*International Journal Of Health, Engineering And Technology (IJHET)* *E-ISSN 2829 - 8683*
Volume 5, Number 2, July 2026, *Page. 2100 - 2108*
Email : editorijhess@gmail.com

# The Relationship Between Physical Activity And Macronutrient Intake With The Menstrual Cycle In Members Of The Surabaya State University Tennis Club

**Laila Al Istighfara[1)*], Satwika Arya Pratama[2)], Cleonara Yanuar Dini[3)], Ratna Candra Dewi[4)]**
[1,2,3,4)] Bachelor of Nutrition Study Program, Surabaya State University, Surabaya, East Java, Indonesia

*Corresponding Author
E-mail: laila.22161@mhs.unesa.ac.id

***Abstract***
*The menstrual cycle is an important indicator of reproductive health, hormonal balance, and energy sufficiency in women who are physically active. Irregular menstrual cycles may be related to an imbalance between physical activity and nutrient intake, particularly among college students who actively participate in sports. This study aimed to determine the relationship between physical activity and macronutrient intake and the menstrual cycle among members of the Surabaya State University Tennis Club. This study used a quantitative cross-sectional design with a sample of 41 respondents selected through total sampling. Data were collected using the IPAQ-LF, a 3×24-hour food recall, and a menstrual cycle questionnaire, and were analyzed using the Fisher-Freeman-Halton Exact Test. The results showed that the majority of respondents engaged in vigorous physical activity (58.5%), had insufficient carbohydrate intake (85.4%), insufficient protein intake (90.2%), excessive fat intake (41.5%), and a normal menstrual cycle (63.4%). The analysis revealed no significant association between physical activity and the intake of carbohydrates, protein, and fat and the menstrual cycle. The conclusion of this study is that physical activity and the intake of macronutrients are not significantly associated with the menstrual cycle.*

***Keywords: Carbohydrates, Fat, Menstrual Cycle, Physical Activity, Protein.***

## INTRODUCTION

The menstrual cycle is an important indicator to assess reproductive health, hormonal balance, and energy adequacy in women who are actively exercising. Menstrual cycle disruption can reflect an imbalance between the energy consumed and the energy expended during physical activity . The condition is often associated with (Taim et al., 2023; Ihalainen et al., 2024) low energy availability, which is a state when there is insufficient energy available to support the body's physiological functions after being used for exercise. Menstrual disorders are also related to Mountjoy et al. (2023) the Female Athlete Triad and Relative Energy Deficiency in Sport (REDs), which can have an impact on health, endocrine function, recovery, injury risk, and sports performance (De Souza et al., 2014; Mountjoy et al., 2023).

Menstrual cycle disruption is still a reproductive health problem experienced by many women. Normal menstrual cycles are in the range of 21–35 days, while cycles of less than 21 days or more than 35 days are abnormal. Menstrual irregularities can be related to physiological disorders, hormonal imbalances, and nutritional fulfillment problems. In members of the Field Tennis UKM of the State University of Surabaya, a preliminary study showed that 15 out of 40 respondents or 37.5% had menstrual cycle disorders, while 25 respondents or 62.5% had normal menstrual cycles. These findings show that menstrual cycle disorders are still found in female students who actively participate in campus sports, so factors related to this condition need to be analyzed (Nuraini, 2018; Attia et al., 2023).

Physical activity and macronutrient intake are factors that can affect the regularity of the menstrual cycle. High-intensity physical activity can cause physical stress and affect the hypothalamic–pituitary–ovarian axis, thus impacting the production of follicle stimulating hormone (FSH), luteinizing hormone (LH), estrogen, and progesterone (Novianti et al., 2025). In addition, carbohydrates serve as the main source of energy, protein helps with tissue repair after exercise, while fat plays a role in energy balance and hormonal function. If physical activity is not balanced with adequate energy and macronutrient intake, the risk of energy imbalance and impaired reproductive function can increase (Domínguez et al., 2021; Fleming et al., 2021; Salwi et al., 2025).

