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Fast Food Intake, Physical Activity, and Nutritional Status in 11th-Grade Students at State Senior High School 1 Luwuk

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ABSTRACT

Adolescence is a critical period marked by rapid physical and behavioral changes that may influence nutritional status. High fast food consumption and low physical activity are increasingly common among adolescents and may contribute to nutritional problems. This study aimed to examine the association between fast food consumption, physical activity, and nutritional status among eleventh-grade students at State Senior High School (SSHS) 1 Luwuk, Banggai Regency, Indonesia. An analytic observational study with a cross-sectional design was conducted involving 197 students selected through simple random sampling. Fast food consumption was assessed using a Food Frequency Questionnaire (FFQ), while physical activity was measured using the Physical Activity Level (PAL) questionnaire. Nutritional status was determined based on Body Mass Index-for-Age (BMI-for-age) according to WHO standards. Data were analyzed using univariate and bivariate methods, with associations tested using the Chi-square test. Results showed that 53% of respondents frequently consumed fast food, and this behavior was significantly associated with nutritional status. Although 92% of students engaged in light physical activity, no significant relationship was found between physical activity and nutritional status. The distribution of nutritional status indicated that 49% of students were normal, 29% underweight, 18% overweight, and 4% obese. Statistical analysis confirmed a significant association between fast food consumption and nutritional status ($p < 0.05$; OR = 1.24), while physical activity showed no significant association ($p > 0.05$). In conclusion, frequent fast food consumption is associated with abnormal nutritional status among adolescents, whereas physical activity is not. Nutrition education programs promoting healthy eating and balanced diets are recommended.

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Fast food consumption; Physical activity; Nutritional status; Adolescents; BMI-for-age

KEY MESSAGES

- *Frequent fast food consumption is significantly associated with abnormal nutritional status among adolescents, indicating its critical role as a modifiable dietary risk factor in this population*
- *Physical activity level was not significantly associated with nutritional status, suggesting that dietary factors may have a more dominant influence than activity patterns in this study context.*
- *A dual burden of malnutrition persists, with substantial proportions of underweight and overweight/obese students, highlighting ongoing nutritional transition among Indonesian adolescent*

INTRODUCTION

Adolescents aged 12–14 years are in early adolescence, a developmental stage in which cognitive capacity and emotional maturity are not yet fully established. In contrast, individuals in late adolescence (17–21 years) generally attain greater cognitive maturity and accumulate diverse life experiences, both positive and negative, through which they begin to formulate and internalize their own moral framework. (Ilmiawati & Kuntoro, 2017). From both biological and psychological perspectives, adolescents have distinct nutritional requirements. Biologically, their nutrient intake must be aligned with their level of physical activity and the rapid growth that characterizes this developmental stage. Compared with childhood, adolescence is associated with increased requirements for protein, vitamins, and minerals per unit of energy expenditure, reflecting accelerated somatic growth, hormonal changes, and tissue maturation. Psychologically, however, adolescents often place limited emphasis on health considerations when making dietary choices. Instead, their decisions are frequently influenced by external factors such as peer environment, prevailing social norms, and hedonistic lifestyle trends, all of which may substantially shape eating behaviors (Adriani & Wiratjamadi, 2012).

Food constitutes a fundamental requirement for optimal growth and development, including during adolescence. Inadequate dietary intake, whether in terms of quantity or quality, may disrupt metabolic processes and increase susceptibility to disease. Conversely, excessive food consumption in the absence of sufficient physical activity may predispose adolescents to adverse health outcomes, including an elevated risk of degenerative diseases later in life (Adriani & Wiratjamadi, 2012).

