

## RELATIONSHIP BETWEEN FAST FOOD CONSUMPTION AND THE INCIDENCE OF DEPRESSION

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### ABSTRACT

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**Background:** Depression is a mood disorder that causes loss of motivation to stay or to do daily activities. Research on depression prevalence indicates that approximately 4.4% of the worldwide population suffers it. The mechanism in which depression occurred due to fast foods is the excessive fat content disturbs neurogenesis in the brain. This research is carried out to look into the connection among fast food intake with the incidence of depression.

**Method:** An analytical study with a cross-sectional design is the method chosen to conduct this research. The samples include college students from the Faculty of Medicine in University of Sumatera Utara admitted in 2018 and acquired with total sampling. The tools used in this research were the CES-D and FFQ questionnaire.

**Results:** The incidence of depression among applicants in 2018 was 48.3%. The statistical calculations indicates that there is a significant relationship between fast food consumption and depression ( $p=0,043$ ); but not significant to family income ( $p=0,684$ ) and physical activity ( $p=0,289$ ).

**Discussion:** The causes of depression cannot stand on its own as it is multifactorial in nature. The association between fast food consumption and depression because there is an occurrence of neuroinflammation in the brain. But the inconsistent association between family income and physical activity may be related to other factors such as genetic, gender, sociocultural, environment, and past events.

**Conclusion:** Excessive consumption of junk food can increase the risk of depression.

**Keywords:** Fast Food, Depression, FFQ, CES-D

## 1. INTRODUCTION

Fast food is a type of food that is high in energy and fat, practical, easy to pack and serve. The existence of fast food restaurants, which are growing steadily in big cities of Indonesia affect the eating habits of teenagers, in addition to the public's business in fulfilling their increasing needs which caused them to set aside their health concerns by consuming fast foods that is not fulfilling a healthy lifestyle.<sup>[1]</sup> In the Indonesian capital, 60.27% of people aged over 3 years consume instant food 1-6 times/week and 6.32% consume more than 1 time/day, 39.41% consume fatty foods more than 1 time/day, 36.43% consume sweet foods more than 1 time/day.<sup>[2]</sup>

According to the *world health organization* (2017), depressive problems are characterized through sadness, lack of hobby or pleasure, emotions of guilt or low self-esteem, disturbed sleep or appetite, emotions of tiredness, and having terrible concentration. Depression may be long-term or recurrent, which significantly impairing your ability to function at work or school or to go about your everyday life. At worst, depression can cause suicide. The prevalence of depression in Indonesia according to riset kesehatan dasar (Riskesdas) in 2018 reached 6.1% in individuals aged 15 years and above. Of all the population in Indonesia which are affected by depression, only about 9% seek for treatment.<sup>[3]</sup>

Several previous studies had shown that there is a relationship between the process of inflammation with depression. Research on the relationship between fast food consumption and the incidence of depression has been widely carried out abroad, but very little has been done in Indonesia and it is usually carried out on students, while it has never been done on medical students before. Therefore, in this study, a study was conducted on students of the medical faculty where they were busy with various lecture, assignments, and exams and tended to choose fast food. This study also looks for the relationship between physical activity and family income on depression which medical students also tend to not have time to exercise and the costs are

borne entirely by their parents. Fast food is a pro-inflammatory food which may contribute toward heightened levels of inflammatory markers observed in depressed people. Studies indicate that high levels of dietary inflammation are associated with increased risk of developing depression.<sup>[4]</sup>

The probable mechanism which is linked to this association can be seen through the process of neurogenesis, in which neurogenesis is tightly linked to pro-inflammatory cytokines and neuro-inflammation. Receptors of the pro-inflammatory cytokines are aggregated in the area that controls cognitive function, like the hippocampus. Pro-inflammatory cytokines could reduce the neurogenesis of the hippocampus in adults which could cause depression. Chronic neuro-inflammation also reduced the sensitivity of the glucocorticoid receptors, which could exacerbate the activities of pro-inflammatory cytokines and chronic neuro-inflammation. On the other hand, neuro-inflammation could also cause an imbalance between oxidative stress and the anti-oxidant system in the body.<sup>[3]</sup>

## 2. METHOD

The study was conducted at the Faculty of Medicine in University of Sumatera Utara, Medan from July 2019 to December 2019. The subjects of the study were students of class 2018 from the Faculty of Medicine in University of Sumatera Utara. The determination of the subjects of the study was according to the method of Total Sampling.

The inclusion criteria of the study are as follows: students of class 2018 from the Faculty of Medicine in University of Sumatera Utara that agreed to fill the questionnaires and are not currently using anti-depressants. Meanwhile, the exclusion criteria is incomplete questionnaires. The study used instruments such as the food frequency questionnaire (FFQ) and center for epidemiologic studies depression (CES-D).