Several previous studies have shown a link between physical activity, nutritional intake, and menstrual cycle. It found that athletes with low macronutrient adequacy tended to experience menstrual disorders more. explains that strenuous exercise without sufficient recovery can suppress hypothalamus function. Mountjoy Fernanda et al. (2021), Gimunová et al. (2022), et al. (2023) emphasizes that low energy availability is an important factor in REDs. Ihalainen et al. (2024) states that changes in the menstrual cycle can be an indicator of disturbances in energy and hormonal balance. It is also reported that menstrual cycle disruption in female athletes is still quite high. However, most previous studies have focused more on elite athletes or assessed only one factor, so there is still a research gap in female students who actively participate in campus sports. Therefore, this study aims to analyze the relationship between physical activity and macronutrient intake with the menstrual cycle in members of the Field Tennis UKM of the State University of Surabaya. The results of this study are expected to be empirical information in maintaining the balance of physical activity, nutritional intake, and reproductive health of female students who are active in sports (Fadila & Kumaat 2024).

## RESEARCH METHODS

This study is a quantitative research with a correlational analytical design and a cross-sectional approach. The research was carried out at the Faculty of Sports and Health Sciences, State University of Surabaya in February-April 2026. The research population is all female members of the Field Tennis UKM of the State University of Surabaya as many as 45 students. The sample was determined using a total sampling technique based on inclusion and exclusion criteria, namely female members of Field Tennis UKM who were willing to become respondents through filling out informed consent and did not have a history of reproductive diseases. The number of samples analyzed in this study was 41 respondents.

Data were collected through interviews, questionnaires, and anthropometric measurements. The menstrual cycle was obtained using a questionnaire adopted from the self-report method based on the average menstrual cycle of the last three months. Physical activity was measured using the International Physical Activity Questionnaire-Long Form (IPAQ-LF) in Indonesian adopted from and categorized based on the MET-minute/week score. The intake of macronutrients in the form of carbohydrates, proteins, and fats was obtained through non-sequential 3×24-hour food recall interviews, then compared with the daily needs of the respondents and categorized into less, sufficient, and more (Aldiba, 2022; Hastuti, 2013).

The data was analyzed univariately to describe the characteristics of the respondents and the distribution of each variable in the form of frequency and percentage. Bivariate analysis was used to determine the relationship between physical activity and macronutrient intake and menstrual cycle using the Fisher-Freeman-Halton Exact Test, because the assumption of the Chi-Square test was not met. The results of the analysis are stated to be meaningful if the p-value is <0.05 at a confidence level of 95%.

## RESULTS AND DISCUSSION

### Respondent Characteristics

**Table 1. Respondent Characteristics**

| Respondent Characteristics | Frequency | Percentage |
|---|---|---|
| Age | | |
| 19 years old | 7 | 17,1% |
| 20 years old | 14 | 34,1% |
| 21 years old | 8 | 19,5% |
| 22 years old | 12 | 29,3% |
| Year of the Force | | |
| 2022 | 5 | 12,2% |
| 2023 | 12 | 29,3% |
| 2024 | 14 | 34,1% |
| 2025 | 10 | 24,4% |

Table 1. showing the age range of the respondents 19-22 years. The majority of respondents were 20 years old, namely 14 (34.1%), and 19 years old was the group with the least number of respondents, namely 7 (17.1%) respondents. Based on the year of the batch, the majority of respondents came from the class of 2024 as many as 14 (34.1%), and the least respondents came from the class of 2022, namely 5 (12.2%) respondents.

### Univariate Analysis

**Table 2. Physical Activity Overview**

| Category | Frequency | Percentage |
|---|---|---|
| Medium (600-2999 METs) | 17 | 41,5% |
| Berat (≥3000 METs) | 24 | 58,5% |

Table 2. It shows that most of the respondents are classified as 24 (58.5%) respondents as many as 24 (58.5%) respondents. Meanwhile, 17 (41.5%) of the other respondents were classified as moderate physical activity.

**Table 3. Overview of Macronutrient Intake**

| Macronutrient Intake Categories | Frequency | Percentage |
|---|---|---|
| Carbohydrate Intake | | |
| Less (<80%) | 35 | 85,4% |
| Adequate (80-119%) | 6 | 14,6% |
| Asupan Protein | | |
| Less (<80%) | 37 | 90,2% |
| Adequate (80-119%) | 4 | 9,8% |
| Fat Intake | | |
| Less (<80%) | 13 | 31,7% |
| Adequate (80-119%) | 11 | 26,8% |
| Over (≥120%) | 17 | 41,5% |

Table 3. showing that the majority of respondents had carbohydrate intake in the low category as many as 35 (85.4%) respondents. Meanwhile, the respondents' protein intake was mostly in the underpar category as much as 37 (90.2%), and the majority of respondents' fat intake was in the overweight category as much as 17 (41.5%).

