



The Relationship between *Consumption of Frozen Food, Sweetened Soft Drinks, and Stress with The Nutritional Status of Adolescents*

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ABSTRACT

This study aims to determine the relationship between *frozen food* consumption, sweetened soft drinks, and stress and the nutritional status of adolescents at Al-Hamid Islamic Boarding School, Cilangkap, East Jakarta. The method used cross-sectional design at Al-Hamid Islamic Boarding School, Cilangkap, East Jakarta. The sample in this study was 69 people. The data measured were *frozen food* consumption patterns, sweetened soft drink consumption patterns using questionnaires (FFQ), stress using questionnaires (KPDS), and nutritional status measured using BMI—bivariate analysis using the Gamma test. The results of the study were respondents with high *frozen food* consumption patterns (45%), high, medium (17.4%) and low (37.6%), respondents with sweetened soft drink consumption patterns (45%), high, medium (17.4%) and low (37.6%). Respondents who experienced severe stress (45%), (17.4%) moderate stress, (7.3%) mild stress, (30.3%) not stressed. The results of the bivariate test showed a relationship between *frozen food* consumption patterns and nutritional status (p-value 0.000), a relationship between sweetened soft drink consumption patterns and nutritional status (p-value 0.000), and a relationship between stress and nutritional status (p-value 0.000). The conclusion was that there was a significant relationship between the consumption of *frozen food*, sweetened soft drinks, and stress and nutritional status.

Keywords: *frozen food*, sweetened soft drinks, stress, nutritional status

INTRODUCTION

Adolescent nutritional status is a state of fulfillment of nutrients in the body, where there is a reciprocal intake and absorption of nutrients by the body (Dieny, 2014). The nutritional status of Indonesian adolescents is classified as having many health problems. Many nutritional problems in adolescents are undernutrition, overnutrition, and obesity (Dieny, 2014).

Based on Basic Health Research in 2018, the prevalence of obesity and obesity nationally in adolescents aged 16-18 years is still relatively high, namely adolescent boys with 9.75% more nutrition and 7.40% obesity. Adolescent girls are 15.83% overnourished and 9.19% obese. The highest prevalence of obesity is in Papua (13.5%), East Kalimantan (12.9%), and DKI Jakarta (12.8%). At the same time, the prevalence of obesity is highest in DKI Jakarta (8.3%), Bangka Belitung (6.3%), and DI Yogyakarta (6.2%). The incidence of overnutrition status and obesity in DKI Jakarta in adolescents aged 16-18 is relatively high, especially in the East Jakarta area 13.53%

experience more nutrition, and 9.91% are obese. This percentage is higher than adolescents' nutritional status in other parts of Jakarta (Ministry of Health RI, 2018).

Based on the results of the study living in the Shuffah Hezbollah Islamic Boarding School and Al-Fatah Madrasah Lampung with a total of 72 adolescents found that 1 in 72 adolescents (1.4%) were malnourished, 11 out of 72 adolescents (15.3%) were overnourished, and 2 out of 72 adolescents (2.8%) were obese (Abdullah *et al.*, 2022).

Health problems experienced by teenagers now are also a severe problem worldwide. One of the causes of this health problem is daily food intake; food intake can be in the form of processed food patterns and drinks with excessive calories. These foods and drinks, widely shown on television promotions, are claimed to be high in energy, vitamins, and minerals. Some products have high sugar, sodium, and fat content in addition to additives; consuming such foods and drinks in large quantities can cause premature pathological changes. The adolescent phase's diet will affect health in the aftermath, namely adulthood and old age (Arisman, 2009).

Teenagers favor various processed products. One of them is processed frozen food products or *frozen food*. Frozen food products are semi-finished products with frozen conditions; these processed products can last a long time and are easy to serve. *Processed frozen food* products are divided into several types, namely processed fruits and vegetables, processed meat, *bakery* products and *snacks*, processed fish and seafood, and processed eggs (BPOM, 2021). Fast food or similar preparations such as *frozen products are processed foods with high fat, protein, salt content*, and low fiber (Lazzeri *et al.*, 2006). Research results (Amalia *et al.*, 2021) regarding the purchase of frozen food and processed products noted that 131 respondents from Generation Y born in 1980-1995 (aged 25-45 years) and Generation Z born in 1996-2000 (aged 20-25 years) as many as 66 out of 131 respondents (50.4%) respondents bought 1-2 kinds of frozen food products (frozen food), 55 out of 131 respondents (42%) bought 3-4 kinds of *frozen food* products, 9 out of 131 respondents (7%) respondents buy 5-6 kinds of frozen food products and 1 in 131 respondents (< 1%) buy more than six kinds of *frozen food* products every month. According to (Nagvansh, 2015), the consumption of fast food and its processed types such as *frozen food*, has an impact on health such as obesity, the risk of central system disorders, cardiovascular, and hypertension.