The food frequency questionnaire had been validated by nutrition experts, while validity tests had been conducted on the center for epidemiologic studies depression questionnaire and the usability of this

questionnaire is valid and reliable which makes both of those questionnaires suitable for this study.

### 3. RESULT

From table 1, we can see that from 240 respondents, there are more females (65%) compared to males (35%). Based on depressive symptoms, we can also see that most of the respondents are not depressed (51.7%). Most respondents also consumed fast food often (27.5%), followed by rarely (69.6%) and very often (2.9%).

**Table 1.** Data distribution of respondents

	Frequency (n=240)	Percentage (%)
<b>Gender</b>		
Male	84	35
Female	156	65
<b>Depressive Symptom</b>		
Depressed	116	48.3
Not Depressed	124	51.7
<b>Fast Food Consumption</b>		
Rarely	66	27.5
Often	167	69.6
Very Often	7	2.9

**Table 2.** Frequency distribution of depression according to sex

	Depressed (n=116)	Not Depressed (n=124)
<b>Gender</b>		
Male	38 (15.8%)	78 (32.5%)
Female	46 (19.2%)	78 (32.5%)

From table 2, it can be seen that by gender, there are 38 men who suffer from depression and 46 men who do not suffer from depression. Then for the female gender, there are 78 woman who suffer from depression, and 78

woman who do not suffer from depression. From this study, it was found that based on gender, respondents who experienced symptoms of depression were mostly found in women (32.5%) than men (15.8%).

From table 3, an association can also be found between the incidence of depression and fast food consumption, which mainly consists of respondents who have depressive symptoms and consume fast food often (35%), followed by rarely (10.8%) and very often (2.5%). Meanwhile, most of the respondents who are not depressed often ate fast food (34.6%), followed by rarely (16.7%) and very often (0.4%). The p value also shows that there is a significant relationship between fast food consumption dan depressive symptoms ( $p=0.043$ ).

The study found that most of those who have depressive symptoms came from families with a high income (29.2%) followed by families with a low to moderate income (19.17%). Most respondents who are not depressed also come from a high income family (32.5%) followed by low to moderate income family (19.17%). However, there is no association found between family income and depressive symptoms. This is proven from the p value of 0.684 which doesn't show a significant relationship between the two variables.

There is also no association found between physical activity and depressive symptoms. This is shown from the p value of 0.289. Most of the respondents who are depressed had none to light physical activity (40.4%) followed by those who do moderate to heavy physical activity (7.9%). Similarly, most respondents who are not depressed also had none to light physical activity (40.4%), followed by moderate to heavy physical activity (11.3%).

**Table 3.** Relationship between frequency of fast food consumption, family income and physical activity with depression

	Depressed(n=116)	Not Depressed (n=124)	p value
<b>Fast Food Consumption</b>			
Rarely	26 (10.8%)	40 (16.7%)	0.043
Often	84 (35%)	83 (34.6%)	
Very Often	6 (2.5%)	1 (0.4%)	
<b>Family Income</b>			
Low-moderate	46 (19.17%)	46 (19.17%)	0.684
High	70 (29.2%)	78 (32.5%)	
<b>Physical Activity</b>			
None-light	97 (40.4%)	97 (40.4%)	0.289
Moderate-heavy	19 (7.9%)	27 (11.3%)	

#### 4. DISCUSSION

In this study, it was found that the incidence of depression was higher in women than men. Women show greater sensitivity to interpersonal relationships, while men show greater sensitivity to external careers and factors which are oriented to his future goals. Women also experience specific forms of depression-related illnesses, including premenstrual dysphoric disorder, which is associated with changes in ovarian hormones. Disruption of estrogen homeostasis leads to dysregulation of brain-derived neurotrophic factor (BDNF) therefore impairing 5-HT<sub>2A</sub> signaling and attenuating neuronal synaptic plasticity, which together make the brain state susceptible to depressive symptoms.<sup>[5]</sup>

The statistical test used in this study is the fisher-freeman halton test (alternative to chi-square) which obtained the p value of 0.043.  $P < 0.05$  that could be interpreted as significant. It can be concluded that there is a significant relationship between fast food consumption with depressive symptoms. The finding of this study is similar with a study conducted in Pakistan. The study in Pakistan used the ANOVA test and Tukey post hoc test which showed that there is a significant difference on students aged 20-25 years who consumed fast food and not with the incidence of depression.<sup>[6]</sup> A similar study was also conducted in the Netherlands with a result that showed there is a significant relationship between consuming fast foods with the incidence of depression (p value < 0.001).<sup>[7]</sup>

Several studies showed that foods high in fat and low in carbohydrates (ketogenic diet) could impair cognitive functions. Foods high in saturated fat or total fat could increase the production of free radicals and increase the pro-inflammation condition. This diet induced oxidative destruction and inflammation which is linked to decreased expression of brain-derived neurotrophic factor, decrease in neuronal plasticity, and worsening of cognitive function in animal models. BDNF is a neurotrophin linked to several actions including synaptic plasticity, life sustainability and neuron differentiation. BDNF levels are decreased in patients suffering from depressive symptoms.<sup>[8]</sup>

According to the results of the statistical test with the chi-square method, the p value obtained is 0.684 in which  $p > 0.05$ , which could be interpreted as not significant. Therefore, it could be concluded that there is no significant relationship between family income with depressive symptoms.

