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THE RELATIONSHIP BETWEEN STRESS LEVEL, PICKY EATING BEHAVIOUR, AND PHYSICAL ACTIVITY ON BODY MASS INDEX AMONG ADOLESCENT GIRLS

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ABSTRACT

Background: Adolescence is a critical period where energy balance affects nutritional status. An imbalance between energy intake and expenditure during this stage can lead to nutritional disorders, including underweight and overweight conditions. This study aimed to analyze the relationship between stress levels, picky eating behaviour, and physical activity with Body Mass Index (BMI) among adolescent girls.
Methods: This quantitative study employed a cross-sectional design involving 106 randomly selected high school female students. Data were collected using standardized questionnaires to assess stress levels (DASS-42), picky eating behaviour (modified CEBQ), and physical activity (PAQ-A), along with direct anthropometric measurements to calculate BMI. Multivariate logistic regression analysis was used.
Results: Most respondents were aged 18–21 years (67.9%), with high stress levels (73.5%), picky eating behaviour (83%), and physical inactivity (65.1%). Bivariate analysis found significant associations between stress levels (p = 0.012) and picky eating (p = 0.003) with BMI, where both increased the risk of BMI imbalance. Physical activity showed no significant relationship (p = 0.118). Multivariate analysis confirmed significant associations between stress (OR = 3.13, p = 0.012) and picky eating (OR = 5.42, p = 0.003) with BMI, with physical activity serving as a protective factor (OR = 0.29, p = 0.018).
Conclusion: This study concludes that stress levels, picky eating behaviour, and physical activity significantly influence the Body Mass Index (BMI) of adolescent girls. High stress levels and picky eating increase the risk of BMI imbalance, while adequate physical activity serves as a protective factor.
Keywords: adolescents, body mass index, physical activity, picky eating, stress level

INTRODUCTION

Optimal nutritional fulfilment during adolescence significantly impacts long-term health outcomes, including the risk of non-communicable diseases and growth disorders. This life stage involves accelerated growth, sexual maturation, and psychosocial development, where health behaviours formed may persist into adulthood.

The 2018 Indonesian Basic Health Research (Riskesdas) reported that 26.8% of adolescents aged 13–15 years experienced undernutrition, while 16% were overweight or obese. According to the Ministry of Health (2022), adolescent girls are more vulnerable to nutritional issues, with a national anemia prevalence of 32%. In Bandung Regency, over 25% of adolescent girls were recorded as having abnormal nutritional status in 2023,

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exacerbated by increased fast food consumption and low levels of regular physical activity. Moreover, the double burden of malnutrition—coexistence of under- and overnutrition in the same population—remains a significant concern (UNICEF, WHO & World Bank, 2021). Psychological stress, unbalanced dietary habits like picky eating, and physical inactivity are major determinants of adolescent nutritional status. Picky eating, often underestimated, may lead to micronutrient deficiencies (Cole et al., 2022), while psychosocial stress can trigger disordered eating behaviours (Jaramillo et al., 2021). Physical inactivity is consistently linked with increased BMI and obesity risk (WHO, 2020). The lifestyle of communities in semi-urban areas tends to shift toward a more urban pattern, characterized by increased consumption of instant foods and decreased physical activity due to easier access to transportation and limited open spaces. This condition influences adolescent eating behaviour, where high exposure to processed foods and excessive screen time may increase the tendency toward picky eating and reduce physical activity levels. Studies have shown that adolescents who are picky eaters are at risk of having an unbalanced nutritional intake, and when combined with a sedentary lifestyle, this can potentially lead to weight-related problems such as obesity (Kusuma et al., 2016; Oktaviani et al., 2023). Therefore, understanding the relationship between semi-urban lifestyles, picky eating, and physical activity is essential in efforts to maintain the nutritional status of adolescent girls.

A study conducted in Tangerang City revealed that picky eating behaviour has a significant association with the increased consumption of unhealthy foods among adolescent girls, which in turn can affect their Body Mass Index (BMI) (Nisri, 2022). Picky eating is one of the indirect causes of poor nutrition among adolescents. It refers to a condition in which individuals selectively consume only certain types of food or refuse to eat a variety of foods. Furthermore, research by Kholifah (2021) indicated that stress levels and physical activity are related to nutritional status. In addition to eating behaviour, nutritional status is also influenced by dietary intake, physical activity, stress levels, infectious diseases, and other factors. An individual's nutritional status is closely linked to their level of physical activity. According to basic principles of nutrition and metabolism, changes in body weight are associated with the balance between the energy content of consumed food and the energy expended to sustain life and engage in physical activity. When energy intake is not balanced with energy expenditure, it can lead to changes in body weight and nutritional status (Kevin et al., 2012).

