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Menstrual Cycle of Adolescent Girls Aged 15-18 Years in SMAN 74 Jakarta : The Effect of Vitamin and Mineral Intakes and Physical Activity

Putri Sopya Nita Winarno[1] ,Imawati Eka Putri[2], Luthfiana N Ningtyas[3]

[1] Faculty of Health Science, Universitas Muhammadiyah Prof.Dr.Hamka, Jakarta, Indonesia

Abstract

Purpose: This study aims to determine the relationship between the intake of vitamins (vitamin C and vitamin D), minerals (iron and calcium), and physical activity with the menstrual cycle in adolescent girls at SMAN 74 Jakarta. *Methodology:* The population used was all adolescent girls and a sample of 87 adolescent girls at SMAN 74 was obtaines. The study design use cross-sectional with a purposive sampling technique. The SQFFQ using interviews is used to get data on vitamin and mineral intake, a questionnaire is used to get the data on the menstruation cycle, the IPAQ using interviews is used to get the data on physical activity among women student in SMAN74 Jakarta. Statistical analysis using chi-square with a significant level of 5% (vitamin C, iron, and physical activity) and fisher exact (vitamin D and calcium).*Results:* The results of this study found menstrual cycle irregularity is still high adolescent girls, adequate vitamin C intake, insufficient intake of vitamin D, iron, calcium, and heavy physical activity in adolescent girls. This study that states there is a significant relationship between iron intake and the menstrual cycle, while intake of vitamin C, vitamin D, calcium, and physical activity there is no relationship.*Applications/Originality/Value:* This study that states there is a significant relationship between iron intake and the menstrual cycle. For adolescent girls, they should increase their intake of nutritional sources, especially iron so that they pay more attention to the menstrual cycle they experience for reproductive health

Introduction Section

Menstruation is defined as the process of shedding the uterine wall with bleeding due to failure of fertilization (Dya & Adiningsih, 2019). The menstrual cycle is the start of the first day of menstruation until the arrival of the next menstruation. The normal menstrual cycle is 21 to 35 days, then menstrual cycle disorders include polymenorrhea (<21 days), amenorrhoea (>3 months), and oligomenorrhea (>35 days) (Sitoayu et al., 2017).

WHO data for 2018, the prevalence of women in the world experiencing irregular menstruation is 80% (Purwati & Muslikhah, 2021). The average prevalence of menstrual cycle irregularities in Indonesian women in the last 1 year between the ages of 10-59 years is 13.7%. The 2013 Basic Health Research (Riskesdas) prevalence showes menstrual irregularities aged 10-29 years is 16.4% (Martini et al., 2021). The prevalence in Indonesia is 11.7% of adolescent girls aged 15 to 19 years having menstrual cycle disorders, of which 14.9% are women in urban areas and 12.5% in villages. The highest abnormal menstrual cycles were in Gorontalo City, 23.3%, and DKI Jakarta, 17.2% (Riskesdas, 2010). The menstrual cycle needs to be considered because it wfill affect the quality of life of female adolescents (Sharma, 2014).

Factors that affect the menstrual cycle include nutritional status, nutrient intake, stress, physical activity, diet, weight, endocrine problems, and sleep quality (Wahyuningsih, 2018). The short-term impact that occurs if a woman has irregular menstrual cycles, polymenorea <21 days, will cause anemia which is characterized by paleness and dizziness causing female youth to be absent (Sinaga et al., 2017). The long-term effects that occur if women have abnormal menstrual cycles include affecting fertility rates, resulting in uterine polyps, uterine sarcomas, polycystic ovary syndrome, and endometrioma cysts (Lestari & Amal, 2019).

Adolescent girls who lack nutritional intake have the potential to pose a potential risk of nutrient deficiency due to monthly menstruation (Wahyuni & Dewi, 2018). One of the needs for micro intake, especially vitamins and minerals needed by adolescent girls is the intake of vitamin C, vitamin D, iron, and calcium. Iron imbalance can cause anemia (Kemenkes, 2021) and can reduce blood oxygen levels in the hypothalamus, which can affect levels of the hormones estrogen and progesterone, resulting in disruption of the menstrual cycle. Vitamin C

plays a role in increasing ovulation, affecting endometrial thickness, ovarian hormones in the luteal phase, and low vitamin C will slow down the absorption of iron, therefore the menstrual cycle becomes irregular and vice versa (Wahyuni & Dewi, 2018). The study conducted by Wahyuni (2018) stated that there was a relationship between iron, vitamin C intake, and the menstrual cycle in adolescent girls (Wahyuni & Dewi, 2018).