Fast food is commonly referred to as junk food. Literally, the term "junk food" denotes food of poor nutritional value, implying products that provide limited essential nutrients relative to their energy content. Frequent consumption of such foods has been associated with various adverse health outcomes, including obesity, type 2 diabetes mellitus, hypertension, coronary heart disease, stroke, and certain types of cancer (Sari, 2008). Fast food has gained widespread popularity due to its rapid preparation, broad availability, convenience, affordability, and palatable taste. However, habitual and excessive consumption of fast food may have detrimental health consequences across all age groups, including children, adolescents, and adults. In addition to systemic health effects, long-term intake of fast food may also negatively affect oral health. Products with high sugar content can increase the risk of dental caries by promoting acid production from oral bacteria, leading to enamel demineralization and tooth decay (Oktavia & Sholehudin, 2011).

Adolescence represents a critical developmental period characterized by substantial hormonal, structural, and psychological changes. During this stage, rapid physiological growth is accompanied by significant psychosocial adjustments. The major nutritional problems observed in adolescents include iron deficiency anemia, overweight and obesity, as well as undernutrition. These conditions are closely associated with increased consumption of energy-dense, nutrient-poor processed foods, which contribute to excessive caloric intake and subsequent weight gain. High intake of junk food has been identified as a key factor underlying adolescents' vulnerability to overweight and obesity (Istiany & Rusilanti, 2013). A survey conducted by Nilsen (2008) reported that 69% of urban residents in Indonesia consumed fast food. Of these, 33% reported consuming it as lunch, 25% as dinner, 9% as a snack, and 2% as breakfast (Nilsen, 2008). Physical activity is defined as any bodily movement produced by skeletal muscles and their supporting systems. During physical activity, muscles require additional energy beyond basal metabolic processes to sustain movement. The amount of energy expended depends on the number of muscles engaged, the duration of the activity, and the intensity or workload performed (Indriawati & Soraya, 2009).

Nutritional status refers to the physiological condition of the body as influenced by dietary intake and the utilization of nutrients. It is commonly classified into three categories: undernutrition, normal nutritional status, and overnutrition. Among adolescents, nutritional status can be assessed using several methods, one of which is the Body Mass Index (BMI). BMI is considered appropriate for this age group because adolescents are still undergoing growth and development, making anthropometric indices particularly relevant for evaluation (Almatsier, 2010). Nutritional status also reflects the adequacy of nutrient intake in supporting optimal growth, as indicated by body weight and height measurements. More broadly, it is defined as a health condition resulting from the balance between nutrient requirements and nutrient intake. Assessment of nutritional status typically involves anthropometric measurements, supported by biochemical indicators and dietary history data to provide a comprehensive evaluation (Beck, 2000).

A study conducted in Bangladesh reported that students who consumed fast food ≥2 days per week had a 2.2-fold higher risk of developing obesity. Furthermore, another study indicated that among adolescents who consumed fast food, 22.45% were classified as pre-obese and 9.52% as obese. Approximately 54.40% of students expressed a preference for fast food, and more than 60% were

unaware that fast food is considered unhealthy (Purohit et al., 2016). According to the 2013 Indonesian Basic Health Research Survey (Riset Kesehatan Dasar, Riskesdas), the national prevalence of overweight among adolescents aged 13–15 years was 10.8%, comprising 8.3% overweight and 2.5% obese. Among adolescents aged 16–18 years, the prevalence of overweight increased significantly from 1.4% in 2007 to 7.3% in 2013 (Ministry of Health of Indonesia, 2013). Data from the Indonesian Ministry of Health (2018) indicated that 25.7% of adolescents aged 13–15 years and 26.9% of those aged 16–18 years were classified as stunted or severely stunted. In addition, 8.7% of adolescents aged 13–15 years and 8.1% of those aged 16–18 years were categorized as thin or severely thin. The prevalence of overweight and obesity was 16.0% among adolescents aged 13–15 years and 13.5% among those aged 16–18 years. These findings underscore the urgent need to improve the nutritional status of Indonesian adolescents. The 2017 UNICEF baseline survey further highlighted shifts in dietary patterns and physical activity behaviors among adolescents, indicating emerging nutritional challenges within this population.