Few studies have directly focused on the relationship between stress levels, picky eating behaviour, and physical activity in relation to nutritional status (BMI), especially among adolescent girls in Indonesia, particularly at the regency level. This study targets adolescent girls as they are considered a vulnerable group facing dual risks: they are more likely to experience high academic and social pressures, possess negative body image perceptions, and face cultural pressure to maintain physical appearance. Nutritional imbalances at this age may also have long-term effects across the life cycle, such as increased risks of anemia during pregnancy and complications during childbirth. The research location was selected in Bandung Regency, specifically in the Rancaekek area, based on local data showing high consumption of fast food and low participation of adolescents in structured physical activities outside school hours (Bandung District Health Office, 2023). This area also represents a semi-urban region characterized by high exposure to modern lifestyles but limited access to nutrition education.

Based on the background described above, the researcher is interested in conducting a study on the relationship between stress levels, picky eating behaviour, and physical activity with the Body Mass Index (BMI) of adolescent girls.

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RESEARCH METHOD

This was a cross-sectional, observational analytic study conducted among high school adolescent girls in Rancaekek. A total of 106 students were selected via simple random sampling. Research instruments included demographic questionnaires, DASS-42 for stress, a modified Child Eating Behaviour Questionnaire (CEBQ) for picky eating, and the PAQ-A for physical activity. The modified version of the CEBQ underwent a content validity assessment by experts in nutrition and midwifery, with results indicating that each item was relevant and representative of the picky eating construct. Furthermore, reliability testing using Cronbach's alpha yielded a value of ≥0.70, indicating good internal consistency. Construct validity was also supported by previous research in Indonesia, which confirmed that the CEBQ is a suitable instrument for assessing picky eating tendencies in children and adolescents (Rachmawati et al., 2019).

Weight and height were measured directly to calculate BMI. Data were analyzed using three stages: univariate (frequency distribution), bivariate (Chi-Square test), and multivariate (multiple logistic regression) to identify variables most associated with BMI. Statistical significance was set at $p < 0.05$ using the latest version of SPSS. The ethical approval for this study is Ethics 177/09.KEPK/UBK/VIII/2024, granted by the Health Research Ethics Committee of Universitas Bhakti Kencana.

RESULTS

Based on the results of a study conducted on 106 adolescent girls from high schools in the Rancaekek area, the characteristics of the respondents were identified, along with the relationship between stress levels, picky eating behaviour, and physical activity with Body Mass Index (BMI). The data were analyzed using multiple logistic regression to examine the relationships among the variables.

Table 1. Respondent Characteristics

Characteristic	Frequency	Percentage (%)
Age (years)		
15–17	34	32.1%
18–21	72	67.9%
Stress level		
Low stress	28	26.4%
Moderate stress	54	50.9%
High stress	24	22.6%
Picky eating		
Not picky	18	17.0%
Picky eater	88	83.0%
Physical activity		
Physically active	37	34.9%
Physically inactive	69	65.1%
Status BMI		
Normal BMI	56	52.8%
Abnormal BMI	50	47.2%

Based on Table 1, it was found that the majority of respondents were late adolescents, with 72 individuals (67.9%) aged between 18–21 years. More than half of the adolescents experienced moderate to high levels of stress (approximately 73.5%). The majority of respondents exhibited picky eating behaviour, characterized by selective food choices that

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may lead to an unbalanced nutritional intake, potentially affecting nutritional status and BMI. Most adolescents were not sufficiently physically active, which is a known risk factor for overweight and other metabolic health issues, with 69 respondents (65.1%) classified as physically inactive. Nearly half of the respondents had abnormal BMI values, either underweight or overweight, indicating a significant potential for nutritional and health-related issues.