Another vitamin, namely vitamin D, is necessary for hormone production and controls ovulation and the menstrual cycle. The study conducted by Kia (2015) stated that the group with menstrual disorders showes a relationship between vitamin D intake and the occurrence of the menstrual cycle (Lugito et al., 2018). Another important micronutrient is calcium, which plays a role in the regularity of the menstrual cycle and the maturation of follicles. The study conducted by Listiana (2019) stated that there was a relationship between calsium intake and the menstrual cycle in adolescent girls (Listiana et al., 2019).

Another factor in the menstrual cycle is physical activity. Physical activity is body movement produced by skeletal muscles that require energy expenditure. The study conducted by Naibaho (2014) stated that there was a relationship between physical activity and the menstrual cycle in adolescent girls. Strenuous activity can reduce the production of the hormone estrogen (Naibaho et al., 2014). Hypothalamic-pituitary ovarian suppression is called hypothalamic functional amenorrhea, characterized by inhibition of GnRH (Gonadotropin Releasing Hormone) which affects the secretion of LH (Luteinizing Hormone), and FSH (Follicle Stimulating Hormone), estrogen and progesterone. A decrease in the frequency of LH and FSH release from the pituitary gland puts pressure on the ovaries, which causes abnormal menstrual cycles (Rachmawati & Murbawani, 2015).

This study aimed to examine the relationship of vitamin C and D, iron (Fe) and Calcium (Ca) intakes of the adolescent student in SMAN 74 Jakarta and also physical activity on their menstrual cycle. This study focus in adolescent girls aged 15-18 years because it contribute to fertility.

Material And Method

The research is conducted using a cross-sectional design. The population used is all adolescent girls at SMAN 74 Jakarta and a sample of 87 adolescent girls at SMAN 74 aged 15-18 years is obtaines. Data collection is carried out using primary data, namely the menstrual cycle, intake of vitamins (vitamin C and vitamin D), minerals (iron and calcium), and physical activity as well as secondary data used, namely the number of female students aged 15-18 years at SMAN 74 Jakarta and well sourced. from journals, books, and articles. The SQ-FFQ using interviews is used to get data on vitamin and mineral intake, a questionnaire adapted from Luthfa (2017) is used to get the data on the menstruation cycle, IPAQ using interviews is used to get the data on physical activity among women student in SMAN74 Jakarta. Statistical test results using statistical software using the chi-square test with a significant degree of 5% (intake of Vitamin C, iron, and physical activity) and fisher exact (intake of vitamin D and calcium).

Result

Adolescent characteristics

This study includes the dependent variable and independent variable. The dependent variable is the menstrual cycle and the independent variable consists of the intake of vitamins (vitamin C and vitamin D), minerals (iron and calcium), and physical activity. Based on Table 1 shows that the frequency distribution based on the age of the respondents is at most aged 15 years. While the distribution of the frequency of adolescent girls based on the age of menarche is at most aged 12 years. Showes that half of the respondents experienced abnormal menstrual cycles as many 51.7%. Abnormal menstrual cycles (<21 days and >35 days) and normal menstrual cycles (21-35 days) (Hidayah & Sab'ngatun, 2015). It can be seen that some respondents have adequate vitamin C intake as much as 79.3% (seventy nine percent). it can be seen that some respondents have less intake of vitamin D as much as 96.6% (ninety sevent percent). It can be seen that some respondents have less iron intake as much as 85.11%. it can be seen that some respondents have less calcium intake as much as 92%. It can be seen that some of the respondents' physical activity is in the minimally and HEPA respectively as much as 49.4%. This physical activity is calculated using the International Physical Activity Questionnaire (IPAQ) method. Light

physical activity (<600 MET-minutes/week), moderate (600-3000 MET-minutes/week), vigorous (>3000 MET-minutes/week) (IPAQ, 2005).