According to the World Health Organization (WHO, 2016), the global prevalence of nutritional status among children and adolescents aged 5–19 years, based on BMI-for-age (standard deviation), was reported as 10.5% underweight, 18.0% overweight, and 6.8% obese. Nationally, data from the 2018 Indonesian Basic Health Research Survey (Riset Kesehatan Dasar, Riskesdas) indicated that, among adolescents aged 13–15 years, the prevalence of nutritional status based on BMI-for-age was as follows: 1.9% severely thin, 6.8% thin, 75.3% normal, 11.2% overweight, and 4.8% obese. At the provincial level, particularly in Central Sulawesi, the prevalence among adolescents aged 13–15 years was 2.0% severely thin, 7.5% thin, 78.9% normal, 8.1% overweight, and 3.1% obese. SSHS 1 Luwuk is a public senior high school located in Central Sulawesi Province, Indonesia. Similar to other senior high schools in Indonesia, the duration of study is three academic years, from Grade X to Grade XII. The school is situated on Dewi Sartika Street, Luwuk Subdistrict, Banggai Regency, and is equipped with facilities that support the learning process, including classrooms, science laboratories, computer laboratories, and sports fields. Students at SSHS Negeri 1 Luwuk tend to consume fast food during school breaks, after school hours, and even at breakfast. Their understanding of balanced dietary intake necessary for maintaining optimal body composition appears limited, leading to the perception that fast food constitutes a practical option for achieving and maintaining an ideal body shape. In addition to its affordability and rapid preparation, the palatability of fast food is a major factor influencing students' preference for these products.

The findings of Erni et al. (2018) among adolescents at SSHS 1 Luwuk indicated that, of the 187 students assessed, 55 (29%) were diagnosed with anemia. The majority of participants were classified as having poor nutritional status (89%), while only 11% were categorized as having good nutritional status. Based on Body Mass Index-for-Age (BMI-for-age), the distribution of nutritional status among students in SSHS 1 Luwuk, Luwuk City, was as follows: 3 students (0.8%) were classified as severely thin, 18 students (4.8%) as thin, 282 students (75.6%) as normal, 35 students (9.3%) as overweight, and 35 students (9.3%) as obese. In light of these findings, the present study seeks to further investigate the relationship between fast food consumption and physical activity with the nutritional status of Grade XI students at SSHS 1 Luwuk, Banggai Regency.

METHODS

This study employed an analytical research design to examine the relationship between the independent variables—fast food consumption and physical activity—and the dependent variable, namely the nutritional status of adolescents at SSHS 1 Luwuk. A cross-sectional approach was applied, as both the independent variables (fast food consumption and physical activity) and the dependent variable (nutritional status) were measured at a single point in time. The study was conducted from September 22 to September 30, 2021, among Grade XI students at SSHS 1 Luwuk, Banggai Regency. The study population comprised all Grade XI students enrolled at SSHS 1 Luwuk. Proportionate sampling was used to determine the number of participants from each class. Subsequently, a simple random sampling technique was applied to select respondents. This method involves selecting samples randomly, either by drawing lots or by using a table of random numbers. In this study, the lottery method was employed to ensure equal probability of selection for all eligible students. To ensure the accuracy and local relevance of the data, the FFQ and PAL questionnaires used in this study were selected based on their established reliability in Indonesian adolescent cohorts.

RESULTS

Univariate analysis

Univariate analysis was conducted to describe the distribution of each study variable independently. The variables analyzed included sex, age, fast food consumption, physical activity, and nutritional status. This analysis aimed to provide a comprehensive overview of the characteristics of the study participants and the frequency distribution of each variable.

Gender

The distribution of the sample by sex can be presented in the following table 1.

