

The Incidence of Obesity among Adult Women in Pekanbaru City, Indonesia, Related to High Fat Consumption, Stress Level, and Physical Activity

Yudia Mailani Putri, Martalena Purba, B. J. Istiti Kandarina

Abstract—Background: Obesity has been recognized as a global health problem. Individuals classified as overweight and obese are increasing at an alarming rate. This condition is associated with psychological and physiological problems. As a person reaches adulthood, somatic growth ceases. At this stage, the human body has developed fully, to a stable state. As the capital of Riau Province in Indonesia, Pekanbaru is dominated by Malay ethnic population habitually consuming cholesterol-rich fatty foods as a daily menu, a trigger to the onset of obesity resulting in high prevalence of degenerative diseases. Research objectives: The aim of this study is elaborating the relationship between high-fat consumption pattern, stress level, physical activity and the incidence of obesity in adult women in Pekanbaru city. Research Methods: Among the combined research methods applied in this study, the first stage is quantitative observational, analytical cross-sectional research design with adult women aged 20-40 living in Pekanbaru city. The sample consists of 200 women with BMI \geq 25. Sample data is processed with univariate, bivariate (correlation and simple linear regression) and multivariate (multiple linear regression) analysis. The second phase is qualitative descriptive study purposive sampling by in-depth interviews. six participants withdrew from the study. Results: According to the results of the bivariate analysis, there are relationships between the incidence of obesity and the pattern of high fat foods consumption (energy intake ($p\leq 0.000$; $r = 0.536$), protein intake ($p\leq 0.000$; $r=0.307$), fat intake ($p\leq 0.000$; $r=0.416$), carbohydrate intake ($p\leq 0.000$; $r=0.430$), frequency of fatty food consumption ($p\leq 0.000$; $r=0.506$) and frequency of viscera foods consumption ($p\leq 0.000$; $r=0.535$). There is a relationship between physical activity and incidence of obesity ($p\leq 0.000$; $r=-0.631$). However, there is no relationship between the level of stress ($p=0.741$; $r=0.019$) and the incidence of obesity. Physical activity is a predominant factor in the incidence of obesity in adult women in Pekanbaru city. Conclusion: There are relationships between high-fat food consumption pattern, physical activity and the incidence of obesity in Pekanbaru city whereas physical activity is a predominant factor in the occurrence of obesity, supported by the unchangeable pattern of high-fat foods consumption.

Keywords—Obesity, adult, high in fat, stress, physical activity, consumption pattern.

I. INTRODUCTION

NUTRITION is one of the main problems worldwide. Especially in low-income countries, undernutrition leads to infections, thus increasing health costs. Whereas developed countries tend to get overnutrition that has a connection with degenerative disease. Developing countries tend to get double

nutrition problem; those are undernutrition and overnutrition [1].

Overweight and obesity is claimed as a global health problem by the World Health Organization (WHO) [2]. Obesity prevalence in developed countries was about 2,4% in South Korea till 32,2% in the United States of America. While in developing countries was about 2,4% in Indonesia till 35,6% in Saudi Arabian [3].

Obesity in women was three times higher than men, because of the lower metabolism rate in women compared to men [4]. In mature age, the growth rate stops and reaches a balance (homeostatic state). Dynamic balancing between parts of the body and the function occurs continuously throughout life, so it needs a balancing between energy intake and energy expenditure to avoid obesity [5]. Health National Survey 2010 (Riskesdas) showed that nutrition problem for adult citizen (age > 18 years old) was about 12,6% is classified as thin and 21,7% classified as overweight and obesity. So it showed that nutrition problem among adult was overweight/obesity [6].

Overweight and obesity are the main risk factor for chronic diseases [2]. There are many factors causing overweight. Irreversible factors are genetic, ethnic, sex and age; the reversible factors such as food consumption, lifestyle, stress and physical activity [7].

Atkinson [8] explained that high-fat food contained two times higher calories than high protein food, producing higher energy. Fatty food had higher energy density but is not as satisfying. In addition, fatty food had umami which increases the appetite-triggering excessive consumption [9]. Other factors associated with obesity was stress. Stress triggered a biochemical change in the body, causing stretch of the appetite interval in obesity. People who had stress tend to choose high carbohydrate food that contains high-fat such muffins, donuts, cookies, pastry, and other similar food [6].

Physical activity was also one important determinant causing weight gain. The passive condition could lead to overweight. FINRISK studies conclude that obesity potential occurs in adults with low physical activity, for example, adults who spent their free time to read or watch television, and adults who tend to choose a vehicle for their daily activities than walking or riding a bicycle [10].