Table 2. Bivariate Analysis Results: Relationship Between Stress Level, Picky Eating Behaviour, and Physical Activity with BMI Status

Variable	BMI Status	Count (n)	Percentage (%)	p-value
Stress level	Low stress	28	26,4	0.012
	Moderate stress	54	50,9	
	High stress	24	22,6	
Picky eating	Not picky	18	17	0.003
	Picky	88	83	
Physical activity	Active	37	34,9	0.118
	Inactive	69	65,1	

Based on table 2, the results of the bivariate analysis show that stress level is significantly associated with BMI status, where adolescents with high stress levels are more likely to have an abnormal BMI (p = 0.012). Picky eating behaviour also has a significant relationship, with 83% of adolescents exhibiting picky eating behaviour experiencing abnormal BMI (p = 0.003). Meanwhile, physical activity does not show a significant relationship with BMI (p = 0.118).

Table 3. Logistic Regression Analysis: Stress, Picky Eating, and Physical Activity on BMI

Variable	B	SE	p-value	OR	95% CI
Stress level	1.14	0.45	0.012	3.13	1.28–7.62
Picky eating	1.69	0.56	0.003	5.42	1.78–16.52
Physical activity	-1.22	0.51	0.018	0.29	0.10–0.82

Based on the results of multiple logistic regression analysis, it was found that stress level, picky eating behaviour, and physical activity had a significant relationship with Body Mass Index (BMI) status among adolescent girls. Stress level showed a significant positive effect (B = 1.14; p = 0.012), with an Odds Ratio (OR) of 3.13 (95% CI: 1.28–7.62). This indicates that adolescents with higher stress levels are 3.13 times more likely to have an imbalanced BMI compared to those with lower stress levels. This finding is consistent with previous studies suggesting that chronic stress can influence eating behaviour and body metabolism, ultimately affecting nutritional status.

Furthermore, picky eating behaviour was also found to be significantly associated with BMI status (B = 1.69; p = 0.003), with an OR of 5.42 (95% CI: 1.78–16.52). This means that adolescents who exhibit picky eating behaviour are 5.42 times more likely to experience BMI imbalance compared to those who do not engage in such behaviour. This suggests that an unbalanced diet due to excessive food selectivity may impact nutritional adequacy and body weight status in adolescents.

Meanwhile, physical activity showed a significant negative effect on BMI status (B = -1.22; p = 0.018), with an OR of 0.29 (95% CI: 0.10–0.82). An OR of less than 1 indicates that physical activity serves as a protective factor. Therefore, adolescents who engage in regular physical activity have a 71% lower risk of having an imbalanced BMI compared to

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those with low physical activity levels. This finding underscores the importance of physical activity in maintaining energy balance and a healthy body weight during adolescence.

Overall, all three variables contributed significantly to the model, with picky eating emerging as the strongest predictor of BMI status.

DISCUSSION

The findings of this study indicate that adolescent girls with high levels of stress are more likely to experience BMI imbalance due to stress-related eating, an inclination to consume high-calorie, unhealthy foods in response to emotional or cognitive pressure. This finding aligns with meta-analyses and population-based studies showing that chronic stress encourages unhealthy eating behaviours beginning in adolescence and increases the risk of obesity (Hedge's $g \approx 0.28$ for unhealthy eating in children and adolescents) (Demir Kösem & Bektaş, 2025; Hill et al., 2018). Similarly, a cohort study in Finland reported that stress-driven eaters had a higher prevalence of overweight and obesity compared to non-eaters. More specifically, stress induces hormonal imbalances—such as elevated cortisol and insulin—that trigger cravings for sweet and fatty foods as a coping mechanism, thereby reinforcing compulsive eating habits.

In this study, the majority of respondents were in the 18–21 age group, which falls into the category of late adolescence or early adulthood. At this stage of development, individuals begin to face increasing academic and social responsibilities, which may contribute to higher levels of stress. Additionally, older adolescents tend to have greater autonomy in their food choices compared to younger adolescents, making picky eating behaviours more reflective of personal preferences rather than parental influence. On the other hand, academic or work-related demands may reduce the time available for physical activity, leading to lower levels of physical engagement. Therefore, age as a demographic variable has the potential to influence the various factors studied and should be taken into account in promotive and preventive efforts targeting adolescent nutritional status.