Processed *frozen food* products are widely consumed and in demand by teenagers because they are easy and practical to serve. In addition to processed *frozen food*, teenagers also like to consume sweetened drinks. Sweetened soft drinks or sugar-sweetened *beverages* contain sugar and high calories but are low in other nutrients. Added sugars commonly used in these products are sucrose, white sugar, brown sugar, *honey*, and *high corn fructose syrup* (HCFS) (Mann and Truswell, 2007). The Basic Health set in 2018 revealed that 56.4% of adolescents aged 15-19 years in Indonesia consume sweetened soft drinks ≥ 1 time per day (Ministry of Health RI, 2018). Excessive consumption of sweetened soft drinks has an impact on increasing the risk of non-communicable diseases, namely obesity, type II diabetes mellitus, and cardiovascular disease (Malik and Hu, 2019).

Based on the 2014 diet study, the availability of beverages in Indonesia is classified into two types, namely powder and liquid packaging (Siswanto, 2014).

Factors that affect nutritional status other than diet are stress. Stress is a change in life events that may take place in schools, dormitories, and communities. Adolescent stress urges self-adaptation; if adaptation fails, individuals will experience disorders, including eating disorders; these eating disorders will affect the nutritional status of the adolescent (Nadeak, 2013). According to research, the stress score of a person, the high level of nutritional status indicators, in stressful conditions, a person experiences changes in appetite and impacts nutritional status. A person in a stressful condition triggers two eating behaviors: approaching eating (emotional eaters) and reducing eating (*non-emotional eaters*). Approaching eating (*emotional eaters*) applies to someone with more nutritional status, obese and obese. Staying away from eating (*non-emotional eaters*) applies to someone underweight or deficient nutritional status. The stress experienced by respondents significantly affects their nutritional status because there is a decrease in BMI / you and an increase in BMI / you. Hence, the nutritional status of respondents is diverse (Nadeak, 2013). This study aims to determine the consumption patterns of *frozen food*, sweetened soft drinks, and adolescent stress at Al-Hamid Islamic Boarding School, Cilangkap, East Jakarta.

METHOD

This research was conducted with an analytical descriptive method using a *cross-sectional* research design. The location of this research is Pondok Pesantren Al-Hamid Cilangkap, East Jakarta. This research was conducted in March-November 2022.

The population of this study is young women of MA Al-Hamid with an age range of 15-18 years residing in the Al-Hamid Islamic Boarding School, Cilangkap, East Jakarta. Sampling was done using *simple random sampling* with a total sample of 69 adolescent girls. The inclusion criteria in this study were women aged 15-18 years, adolescents at Al-Hamid Islamic Boarding School, Cilangkap, East Jakarta, and willing to participate in the research through *informed consent*. The exclusion criteria in this study were to declare resignation or leave in the middle of the study and not in a fasting condition.

The independent variables were *frozen food* consumption, sweetened soft drink consumption, and stress. The dependent variable in this study was nutritional status. Data on *frozen food* consumption and sweetened soft drink consumption were obtained by interviewing and filling out the *Qualitative FFQ* questionnaire. Stress data was obtained by filling out the KPDS (*Kessler et al.*) questionnaire, and nutritional status data was obtained by measuring weight and height and calculated by the BMI / U formula using the Z-score according to the 2020 Nutritional Anthropometry Decree.

The data obtained were processed and analyzed using SPSS software version 24.0. Bivariate analysis can be determined using gamma statistical tests.

RESULTS AND DISCUSSION

Table 1. The Relationship between Frozen Food Consumption and the Nutritional Status of Adolescent Adolescents at Al-Hamid Islamic Boarding School, Cilangkap, East Jakarta

Frozen food consumption patterns	Nutritional Status			Correlation Coefficient (r)	Value p
	Usual	Fat	Obesity		
Low	26	0	0	0.543	0,00
Moderate	0	12	0		
High	0	1	30		
Total	26	13	30		

Based on the results of *gamma* statistical tests between frozen food consumption patterns and nutritional status presented in the table, it is known that the majority of respondents have high *frozen food* consumption patterns and obesity nutritional status, which is as many as 30 respondents (43.5%)

The *gamma* test results in Table 1 showed that the variables of *frozen food* consumption patterns and nutritional status have a significance value (p-value) of 0.00 ($p < 0.05$). Based on the results obtained, it can be concluded that there is a relationship between *frozen food* consumption patterns and nutritional status. The correlation coefficient (r) value 0.543 indicates a positive correlation with moderate correlation strength.