**Bivariate Analysis**

**Table 4. Correlation Test of Physical Activity with Menstrual Cycle**

| Physical Activity | | Menstrual Cycle | | | Total |
|---|---|---|---|---|---|
| | | Normal | Polymenorrhea | Oligomenorrea | |
| Medium | n | 13 | 2 | 2 | 17 |
| | % | 31,7% | 4,9% | 4,9% | 41,5% |
| Weight | n | 13 | 8 | 3 | 24 |
| | % | 31,7% | 19,5% | 7,3% | 58,5% |
| Total | n | 26 | 10 | 5 | 41 |
| | % | 63,4% | 24,4% | 12,2% | 100% |
| *p* = 0,289 | | | | | |

Table 4. It is known that the results of data analysis using the Fisher-Freeman-Halton Exact Test obtained a value *of p* = 0.289. This shows that there is no significant relationship between physical activity and menstrual cycles.

**Table 5. Correlation Test of Carbohydrate Intake with Menstrual Cycle**

| Carbohydrate Intake | | Menstrual Cycle | | | Total |
|---|---|---|---|---|---|
| | | Normal | Polymenorrhea | Oligomenorrea | |
| Less | n | 22 | 9 | 4 | 35 |
| | % | 53,7% | 22% | 9,8% | 85,4% |
| Enough | n | 4 | 1 | 1 | 6 |
| | % | 9,8% | 2,4% | 2,4% | 14,6% |
| Total | n | 26 | 10 | 5 | 41 |
| | % | 63,4% | 24,4% | 12,2% | 100% |
| *p* = 1,000 | | | | | |

Table 5. It is known that the results of data analysis using the Fisher-Freeman-Halton Exact Test obtained a value *of p* = 1,000. This suggests that there is no significant relationship between carbohydrate intake and menstrual cycle.

**Table 6. Correlation Test of Protein Intake with Menstrual Cycle**

| Protein Intake | | Menstrual Cycle | | | Total |
|---|---|---|---|---|---|
| | | Normal | Polymenorrhea | Oligomenorrea | |
| Less | n | 23 | 10 | 4 | 37 |
| | % | 56,1% | 24,4% | 9,8% | 90,2% |
| Enough | n | 3 | 0 | 1 | 4 |
| | % | 7,3% | 0% | 2,4% | 9,8% |
| Total | n | 26 | 10 | 5 | 41 |
| | % | 63,4% | 24,4% | 12,2% | 100% |
| *p* = 0,291 | | | | | |

Table 6. It is known that the results of data analysis using the Fisher-Freeman-Halton Exact Test obtained a value *of p* = 0.291. This suggests that there is no significant relationship between protein intake and menstrual cycle.

**Table 7. Correlation Test of Fat Intake with Menstrual Cycle**

| Fat Intake | | Menstrual Cycle | | | Total |
|---|---|---|---|---|---|
| | | Normal | Polymenorrhea | Oligomenorrea | |
| Less | n | 11 | 2 | 0 | 13 |
| | % | 26,8% | 4,9% | 0% | 31,7% |
| Enough | n | 5 | 4 | 2 | 11 |
| | % | 12,2% | 9,8% | 4,9% | 26,8% |
| Read More | n | 10 | 4 | 3 | 17 |
| | % | 24,4% | 9,8% | 7,3% | 41,5% |
| Total | n | 26 | 10 | 5 | 41 |
| | % | 63,4% | 24,4% | 12,2% | 100% |
| *p* = 0,288 | | | | | |

Table 7. It is known that the results of data analysis using the Fisher-Freeman-Halton Exact Test obtained a value *of p* = 0.288. This suggests that there is no significant relationship between fat intake and menstrual cycle.

