OVERVIEW OF CHANGING EATING PATTERNS AND THE ASSOCIATION WITH GENDER IN ADOLESCENT ATHLETES IN STUDENT-ATHLETE TRAINING CENTRE DKI JAKARTA DURING COVID-19

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ABSTRACT

Athletes are a group that has experienced changes, especially regarding their eating patterns and physical activities, during Covid-19. Several studies have found changes in eating patterns, particularly in the frequency and types of food consumed, among adolescent athletes during Covid-19. A study showed that changes in eating patterns during the isolation of the pandemic influenced female athletes more than males. Female athletes found challenges in fulfilling energy needs and fighting with their body image. However, their adherence and awareness to consuming healthy food are better than male athletes. Based on the background, this research aims to explore the overview of changes in eating patterns and the relations with gender among adolescent athletes in Indonesia who train at the Student Sports Training Center (PPOP) during Covid-19. This study is an observational study with a cross-sectional design. The study subjects were 139 athletes from six sports groups and 25 sports branches conducted in July-August 2021. Data collection was done through online questionnaires via Google Forms consisting of questions regarding changes in eating patterns, amount of food intake, types of food consumed, methods of food preparation, quality of food consumed, and frequency of meals per day. This study obtained ethical approval with the number KE/1174/11/2021. Through data analysis using the Chi-square test, it was found that there was no statistical association between gender and changes in eating pattern variables of adolescent athletes in PPOP DKI Jakarta during Covid-19.

Keywords: *eating pattern, adolescents, athletes, Covid-19*

INTRODUCTION

The adolescent population in Indonesia aged 10-19 years reached 46 million (17%) of the total population in 2021, with 52% consisting of males and 48% of females (UNICEF Indonesia, 2021). According to the U-Report Indonesia, there has been an increase in unhealthy eating patterns among Indonesian adolescents during Covid-19, accompanied by decreased physical activity and social contact (U-Report UNICEF Indonesia, 2021). During the pandemic, it was reported that 40% of adolescents aged 15-19 consumed less diverse foods, 30% consumed fewer eggs and nuts, and 30% consumed fewer fruits, vegetables, and animal protein sources (UNICEF Indonesia, 2021). Similar findings were found in the study, where only 9.8% of adolescents consumed vegetables during the Covid-19 pandemic, and fruit consumption was at 29% (Putri & Sartika, 2021). As for physical activity, 22% of adolescents engaged in more physical activity, but there were more adolescents (49%) whose physical activity decreased (U-Report UNICEF Indonesia, 2021).

Changes in eating patterns and decreased physical activity impact health and fitness, particularly for athletes, where changes in eating patterns and decreased physical activity can also affect sports performance. Social restrictions and quarantine during Covid-19 have significant consequences for the decline in physical activity among athletes due to many sporting events being cancelled, such as routine training activities and sports competitions, lack of direct communication between athletes and coaches, lack of exposure

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to sunlight, and less than ideal sports training conditions (Jukic et al., 2020).

Less than ideal conditions for athletes, especially during the Covid-19 outbreak, become factors triggering adaptation and changes in lifestyle habits, one of the most affected being changes in eating patterns and habits. Adequate nutrient intake and proper eating patterns are important for maintaining athletes' nutritional status and supporting their performance, especially in adolescent athletes with optimal physical growth et al., 2021). The nutritional needs of the adolescent population based on the 2019 Recommended Dietary Allowance for Indonesian females aged 13-18 years require 300 grams of carbohydrates and a range of 2050-2100 energy per day, while for males it is 350-400 grams per day for carbohydrates and a daily energy range of 2400-2650 kcal (Kemenkes RI, 2019). As for the athlete population, the macronutrient requirements may differ from the general population and vary within the sports branches. Moreover, with the development of personalized nutrition, athletes' nutrient needs may be diverse. Although daily nutrient needs may be personal, estimated energy requirements for adolescents with high-intensity physical activity are approximately at least 2855-2875 kcal/day for girls and 3450-3650 kcal/day for boys aged 14-16, and 2875 kcal/day for girls and 3825-3925 kcal/day for boys aged 16-18 (McKinney et al., 2019). Moreover, the daily protein needs for adolescent athletes is approximately 1.5 g/kg; at least 50% of the total energy intake is for carbohydrates and 20-35% for fat (Hecht et al., 2023).