Based on research conducted by Yulianingsih et al., (2017) regarding the consumption of *fast food* or processed foods, such as *frozen food*, with the nutritional status of adolescents at SMAN 1 Baturetno Wonogiri, the result (p-value) was 0.000. So, it can be concluded that there is a significant relationship between the consumption of *fast* or processed foods, such as *frozen food*, and adolescents' nutritional status at SMAN 1 Baturetno Wonogiri. Based on this study, age is an influential factor in *frozen food* consumption patterns, especially for those who experience instability and are easily affected by the surrounding environment and follow the trends of the developing era.

Ready-to-eat foods and *frozen food* products do not contain good carbohydrates and protein in sufficient quantities. The body's blood sugar levels suddenly drop after eating, causing feelings of anger, fatigue, craving consumption of foods containing sugar again, and causing weight gain (Ashakiran and Deepthi, 2012). How to process frozen food products by frying causes the fat content to increase in the processed *frozen food*. Consumption of processed *frozen food* with the process of frying will increase the fat content that enters the body. Excess fat consumption in the body will be distributed to the *upper* and *lower body*, causing obesity. The accumulation of fat in the body can occur due to an increase in the process of lipogenesis. Frozen *food*, processed products, and high fat due to the processing process also contain high sodium. Excess sodium intake causes the composition of sodium in the extracellular fluid to increase; to normalize it, the intracellular fluid must be pulled out so that the volume of extracellular fluid increases. The increased volume of extracellular fluid causes blood volume to rise, impacting the emergence of hypertension (Krummel, 2004).

Table 2. The Relationship between Consumption of Sweetened Soft Drinks with the Nutritional Status of Adolescents at Al-Hamid Islamic Boarding School, Cilangkap, East Jakarta

Consumption pattern of sweetened-soft-drinks	Nutritional Status			Correlation Coefficient (r)	Value p
	Usual	Fat	Obesity		
Low	26	0	0	0.543	0,00
Moderate	0	12	0		
High	0	1	30		
Total	26	13	30		

Based on the results of *gamma* statistical tests between sweetened soft drink consumption patterns and nutritional status presented in the table, it is known that most respondents have high sweetened light consumption patterns and obese nutritional status, which is as many as 30 respondents (43.5%).

The *gamma* test results in Table 2 showed that the variables of sweetened soft drink consumption patterns with nutritional status have a significance value (p-value) of 0.00 ($p < 0.05$). Based on the results obtained, it can be concluded that there is a relationship between the consumption pattern of sweetened soft drinks and nutritional status. The value of the correlation coefficient (r) of 0.543 indicates that the correlation shows a positive correlation with a moderate correlation strength.

This study is in line with previous research conducted by (Cahyaningtyas, 2018) regarding the relationship between the frequency of consumption of caloric drinks and nutritional status in students at SMA Negeri 5 Surakarta, getting results (p-value) of 0.000. So, it can be concluded that there is a relationship between the frequency of caloric drinks and nutritional status in SMA Negeri 5 Surakarta students. Another study conducted by (Saidah et al., 2017) on the relationship between consumption habits of sweetened beverages and the incidence of more nutrition in adolescents at SMA Institut Indonesia Semarang obtained results (p-value) 0.001. So, it can be concluded that a relationship exists between consuming sweetened beverages and the incidence of more nutrition in adolescents at SMA Institut Indonesia Semarang.

Age becomes a factor that affects a person's consumption patterns; in this study, the adolescent age phase follows the trend of the times and pays less attention to diet; research conducted by (Chan *et al.*, 2014) found that adolescents are a group with high consumption of sweetened drinks. The prevalence of obesity has increased among adolescents in recent times. It has become an essential concern in the health of children and adolescents because of the consumption of sweetened soft drinks (Chan *et al.*, 2014). Teenagers who consume sweetened drinks are not aware of the energy content of sugar in them because it is a liquid. Sweetened drinks contain simple sugars and are called sucrose. Sucrose-type sugar consists of two monosaccharides, namely fructose and glucose. Sucrose, when it enters the body through digestion, is broken down into glucose-fructose through digestion in the intestine. Fructose that the intestines have absorbed is carried through the blood vessels to the liver to be metabolized into fat. Glucose is absorbed more quickly by the body for energy than fructose because fructose does not stimulate insulin release.

Fructose is carried to cells through different channels from glucose until, in the liver, fructose is converted into glycerol. In contrast, glucose stored as glycogen is used as energy reserves and causes weight gain (Mann and Truswell, 2007).

The mechanism of fructose in increasing weight is fructose after intestinal absorption; 50-75% of fructose is metabolized in the liver, and the rest of the metabolism is excreted through the kidneys. The first enzyme that plays a role in fructose metabolism is fructokinase or ketohexokinase, which uses Adenosine Tri Posfat (ATP) to phosphorylate fructose to fructose-1 phosphate, which occurs in the liver, intestinal epithelium, A cell deposits and vascular endothelium: fructose-1 phosphate and Acetyl-CoA. Furthermore, acetyl-CoA is converted into Acyl-CoA, related to glycerol-3 phosphate, forming excessive triglycerides in the body to be stored, causing accelerated weight gain (Mann and Truswell, 2007).