**Discussion**

**The Relationship of Physical Activity with the Menstrual Cycle**

The results of the statistical test showed *a p* value of 0.289 (*p>0.05), which* means that there was no significant relationship between physical activity and menstrual cycle in members of the Field Tennis UKM of the State University of Surabaya. These findings suggest that the menstrual cycle is not only influenced by physical activity, but can also be related to other factors such as nutritional status, energy balance, hormonal conditions, diet, body mass index, and stress levels. This is supported by research that states that menstrual cycle disorders are influenced by various factors such as stress levels, hormonal levels, high and low BMI, diet, and physical activity (Wanggy et al., 2022).

Physiologically, high-intensity physical activity has the potential to affect the work of the hypothalamus in regulating the release of *Gonadotropin Releasing Hormone* (GnRH). Disruption of this mechanism can have an impact on changes in the secretion of the hormones FSH and LH that play a role in the ovulation process and the regularity of the menstrual cycle. However, in this study, physical activity has not been shown to be significantly related to the menstrual cycle. Basri et al. (2018), De Souza et al. (2019) It is stated that exercise does not directly cause disturbances in reproductive function, but low energy availability due to energy deficit which is the main factor. An imbalance between the body's intake and energy needs can inhibit reproductive function as well as affect the menstrual cycle in women who actively exercise (De Souza et al., 2019).

The results of this study are in line with the research of Salwi et al. (2025) in female students of the Faculty of Sports Sciences, Padang State University reported that the intensity of physical activity did not have a significant relationship with the menstrual cycle (*p>0.05). Similar results* were also found in adolescent female basketball athletes, with a Sangi et al. (2025) *p-value of 1,000 (p>0.05),* suggesting that physical activity was not meaningfully associated with menstrual cycle disruption. In addition, Fernanda et al. (2021) also stated that there was no relationship between physical activity and menstrual cycle disorders in PB Jaya Raya and PB Sarwendah badminton athletes. However, the results of this study are different from the findings that show a relationship between physical activity and the incidence of menstrual cycles in adolescent basketball athletes in Karawang Regency. The difference in results was also seen in a study of female athletes of the Indonesian National Sports Committee (KONI) Medan, which stated that physical activity was significantly related to the menstrual cycle (Novianti et al., 2025), (Nurjannah, 2021), *p<0.05).*

**The Relationship between Macronutrient Intake and Menstrual Cycle**

**The Relationship between Carbohydrate Intake and the Menstrual Cycle**

The results of the statistical test showed a *p* value of 1,000 (*p>0.05), which* means that there was no significant relationship between carbohydrate intake and menstrual cycle in members of the Field Tennis UKM of the State University of Surabaya. These findings show that although most respondents have a low carbohydrate intake, the majority still experience a normal menstrual cycle. This condition indicates that the regularity of the menstrual cycle is not only influenced by carbohydrate intake, but also by other factors such as hormonal balance, nutritional status, stress levels, sleep quality, and overall nutritional adequacy.

Carbohydrates are the main source of energy that plays a role in maintaining the body's energy balance. Insufficient carbohydrate intake in the long term can decrease energy availability, thereby interfering with the release of Gonadotropin Releasing Hormone (GnRH), which further affects the secretion of reproductive hormones and the ovulation process (Fernanda et al., 2021). However, in this study, carbohydrate intake has not been shown to be significantly related to the menstrual cycle. This is suspected because the energy needs of the respondents can still be met from other nutrients or the presence of other physiological factors that play a role in maintaining reproductive function.

The results of this study are in line with those that reported no association between carbohydrate intake and menstrual cycle in adolescent female athletes (Khumairoh et al., (2024) *p=0.723).* However, the results of this study are different from the findings of Fernanda et al. (2021) in female badminton athletes who showed a meaningful relationship between carbohydrate intake and menstrual cycle disorders with *a value of p=0.015.* The difference in results was also seen in studies that stated that there was a relationship between carbohydrate intake and menstrual cycle disorders with a value of p=0.000. A similar study on the relationship between nutrient intake and menstrual cycle in adolescent female martial arts athletes at the Ragunan Student Sports Development and Training Center in Jakarta also showed that there was a significant relationship between carbohydrate intake and menstrual cycle (Rachmawati & Murbawani 2015), (Rosaline MP, 2017).