It is generally known that eating patterns in females and males can be different due to different body compositions and females tending to be more conscious about body image. On the other hand, some findings reported that female athletes were better at choosing food quality than male athletes. However, it was still found that both male and female athletes find challenges in consuming adequate energy and macronutrients during Covid-19 (Chong et al., 2024; Nuckols, 2022).

In the athlete group, the need for these macronutrients and micronutrients is higher given the level of physical activity and training load according to their sports branch involving energy expenditure. Therefore, maintaining a good and proper diet in adolescent athletes, especially during the training from home conditions during Covid-19, becomes fundamental. Understanding the eating patterns and changes in eating patterns in athletes, especially during the pandemic, can serve as a reference for providing appropriate and valuable educational advice to evaluate meal regulations during the pandemic and to ensure they remain intact after the Covid-19 epidemic ends and new habits are implemented. Moreover, knowing the association between eating patterns and gender may help to understand the habits of both genders so that more suitable nutrition suggestion approaches can be applied to male and female athletes.

METHODS

Research Design

This study employs a cross-sectional design to investigate the relationship between gender and changes in eating patterns, food intake quantity, types of food, food preparation, food quality consumed, and meal frequency among adolescent athletes in PPOP DKI Jakarta during the Covid-19 pandemic.

Population and Sample

The population of this study comprises all athletes registered as PPOP DKI Jakarta athletes during the Covid-19 pandemic in 2021. The sample size for the study is 139 athletes selected through the total sampling method. Athletes who did not complete the research instruments and provide informed consent were excluded from the study. The characteristics of the research respondents are presented in Table 1.

Data Collection

A digital Google Form-based online questionnaire is used to collect data. The data collection form includes respondents' identities and questions about changes in eating patterns during Covid-19. Respondents' identities include gender, age, and sports branches. Questions related to changes in eating patterns during the pandemic include meal pattern regularity, changes in the quantity and the quality of food consumed,

meal frequency, and food preparation process during training from home. Assessment of the questionnaire points is done using a Likert scale. For the questions regarding changes in eating patterns, scale 1 indicates irregular eating patterns, scale 2 indicates no change, and scale 3 indicates improved eating patterns. For questions regarding food intake quantity and food quality, scale 1 indicates less, scale 2 indicates no change, and scale 3 indicates improvement. For questions regarding types of food, scale 1 indicates high-fat, scale 2 indicates high-carbohydrate, scale 3 indicates high-protein, scale 4 indicates high fruits and vegetables, and scale 5 indicates balanced nutrition. For questions regarding meal frequency, scale 1 indicates once, scale 2 indicates twice, and scale 3 indicates more than three times. For questions regarding food preparation, scale 1 indicates food obtained from online food ordering or purchased outside, scale 2 indicates food consumed from catering, and scale 3 indicates self-prepared/cooked food. All the data collected were fully self-administered subjectively by the participants. Frequency and type of food consumed scored as categories in the Likert scale to know the general overview of eating patterns and were not estimated into nutrition value. The online questionnaires have been used in previous studies so that they have passed the validity and reliability check before using.

Statistical Analysis

Statistical analysis is performed using SPSS Program Version 27. Data are presented as mean ± standard deviation in tabular form. Descriptive analysis is used to present respondent characteristics data. The Chi-square and Fisher tests were used to test the relationship between gender and changes in eating patterns, quantity of food consumed, quality of food consumed, meal frequency, and food preparation process during training from home among athletes in PPOP DKI Jakarta during the Covid-19 pandemic.

Result

The total respondents involved in the study amounted to 139 individuals, with a proportion of 56% males and 44% females, with an average age of 15 years. Respondents came from 25 sports branches categorized into six groups: aquatic, athletics, gymnastics, games, martial arts, and other branches. The aquatic group consists of swimming, rowing, and diving. Athletics and relay running are included in the athletics category. Meanwhile, aerobic, rhythmic, and artistic gymnastics are categorized as gymnastics, while the martial arts group comprises wrestling, taekwondo, karate, *pencak silat*, boxing, judo, and *tarung derajat*. Table tennis, badminton, basketball, indoor volleyball, beach volleyball, soccer, and *sepak takraw* are categorized as game groups, and weightlifting, rock climbing, and archery are included in other groups. The complete characteristics of the respondents are presented in Table 1 below.

