, a quarter plate for protein, and a quarter for whole grains from rice, wheat or pasta, and you are required to wash your hands with soap, do 30 minutes of physical activity per day, consume water 8 glasses of white per day, regularly monitor body weight, and regulate the amount of sugar, salt and fat consumed (43).

5. CONCLUSION

From this research it can be concluded that there is no significant relationship between the type and frequency of consumption of fried foods and the incidence *of* overweight in adults aged 19-44 years in Indonesia. Status, frequency and amount of alcohol consumption are not related to the incidence of overweight in adults aged 19-44 years in Indonesia. Nutritional knowledge of "*Isi Piringku Model T*" is not related to the incidence of overweight at the age of 19-44 years in Indonesia.

Even though they don't have a significant relationship, the Indonesian people It is recommended to be able to control and reduce the type of food, especially sources simple carbohydrates and fried foods to minimize the incidence *of* overweight *.* There is a need to increase nutritional knowledge about "*Isi Piringku Model T*" in the community by using various media such as posters, videos, photos and infographics.

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