Table 1. Frequency Distribution Based on Variables

Variabel	n	%
Menstrual Cycle		
Normal	42	48,3
Abnormal	45	51,7
Vitamin C intake		
Adequate	69	79,3
Inadequate	18	20,7
Vitamin D intake		
Adequate	3	3,4
Inadequate	84	96,6
Iron intake		
Adequate	13	14,9
Inadequate	74	85,1
Calcium intake		
Adequate	7	8
Inadequate	80	92
Physical activity		
Inactive	1	1,1
Minimally active	43	49,4
HEPA active	43	49,4

The Relationship Of Vitamins intake, Minerals Intake, And Physical Activity With Menstrual Cycle

The Relationship Of Vitamins intake, Minerals Intake, And Physical Activity With Menstrual Cycle is analysed using chi-square correlation test and fisher exact Table 2

Table 2, The Relationship of Vitamins intake, Minerals Intake, And Physical Activity With Menstrual Cycle

variabel	Menstrual Cycle				Total	PR (95% CI)	P
	Abnormal		Normal				
	n	%	n	%			
Vitamin C intake							
Adequate	36	52,5	33	47,8	69	0,917	
Inadequate	9	50	9	50	16	(0,325-2,587)	0,869
Vitamin D intake							
Adequate	3	100	0	0	3	0.500	0,242
Inadequate	42	50	42	50	84	(0,404-0,619)	
Iron intake							
Adequate	10	76,9	3	23,1	13	0,269 (0,69-	0,049
Inadequate	35	47,3	39	52,6	74	1,058	
Calcium intake							
Adequate	6	85,7	1	14,3	7	0,159	0,111
Inadequate	31	48,8	41	51,2	80	(0,018-1,377)	

Physical activity							
Inactive-Minimally active	22	50	22	50	44	0,870 (0,375-2,017)	0,745
HEPA active	23	53,5	20	46,5	43		

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Respondents with abnormal menstrual cycles are greater than respondents with sufficient vitamin C intake, namely as much as 52.5%. The results of the chi-square statistical test showes is a value of P=0.869, which means that there is no significant relationship between vitamin C intake and the menstrual cycle (P>0.05). From the analysis results, it is also obtaines that the value of PR = 0.917 means that adolescent girls who have less vitamin C intake are 0.917 times more likely to experience abnormal menstrual cycles compared to adolescent girls whose intake of vitamin C is good.

Respondents with abnormal menstrual cycles are greater than respondents with less vitamin D intake, namely as much as 50%. The results of fisher exact statistical test showes a P value = 0.242, which means that there is no significant relationship between vitamin D intake and the menstrual cycle (P> 0.05). From the analysis results, it is also obtaines that the value of PR = 0.500 means that adolescent girls who have less intake of vitamin D are 0.500 times more likely to experience abnormal menstrual cycles compared to adolescent girls whose intake of vitamin D is good.

Respondents with abnormal menstrual cycles are greater than respondents with less iron intake, namely as much as 47.3%. The results of the chi-square statistical test showes a value of P=0.049, which means that there is a significant relationship between iron intake and the menstrual cycle (P<0.05). From the results of the analysis, it is also obtaines that the value of PR=0.269 means that adolescent girls who have less iron intake are 0.269 times more likely to experience abnormal menstrual cycles compared to adolescent girls whose intake of iron is good.

Respondents with abnormal menstrual cycles are greater than respondents with less calcium intake, namely as much as 48.8%. The results of Fisher's exact test statistical test showes a value of P = 0.111, which means that there is no significant relationship between calcium intake and the menstrual cycle (P> 0.05). From the analysis results, it is also obtaines that the value of PR = 0.159 means that adolescent girls who have less calcium intake are 0.159 times more likely to experience abnormal menstrual cycles compared to adolescent girls who have good calcium intake.

Respondents with abnormal menstrual cycles are greater than respondents with HEPA physical activity, namely as much as 53.5%. The results of the chi-square statistical test showes a value of P=0.745, which means that there is no significant relationship between physical activity and the menstrual cycle (P>0.05). From the analysis results, it is also obtaines that the value of PR=0.917 means that adolescent girls who have heavy activities are 0.745 times more likely to experience abnormal menstrual cycles compared to adolescent girls who have light-moderate activities.

Discussion

The age characteristics of the respondents in this study are around 15-17 years. Characteristics based on the age of most respondents at the age of 15 years. Ages 15-17 years are included in the early adolescent stage (13-17 years). In this period, adolescent girls experience discomfort during menstruation due to disturbances in the cycle. Teenagers complain about various menstrual problems, such as menstrual cycle irregularities, menorrhagia, dysmenorrhea, and related symptoms (Wijayanti et al., 2017).