Table 1. Characteristics of the respondents

Variable	Gender	N	%	Mean±SD
Age (years)	Male	78	56.1	15.82±1.22
	Female	61	43.9	15.19±1.16
Body weight (kg)	Male	78	56.1	64.25±12.52
	Female	61	43.9	53.26±8.42
Sport Groups				
Aquatic	Male	9	40.9	
	Female	13	59.1	
Athletic	Male	6	50	
	Female	6	50	
Gymnastic	Male	1	8	
	Female	11	92	
Game	Male	29	72.5	
	Female	11	27.5	
Martial arts	Male	29	69	
	Female	13	31	
Others	Male	6	54	
	Female	5	46	

Table 2 below provides statistical results on the differences in changes in eating patterns during training from home during Covid-19 and the relation with gender in adolescent athletes in PPOP DKI Jakarta. The visualization of Table 2 is shown in Figures 1-6.

Based on the results in Table 2, it can be observed that most variables related to changes in eating patterns did not vary significantly during Covid-19, both among male athletes (44.9%) and female athletes (44.3%). Regarding the changes

Table 2. Overview of changes in eating patterns among male and female athletes and the association with gender

	Male (%)	Female (%)	Pearson X^2
Changes in eating pattern			
Worst	38.5	36.1	0.89 (p>0.05)
No change	44.9	44.3	
Better	16.7	19.7	
Changes in food quantity			
Worst	15.4	13.1	0.91 (p>0.005
No change	39.7	42.6	
Better	44.9	44.3	
Changes in types of food group most often consumed			
High fat	21.8	9.8	0.23 (p>0.05)
High carbohydrate	15.4	26.2	
High protein	28.2	24.6	
High vegetables and fruits	3.8	6.6	
Balanced nutrition	30.8	32.8	
Changes in food quality			
Worst	34.6	36.1	0.20 (p>0.05)
No change	50	37.7	
Better	15.4	26.2	
Food preparation			
Online delivery	15.4	11.5	0.64 (p>0.05)
Catering service by PPOP	1.3	1.6	
Home-cooking	83.3	86.9	
Meal frequency/day			
1 time	0	3.3	0.15 (p>0.05)
2 times	26.9	36.1	
>3 times	73.1	60.7	

in food intake quantity during the Covid-19, a significant portion of respondents reported improvement, with 44.9% of male athletes and 44.3% of female athletes stating positive changes. About 30.8% of male athletes and 32.8% of female athletes indicated that the types of food consumed during the pandemic leaned toward balanced nutrition. Regarding food preparation variables, most male athletes (83.3%) and female athletes (86.9%) consumed self-prepared/cooked food rather than purchasing food from outside or catering. As for the variable of changes in the quality of food consumed, male and female athletes reported no significant changes during training from home amid the pandemic. Most male athletes (73.1%) and female athletes (60.7%) had a meal frequency of more than three times a day during the pandemic.

The significance level (p-value) results for all six variables are more than 0.05, indicating that the null hypothesis (H0) is accepted. It means that statistically, there is no significant relationship between gender and changes in eating patterns, food intake quantity, types of food commonly consumed, food preparation, food quality consumed, and meal frequency among adolescent athletes in PPOP DKI Jakarta during training from home amid the Covid-19 pandemic.