As a Melayu citizen-dominated capital, Pekanbaru in Riau, is especially at risk for the complications of overnutrition stated earlier. The food culture of West Sumatran of consuming high cholesterol food and fatty food in daily life settings was taken up by these citizens. This food pattern

Istiti-Kandarina Bernadette Josephine is with the Gadjah Mada University, Indonesia (e-mail: ikandarina@yahoo.com).

could trigger obesity hence increasing the prevalence of degenerative diseases. Recently the obesity prevalence in Riau according to BMI is about 10,3%. According to sex, obesity in women is higher by about 14,5%. Based on survey results, fat consumption and energy contribution of fat in Riau is over the 25% of the total energy consumption recommendation by Pedoman Umum Gizi Seimbang (PUGS) [11] which lies at 25,2%. Fat consumption in urban areas of Riau especially was high so that it was included into the top 10 provinces of high-fat food consuming provinces of Indonesia with 27,6% [6].

Provided these survey results, it was thought important to address the issue of high fat consumption, stress level, and physical activity related to obesity among women in Pekanbaru in research.

II. METHOD AND MATERIALS

This research used a mixed method combining quantitative and qualitative research methods. This combination method was intended to obtain complete data from each study variable and could further clarify the reason that caused this. The first step was accomplished by a quantitative method; the second step was finalized with a qualitative method.

The quantitative method of the first step was an analytical observational method with cross-sectional study design whilst the qualitative method was a descriptive qualitative method. This study was conducted in 12 districts in Pekanbaru. Data was collected in April-June 2014. The population of this study was 201 women aged 20-40 years old. The criteria of the sample were BMI ≥ 25 , not currently in a state of pregnancy, in good health (physically and mentally), not in a certain diet program and less than one year of postpartum.

Independent variable in this study was high-fat food consumption, stress level, and physical activity. Consumption pattern obtained by using *semi-quantitative food frequency questionnaire* (SQFFQ), respondents were interviewed about the frequency of food intake for the last month and about the quantity of food in one meal. The stress level was obtained by using DASS 42 questionnaire with 42 statements associated with stress. Physical activity obtained by using International Physical Activity Questionnaire (IPAQ) [12].

The dependent variable in this study was obesity among women. It obtained by weight and height measurement that converted to BMI to determine obesity level of each respondent.

Qualitative data obtained by depth interview with some participants, they are about 6 participants contain 4 respondents, 1 Riau Malay leader, 1 representatives of Health department of Pekanbaru.

III. RESULT AND DISCUSSION

The result of this research showed that the youngest participant was 21 years old and the oldest was 40 years old. The average participant was aged 30-40 years old (51,7%).

Most of the participants came from a higher educational background (83,6%), were unemployed (63,7%), had a high income (81,6%), were married (67,2%), and had a body mass

index classification obese II (51,7%) with BMI average of 30,44kg/m².

TABLE I
RESPONDENTS DISTRIBUTION RELATED TO CHARACTERISTICS AND
BODY MASS INDEX (BMI)

Variable	Total (n)	Percent (%)
Age		
• 20-29 years	97	48,3
• 30-40 years	104	51,7
Academic Qualification		
• Low	33	16,4
• High	168	83,6
Employment status		
• Employed	73	36,3
• Unemployed	128	63,7
Household Income		
• Low (< Rp.1.260.000,-)	37	18,4
• High (\geq Rp.1.260.000,-)	164	81,6
Marital Status		
• Married	135	67,2
• Unmarried	66	32,8
Index Massa Tubuh (IMT)		
• Obese I (25,0-29,9)	107	53,2
• Obese II (≥ 30)	94	46,8

Average of participants' energy intake in this study was 2656,2 kcal, 167 respondents (83,1%) had excessive energy intake. Average of protein consumption was 115,1 gr, 106 respondents (52,7%) had sufficient protein consumption. Average of participants' fat intake was 89,4 gr, 181 participants (90,0%) had excessive of fat intake ($>25\%$ calorie total). Average of carbohydrate consumption was 350,9 gr, 194 participants (96,5%) had sufficient carbohydrate consumption ($\leq 60\%$ energy total).

Average of participants' score of stress level was 23,30 points. Most of the participants were in stress (75,6%). The average of physical activity score was 1293 MET-minute/week. Most participants had a low physical activity were about 169 respondents (84,1%).

In this study, an average of the frequency of fat consumption was 4 times/week and frequency of viscera consumption was 3 times/week. 112 participants (55,7%) often consumed fatty food (oily and fatty food), and 110 participants (54,7%) often consumed animal intestines.

Type of food that was often consumed by participants in Pekanbaru was food that was widely available in the market and became a daily consumption of participants. The list showed in Table VIII.

A. Participants' Characteristic

The statistical result showed the significant correlation between BMI with age of respondents by p-value was 0,049. Correlation between BMI with age was classified as low correlation by r value was 0,139 with the positive pattern, means that older the age, BMI increased. Coefficient value with determinant 0,025 means that regression line equation that obtained could explain 2,5% BMI variations.