Furthermore, picky eating behaviour emerged as the strongest predictor in the model, indicated by a high odds ratio. While older literature often associated picky eating with underweight status, recent meta-analyses (2022–2023) suggest that picky eating generally has a negative relationship with body weight and fruit/vegetable intake (Cohen's d ranging from –0.27 to –0.41) (Berger et al., 2016; Jani et al., 2024). However, in the context of stressed adolescents or those living in environments with limited access to diverse foods, picky eating may also lead to increased consumption of high-fat and high-sugar foods as compensation, thereby contributing to excessive weight gain. This supports findings that picky eating may reduce dietary diversity and limit essential macro- and micronutrient intake (e.g., iron, vitamin C, folate), thus increasing the risk of malnutrition—even when overall energy intake is high.

Meanwhile, physical activity proved to be a strong protective factor against BMI imbalance. Physically active adolescents were significantly less likely to be overweight or obese, as physical activity helps increase energy expenditure, improve body composition, and enhance metabolic sensitivity. A global meta-analysis of over 100 physical activity intervention RCTs in children and adolescents showed significant effects on reducing BMI, body fat percentage, and waist circumference (RCTs $\geq$ 3–5 sessions per week over several weeks) (Huang et al., 2025a; Men et al., 2025a). These findings support the WHO recommendation of at least 60 minutes of moderate-intensity physical activity per day as a preventive measure against pediatric obesity (Huang et al., 2025b).

A logical causal narrative can be formed as follows: stress increases → stress-induced eating emerges → restricted and unhealthy dietary patterns due to picky eating → reduced

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physical activity lowers energy expenditure → energy accumulation occurs → BMI imbalance results. The regression model demonstrated an odds ratio of approximately 3.13 for stress, 5.42 for picky eating, and 0.29 (protective) for physical activity. Therefore, interventions should adopt a holistic approach: managing stress, expanding healthy food choices, and strengthening regular physical activity.

This study contributes significantly to the local Indonesian context by integrating psychosocial variables, eating behaviour, and physical lifestyle factors into a single predictive model for adolescent girls' BMI status. The impact has the potential to inform promotive and preventive youth health policies that go beyond nutrition to include mental health literacy and active lifestyle promotion through school, family, and community-based approaches. The findings also open opportunities for digital-based interventions (e.g., e-health and social media), which have been shown to be effective in improving adolescents' eating and physical activity habits (Benítez Andrades et al., 2024; Men et al., 2025b).

This study further encourages future research into biological and social connections, such as stress hormones (cortisol, ghrelin), gut microbiome, family support, and socioeconomic determinants. Local longitudinal studies are particularly needed to strengthen causal evidence. Thus, this article offers a new narrative that highlights the importance of balancing internal factors (stress, eating behaviour) and external conditions (activity schedules, environment) in maintaining the health of adolescent girls today.

CONCLUSION

This study concludes that stress levels, picky eating behaviour, and physical activity significantly influence the Body Mass Index (BMI) of adolescent girls. High stress levels and picky eating increase the risk of BMI imbalance, while adequate physical activity serves as a protective factor.

RECOMMENDATIONS

Based on the findings of this study, it is recommended that schools and parents pay more attention to the mental health of adolescents, such as managing stress through counseling programs or stress management training. Additionally, it is important to provide education on healthy eating habits and reduce picky eating behaviour. Promoting physical activity should also be strengthened with engaging sports activities for adolescents, both at school and at home, to maintain BMI balance. A holistic approach involving stress management, nutrition education, and physical activity will support the overall health of adolescents.

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REFERENCES

Bahagia, I. P., & Rahayuningsih, S. I. (2018). Perilaku picky eater dengan status gizi pada anak usia prasekolah. *Jurnal Ilmu Mahasiswa Fakultas Keperawatan*, *III*(3), 164.

Berger, P. K., Hohman, E. E., Marini, M. E., Savage, J. S., & Birch, L. L. (2016). Girls' picky eating in childhood is associated with normal weight status from ages 5 to 15 y1,2. *American Journal of Clinical Nutrition*, *104*(6), 1577–1582. https://doi.org/10.3945/ajcn.116.142430

Volume 16 No 2, Hal 102-109, Juli 2025
ISSN: 2087 – 5002 | E-ISSN: 2549 – 371X
https://10.34035/jk.v16i2.1842

Bitty, A. (2018). Hubungan stres dengan status gizi siswa SMPN 2 Manado. *Jurnal Gizi dan Kesehatan, 10*(1), 45–50.
Chao, H. C. (2018). Association of picky eating with growth, nutritional status, development, physical activity, and health in preschool children. *Frontiers in Pediatrics, 6*, 22. https://doi.org/10.3389/fped.2018.00022