A similar study conducted by Jeong *et al.* on medical students in Korea showed an insignificant result between income and depressive symptoms in which the p value obtained is 0.67.<sup>[9]</sup> In a similar study in Yogyakarta, the geriatric group is also shown to not display a significant relationship between the respondents income and depression (p value=0.136).<sup>[10]</sup>

The results are not similar with another study which was conducted in urban and rural areas of China in which respondents with a lower income suffers more from depression compared to respondents with a higher income. In the

study, incidence of depression was relatively low ( $P < 0.05$ ) among elderly with high income in the urban areas.<sup>[11]</sup>

A difference in income with the incidence of depression could be explained by the difference of ecological level. In an individual level, the effect from the difference of income in an individual's health tend to be mediated, especially through psychological pressure. In an environmental level, there is a social comparison, which is comparing yourself with others who are better off while the social gap is very huge which results in a feeling of social defeat or status anxiety. The feeling of retraction and shame which is experienced by those who are at the lower positions in society. In a national or regional level, the neo-material hypothesis suggested that the great income imbalance is associated with the lack of materials which is relevant to health. This includes the lack of investment in housing, education, public transport, pollution control, availability of healthy foods, and accessibility to health care.<sup>[12]</sup>

A factor that could cause the result of this study to be insignificant is the fact that most students from the Faculty of Medicine in University of Sumatera Utara came from families with middle to high economic status. Because of that, financial conditions bear little to no weight on the students. Students no longer have to worry about financial problems.<sup>[13]</sup> The results of this study shows that a high economic status doesn't always guarantee the happiness of the respondent. Other elements consist of demographic and social factors (being female, low organized spiritual activity, loss of social assistance and shortage of private control), terrible or horrifying life events (sexual violence and abuse sustained during childhood) and dangerous behaviors related to one's health (tobacco use, abnormal sleep duration, elevated salt intake, infrequent meals in a day, excessive internet use and previous injuries in the past) have been related to depressive symptoms.<sup>[14]</sup>

From the table above it can be seen that the result of the statistical test with the chi-square method obtained a p value of 0.289 in which  $p > 0.05$  which

could be interpreted as not significant. Therefore, it can be concluded that there is no significant relationship between frequency of physical activity with depressive symptoms. The results of this study is not in accordance with another study conducted in the United States which studied samples of adults aged 18 years and above, in which the study found that there is a significant relationship between the decrease in the incidence of depression with physical activity intervention and the p value obtained was 0.001.<sup>[15]</sup> Another study by Tegawati *et al.* shows that there is no significant relationship between the effects of gymnastics with a decrease in depression in which the p value obtained is 0.954.<sup>[16]</sup>

Physical activity becomes an effective strategy to delay or return physical functions which was previously decreased and reduce depression. Physical activity or exercise has a central effect towards depression through an increase in the release of  $\beta$ -endorphin availability of the brain's neurotransmitter (such as serotonin, dopamine and noradrenalin) or on BDNF. Physical activity can increase self-confidence, self-value and a sense of achievement. Other than those benefits, an increase in social interaction which was felt during physical activity with a group has a positive effect on the mood of the patient.<sup>[17]</sup>

The result of this study which showed no significant relationship between physical activity with depression could be caused by various conditional factors and other factors which is individual in nature. Factors that could cause depression include : First, a biological dimension which is influenced from the depressed patient's family could increase the incidence of depression on the patient; second, the psychological dimension which is the condition of the environment such as stressful, learned despair and negative cognitive style; third, a sociocultural dimension which includes various interpersonal relationships, family relationship, social support and influence from surrounding cultures.<sup>[16]</sup>

## 5. CONCLUSION

High consumption of fast food can increase the risk for depression. However, there is no relationship between fast food consumption with physical activity and family income.

## 6. SUGGESTIONS

It is advised for both adolescents and adults to avoid excessive consumption of fast food, and increase the frequency of exercise in order to avoid the risk of developing depression. For patients of depression with no signs of relief, it is advised to arrange a visit to a psychiatrist in order to find the cause and solution to the condition they are suffering from. We suggest for the next study held related to this topic to discuss further about the variety of other factors that can cause depression, such as a history of smoking, drinking alcohol, abuse and et cetera.

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