**The Relationship between Protein Intake and Menstrual Cycle**

The results of the statistical test showed a p value of 0.291 (p>0.05), which means that there was no significant relationship between protein intake and menstrual cycle in members of the Field Tennis UKM of the State University of Surabaya. These findings suggest that although most respondents had a low protein intake, the majority still had a normal menstrual cycle. This indicates that the regularity of the menstrual cycle is not only influenced by protein intake, but also by other factors such as energy balance, nutritional status, physical activity, hormonal conditions, sleep quality, and stress levels.

Physiologically, proteins play an important role in hormone synthesis, tissue repair, and maintaining metabolic function, including the reproductive system. Long-term protein deficiency has the potential to disrupt the balance of reproductive hormones, such as estrogen and progesterone, which play a role in the ovulation process and the regularity of the menstrual cycle. However, in this study, protein intake has not been shown to be significantly related to the menstrual cycle. This condition is suspected to be because the energy needs of the respondents' bodies can still be met from other nutrients so that reproductive function is maintained (Fernanda et al., 2021).

The results of this study are in line with Rosaline MP (2017) who reported no relationship between protein intake and menstrual cycle in adolescent female martial artists (p=0.510). Similar results were also found by Khumairoh et al. (2024) which reported that there was no significant relationship between protein intake and menstrual cycle in adolescent female athletes at SMA Negeri Sport (SMANOR) Sidoarjo East Java and SMA Negeri 1 Sewon with a value of p=0.522. Research by Rachmawati & Murbawani (2015) on dancers also stated that there was no association between protein intake and menstrual cycle disruption (p=0.195). However, the results of this study are different from the findings of Fernanda et al. (2021) In female badminton athletes who reported a significant relationship between protein intake and menstrual cycle disorders with a value of p=0.021.

**The Relationship of Fat Intake to the Menstrual Cycle**

The results of the statistical test showed a p value of 0.288 (p>0.05), which means that there was no significant relationship between fat intake and menstrual cycle in members of the Field Tennis UKM of the State University of Surabaya. These findings show that most respondents still have a normal menstrual cycle even though their fat intake is in the low or high category. This indicates that the regularity of the menstrual cycle is not only influenced by fat intake, but also by other factors such as energy balance, nutritional status, physical activity, hormonal conditions, sleep quality, and stress levels.

Physiologically, fat plays a role in the synthesis of steroid hormones, including estrogen and progesterone, which regulate ovulation and the regularity of the menstrual cycle. Too low or excessive fat intake has the potential to disrupt the balance of reproductive hormones through changes in energy availability and hypothalamus function. However, in this study, fat intake has not been shown to be significantly related to the menstrual cycle. This condition is suspected to be because the energy balance and reproductive function of the respondents can still be maintained by other factors (Lestari et al., 2023).

The results of this study are in line with Khumairoh et al. (2024) reported no association between fat intake and menstrual cycle in adolescent female athletes (*p=0.646)*. However, the results of this study are different from the findings of Rosaline MP (2017) regarding the relationship between nutrient intake and menstrual cycle in adolescent female martial arts athletes at the Ragunan Student Sports Development and Training Center in Jakarta which states that there is a significant relationship between fat intake and menstrual cycle with *a value of p=0.001*. A similar study by Rachmawati & Murbawani (2015) on dancers also reported that nutrient intake, including fat, was associated with menstrual cycle disruption due to low energy availability and high physical activity with *a p=0.000 value*. Fernanda et al. (2021) also mentioned a significant relationship between fat intake and menstrual cycle disorders in female badminton athletes with *a value of p=0.021*.

## CONCLUSIONS

Based on the results of the study, most of the members of the Field Tennis UKM at the State University of Surabaya have physical activity in the heavy category, carbohydrate and protein intake that is classified as less, and fat intake that is classified as more, but the majority still have a normal menstrual cycle. The results of the analysis showed that there was no significant relationship between physical activity and macronutrient intake including carbohydrates, proteins, and fats with the menstrual cycle in members of the Field Tennis UKM of the State University of Surabaya. Thus, the regularity of the menstrual cycle in the respondents is suspected to be influenced not only by physical activity and macronutrient intake, but also by other factors that were not studied in this study.