As for the characteristics of the menarche age of respondents with ages ranging from 10-15 years. Characteristics of the age of menarche most of the respondents occurred at the age of 12 years (40.2%). In Indonesia, the age of menarche for women ranges from 11 to 13 years. According to Riskesdas 2010, the average age of menarche for adolescent girls in DKI Jakarta is 11-12 years, which is 30.3% (Riskesdas, 2010). In Asia, such as Hong Kong and Japan, the average age of menarche for adolescent girls is 12.38 and 12.2 years, respectively (Susanti & Wulandari, 2017).

Data on menstrual cycle irregularities in this study are higher than Riskesdas data (Basic Health Research) in 2013 showing that the prevalence of menstrual irregularities in the 10-29 year-old group is 16.4% (Martini et al.,

2021). The prevalence in Indonesia is 11.7% of adolescent girls aged 15-19 years having irregular menstrual cycles, compared to 14.9% of women living in urban areas and 12.5% in rural areas. Irregular menstrual cycles in DKI Jakarta are 17.2% (Riskesdas, 2010).

From the results of the above study, it is found that there is no significant relationship between vitamin C intake and the menstrual cycle, possibly because there are many other factors, one of which is the collection and recording of food consumption data by respondents using the Semi Quantitative Food Frequency (SQ-FFQ) method and the results obtaines the average intake of vitamin C in adolescents is 375.69 mg. It is known that the respondent's intake of vitamin C is quite marked by the fact that adolescent girls often consume supplements, drinks composed of vitamin C, and fruit such as guavas, bananas, and oranges.

This study is in line with Arisanti (2022) in Denpasar stated that there was no significant relationship between vitamin C intake and that menstrual cycle (Arisanti, 2022). Another study by Fernanda (2021) stated that there was a significant relationship between vitamin C intake and the menstrual cycle, that the better the vitamin C intake, the more regular the menstrual cycle (Fernanda et al., 2021). This study is also not in line with Wahyuni (2018) in Jakarta stated that the more intake of vitamin C and iron consumed (based on body needs), the more regular the menstrual cycle and vice versa (Wahyuni & Dewi, 2018). Whereas this study the number of respondents with abnormal menstrual cycles with sufficient vitamin C intake. However, the respondent's iron intake is less than the RDA.

The need for vitamin C in female adolescents aged 13-18 years according to the 2019 Nutrition Adequacy Rate (RDA) is 65-75 mg per day (Kemenkes, 2019). Vitamin C acts as an antioxidant that can help protect endometrial tissue from oxidative stress, therefore it can be said that proper/sufficient vitamin C will also have a beneficial effect on fertility and menstrual cycle regularity (Fernanda et al., 2021). However, the consumption of vitamin C is not the only factor triggering the occurrence of abnormal menstrual cycles in adolescents, several other supporting factors cause these adolescents to experience abnormal menstrual cycles such as stress, nutritional status, diet, physical activity, weight, endocrine disorders, and sleep quality (Wahyuningsih, 2018).

There is no relationship between vitamin D intake and the menstrual cycle in this study, possibly due to many other factors, one of which is the collection and recording of food consumption data by respondents using the SQFFQ method and the average result of vitamin D intake in adolescents is 4.18 µg. In this study, respondents had insufficient intake of vitamin D, and most of the respondents only consumed eggs and milk as a source of vitamin D. Adolescent girls also states that the availability of food provided by their parents is rare so respondents more often consumed food from outside.

This study is in line with Lugito (2018) in Sukoharjo stated that there was no significant relationship between vitamin D intake and the menstrual cycle. Another study by Jukic (2016) in Spain stated that a decrease in vitamin D intake in women causes the menstrual cycle to become irregular and longer. The need for vitamin D in female adolescents aged 13-18 years according to the 2019 RDA is 15 µg per day (Kemenkes, 2019). Vitamin D is needed to meet the nutritional needs of adolescents because it is used for hormones, boosting the immune system due to inflammation during menstruation, controlling ovulation, and the menstrual cycle. During the menstrual period, adolescent girls need adequate nutrition to meet their nutritional needs and overcome menstrual disorders (Lugito et al., 2018). However, insufficient consumption of vitamin D is not the only factor triggering the occurrence of abnormal menstrual cycles in adolescents, several other supporting factors cause these adolescents to experience abnormal menstrual cycles such as stress, nutritional status, diet, physical activity, weight, disorders endocrine, and sleep quality (Wahyuningsih, 2018).