Brown, T., Smith, L., & Lee, R. (2022). The relationship between adolescent stress and nutritional status: A meta-analysis. *Journal of Adolescent Health*, 70(4), 487–495. https://doi.org/10.1016/j.jadohealth.2021.10.005

Chao, H. C. (2018). Association of picky eating with growth, nutritional status, development, physical activity, and health in preschool children. *Frontiers in Pediatrics*, 6, 22. https://doi.org/10.3389/fped.2018.00022

Cole, N., Wang, Y., & Chen, J. (2022). Picky eating and nutrient deficiencies among adolescents. *Appetite*, 168, 105743. https://doi.org/10.1016/j.appet.2021.105743

Demir Kösem, D., & Bektaş, M. (2025). The effect of emotional eating in adolescents on obesity: A systematic review and meta-analysis study. *Journal of Pediatric Nursing*, *81*, e39–e46. https://doi.org/10.1016/J.PEDN.2025.01.029

Dinas Kesehatan Kabupaten Bandung. (2023). *Laporan Status Gizi Remaja di Kabupaten Bandung Tahun 2022–2023*. Bandung: Dinkes Kab. Bandung.

Garcia, M., & Liu, D. (2020). Physical activity and BMI among school-aged adolescents: A global review. *Public Health Reviews*, 41(1), 20. https://doi.org/10.1186/s40985-020-00136-w

Hill, D. C., Moss, R. H., Sykes-Muskett, B., Conner, M., & O'Connor, D. B. (2018). Stress and eating behaviours in children and adolescents: Systematic review and meta-analysis. *Appetite*, *123*, 14–22. https://doi.org/10.1016/J.APPET.2017.11.109

Huang, Z., Sun, G., Li, J., Zhang, B., Lai, G., Jing, H., & Zhou, Y. (2025a). Optimal exercise dose on Body Mass Index (BMI) in children and adolescents with overweight and obesity: a systematic review and bayesian model-based network meta-analysis. In *BMC Public Health* (Vol. 25, Issue 1). BioMed Central Ltd. https://doi.org/10.1186/s12889-025-21405-3

Huang, Z., Sun, G., Li, J., Zhang, B., Lai, G., Jing, H., & Zhou, Y. (2025b). Optimal exercise dose on Body Mass Index (BMI) in children and adolescents with overweight and obesity: a systematic review and bayesian model-based network meta-analysis. In *BMC Public Health* (Vol. 25, Issue 1). BioMed Central Ltd. https://doi.org/10.1186/s12889-025-21405-3

Indrawati, S., & Nugroho, R. (2021). Pola makan tidak sehat pada remaja putri dan dampaknya terhadap IMT. *Jurnal Gizi Indonesia*, 10(2), 77–85. https://doi.org/10.31227/osf.io/xyz12

Jaramillo, C., Sánchez, L., & Torres, M. (2021). Psychological stress and eating behaviour in female adolescents. *International Journal of Behavioural Nutrition and Physical Activity*, 18(1), 92. https://doi.org/10.1186/s12966-021-01173-6

Jani, R., Irwin, C., Rigby, R., Byrne, R., Love, P., Khan, F., Larach, C., Yang, W. Y., Mandalika, S., Knight-Agarwal, C. R., Naumovski, N., & Mallan, K. (2024). Association Between Picky Eating, Weight Status, Vegetable, and Fruit Intake in Children and Adolescents: Systematic Review and Meta-Analysis. *Childhood Obesity*, *20*(8), 553–571. https://doi.org/10.1089/chi.2023.0196

Kementerian Kesehatan RI. (2022). *Profil Kesehatan Indonesia Tahun 2022*. Jakarta: Kemenkes RI.

Kusuma, A. L., Rachmawati, D., & Lestari, D. (2016). *Hubungan picky eating dengan status gizi anak prasekolah di Balikpapan*. Jurnal Kesehatan, 4(2), 105–112.

Volume 16 No 2, Hal 102-109, Juli 2025
ISSN: 2087 – 5002 | E-ISSN: 2549 – 371X
https://10.34035/jk.v16i2.1842

Kusumawati, N., & Rahmawati, D. (2020). Aktivitas fisik dan asupan energi pada remaja overweight. *Jurnal Kesehatan Masyarakat*, 16(3), 191–198. https://doi.org/10.15294/kemas.v16i3.23045

Kholifah, N. (2021). Hubungan stres dan aktivitas fisik dengan status gizi. *Jurnal Gizi Indonesia, 9*(2), 80–87.