Table 1. Distribution of Respondents by Sex

Sex	**Frequency (n)**	**Percentage (%)**
Female	102	52%
Male	95	48%
Total	197	100%
Fast Food Consumption	**Frequency (n)**	**Percentage (%)**
Frequent	104	53%
Infrequent	93	47%
Total	197	100%
Physical Activity	**Frequency (n)**	**Percentage (%)**
Light	181	92%
Vigorous	16	18%
Total	197	100%
Nutritional Status	**Frequency (n)**	**Percentage (%)**
Underweight	58	29%
Normal	96	49%
Overweight	36	18%
Obese	7	4%
Total	197	100%

Source: Primary data 2021

Table 1 summarizes the characteristics of the 197 respondents. The sample comprised 52% females (n = 102) and 48% males (n = 95). More than half of the students (53%; n = 104) reported frequent fast food consumption, while 47% (n = 93) reported infrequent consumption. The majority of respondents (92%; n = 181) engaged in light physical activity, with only 8% (n = 16) reporting vigorous activity. In terms of nutritional status, 49% (n = 96) were classified as normal, 29% (n = 58) as underweight, 18% (n = 36) as overweight, and 4% (n = 7) as obese. These findings indicate the presence of both undernutrition and overnutrition within the study population.

Bivariate Analysis

Bivariate analysis was conducted to examine the association between the independent variables—fast food consumption and physical activity—and the dependent variable, namely adolescents' nutritional status. The analysis was performed using the Chi-square test to determine the statistical significance of the relationships between categorical variables.

Association Between Fast Food Intake and Nutritional Status

The association between fast food intake and the nutritional status of Grade XI students at SSHS Negeri 1 Luwuk, Banggai Regency, was analyzed using cross-tabulation (crosstabs) and the Chi-square test. The results of the analysis are presented in the table below.

Table 1. Association Between Fast Food Intake and Nutritional Status Among Grade XI Students at SSHS Negeri 1 Luwuk, Banggai Regency

Physical Activity	Nutritional Status					
	Normal		Abnormal		Total	P Value
	n	**%**	**n**	**%**		
Frequent	48	46.2	56	53.8	104	
Infrequent	48	41.6	45	58.4	93	0,000
Total	**96**	**48.7**	**101**	**51.3**	**197**	

Source: Primary data 2021

Among students who frequently consumed fast food (n = 104), 46.2% had normal nutritional status and 53.8% had abnormal nutritional status. In contrast, among those who consumed fast food infrequently (n = 93), 51.6% were classified as normal and 58.4% as abnormal. The Chi-square test demonstrated a statistically significant association between fast food consumption and nutritional status ($p < 0.05$). Students with normal nutritional status were more likely to report infrequent fast food consumption, whereas abnormal nutritional status was more common among those with frequent consumption.

Association Between Physical Activity and Nutritional Status

The association between physical activity and the nutritional status of Grade XI students at SSHS 1 Luwuk, Banggai Regency, was analyzed using cross-tabulation and the Chi-square test. The results of the analysis are presented in the table below.

Table 2. Association Between Physical Activity and Nutritional Status Among Grade XI Students at SSHS 1 Luwuk, Banggai Regency

Physical Activity	Nutritional Status					
	Normal		Abnormal		Total	P Value
	n	**%**	**n**	**%**		
Light	87	48.1	94	51.9	181	
Vigorous	9	41.6	7	58.4	16	0,184
Total	**96**	**48.7**	**101**	**51.3**	**197**	

Source: Primary data 2021

Among students with light physical activity, 48.1% were classified as having normal nutritional status and 51.9% as abnormal. Among those engaging in vigorous physical activity, 41.6% had normal nutritional status and 58.4% had abnormal status. The Chi-square test showed no significant association between physical activity and nutritional status ($p > 0.05$), indicating that physical activity level was not significantly related to nutritional status in this study population.