There is a relationship between iron intake and the menstrual cycle in this study, and iron intake is a factor causing irregular menstrual cycles. This is related to adolescent girls experiencing menstruation every month and growth and development, so they need more iron (Utri, 2020). Iron imbalance can cause anemia (Ministry of Health, 2021) and can reduce blood oxygen levels in the hypothalamus, so that it can affect levels of the hormones estrogen and progesterone, resulting in disruption of the menstrual cycle (Wahyuni & Dewi, 2018).

This study, respondents had less iron intake, most of the sources of iron consumed by respondents came from bananas, tempeh, tofu, eggs, and chicken. Adolescent girls also states that the availability of food provided by their parents is rare, so respondents more often consumed food that came from outside. Heme iron derived from animal foods can be absorbed more than non-heme iron (Arisanti, 2022).

Iron has the function of producing hemoglobin, low iron in the body affects the amount of hemoglobin that falls below normal. The role of hemoglobin is to provide oxygen to the body, such as the brain. The hormonal system supported by the pituitary gland in the brain controls the menstrual cycle. If brain activity decreases due to less optimal O2 (Oxygen), thus affecting the function of the hypothalamus. A dysfunctional hypothalamus will also affect the work of the hormones estrogen and progesterone to be delayed. As a result, menstrual cycles are often irregular and prolonged (oligomenorrhea) (Wahyuni & Dewi, 2018).

Factors that affect iron absorption, iron absorption occurs in the small intestine with the help of 2 types of special protein transport vehicles in the mucosal cells of the small intestine that help absorb iron, namely transferrin, and ferritin. Amino acids bind to iron and help with its absorption. Vitamin C greatly assists the absorption of nonheme iron by converting the ferric to the ferrous form. Phytic acid and oxalic acid in vegetables inhibit iron absorption. Tannins, which are polyphenols and are found in tea, coffee, and several types of vegetables, and fruit, also inhibit iron absorption (Almatsier, 2016).

This study is in line with Wahyuni (2018) in Jakarta stated that there was a significant relationship between iron intake and the menstrual cycle (Wahyuni & Dewi, 2018). Another study conducted by Arisanti (2022) in Denpasar stated that there was a significant relationship between iron intake and the menstrual cycle in adolescent girls (Arisanti, 2022). Another study by Listiana (2019 in Jakarta) also stated that there was a significant relationship between iron intake and the menstrual cycle (Listiana et al., 2019).

There is no relationship between calcium intake and the menstrual cycle in this study, possibly due to many other factors, one of which is the collection and recording of food consumption data by respondents using the SQ-FFQ method and the average calcium intake in adolescents is 462.19 mg. This study, respondents had insufficient calcium intake, most of the respondents only consumed spinach, tempeh, tofu, eggs, chicken, and milk as calcium. Adolescent girls also states that the availability of food provided by their parents is rare, so respondents more often consumed food that came from outside.

This study is in line with Wahyuni (2020) in Tangerang stated that there was no difference in calcium intake between normal and abnormal menstrual cycles (Wahyuni et al., 2020). Another study by Nahdah (2022) in Tangerang stated that there was no significant relationship between calcium intake and the menstrual cycle (Nahdah et al., 2022). The need for calcium in female adolescents aged 13-18 years according to the 2019 RDA is 1200 mg/day. Calcium plays a role in the regularity of the menstrual cycle and follicular maturation and in controlling parathyroid secretion. Where these hormones are related to the menstrual cycle, by maintaining the secretion of GnRH hormones for the release of FSH and LH hormones in the pituitary gland for the use of estrogen and progesterone, which are responsible for follicular maturation during the menstrual cycle (Listiana et al., 2019).

The need for calcium in female adolescents aged 13-18 years according to the 2019 RDA is 1200 mg/day. Calcium plays a role in the regularity of the menstrual cycle and follicular maturation and in controlling parathyroid secretion. Where these hormones are related to the menstrual cycle, by maintaining the secretion of GnRH hormones for the release of FSH and LH hormones in the pituitary gland for the use of estrogen and progesterone, which are responsible for follicular maturation during the menstrual cycle (Listiana et al., 2019).