## REFERENCES

Aldiba, K. (2022). *Hubungan Tingkat Stres dengan Siklus Menstruasi PADA Mahasiswi Program Pendidikan Profesi Dokter Fakultas Kedokteran Universitas Muhammadiyah Sumatera Utara*. Universitas Muhammadiyah Sumatera Utara.

Attia, G. M., Alharbi, O. A., & Aljohani, R. M. (2023). The Impact of Irregular Menstruation on Health: A Review of the Literature. *Cureus*. https://doi.org/10.7759/cureus.49146

Basri, S. W. G., Vitayani, S., Multazam, A., Alwi, M. K., Arman, & Djafar, N. (2018). *Pengaruh Intensitas Olahraga terhadap Kadar Hormon GNRH (Gonadotropin Releasing Hormon) pada Siklus Haid Atlet di Pusat Pembinaan Latihan Pelajar Makassar*.

De Souza, M. J., Koltun, K. J., & Williams, N. I. (2019). The Role of Energy Availability in Reproductive Function in the Female Athlete Triad and Extension of its Effects to Men: An Initial Working Model of a Similar Syndrome in Male Athletes. *Sports Medicine*, *49*, 125–137. https://doi.org/10.1007/s40279-019-01217-3

De Souza, M. J., Nattiv, A., Joy, E., Misra, M., Williams, N. I., Mallinson, R. J., Gibbs, J. C., Olmsted, M., Goolsby, M., & Matheson, G. (2014). Female Athlete Triad Coalition Consensus Statement on Treatment and Return to Play of the Female Athlete Triad: 1st International conference held in San Francisco, California, May 2012 and 2nd International conference held in Indianapolis, Indiana, May 2013. *British Journal of Sports Medicine*, *48*(4). https://doi.org/10.1136/bjsports-2013-093218

Domínguez, R., Oliver, A. J. S., Da Silva, S. F., López-Samanes, A., Martínez-Sanz, J. M., & Mata, F. (2021). Dietary-nutritional needs in tennis: A narrative review Necesidades dietético-nutricionales en el tenis: Una revisión narrativa. In *Revista Espanola de Nutricion Humana y Dietetica* (Vol. 25). Asociacion Espanola de Dietistas-Nutricionistas. https://doi.org/10.14306/renhyd.25.S1.1029

Fadila, C. N., & Kumaat, N. A. (2024). Hubungan Tingkat Aktivitas Fisik Dan Stres Terhadap Siklus Menstruasi Pada Atlet Karate Putri Di Universitas Negeri Surabaya. *Jurnal Ilmiah Mahasiswa*, *2*(5), 73–83. https://doi.org/10.59841/intellektika.v2i4.1460

Fernanda, C., Gifari, N., Mulyani, E. Y., Nuzrina, R., & Ronitawati, P. (2021). Hubungan Asupan, Status Gizi, Aktivitas Fisik, Tingkat Stres dan Siklus Menstruasi Atlet Bulutangkis. *Sport and Nutrition Journal*, *3*, 1–14. https://journal.unnes.ac.id/sju/index.php/spnj/

Fleming, J. A., Catháin, C., Harper, L. D., & Naughton, R. J. (2021). Dietary Intake and Daily Distribution of Carbohydrate, Protein and Fat in Youth Tennis Players over a 7-Day Training and Competition Period. *Journal of Sports Science and Medicine*, *20*(3), 413–420. https://doi.org/10.52082/jssm.2021.413

Gimunová, M., Paulínyová, A., Bernaciková, M., & Paludo, A. C. (2022). The Prevalence of Menstrual Cycle Disorders in Female Athletes from Different Sports Disciplines: A Rapid Review. In *International Journal of Environmental Research and Public Health* (Vol. 19, Number 21). MDPI. https://doi.org/10.3390/ijerph192114243

Hastuti, J. (2013). *Anthropometry and Body Composition of Indonesian Adults: an Evaluation of Body Image, Eating Behaviours, and Physical Activity*. Queensland University of Technology.