Average of BMI towards education level, job, income, and marital status showed that there was no significant correlation, it determined by a p-value of each variable were (0,577), (0,998), (0,795) dan (0,181), p-value $>0,05$.

TABLE II
RESPONDENTS DISTRIBUTION RELATED TO FOOD CONSUMPTION PATTERN,
STRESS LEVEL, PHYSICAL ACTIVITY

Variable	Total (n)	Percent (%)
Energy consumption		
• Sufficient ($\leq 110\%$ AKE)	167	16,9
• Excessive ($< 110\%$ AKE)	34	83,1
Protein consumption		
• Sufficient ($\leq 15\%$ energy total)	106	52,7
• Excessive ($> 15\%$ energy total)	95	47,3
Fat consumption		
• Sufficient ($\leq 25\%$ energy total)	20	10,0
• Excessive ($< 25\%$ energy total)	181	90,0
Carbohydrate consumption		
• Sufficient ($\leq 60\%$ energy total)	194	96,5
• Excessive ($> 60\%$ energy total)	7	3,5
Stress level		
• Not Stress (skor 0 – 14)	49	24,4
• Stress (15 – 42)	152	75,6
Physical Activity		
• Low (< 1500 MET-minutes/week)	169	84,1
• High (≥ 1500 MET-minutes/week)	32	15,9

TABLE III
FREQUENCY OF HIGH FAT FOOD CONSUMPTION DISTRIBUTION (FREQUENCY
OF FATTY FOOD CONSUMPTION AND FREQUENCY OF VISCERA CONSUMPTION)

Variable	Total (n)	Percent (%)
Frequency of fatty food consumption (oily and fatty food)		
Seldom ($\leq 1-2$ times per week)	89	44,3
Often ($\geq 3-6$ times per week)	112	55,7
Total	201	100
Frequency of viscera consumption		
Seldom ($\leq 1-2$ times per week)	91	45,3
Often ($\geq 3-6$ times per week)	110	54,7
Total	201	100

TABLE IV
THE LIST OF HIGH FAT FOOD TYPES THAT OFTEN CONSUME
BY RESPONDENTS

Main course	One dish meal	Snack
	Lontong gulai	
	Sate padang	Gorengan(bakwan, risoles, tahu isi)
Gulai / Kalio	Nasi lemak	Roti cane
Goreng Balado	Soto padang	Kue lumpur
Rendang	Soto medan	Cendol
	Mie ayam	Bubur kampiun/kolak
	Bakso	

TABLE V
ANALYSIS OF CORRELATION AND SIMPLE LINEAR REGRESSION BETWEEN
BODY MASS INDEX (BMI) AND AGED

VARIABLE	r	R ²	Line Equation	P value
Aged	0,139	0,025	IMT=28,757+0,057*umur	0,049

B. High Fat Food Consumption Pattern

The analysis result of this research showed that there was a significant correlation between BMI with energy intake, protein intake, fat intake and carbohydrate intake ($p < 0,05$). Correlation between BMI with energy intake classified as strong correlation by r-value is 0,536 with the positive pattern; it means the higher the energy intake, the higher the BMI was. Coefficient value with determinant 0,166 means that regression line equation could explain 16,6% of BMI variation. Excessive energy consumption is considered as imbalance phenomenon of food consumption, where food

consumption resulted in higher energy intake than energy expenditure by doing activities leading to obesity [13].

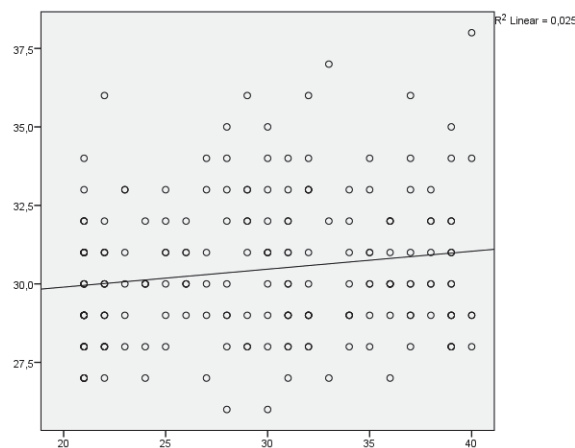


Fig. 1 Graphic of Aged Prediction Towards BMI (Response/Index)

TABLE VI
MEAN DISTRIBUTION OF BODY MASS INDEX (BMI) ACCORDING TO
ACADEMIC QUALIFICATION, EMPLOYMENT, HOUSEHOLD INCOME,
MARITAL STATUS

Variable	N	Mean	SD	SE	P value
Academic qualification					
- High	168	30,399	2,2136	0,4055	0,577
- Low	33	30,636	2,3294	0,1708	
Employment					
- Employed	73	30,438	2,3628	0,2765	0,998
- Unemployed	128	30,438	2,1581	0,1908	
Household Income					
- High	164	30,457	2,2025	0,1720	0,795
- Low	37	30,351	2,3713	0,3898	
Marital Status					
- Married	135	30,585	2,2672	0,1951	0,181
- Unmarried	66	30,136	2,1322	0,2626	

Nilai $p < 0,05$, significant correlation statistically.