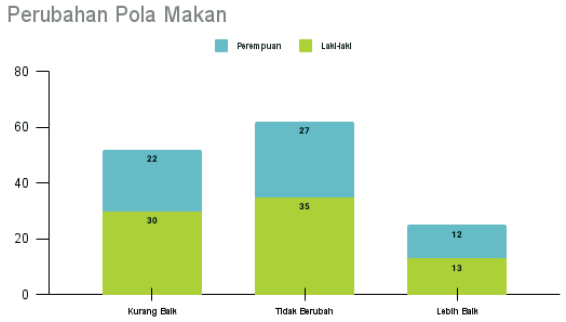

Figure 1. Changes in eating patterns during Covid-19 pandemic

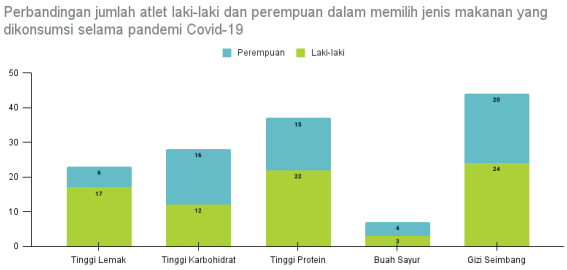

Figure 2. Changes in amount of food during Covid-19 pandemic

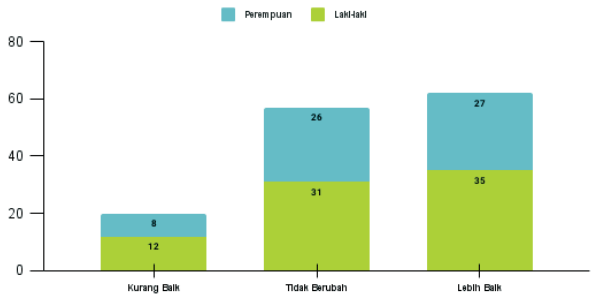

Figure 3. Types of the food most often consumed during the

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Covid-19 pandemic

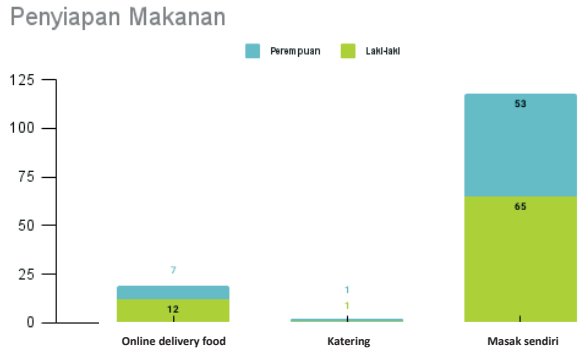

Figure 4. Food preparation during the Covid-19 pandemic

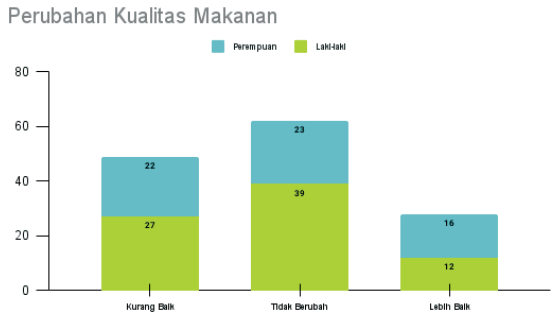

Figure 5. Changes in food quality during the Covid-19 pandemic

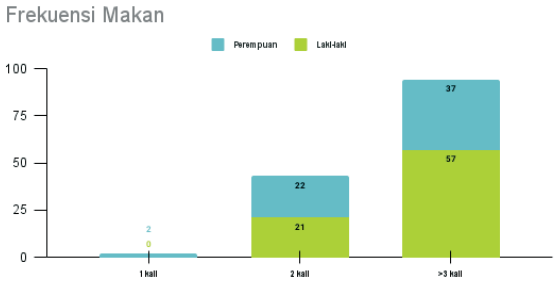

Figure 6. Meal frequency/day during the Covid-19 pandemic

DISCUSSION

Restrictions during the Covid-19 outbreak affected many aspects of athlete lifestyles—particularly athletes who trained at the training centre, like the location of the study. During Covid-19, athletes who usually were provided meals by the food service unit had to train at home and prepare their food, resulting in changes in eating patterns. Challenges in tailoring eating patterns are experienced by all groups, male and female athletes, even though the types of challenges may be different.

Exploring the overview of eating pattern changes in participants of this study found that eating patterns in general and the quality of the food consumed mostly remained as usual (Figures 1 and 5). Besides, the quantity of food and the daily meal frequency were improved; participants had a daily meal more than three times (Figure 6). In addition, although fruit and vegetable consumption was still lower, athletes who consumed a balanced diet (balanced proportion between carbohydrate, fat, and protein as their nutrient requirement recommendation) were higher. It indicates that although athletes prepared their food by themselves at home without strict rules from the nutritionist at the training centre, most athletes had reasonable control of themselves and were adhering to their diet (Figure 3). The result also supported the idea that most participants prefer home cooking for their meals. By serving home cooking, participants could adjust the dishes regarding the food ingredients and quantity to fulfil their nutrient needs.