Ihalainen, J. K., Mikkonen, R. S., Ackerman, K. E., Heikura, I. A., Mjøsund, K., Valtonen, M., & Hackney, A. C. (2024). Beyond Menstrual Dysfunction: Does Altered Endocrine Function Caused by Problematic Low Energy Availability Impair Health and Sports Performance in Female Athletes? In *Sports Medicine* (Vol. 54, Number 9, pp. 2267–2289). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/s40279-024-02065-6

Khumairoh, I., Purba, M. B., & Muslichah, R. (2024). *Hubungan Asupan Makan dan Kualitas Tidur dengan Siklus Menstruasi Atlet Remaja Putri di SMA Negeri Olahraga (SMANOR) Sidoarjo Jawa Timur dan SMA Negeri 1 Sewon* [Universitas Gadjah Mada]. http://etd.repository.ugm.ac.id/

Lestari, I. D., Kosnayani, A. S., & Betaditya, D. (2023). Hubungan Status Gizi dan Asupan Lemak dengan Siklus Menstruasi pada Remaja Putri SMK Bina Putera Nusantara Kota Tasikmalaya Tahun 2022. *Nutrition Scientific Journal*, *2*(2), 59–64.

Mountjoy, M., Ackerman, K. E., Bailey, D. M., Burke, L. M., Constantini, N., Hackney, A. C., Heikura, I. A., Melin, A., Pensgaard, A. M., Stellingwerff, T., Sundgot-Borgen, J. K., Torstveit, M. K., Jacobsen, A. U., Verhagen, E., Budgett, R., Engebretsen, L., & Erdener, U. (2023). International Olympic Committee's (IOC) consensus statement on Relative Energy Deficiency in Sport (REDs). *British Journal of Sports Medicine*, *57*(17), 1073–1097. https://doi.org/10.1136/bjsports-2023-106994

Novianti, R., Kahendra, F., & Intan Apriani, S. (2025). Hubungan Aktivitas Fisik dengan Kejadian Siklus Menstruasi pada Atlet Remaja Bola Basket Kabupaten Karawang. *Jurnal Kesehatan Holistic*, *9*(2). https://doi.org/10.33377/jkh.v9i2.257

Nuraini, S. (2018). *PERBEDAAN KADAR HEMOGLOBIN SEBELUM MENSTRUASI dan PASCA MENSTRUASI*.

Nurjannah, S. (2021). *Hubungan Tingkat Aktivitas Fisik dengan Siklus Menstruasi pada Atlet Wanita Komite Olahraga Nasional Indonesia (KONI) Medan*. Universitas Islam Sumatera Utara.

Rachmawati, P. A., & Murbawani, E. A. (2015). Hubungan Asupan Zat Gizi, Aktivitas Fisik, dan Persentase Lemak Tubuh dengan Gangguan Siklus Menstruasi pada Penari. *Journal of Nutrition College*, *4*(1), 39–49.

Rosaline MP, R. (2017). *Hubungan antara Asupan Zat Gizi terhadap Siklus Menstruasi pada Atlet Bela Diri Remaja Putri di Pusat Pembinaan dan Latihan Olahraga Pelajar Ragunan Jakarta*. UPN Veteran Jakarta.

Salwi, H. E., Afriwardi, A., & Handayani, T. (2025). Hubungan Intensitas Aktivitas Fisik dengan Siklus Menstruasi Pada Mahasiswi Fakultas Ilmu Keolahragaan Universitas Negeri Padang. *Jurnal Ilmu Kesehatan Indonesia*, *6*(1), 47–51. https://doi.org/10.25077/jikesi.v6i1.1378

Sangi, S. K. P., Tendean, H. M. M., & Wagey, F. M. M. (2025). Hubungan Pola Siklus Menstruasi dengan Aktivitas Fisik pada Atlet Basket Wanita Usia Remaja di Kota Manado. *Health & Medical Sciences*, *2*(2), 1–8. https://doi.org/10.47134/phms.v2i2.354

Taim, B. C., Ó Catháin, C., Renard, M., Elliott-Sale, K. J., Madigan, S., & Ní Chéilleachair, N. (2023). The prevalence of menstrual cycle disorders and menstrual cycle-related symptoms in female athletes: A systematic literature review. *Sports Medicine*, *53*(10), 1963–1984.

Wanggy, D. M., Ulfiana, E., & Suparmi. (2022). Hubungan Antara Status Gizi, Pola Makan, Aktivitas Fisik dan Stres dengan Gangguan Siklus Menstruasi. *Indonesian Journal of Midwifery*, *5*(2). http://jurnal.unw.ac.id/index.php/ijm