Correlation between BMI with protein intake classified as medium correlation by r value was 0,307 with the positive pattern, it means with higher protein intake the BMI will follow. Coefficient value with determinant 0,090 means that regression line equation could explain 9% BMI variation. Excessive protein consumption was unfavorable for the body because high protein food was usually also high in fat so could increase fat level in the body if consuming in the long term and lead to obesity [14].

Correlation between BMI and fat intake classified as medium correlation by r value was 0,416 with the positive pattern; it means higher of fat intake, BMI increased. Coefficient value with determinant 0,169 means that regression line equation could explain 16,9% BMI variation. High-fat diet could interfere the balance of fat stored in adipose tissue. The increase of adipose tissue would increase the leptin. This would then influence the energy balancing resulting in obesity [15].

Correlation between BMI and carbohydrate intake was classified as medium correlation. The r value was 0,430 with positive pattern meaning higher in carbohydrate intake resulted in increased BMI. Coefficient value with determinant

0,129 means that regression line equation could explain 12,9% BMI variation. According to Sugianti [16], most of the energy contained in meals comes from carbohydrate reaching 70-80% of the total. This is caused energy from carbohydrate was the cheapest one. Excessive energy from carbohydrate will be stored as glycogen, a short-term energy reserve, and as fat as long-term energy reserves.

TABLE VII
ANALYSIS OF CORRELATION AND SIMPLE LINEAR REGRESSION BETWEEN
BODY MASS INDEX (BMI) WITH ENERGY, PROTEIN, FAT AND
CARBOHYDRATE INTAKE IN PEKANBARU 2014

Variable	r	R ²	Body Mass Index	
			Equation line	P value
Energy Intake	0,536	0,166	IMT=22,020+0,003*AE	0,000
Protein Intake	0,307	0,090	IMT=26,419+0,035*AP	0,000
Fat Intake	0,416	0,169	IMT=24,949+0,061*AL	0,000
Carbohydrate Intake	0,430	0,129	IMT=24,754+0,016*AKH	0,000

Spearman rho test Significant Statistically (p<0,05), AE: Asupan Energi, AL: Asupan Lemak, AP: Asupan Protein, KH: Asupan Karbohidrat.

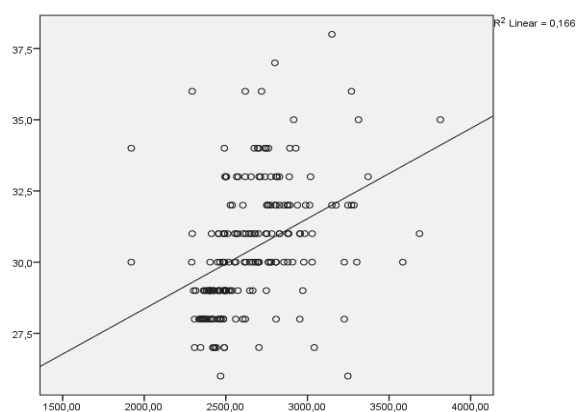


Fig. 2 Graphic of Energy Intake Prediction Towards BMI
(Energy/Index)

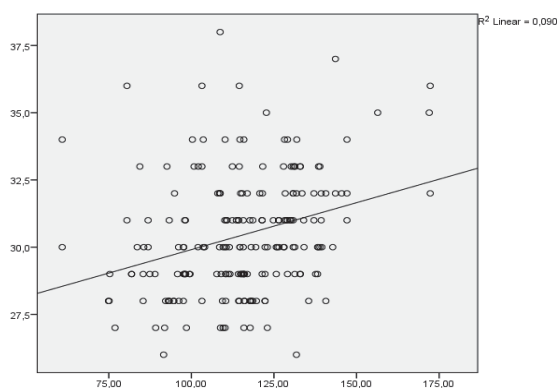


Fig. 3 Graphic of Protein Intake Prediction Towards BMI
(Protein/Index)

According to in-depth interviews of obesity women assumed that obesity that happened in mature age was a normal thing. It because married women who had given birth of children will become an obese naturally. Some women

assumed that obesity who had happened during the marriage was a good image in society.

“...kalau la menikah dulu waktu masih gadis kami kurus sekali..ee..tapi kalau dak gemuk la menikah ni tak baek pula diliat orang..dikira tak dikasi suami pula makan...” (informan 1, in bahasa).