Table 2 shows that statistically there is no relationship between gender and the variety of eating pattern variables in participants during the Covid-19 pandemic ($p>0.05$). In Figure 3, there is no significant difference in proportions between males and females in the selection of food types in high carbohydrates, high protein, fruits and vegetables, and balanced nutrition, even though most athletes tend to consume a balanced diet. This finding is consistent with the research by Siregar (2022), which indicates no relationship between gender and nutritional behavior in consuming fruits and vegetables. The findings show that 59.5% of respondents had low fruit and vegetable consumption, with an average consumption of fruits and vegetables 2-3 times per day and not every week during the Covid-19 pandemic (Siregar & Rahmy, 2022). It may be explained that, during adolescence, both males and females prefer other types of food over fruits and vegetables. It was reported in some previous studies that inadequate fruit and vegetable consumption among adolescents before the Covid-19 pandemic was higher, with a percentage of 75.5% in a study of students at SMPN 238 Jakarta (Amelia & Fayasari, 2020). Insufficient vegetable intake was found in 95.1% of adolescents, and insufficient fruit intake was 56.1%

among adolescents at SMPN 3 Badung before the Covid-19 pandemic (Muna & Mardiana, 2019). Thus, there has been a slight increase in awareness of increased fruit and vegetable intake during the Covid-19 pandemic. This result is consistent with several studies comparing changes in fruit and vegetable intake before and during the Covid-19 pandemic, where Dieny et al.'s (2021) study reported that the average frequency of vegetable consumption increased from two times per day to 2.26 times per day, with 25.7% of respondents increasing their vegetable intake frequency per day. As for fruit consumption, there was an increase from 1.1 times/day to 1.63 times/day, with 38.2% of respondents increasing their daily fruit intake frequency (Dieny et al., 2021). A similar study conducted on 820 adolescents in various countries also showed a significant difference in fruit and vegetable consumption ($p < 0.0001$) between before and during the Covid-19 pandemic (Ruiz-Roso et al., 2020). In addition to fruit and vegetable consumption, the consumption of animal and plant protein also increased during the Covid-19 pandemic, with Dieny et al.'s (2021) study also finding an increase in the average intake of animal protein per day from 2.1 times to 2.4 times and in plant protein from 1.99 times to 2.16 times..

Based on the statistical test, there was no significant relationship between gender and food intake quantity, food quality, and meal frequency during the Covid-19 pandemic among adolescent athletes in PPOP DKI Jakarta (Table 3). This finding is inconsistent with previous studies, which found a relationship between the proportion of intake, food diversity, and meal frequency with gender, showing significant differences between male and female groups. However, the correlation coefficients in these studies indicated weak results and a positive relationship direction. The positive relationship refers to the interpretation that intake, especially energy, food diversity, and meal frequency in female adolescents, is higher than in male adolescents (Rohim, 2024). Regarding energy needs, males have higher energy needs than females, but their intake tends to be low. It can occur because males experience an increase in weight, height, and body mass compared to females during adolescence (Aljaraedah et al., 2019; Rohim, 2024). In terms of food quality diversity, females tend to have healthier food choices than males and have a smaller likelihood of being overweight compared to males because females pay more attention to their diet and health, coupled with the presence of positive body image encouragement where they feel more confident with lower body weight. Regarding meal frequency, female adolescents tend to have a higher and more regular frequency than male adolescents. This is consistent with the research which found that male adolescents tend to skip meals more often, especially breakfast, than females (Otsuka et al., 2020).

The differences in results in this study compared to previous studies may be due to the conditions of the participants in this study, who are already accustomed to regular eating patterns, with varied food intake, meal frequency, and types of food while staying at the PPOP DKI Jakarta dormitory before the Covid-19 pandemic. Thus, when the pandemic occurred, and students had to train from home, there were no significant changes in eating patterns. There were no differences in changes in eating patterns between male and female athlete groups because, during their time at the dormitory before the pandemic, the eating patterns of the respondents were conditioned and formed certain almost similar habits.