DISCUSSION

Association Between Fast Food Intake and Nutritional Status

The findings of this study indicate that the majority of Grade XI students at SSHS 1 Luwuk, Banggai, frequently consumed fast food, with 53% (n = 104) reporting weekly consumption. A statistically significant association was observed between fast food intake and nutritional status among the students. Excessive consumption of fast food may contribute to overweight and obesity due to its high content of fat, cholesterol, sodium, and energy. When such nutrient-imbalanced foods become habitual dietary patterns, they may adversely affect adolescents' nutritional status (Ali, 2004). SSHS 1 Luwuk is situated on Dewi Sartika Street, a central urban area in Luwuk where numerous street food vendors and small kiosks are highly accessible to students. Instant noodles and fried chicken were the most frequently consumed fast food items, with a reported frequency of 3–5 times per week. The frequency of fast food consumption may be influenced by several factors, including media exposure, pocket money, rapid preparation, palatable taste, nutritional knowledge, and attitudes toward fast food. Overall, the high energy density and unfavorable nutrient profile of fast food products may contribute to nutritional imbalances among adolescents.

Adolescents' lifestyles are strongly influenced by their surrounding environment. They tend to prefer foods high in sodium and fat but low in vitamins and minerals, such as snack foods and fast food.

These products are typically energy-dense, high in sodium and fat, and low in essential micronutrients. Excessive preference for certain foods may lead to imbalanced dietary intake, resulting in suboptimal fulfillment of nutritional requirements (Jafar, 2012). The present findings are consistent with those of Tri Handari and Loka (2017), who reported a significant association between fast food consumption and nutritional status among adolescents ($p < 0.05$). This supports the hypothesis that the expansion of the fast food industry in Indonesia has influenced adolescents' dietary habits, particularly in urban areas. Among middle- and upper-income youth, fast food restaurants are perceived as affordable, convenient, and aligned with taste preferences, thereby reinforcing frequent consumption patterns.

Takumansang (2017) also reported a significant association between fast food consumption and nutritional status using the Kendall's Tau test ($\tau = 0.564$; $p = 0.001$). Similarly, a study conducted in Manado by Damapolii et al. (2013) demonstrated a statistically significant relationship between fast food intake and nutritional status ($p = 0.024$) using the Chi-square test at a 95% confidence level. The widespread availability of fast food in Indonesia has substantially influenced adolescents' dietary patterns, from small towns to large urban centers. Urban lifestyles characterized by convenience and time constraints have positioned fast food as a practical dietary alternative due to its rapid preparation, accessibility, and palatable taste. However, the imbalanced nutrient composition of fast food may adversely affect adolescents' nutritional status, particularly when it becomes a habitual dietary pattern. Inappropriate eating habits play a critical role in determining nutritional status and are shaped by both family practices at home and the school environment. Frequent fast food consumption is closely associated with overnutrition, as increased intake elevates the risk of overweight and obesity among adolescents.

Association Between Physical Activity and Nutritional Status

The findings indicated that the majority of Grade XI students at SSHS 1 Luwuk, Banggai (60.78%; n = 110) engaged in light physical activity on a weekly basis. Statistical analysis revealed no significant association between physical activity and nutritional status among the students. This finding may be partly explained by internal factors, such as low self-efficacy and perceived barriers to physical activity that outweigh perceived benefits (Dehdari et al., 2008). Moreover, physical activity is not the sole determinant of nutritional status; other direct factors, including dietary intake and infectious diseases, also play a substantial role (Almatsier, 2010). The World Health Organization (2010) recommends that adolescents engage in at least 60 minutes of moderate-to-vigorous physical activity per day. Adequate physical activity during adolescence provides multiple health benefits, including improved musculoskeletal and cardiovascular health, as well as positive effects on mental health, particularly among adolescent girls (Burdette, 2013).

Previous studies by Dambros et al. (2011) and Ramezankhani et al. (2017) reported that male adolescents are more likely to perceive fewer barriers to physical activity compared to female adolescents. In the present study, commonly reported barriers included academic demands and parental expectations prioritizing educational achievement as a determinant of future well-being. Additional constraints comprised limited peer participation, extended school-related commitments, and reduced opportunities for recreational engagement. These findings are consistent with Kusuma (2013), although no statistically significant differences were observed. While both studies assessed physical activity among senior high school students, variations were noted in activity intensity distribution. In this study, most respondents engaged in vigorous physical activity, whereas Silvano et al. reported predominantly moderate activity levels. Further investigation is warranted to evaluate the validity and reliability of IPAQ as a monitoring instrument for adolescent physical activity.