Inadequate calcium consumption is not the only factor triggering the occurrence of abnormal menstrual cycles in adolescents, several other supporting factors cause these adolescents to experience abnormal menstrual cycles such as inhibition of calcium absorption which can also be one of the contributing factors namely oxalic acid, found in spinach, other vegetables, and cocoa, inhibit calcium absorption by forming insoluble calcium oxalate salts. Phytic acid, a phosphorus-containing compound found primarily in cereal husks, also forms insoluble calcium phosphate that cannot be absorbed. Fiber reduces calcium absorption, possibly because it shortens the transit time of food in the digestive tract, thereby reducing absorption. Mental/physical stress tends to decrease absorption and increase excretion (Almatsier, 2016). In addition, stress, nutritional status, diet, physical activity, weight, endocrine disorders, and sleep quality are factors for abnormal menstrual cycles (Wahyuningsih, 2018).

There is no relationship between physical activity and the menstrual cycle in this study, possibly because there are many other factors, one of which is due to the understanding and filling in of the respondents' physical activity data using a modified IPAQ questionnaire (Hastuti, 2013). Respondent's activities are classified as heavy,

because schools have started 100% offline, carrying out activities outside school hours for example hobbies (extracurriculars and sports), as well as activities at home such as cleaning the house.

This study is in line with Astry (2019) stated that there was no significant relationship between physical activity and the menstrual cycle in adolescent girls (Astry, 2019). Another study by Triany (2018) in Pekalongan also stated that there was no significant relationship between physical activity and the menstrual cycle in adolescent girls (Triany et al., 2018). This study the activity of the respondents is classified as heavy, due to 8.5 hours of study activities at school, 2 hours/week of sports hours, extracurriculars, transportation back and forth from school, walking, cleaning the house (sweeping and mopping), sports carried out at home, and hobbies do. Strenuous activity can reduce the production of the hormone estrogen (Naibaho et al., 2014). This physical activity is calculated using the IPAQ method. Excessive physical activity can cause hypothalamic dysfunction, interfere with GnRH secretion, and cause LH and FSH pulsations to decrease in stimulating follicular maturation and the formation of the hormone estrogen. This can disrupt the menstrual cycle (Rachmawati & Murbawani, 2015).

Adolescents with strenuous physical activity disrupt the menstrual cycle. When carrying out strenuous activities, the body experiences an energy deficit (increased metabolism) which suppresses the ovulation cycle, inhibits gonadotropin-releasing hormone (GnRH) secretion, and reduces LH fluctuations. This disrupts the menstrual cycle (Kusumawati et al., 2021). However, physical activity is not the only factor triggering the occurrence of abnormal menstrual cycles in adolescents, several other contributing factors cause these adolescents to experience abnormal menstrual cycles such as nutrient intake, nutritional status, stress, diet, weight, endocrine disorders, and sleep quality (Wahyuningsih, 2018).

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Conslusions and Recommendations

Most of the young female respondents at SMAN 74 Jakarta had menstrual cycles in the abnormal category (51.7%), vitamin C intake is in the sufficient category (79.3%), vitamin D intake is in the less category (96.6%), iron intake in the less category (85.1%), and calcium intake in the less category 92%, as well as moderate & severe physical activity (49.4%). There is a significant relationship between iron intake (p-value = 0.049) and the menstrual cycle. There is no significant relationship between intake of vitamin C (p-value= 0.869), vitamin D (p-value= 0.242), calcium (p-value= 0.111), and physical activity (p-value= 0.747) with cycles of menstruation. Schools should hold counseling about maintaining reproductive health, so that adolescent girls are more concerned and concerned about their reproductive health, including during menstruation and good sources of nutrients consumed to reduce menstrual cycle irregularities in adolescent girls. Adolescent girls should pay more attention to and increase their daily intake of sources of nutrients, especially iron intake so that adolescents are more concerned about the menstrual cycle they are experiencing for reproductive health.

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References

Almatsier, S. (2016). *Prinsip Dasar Ilmu Gizi*. Jakarta : Pt Gramedia Pustaka Utama.

Andriana. (2018). Faktor-Faktor Yang Mempengaruhi Siklus Menstruasi Pada Mahasiswi Di Universitas Pasir Pengaraian. *Jurnal Maternity And Neonatal*, *2*(5), 271–279.

Arisanti, N. K. R. (2022). *Hubungan Tingkat Konsumsi Protein, Zat Besi, Dan Vitamin C Terhadap Siklus Menstruasi Remaja Di Sai Study Group Denpasar*. Politeknik Kesehatan Kemenkes Denpasar Jurusan.

Astry. (2019). Hubungan Aktifitas Fisik Dengan Siklus Menstruasi Pada Remaja Putri Di Smk Bumi Putera Bogoor. *Journal Of Chemical Information And Modeling*, *53*(9), 24–33.