“...when I was young, I was so thin.. but now, after being married, if i am not corpulent, it becomes a bad image in society, people will assume that my husband did not take care of me...”

Food that is consumed in Pekanbaru is high in calories and fat; it would be difficult to change the eating pattern because it has already become a habit or culture. It has become an image of an established socioeconomic status. Traditional Melayu meals are people's favorite meals hence it is difficult to change the food habit. Obesity is feared and needs to be prevented, but it is hard to beat by the participant.

“...kalau kami dirumah sehari-hari masak gulai soalnya kalau tak begulai ayah anak-anak tak makan, kalau tumis-tumis bening tak ado yang suko..yoo jadi masak sajo gulai samo goreng balado bisa kalo nak dipanas-panas...” (informan 1, in bahasa).

“... I usually cook gulai because if there is no gulai, my husband and children do not want to eat...my family like fatty food, so i cook gulai and balado, besides those meals can be reheated..” (informan 1).

The analytical result showed that there was a significant correlation between frequency of fatty food consumption and frequency of animal intestines consumption with BMI (p value<0,05). Correlation between BMI with the frequency of high-fat food was classified as a strong correlation (r=0,506) with the positive pattern. This can be interpreted as regular consumption of fatty foods in a week was followed by increased BMI. Coefficient value with determinant 0,253 means that regression line equation could explain 25,3% BMI variation. Consuming fatty food 7 times/week or more had obesity risk 1,21 times higher than participants consuming fatty food less than 7 times/week [17].

Correlation between BMI with the frequency of animal intestines consumption was classified as a strong correlation (r=0,535) with the positive pattern. Frequent intestines consumption in a week increased BMI. Coefficient value with determinant 0,312 can be interpreted as regression line equation explaining 31,2% BMI variation. Intestines determined as high fat and high-calorie food contained cholesterol 4-15 higher than meat, configuring a higher calorie intake leading to obesity. *Gulai*, Gulash containing offal is food with high calorie and is rich in flavor. The fat that contained in food could be thought to increase the appetite [18].

Frequent fatty food consumption (fatty and oily food) combined with a high rate of intestine consumption was becoming a habit; the participant said that consuming those meals became a habit in society.

“...kalo biasonyo paling gulai goreng balado kantang tu lah.” (informan 1, in bahasa).

"...Usually i eat gulai and potato balado..." (informan 1). "...iya tiap hari lah..apolai kan..disini memang begitu lah yang dimasak..kalau tak begitu tak selera makan macam orang sakit je..." (informan 3, in bahasa).

"...yes, i eat those meals everyday...it is a food habit, if there is no gulai or balado, I do not want to eat then I look like a sick persons..."

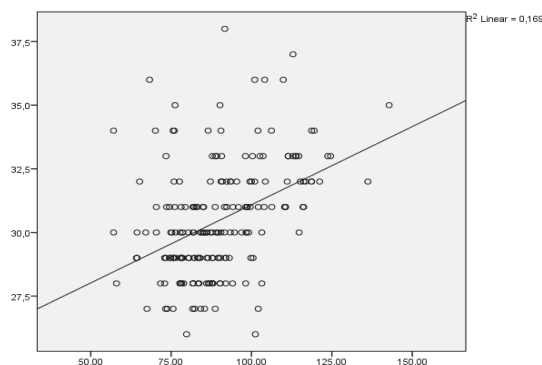


Fig. 4 Graphic of Carbohydrate Intake Prediction Towards BMI (Carbohydrate/Index)

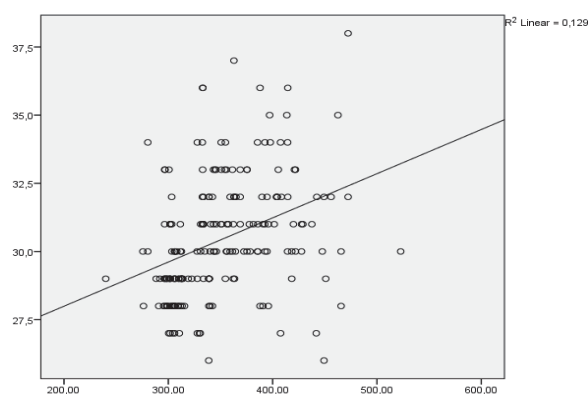


Fig. 5 Graphic of Fat Intake Prediction towards BMI (Fat/Index)

C. Stress Level and Physical Activity Analyses

Analysis result of correlation between BMI and stress level showed that there was no significant correlation ($p=0.791$). Correlation between stress level and BMI was a small correlation ($r=-0.019$), it means that the higher the stress level, the BMI decreased. Coefficient value with determinant 0,003 means that the regresion equation line can explain 0,3% of BMI variation. Stress did not increase the obesity risk in the future. Moreover, eating habit in obese people was difficult to diferrentiate as a impact of stress or not. Obese people tend to eat if there is a desire to eat, not because they feel hungry.