In contrast to the present findings, Azizah (2014) reported a significant association between physical activity and nutritional status ($p = 0.000$). The study, involving adolescents aged 12–19 years, found that the majority of participants were overweight and exhibited low levels of physical activity. Physical activity was assessed using the Physical Activity Level (PAL) method, which differs from the measurement approach applied in this study. The high prevalence of light-intensity physical activity among adolescents may be attributed to sedentary lifestyle patterns, including the preference for motorized transportation even for short distances between home and school. This behavioral shift contributes to reduced overall energy expenditure. Regular engagement in physical activity remains essential for maintaining optimal nutritional status and preventing excess weight gain.

CONCLUSION

This study among eleventh-grade students of SSHS 1 Luwuk, Banggai Regency, identified a significant association between fast food consumption and nutritional status (p = 0.000), with students presenting non-normal nutritional status more likely to frequently consume fast food. Conversely, no significant association was found between physical activity and nutritional status (p = 0.184), as the majority of students with normal nutritional status reported predominantly light-intensity physical activity. These findings highlight the need for school-based nutrition interventions focusing on reducing fast food consumption and promoting healthier dietary behaviors to support optimal adolescent nutritional status.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

Adriani, M., & Wiratjamadi, B. (2012). *Pengantar Gizi Masyarakat* (2nd ed.). Kencana.

Ali, K. (2004). *Peranan pangan dan gizi untuk kuaitas hidup*. Grasindo.

Almatsier, S. (2010). *Prinsip Dasar Ilmu Gizi*. PT Gramedia Pustaka..

Azizah, D. N. (2014). Hubungan Asupan Energi dan Aktivitas Fisik dengan Indeks Massa Tubuh pada Remaja Putri di Madrasah Aliyah Almukmin Sukoharjo. *Fakultas Ilmu Kesehatan, Universitas Muhammadiyah Surakarta*.

Beck, M. (2000). *Paradigma Baru Pencegahan Karies Gigi*. Lembaga Penerbit Fakultas. Ekonomi universitas Indonesia.

Burdette, K. (2013). *Adolescent Girls and Physical Activity - Strengthening the Body, Mind and Soul.* American Psychological Assocation. https://www.apadivisions.org/division-35/news-events/news/physical-activity

Damapolii, W., Mayulu, N., & Masi, G. (2013). Hubungan Konsumsi Fastfood Dengan Kejadian Obesitas Pada Anak Sd Di Kota Manado. *Jurnal Keperawatan UNSRAT*, *1*(1), 111774.

Dambros, D. D., Lopes, L. F. D., & dos Santos, D. L. (2011). Barreiras percebidas e hábitos de atividade física de adolescentes escolares de uma cidade do sul do brasil. *Revista Brasileira de Cineantropometria e Desempenho Humano*, *13*(6), 422–428. https://doi.org/10.5007/1980-0037.2011v13n6p422

Dehdari, T., Heidarnia, A., Ramezankhani, A., Sadeghian, S., & Ghofranipour, F. (2008). Anxiety, self efficacy expectation and social support in patients after coronary angioplasty and coronary bypass. *Iranian Journal of Public Health*, *37*(4), 119–125.