Table 3. The Relationship of Stress with Adolescent Nutritional Status at Al-Hamid Islamic Boarding School, Cilangkap, East Jakarta

Stress Level	Nutritional Status			Correlation Coefficient (r)	P value
	Usual	Fat	Obesity		
Severe stress	0	1	30	-0,621	0,00
Moderate stress	1	12	0		
Mild Stress	4	0	0		
No Stress	21	0	0		
Total	26	13	30		

Based on the results of *gamma* statistical tests between stress and nutritional status presented in the table, it is known that the majority of respondents have severe stress conditions and nutritional status of obesity, namely 30 respondents (43.5%).

The *gamma* test results in table 3 showed that stress variables and nutritional status have a significance value (p-value) of 0.00 ($p < 0.05$). Based on the results obtained, it can be concluded that there is a relationship between stress and nutritional status. The correlation coefficient (r) value of -0.621 indicates a negative correlation with solid forces.

This study aligns with previous research conducted by (Manginte on the relationship between stress and nutritional status of students of the nursing bachelor program in Semester VIII Stikes Tana Toraja in 2015, obtained results (p-value) 0.003. So, it can be concluded that there is a relationship between stress and the nutritional status of students of the nursing bachelor program in Semester VIII Stikes Tana Toraja in 2015. Research conducted (Aulianti and Puspitasari, 2021) regarding the relationship between stress levels and physical activity with nutritional status at the age of women in Tangerang obtained results (p-value) 0.00. It can be concluded that there is a relationship between stress levels and physical activity with nutritional status at the age of women in Tangerang.

Stress will impact changes in appetite; adolescents with more nutritional status eat more and consume more high-energy foods. Adolescents with less nutritional status reduce energy consumption more or find eating difficult. Individual responses vary when associated with eating

behavior; in stressful circumstances, there is a change in eating behavior. Individuals in a state of stress consume more food (emotional eaters), and conversely, their eating behavior has no effect or decreases (*non-emotional eaters*). The stress mechanism starts from releasing the hormone CRH (*corticotrophin-releasing hormone*), suppressing appetite. The brain will send messages to the adrenal glands above the kidneys to release more adrenaline hormone (epinephrine). This adrenaline hormone helps trigger the body's response to delay eating. If stress continues, the adrenal glands will release another hormone, cortisol, to increase appetite. High cortisol hormone and high insulin levels in the body cause the hormone ghrelin to increase. Ghrelin is also called the "*hunger hormone*," which signals the brain to eat and store calories and fat more effectively. Therefore, the increase in this hormone makes it difficult to lose weight, and the individual experiences (*emotional eating*). On the contrary, someone in a stress condition does not reduce eating; the hormone CHR (*corticotrophin-releasing hormone*) suppresses hunger. Eventually, appetite decreases and experiences (*non-emotional eaters*). This condition depends on how the body responds to the stress experienced (Sominsky and Spencer, 2014).

A person is in acute stress; stress that occurs quickly with pressure is strong enough but disappears quickly. The brain will signal to release adrenaline and non-adrenaline hormones to the adrenal glands. This hormone affects the decrease in appetite so that the body slows down physiological work, resulting in heart rate, blood pressure, increased triglyceride levels, and decreased blood flow to the skin, kidneys, and digestive system (Sominsky and Spencer, 2014).

While in chronic conditions, namely stress that occurs in the long term. In this condition, the adrenal glands will release another hormone, cortisol. High cortisol hormone and high insulin levels in the body cause the hormone ghrelin to increase. The hormone cortisol also activates the enzyme lipoprotein lipase and inhibits the breakdown of triglycerides, which can cause fat reserves to become more abundant. A person's chronic stress appetite will increase, and the storage of fat reserves becomes more—this causes a person's weight gain (Nasrani and Purnawati, 2015).

CONCLUSIONS

There was a relationship between *the consumption of frozen food*, sweetened soft drinks, and stress and the nutritional status of adolescents in Pondok Messagetrend Al-Hamid Cilangkap, East Jakarta.

Researchers advise respondents to pay more attention to food and beverage consumption patterns so as not to overdo it because it can have an impact on their respective health. Suggestions for further researchers are expected to pay more attention to the number of samples and instruments used, especially instruments for consumption patterns of *frozen food* and sweetened soft drinks, researchers can then use Semi-Quantitative FFQ or 24-hr recall. In addition, further research needs to be done to determine the amount of energy consumed by respondents every day.

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