Stress in daily life did not influence the subject's eating habit. Stress was considered as a problem that always happened in life, but it did not change the habit in consuming food.

"...ya kadang ada juga lah kita stres ya banyak pikiran belum kerja rumah, anak, suami...tapi biasa saja tidak mengganggu...sampai saat ini lah, mungkin karna

gemuk ni, lewat sedikit saja waktu makan sudah lapar..." (informan 2 in bahasa).

"sometimes i feel stressed because there are a lot of problem in work, home, with children and husband. But it did not bother me till now. Maybe because I am corpulent, so if I pass the eating time by a little, I already feel hungry..." (informan 2)

Correlation between BMI and physical activity was classified as a strong correlation ($r=0.631$) with the negative pattern; it means the lower of physical activity, the BMI increased. Coefficient value with determinant 0,373 means regression equation line could explain 37,3% of BMI variation. Physical activity was an effort to prevent the increasing of body weight and also contributed significantly to decrease the body weight in the long term. Besides, it could decrease the chronically ill risk [19]. Low of physical activity level had a positive correlation with obesity among women [20], [21].

TABLE VIII
ANALYSIS OF CORRELATION AND SIMPLE LINEAR REGRESSION BETWEEN BODY MASS INDEX (BMI) WITH FREQUENCY OF HIGH FAT FOOD CONSUMPTION IN PEKANBARU 2014

VARIABLE	Body Mass Index			
	r	R ²	Equation line	P value
Frequency of fatty food consumption per week	0,506	0,253	IMT=27,957+0,700*FKML	0,000
Frequency of viscera consumption per week	0,535	0,312	IMT=27,823+0,771*FKJ	0,000

Spearman rho test: Significant statistically ($p<0,05$), FKML: Frekuensi Konsumsi Makanan Berlemak (freq of fatty foodconsumption weekly), FKJ: Frekuensi Konsumsi Jeroan.

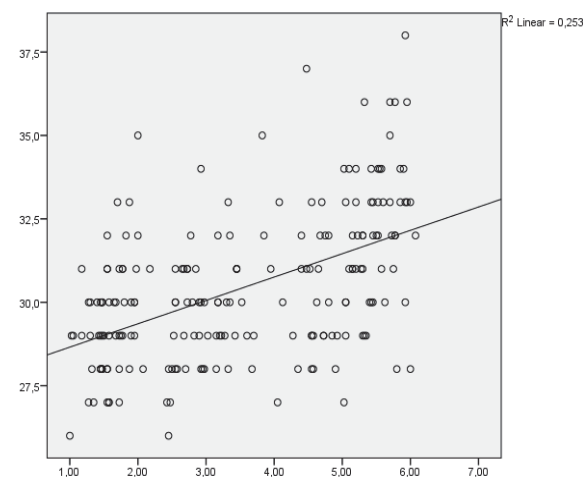


Fig. 6 Graphic of Fatty Food Consumption Towards BMI

Physical activities like exercise routine and minimize the use of a vehicle were difficult to do because people did not have time to do those activities. Besides the hot weather in Pekanbaru detained people to do a physical activity outside the house and obesity made people unwilling to become more active.

"...ee yaa..paling setiap hari ya begitu lah menyapu ngurus anak-anak masak ya aktivitas rutin saja, kalau tak ada lagi kerja ya begolek (tiduran), nonton tv, kadang yo duduk depan rumah..."(informan 1, in bahasa).

"...ee yaa.. every day I am just sweeping, take care of my children, cooking..just my routine activities. If there is no more to do, i am just laying in bed, watching television, and sometimes sitting in the terrace..." (informant 1).

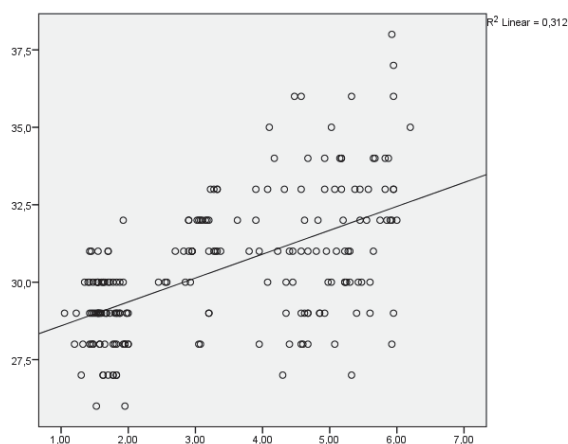


Fig. 7 Graphic of Viscera Consumption Towards BMI

After analyzed the multivariate double linear IV regression, we concluded that this regression was the most suitable analysis technique for this research. The variables consist of protein intake, fat intake, the frequency of fatty food

consumption, the frequency of viscera consumption and physical activity.