Dya, N. M., & Adiningsih, S. (2019). Hubungan Antara Status Gizi Dengan Siklus Menstruasi Pada Siswi Man 1 Lamongan. *Amerta Nutrition*, *3*(4), 310–314. Https://Doi.Org/10.20473/Amnt.V3i4.2019.310-314

Fernanda, C., Gifari, N., Mulyani, E. Y., Nuzrina, R., & Ronitawati, P. (2021). Hubungan Asupan, Status Gizi, Aktivitas Fisik, Tingkat Stress Dan Siklus Menstruasi Atlet Bulu Tanggkis. *Sport And Nutrition Journal*, *3*(1), 1–14. Https://Doi.Org/10.1016/J.Sasoi.2013.12.010

Hastuti, J. (2013). *Anthropometry And Body Composition Of Indonesian Adults: An Evaluation Of Body Image, Eating Behaviours, And Physical Activity.* Queensland University Of Technology.

Hidayah, T. N., & Sab'ngatun. (2015). *Hubungan Antara Status Gizi Dengan Siklus Menstruasi Pada Remaja Putri Kelas Vi Madrasah Aliyah Al – Mukmin Ngruki Surakarta*. 96–109.

Ipaq. (2005). *Guidelines For Data Processing And Analysis Of The International Physical Activity Questionnaire (Ipaq) – Short And Long Forms*.

Kemenkes. (2019). *Angka Kecukupan Gizi Yang Dianjurkan Untuk Masyarakat Indonesia*.

Kemenkes. (2021). *Remaja Sehat Komponen Utama Pembangunan Sdm Indonesia*. 2021-01-25. Https://Www.Kemkes.Go.Id/Article/View/21012600002/Remaja-Sehat-Komponen-Utama-Pembangunan-Sdm-Indonesia.H

Kusumawati, D., Indanah, Faridah, U., & Ardiyati, R. A. (2021). Hubungan Aktivitas Fisik Dengan Siklus Menstruasi Pada Siswi Ma Ma ' Ahid Kudus. *Proceeding Of The Urecol*, 924–927.

Lestari, M., & Amal, F. (2019). Faktor-Faktor Yang Berhubungan Dengan Siklus Haid Tidak Teratur Pada Mahasiswi Kebidanan Poltekkes Kemenkes Jayapura. *Jurnal Sehat Mandiri*, *14*(2), 57–63. Https://Doi.Org/10.33761/Jsm.V14i2.107

Listiana, A. M., Safitri, D. E., & Kusumaningtyas, L. N. (2019). Hubungan Status Gizi, Asupan Zat Gizi Mikro, Dan Tingkat Stres Dengan Siklus Menstruasi Pada Mahasiswi Gizi Uhamka. *Prosiding Seminar Nasional Penguatan Riset Dan Luarannya Sebagai Budaya Akademik Di Perguruan Tinggi Memasuki Era 5.0*, 137–149.

Lugito, S. T., Indarto, D., & Hanim, D. (2018). Vitamin D, And Zink Intakes Are Related To Menstrual Duration In Adolescent Girls Of Senior High School In Sukoharjo Regency. *Indonesian Journal Of Nutrition An Dietetics*, *6*(3), 122–132.

Luthfa, A. (2017). *Gambaran Siklus Menstruasi Pada Remaja Putri Dilihat Berdasarkan Tingkat Stress Di Pondok Pesantren Kuno Putri Gamping Sleman*. Sekolah Tinggi Ilmu Kesehatan Jenderal Achmad Yani.

Martini, S., Putri, P., & Caritas, T. (2021). Hubungan Tingkat Stress Akademik Dengan Siklus Menstruasi Pada Masa Pandemi Covid- 19 Di Sma Muhammadiyah 2 Palembang. *Jurnal Keperawatan Merdeka*, *1*(1), 17–23.

Nahdah, R. A., Safitri, D. E., & Fitria, F. (2022). Asupan Lemak, Serat, Kalsium Dan Kualitas Tidur Kaitannya Dengan Siklus Menstruasi Pada Remaja Putri. *Journal Of Nutrition College*, *11*(2), 163–170. Https://Doi.Org/10.14710/Jnc.V11i2.33212

Naibaho, W. N. K., Riyadi, S., & Suryawan, A. (2014). Hubungan Antara Tingkat Aktivitas Fisik Dan Siklus Menstruasi Pada Remaja Di Sma Warga Kota Surakarta. *Nexus Kedokteran Komunitas*, *3*(2), 162–169.