Erni, Y. L., Marselina, S., Mirawati, T., Dwi, W. B., & Muhammad, S. (2018). *Jurnal Kesmas Untika Luwuk : Public Health Journal*. *9*, 18–26. https://journal.fkm-untika.ac.id/index.php/phj

Ilmiawati, H., & Kuntoro, K. (2017). Pengetahuan Personal Hygiene Remaja Putri pada Kasus Keputihan. *Jurnal Biometrika Dan Kependudukan*, *5*(1), 43. https://doi.org/10.20473/jbk.v5i1.2016.43-51

Indriawati, R., & Soraya, F. (2009). Hubungan Konsumsi Makanan Cepat Saji dan Tingkat Aktivitas Fisik terhadap Obesitas pada Kelompok Usia 11-13 Tahun. *Mutiara Medika Edisi Khusus*, *9*(2), 121–128. http://journal.umy.ac.id/index.php/mm/article/view/1615

Istiany, A., & Rusilanti. (2013). *Gizi Terapan*. PT Remaja Rosdakarya.

Jafar, N. (2012). Perilaku Gizi Seimbang Pada Remaja. *Universitas Hasanuddin*.

Kemenkes RI. (2011). KEPMENKES RI Tentang Standar Antropometri Penilaian Status Gizi Anak. In *Jornal de Pediatria* (Vol. 95, Issue 4, p. 41).

Kemenkes RI. (2018). Hasil Riset Kesehatan Dasar Tahun 2018. *Kementrian Kesehatan RI*, *53*(9), 1689–1699.

Kusuma, H. S., Darmono, S. S., & Anggraini, M. T. (2013). Hubungan Tingkat Konsumsi dan aktivitas fisik dengan IMT (Index Massa Tubuh). *Jurnal Kedokteran Muhammadiyah*, *1*(2), 49–53.

Nilsen, A. C. (2008). *Majalah Appetite Journey*. Universitas Sumatra Utara.

Oktavia, E. A., & Sholehudin. (2011). *Hidup Sehat Berdasarkan Golongan Darah*. Dukom.

Permenkes. (2020). PERATURAN MENTERI KESEHATAN REPUBLIK INDONESIA. *Composites Part A: Applied Science and Manufacturing*, *68*(1), 1–12. http://dx.doi.org/10.1016/j.ndteint.2014.07.001%0Ahttps://doi.org/10.1016/j.ndteint.2017.12.003%0Ahttp://dx.doi.org/10.1016/j.matdes.2017.02.024

Purohit, G., Shah, T., & Harsoda, J. M. (2016). Prevalence of obesity in medical students and its correlation with cardiovascular risk factors: Emergency alarm for today? *Kathmandu University Medical Journal*, *13*(52), 341–345. https://doi.org/10.3126/kumj.v13i4.16834

Radji, M. (2011). *Buku Ajar Mikrobiologi Panduan Mahaisiwa Farmasi &. Kedokteran*. Penerbit Buku Kedokteran.

Ramezankhani, A., Tavassoli, E., Heydarabadi, A. B., & Reisi, M. (2017). Proper consumption of sugary drinks and its association with adolescent girls' knowledge and skill. *International Journal of Pediatrics*, *5*(2), 4343–4351. https://doi.org/10.22038/ijp.2016.20849.1747

Sari, R. W. (2008). *Dangerous junk food : bahaya makanan cepat saji dan gaya hidup sehat*. Panembahan.

Takumansang, S. A. (2017). Hubungan Konsumsi Fast Food Terhadap Obesitas Remaja di Smp Muhammadiyah 9 Yogyakarta. *Universitas 'Aisyiyah Yogyakarta*, 1–10. http://digilib.unisayogya.ac.id/2595/1/NASKAH PUBLIKASI.pdf

Tri Handari, S. R., & Loka, T. (2017). Hubungan Aktivitas Fisik dan Kebiasaan Konsumsi Fast Food dengan Status Gizi Lebih Remaja SMA Labschool Kebayoran Baru Jakarta Selatan Tahun 2016. *Jurnal Kedokteran Dan Kesehatan*, *13*(2), 153. https://doi.org/10.24853/jkk.13.2.153-162

WHO. (2016). *Global Health Observatory data repository by category Body Massa Indeks.* apps.who.int/gho/data/node.main.BMIANTHROPOMETRY?lang=eg

World Health Organization. (2010). *Global Recommendtion on Physical Activity for Health*. WHO.