TABLE IX
ANALYSIS OF CORRELATION AND SIMPLE LINEAR REGRESSION BETWEEN BODY MASS INDEX (BMI) WITH STRESS LEVEL AND PHYSICAL ACTIVITY IN PEKANBARU 2014

Variable	Body Mass Index (BMI)			
	r	R ²	Equation line	P value
Stress level	-0,019	0,003	IMT=30,730-0,13*TS	0,791
Physical Activity	-0,631	0,373	IMT = 39,811-0,007*AF	0,000

Spearman rho test: Significant Statistically (p<0,05), TS: Tingkat stress, AF: Aktivitas Fisik.

The most influential for dependent variable is an independent variable which had the biggest standardized coefficient B value or had the biggest value result from quadrate multiplied of partial correlations of the last modeling who had passed assumption test.

From this multivariate double linear regression, we could conclude that physical activity had the biggest value of the standardized coefficient B and quadrate multiplied of partial correlations. Besides frequency of viscera consumption was in the second rank. Then those variables became predominant factors of body mass index (BMI).

IV. CONCLUSIONS

There was a correlation between high-fat food consumption pattern and physical activity with obesity level in Pekanbaru. Where physical activity became a predominant factor or the most influential factor for obesity level among women in Pekanbaru. High fat consumption became a habit that difficult to change, but it could be changed by educating people to have a healthy diet.

TABLE X
MULTIVARIAT DOUBLE LINEAR REGRESSION MODELLING BETWEEN INDEPENDENT VARIABLE WITH BODY MASS INDEX (BMI)

Variable	I		II		III		IV	
	Stand. Coeff.	B P value	Stand. Coeff.	B P value	Stand. Coeff.	B P value	Stand. Coeff.	B P value
Aged	0,006	0,743	0,007	0,703				
Marital Status	-0,044	0,855						
Energy intake	0,000	0,498	0,000	0,486	0,000	0,486		
Protein intake	0,012	0,086	0,012	0,087	0,011	0,092	0,013	0,033
Fat intake	0,020	0,020	0,020	0,020	0,020	0,018	0,022	0,008
Frequency of fatty food consumption	0,0322	0,000	0,321	0,000	0,321	0,000	0,318	0,000
Frequency of viscera consumption	0,353	0,000	0,352	0,000	0,361	0,000	0,373	0,000
Physical Activity	-0,004	0,000	-0,004	0,000	-0,004	0,000	-0,004	0,000

TABLE XI
STANDARDIZED COEFFICIENT B AND PARTIAL CORRELATIONS ANALYSIS OF MULTIVARIAT DOUBLE LINEAR REGRESSION

Variable	Stand. Coeff. B	Partial Corr.	(Partial Corr.) ² x 100%
Protein Intake	0,113	0,152	2,3%
Fat Intake	0,145	0,190	3,6%
Frequency of Fatty Food Consumption	0,229	0,285	8,1%
Frequency of Viscera Consumption	0,270	0,321	10,3%
Physical Activity	-0,307	-0,344	11,8%

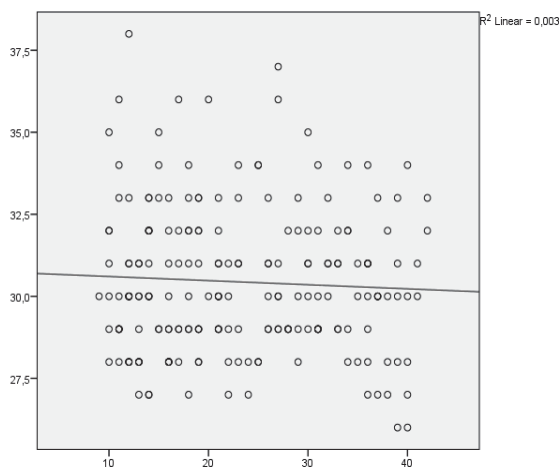


Fig. 8 Graphic of Stress Level Towards BMI (Stress/Index)