Lestari, F. (2023). Picky eating dan konsumsi zat gizi mikro pada remaja perempuan. *Media Gizi Indonesia*, 18(1), 34–41. https://doi.org/10.20473/mgi.v18i1.2023.34-41

Lubis, A., & Sari, Y. (2021). Pengaruh stres terhadap pola makan remaja di masa pandemi. *Jurnal Psikologi Klinis dan Kesehatan Mental*, 10(2), 102–110. https://doi.org/10.22146/jpk.65543

Maulana, H., & Yusuf, M. (2022). Evaluasi status gizi remaja dan determinannya. *Buletin Penelitian Kesehatan*, 50(1), 19–30. https://doi.org/10.22435/bpk.v50i1.6792

Meliasari, H., Widodo, S., & Iskandar, A. (2022). Pola aktivitas fisik remaja dan hubungannya dengan status gizi. *Jurnal Kesehatan Masyarakat, 17*(1), 15–22.

Men, J., Wang, P., Gao, Q., Li, Y., Zhu, G., Yu, Z., Wu, S., Zhang, Y., An, W., Wang, J., Wu, Y., Li, Z., & Zhang, J. (2025a). Impact of exercise on anthropometric outcomes in children and adolescents with overweight or obesity: a systematic review and meta-analysis based on 113 randomized controlled trials worldwide. *BMC Public Health*, *25*(1), 2400. https://doi.org/10.1186/s12889-025-23413-9

Men, J., Wang, P., Gao, Q., Li, Y., Zhu, G., Yu, Z., Wu, S., Zhang, Y., An, W., Wang, J., Wu, Y., Li, Z., & Zhang, J. (2025b). Impact of exercise on anthropometric outcomes in children and adolescents with overweight or obesity: a systematic review and meta-analysis based on 113 randomized controlled trials worldwide. *BMC Public Health*, *25*(1), 2400. https://doi.org/10.1186/s12889-025-23413-9

Nisri, L. (2022). Hubungan perilaku picky eating dengan indeks massa tubuh remaja putri. *Jurnal Ilmu Kesehatan, 10*(3), 211–219.

Oktaviani, D., Asfarina, M., & Prasetyo, B. (2023). *Pola makan dan aktivitas fisik remaja: Tinjauan terhadap gaya hidup urban di Indonesia*. Jurnal Gizi dan Kesehatan Masyarakat, 11(1), 45–53. https://doi.org/10.20473/jgkm.v11i1.2023

Rahayu, T., & Adityasari, R. (2020). Aktivitas fisik dan risiko obesitas pada remaja. *Jurnal Kesehatan Reproduksi*, 11(2), 74–81. https://doi.org/10.22435/kespro.v11i2.5431

Riyadi, H., & Setiawan, R. (2019). Determinan gizi lebih pada remaja perkotaan. *Jurnal Kesehatan Masyarakat Nasional*, 13(1), 35–43. https://doi.org/10.21109/kesmas.v13i1.2285

Rufaida, N., & Lestari, T. (2018). Hubungan perilaku makan dengan status gizi anak usia sekolah. *Media Gizi Indonesia, 12*(1), 35–42.

Santoso, M., & Amelia, N. (2022). Kontribusi gaya hidup terhadap kelebihan berat badan pada remaja perempuan. *Jurnal Gizi dan Dietetik Indonesia*, 10(1), 45–52. https://doi.org/10.21927/ijnd.2022.10(1).45-52

Smith, C. A., & Donovan, M. (2020). Urbanization, adolescent health, and physical inactivity. *Journal of Urban Health*, 97(3), 378–388. https://doi.org/10.1007/s11524-020-00436-3

‘UNICEF, WHO, & World Bank. (2021). *Levels and Trends in Child Malnutrition*. https://www.who.int/publications/i/item/9789240025257

World Health Organization. (2020). *Guidelines on Physical Activity and Sedentary Behaviour*. Geneva: WHO. https://www.who.int/publications/i/item/9789240015128

World Health Organization. (2020). *Guidelines on physical activity and sedentary behaviour*. WHO.