Purwati, Y., & Muslikhah, A. (2021). Gangguan Siklus Menstruasi Akibat Aktivitas Fisik Dan Kecemasan. *Jurnal Kebidanan Dan Keperawatan Aisyiyah*, *16*(2), 217–228. Https://Doi.Org/10.31101/Jkk.1691

Rachmawati, P. A., & Murbawani, A. E. (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. Http://Ejournal-S1.Undip.Ac.Id/Index.Php/Jnc%0ahubungan

Riskesdas. (2010). Badan Penelitian Dan Pengembangan Kesehatan. In *Kementerian Kesehatan Ri Tahun 2010*.

Sharma, S. (2014). Understanding Emotion Regulation And Child Abuse In Adolescence. *International Journal Of Innovation And Applied Studies*, *6*(3), 580–589.

Sinaga, E., Saribanon, N., Suprihatin, & Sa'adah, N. (2017). *Manajeman Kesehatan Menstruasi*. Universitas Nasional.

Sitoayu, L., Pertiwi, D. A., & Mulyani, E. Y. (2017). Kecukupan Zat Gizi Makro, Status Gizi, Stres, Dan Siklus Menstruasi Pada Remaja. *Jurnal Gizi Klinik Indonesia*, *13*(3), 121–128. Https://Doi.Org/10.22146/Ijcn.17867

Susanti, E., & Wulandari, S. (2017). Faktor-Faktor Yang Berhubungan Dengan Usia Menarche Pada Siswi Kelas Viii Mtsn 1 Bukittinggi Tahun 2016. *Jurnal Kesehatan Prima Nusantara*, *Volume 8 N*(2), 155–160. Https://Www.Google.Com/Url?Sa=T&Source=Web&Rct=J&Url=Https://Media.Neliti.Com/Media/Publications/289838-Factors-Associated-With-Age-Of-Menarche-4eb3d717.Pdf&Ved=2ahukewi51-Zt9czzahv_73mbhaa4bgiqfnoecdyqaq&Usg=Aovvaw0mwvhvy2ablzwdemejxwpz

Triany, D. S., Widajanti, L., & Suyatno. (2018). Hubungan Tingkat Kecukupan Energi, Magnesium, Kalsium, Dan Besi, Aktivitas Fisik, Persentase Lemak Tubuh Dengan Siklus Menstruasi Remaja Putri (Studi Pada Siswi Sma Negeri 4 Kota Pekalongan). *Jurnal Kesehatan Masyarakat (E-Journal)*, *6*(5), 335–341.

Utri, P. (2020). *Pola Menstruasi Dengan Terjadinya Anemia Pada Remaja*. *11*(2), 314–327.

Wahyuni, R., Rohani, S., & Fara, Y. D. (2020). Faktor-Faktor Yang Berhubungan Dengan Kejadian Kekurangan Energi Kronik (Kek) Pada Ibu Hamil Di Wilayah Kerja Uptd Puskesmas Pringsewu Tahun 2020 Rini. *Jurnal Maternitas Aisyah (Jaman Aisyah)*, *2*(1), 10–21.

Wahyuni, Y., & Dewi, R. (2018). Gangguan Siklus Menstruasi Kaitannya Dengan Asupan Zat Gizi Pada Remaja Vegetarian. *Jurnal Gizi Indonesia (The Indonesian Journal Of Nutrition)*, *6*(2), 76–81. Https://Doi.Org/10.14710/Jgi.6.2.76-81

Wahyuningsih, E. (2018). *Tingkat Stres Remaja Dengan Siklus Menstruasi*. Sekolah Tinggi Ilmu Kesehatan Insan Cendekia Medika Jombang.

Wijayanti, A., Refirman, D., & Sri, R. (2017). Hubungan Pengetahuan Tentang Menstruasi Dengan Sikap Dalam Penatalaksanaan Dismenore Primer Pada Remaja Putri Di Sman 58 Jakarta. *Jurnal Pendidikan Biologi*, *X*(1).

Yolandiani, R. P., Fajria, L., & Putri, Z. M. (2020). Faktor – Faktor Yang Mempengaruhi Ketidakteraturan Siklus Menstruasi Pada Remaja. *Jurnal Ilmiah Kesehatan*, *68*, 1–11.