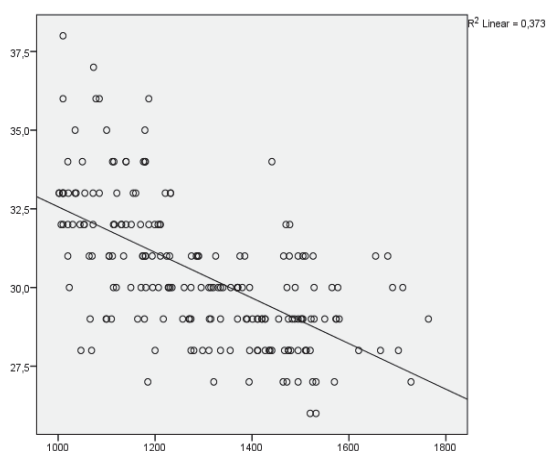


Fig. 9 Graphic of Physical Prediction Activity Prediction Towards BMI

REFERENCES

- [1] Soekirman. (2000). Ilmu Gizi dan Aplikasinya untuk Keluarga dan Masyarakat. Departemen Pendidikan Nasional. Direktorat Jendral Pendidikan Tinggi. Jakarta.
- [2] WHO (2006b). Surveillance of Risk Factor Related to Non Communicable Diseases: Current of Global Data
- [3] Low, S., Chin, M.C& Deurenberg-Yap M. 2009. Review on Epidemic of Obesity. *Annals Academy of Medicine*. 2009: 38(1).
- [4] Adriani, M., Wirjatmadi, B. (2012). Pengantar Gizi Masyarakat. Cetakan ke-1. Jakarta: Kencana Prenada Media Group.
- [5] Soetarjo, S. (2011). Gizi Usia Dewasa. Dalam Sunita Almtsier (eds). *Gizi Seimbang dalam Daur Kehidupan*. Jakarta: Penerbit PT. Gramedia Pustaka Utama.
- [6] Laporan Hasil Riset Kesehatan Dasar (Riskesdas) Indonesia-2010. Jakarta:
- [7] Harahap, H. Yekti Widodo dan Ria Sukarno (2005). Penggunaan Berbagai *Cut-off* Indeks Massa Tubuh sebagai Indikator Obesitas Terkait Penyakit Degeneratif. Jakarta, Badan Litbangkes.
- [8] Atkinson RL. (2005). Etiologies of Obesity. Didalam: *The Management of Eating Disorders and Obesity*, Ed. D.J. Goldstein, editor. Totowa: Humana Press, Inc.
- [9] Hidayati, S.N., Irawan, R. Hidayat, B. (2009). *Obesitas* pada Anak. Surabaya: Devisi Nutrisi dan Penyakit Metabolik, Ilmu Kesehatan Anak. Fakultas kedokteran UNAIR.
- [10] Latih-Koski, M., Pietinen, P., Heliovaara, M., Vartiainen, E. (2002). *Association of Body Mass Index and Obesity with Physical Activity,*

Food Choices, Alcohol Intake and Smoking in the 1982-1997 FINRISK Studies. *Am J Clin Nutr* 2002; 75:809-17.

- [11] International Physical Activity Questionnaire (IPAQ). (2004). IPAQ scoring protocol. Tersedia dalam: \leq <http://www.ipaq.ki.se>>. (diakses 2 september 2013).
- [12] Laporan Hasil Riset Kesehatan Dasar (Riskesdas) Indonesia-2010. Jakarta:
- [13] Djanggan Sargowo, Sri Endarini, 2011, *Pengaruh Komposisi Asupan Makan terhadap Komponen Sindrom Metabolik pada Remaja*, *J Kardiologi Indones*. 2011; 32:14-23 ISSN 0126/3773.
- [14] Almtsier, S. (2001). *Prinsip Dasar Ilmu Gizi*. Jakarta: Gramedia Pustaka Utama.
- [15] Sassi, F, Cecchini M, Lauer J., Chisholm D. (2009), *"Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies"*, *OECD Health Working Papers*, No. 48, OECD
- [16] Sugianti, E. Hardiyansyah dan Afriyansyah, N. (2009). Faktor Risiko Obesitas.
- [17] Sudikno, Hardayati, M., Besral. (2010). Hubungan Aktivitas Fisik dengan Kejadian Obesitas Pada Orang Dewasa di Indonesia (Analisis Data Riskesdas 2007). *Gizi Indo* 2010,33(1):37-49.
- [18] Meissinger, J. L., J. M. James and C. R. Calkins. 2006. *Flavor Relationships among Muscles from The Beef Chuck and Round*. *Journal of Animal Science*. 84: 2826-2833.
- [19] Jakicic JM, Otto AD. (2005). *Physical activity considerations for the treatment and prevention of obesity*. *Am J Clin Nutr*. 82(suppl):226S-9S.
- [20] Janghorbani Mohsen,* Masoud Amini,† Walter C. Willett,‡ Mohammad Mehdi Gouya,‡ Alireza Delavari,Siamak Alikhani, and Alireza Mahdavi (2007). *First Nationwide Survey of Prevalence of Overweight, Underweight and Abdominal Obesity in Iranian Adults*. *Obesity*. 15:2797-2808.
- [21] Jauch-Chara K.Oltmanns K, (2014) Obesity – A neuropsychological disease? Systematic review and neuropsychological model. *Progress in Neurobiology* 114: 84-101.