Based on the results in Table 2, there was no significant relationship between gender and food preparation, with no differences in the male and female adolescent athletes. When looking at Figure 4, it can be seen that the majority of adolescent athletes in PPOP DKI Jakarta, both male and female, chose home-cooked food during the Covid-19 pandemic. It is consistent with research by Dieny et al. (2021) and a study conducted in Poland (Sidor & Rzymski, 2020) where it was found that participants who had a habit of eating out during the pandemic were around 39.6%, indicating that people prioritized eating at home. The majority preferred to prepare their food. Respondents feel safer regarding food hygiene if they prepare their food. In addition, buying food outside also contributes to higher fat intake compared to self-prepared food products.

Although the results of this study show non-significant results in the relationship between gender and various eating patterns among PPOP DKI Jakarta athletes during the Covid-19

pandemic, the findings of this study can provide an overview of the eating patterns of adolescent athletes in PPOP DKI Jakarta during the Covid-19 pandemic. This study is a cross-sectional study that cannot see the cause-effect relationship of each variable. In addition, the respondents in this study only involve athletes in PPOP DKI Jakarta, so the result may not be generalized in a more significant community.

CONCLUSION

In general, the participation rate of athletes in the study is evenly distributed between male and female athletes (56% and 44%) with an average age of 15 years and weights ranging from 53-65 kg. Changes in eating patterns and food quality did not vary significantly, but food intake quantity improved. Both male and female athletes' food intake variations during the Covid-19 pandemic tended to lean toward balanced nutrition and self-cooking food preparation processes. Additionally, meal frequency during training from home amid the Covid-19 pandemic was mainly regular, with a frequency of >3 times daily. Statistically, there is no relationship between gender and changes in eating patterns, food intake quantity, types of food commonly consumed, food preparation, food quality consumed, and meal frequency among adolescent athletes in PPOP DKI Jakarta during training from home amid the Covid-19 pandemic.

SUGGESTION

The data assessment in this study was conducted during the Covid-19 pandemic outbreak, so that the results may change over time. Further research on the relationship between eating patterns and sleep quality, fatigue levels, stress levels, fitness, and the level of physical activity among athletes during training from home can enrich this study and serve as a reference in depicting the holistic condition of athletes during the Covid-19 pandemic.

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REFERENCES

Aljaraedah, T. Y., Takruri, H. R., & Tayyem, R. F. (2019). Dietary practices and nutrient intake among adolescents: A general review. *Obesity Medicine*, *16*, 100145. https://doi.org/10.1016/j.obmed.2019.100145

Amelia, C. M., & Fayasari, A. (2020). FAKTOR YANG MEMPENGARUHI KONSUMSI SAYUR DAN BUAH REMAJA DI SMP NEGERI 238 JAKARTA. *Jurnal Gizi Dan Pangan Soedirman*, *4*(1), 94. https://doi.org/10.20884/1.jgps.2020.4.1.2642

Chong, C. Y., Tan, C. X., Tsai, M.-C., Tan, S. S., Hariyono, H., & Tan, S. T. (2024). Gender differences in dietary intake and physical activity among university students: A post-COVID-19 pandemic study. *Nutrition & Food Science*, *54*(7), 1190–1201. https://doi.org/10.1108/NFS-01-2024-0015

Dieny, F. F., Jauharany, F. F., Tsani, A. F. A., & Nissa, C. (2021). Perilaku makan sebelum dan selama pandemi covid-19 pada kelompok remaja dan dewasa di Indonesia. *AcTion: Aceh Nutrition Journal*, *6*(2), 128. https://doi.org/10.30867/action.v6i2.418

Hecht, C., Bank, N., Cook, B., & Mistovich, R. J. (2023). Nutritional Recommendations for the Young Athlete. *Journal of the Pediatric Orthopaedic Society of North America*, *5*(1), 599. https://doi.org/10.55275/JPOSNA-2023-599

Jukic, I., Calleja-González, J., Cos, F., Cuzzolin, F., Olmo, J., Terrados, N., Njaradi, N., Sassi, R., Requena, B., Milanovic, L., Krakan, I., Chatzichristos, K., & Alcaraz, P. E. (2020). Strategies and Solutions for Team Sports Athletes in Isolation due to COVID-19. *Sports*, *8*(4), 56. https://doi.org/10.3390/sports8040056

Kemenkes RI. (2019). *Peraturan Menteri Kesehatan Republik Indonesia Nomor 28 Tahun 2019 Tentang Angka Kecukupan Gizi yang Dianjurkan Untuk Masyarakat Indonesia*. http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No__28_Th_2019_ttg_Angka_Kecukupan_Gizi_Yang_Dianjurkan_Untuk_Masyarakat_Indonesia.pdf

McKinney, J., Velghe, J., Fee, J., Isserow, S., & Drezner, J. A. (2019). Defining Athletes and Exercisers. *The American Journal of*

Cardiology, *123*(3), 532–535. https://doi.org/10.1016/j.amjcard.2018.11.001

Muna, N. I., & Mardiana, M. (2019). Faktor-Faktor yang Berhubungan dengan Konsumsi Buah dan Sayur pada Remaja. *Sport and Nutrition Journal*, *1*(1), 1–11. https://doi.org/10.15294/spnj.v1i1.31187

Nuckols, J. (2022). *A Comparison of Dietary Intake in Female College Volleyball Players Before and During the COVID-19 PandemicPlayers Before and During the COVID-19 Pandemic* [Western Washington University]. https://cedar.wwu.edu/cgi/viewcontent.cgi?article=2141&context=wwuet

Otsuka, Y., Kaneita, Y., Itani, O., Jike, M., Osaki, Y., Higuchi, S., & Kanda, H. (2020). Gender differences in dietary behaviors among Japanese adolescents. *Preventive Medicine Reports*, *20*, 101203. https://doi.org/10.1016/j.pmedr.2020.101203

Penggalih, M.H.S.T., Solichah, K.M., Nadia , Ratna,A., Ningrum, R.K., Achmad,A.S., & Reswati, V.D.Y. (2021). *Pedoman Penatalaksanaan Gizi Atlet*. UGM Press.

Putri, R. M., & Sartika, R. A. D. (2021). Effects Of The Covid-19 Pandemic On Eating Habits And Exercise Habits Of The Selected High School Adolescents In West Lampung Regency. *Jurnal Kesehatan Komunitas*, *7*(2), 164–169. https://doi.org/10.25311/keskom.Vol7.Iss2.942

Rohim, W. A. (2024). HUBUNGAN DURASI PENGGUNAAN GAWAI, TINGKAT STRES, JENIS KELAMIN, DAN TEMPAT TINGGAL DENGAN POLA MAKAN REMAJA DI JEMBER. *Jurnal Gizi Universitas Negeri Surabaya*, *3*(4), 500–511.

Ruiz-Roso, M. B., De Carvalho Padilha, P., Mantilla-Escalante, D. C., Ulloa, N., Brun, P., Acevedo-Correa, D., Arantes Ferreira Peres, W., Martorell, M., Aires, M. T., De Oliveira Cardoso, L., Carrasco-Marín, F., Paternina-Sierra, K., Rodriguez-Meza, J. E., Montero, P. M., Bernabè, G., Pauletto, A., Taci, X., Visioli, F., & Dávalos, A. (2020). Covid-19 Confinement and Changes of Adolescent's Dietary Trends in Italy, Spain, Chile, Colombia and Brazil. *Nutrients*, *12*(6), 1807. https://doi.org/10.3390/nu12061807

Sidor, A., & Rzymski, P. (2020). Dietary Choices and Habits during COVID-19 Lockdown: Experience from Poland. *Nutrients*, *12*(6), 1657. https://doi.org/10.3390/nu12061657

Siregar, M. H., & Rahmy, H. A. (2022). KECUKUPAN KONSUMSI BUAH DAN SAYUR PADA REMAJA PADA MASA PANDEMI COVID-19 BERDASARKAN FAKTOR DEMOGRAFI. *Hearty*, *10*(2), 89. https://doi.org/10.32832/hearty.v10i2.6468

UNICEF Indonesia. (2021). *Profil Remaja 2021*. https://www.unicef.org/indonesia/media/9546/file/Profil%20Remaja.pdf

U-Report UNICEF Indonesia. (2021). *Jajak Pendapat tentang Gizi Remaja Selama Pandemi 2021*. https://indonesia.ureport.in/opinion/5217/