JPPIPA 10(11) (2024)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Effect of Use Hormonal Progestin Birth Control on Length of Use, Incidence of Menstrual Cycle Disorders in Birth Control Acceptors in Muara Enim District in 2024

Olivia Nency[1*], Desiani Putri Utami[1], Desna Pramita Devi[1], Laila Farhan[1], Meyta Sari[1], Mona Fitri[1], Neti[1], Rosdiana Juliani[1], Lidia Aryani Sapitri[1]

[1] Sekolah Tinggi Ilmu Kesehatan Abdi Nusantara, Jakarta, Indonesia

Received: June 17, 2024
Revised: August 22, 2024
Accepted: November 25, 2024
Published: November 30, 2024

Corresponding Author:
Olivia Nency
Olivia.nency123@gmail.com

DOI: 10.29303/jppipa.v10i11.8932

Abstract: This study aims to determine the effect of progestin hormonal contraceptive use on the duration of use and the incidence of menstrual cycle disorders among contraceptive acceptors in Muara Enim District in 2024. The method used is a correlational design with a cross-sectional approach. The population in this study consisted of all hormonal contraceptive acceptors in Muara Enim District, with a sample size of 853 people, determined using G Power software. Data analysis was conducted using the Spearman's rho test. The statistical test results showed a p-value of 0.000 (<0.05), indicating a significant relationship between hormonal contraceptive use and menstrual cycle disorders. A correlation coefficient of 0.28 indicates a fairly strong and positive relationship. Furthermore, there is a relationship between the duration of hormonal contraceptive use and menstrual cycle disorders, with a p-value of 0.000 (<0.05) and a correlation coefficient of 0.39, suggesting a moderate and positive relationship in the same direction. These findings are expected to provide valuable information for healthcare providers to offer more accurate recommendations regarding potential menstrual cycle disorders in progestin hormonal contraceptive users, enabling patients to better understand the possible risks associated with this contraceptive method.

Keywords: Birth control; Hormonal progestin; Menstrual cycle disorders.

Introduction

Around 287,000 women died during or after pregnancy and childbirth in 2020. Nearly 95% of total maternal deaths occurred in low- and lower-middle-income countries that year, and most were preventable. Efforts to prevent maternal deaths are very important, with a focus on preventing unwanted pregnancies (Knoedler et al., 2022; UN, 2019; Yefimenko, 2020). All women, including teenagers, must have adequate access to contraception, safe abortion services in accordance with applicable law, and quality post-abortion services. The Family Planning (KB) Program is one of the 4 pillars of the intervention program to reduce maternal mortality in safe motherhood. Reducing the maternal mortality rate as an indicator of improving the health of mothers, children and families.

Family planning programs through the use of contraception reduce maternal deaths through two mechanisms, namely reducing births and reducing high-risk pregnancies (Kemenkes, 2021). Contraceptive use worldwide, according to data from World Health Organization, more than 100 million couples use effective contraception. Of this number, around 75% choose hormonal contraception, while 25% choose non-hormonal contraception. In 2019, the percentage of

How to Cite:
Nency, O., Utami, D. P., Devi, D. P., Farhan, L., Sari, M., Fitri, M., … Sapitri, L. A. (2024). Effect of Use Hormonal Progestin Birth Control on Length of Use, Incidence of Menstrual Cycle Disorders in Birth Control Acceptors in Muara Enim District in 2024. *Jurnal Penelitian Pendidikan IPA*, *10*(11), 9267–9274. https://doi.org/10.29303/jppipa.v10i11.8932

contraceptive users worldwide reached 89%, which increased to 92.1% in 2020. In Southeast, South and West Asia, around 43% of the population uses contraception. According to the Central Statistics Agency (BPS), in 2022, it was recorded that 55.36% of couples of childbearing age (PUS) in Indonesia used contraceptive devices and drugs. Meanwhile, the number of couples of childbearing age (PUS) who use contraceptive devices and drugs in South Sumatra in 2022 is 81.7% and in Muara Enim Regency it is 94.7% (South Sumatra Health Office Profile, 2022). When choosing the type of contraceptive, the majority of active family planning participants chose injections (56.1%), pills (18.18%), IUD (8.35%), MOW (3.66%) Condoms (2.06%). Calendar (1.39%) and other contraceptives (0.4%) (BKKBN, 2024).

One type of contraception that is commonly used is hormonal contraception (Sims et al., 2021; Vannuccini et al., 2022; Yang et al., 2019). This method is considered to have a high level of effectiveness, however, hormonal contraceptives, especially those containing progestin, can affect the menstrual cycle. The majority of users experience an increased incidence of irregular blood spots, light or out-of-cycle bleeding that is sometimes prolonged, as well as oligomenorrhea or even amenorrhea in some cases (Manuaba, 2018; Sinaga, 2021). Concern about the side effects of hormonal contraception often becomes a barrier to use and can lead to premature discontinuation of contraceptive use. The main cause of drop out in the first year of hormonal contraceptive use is irregular bleeding, which causes discontinuation of contraceptive use in 2-7% of users. Based on the data obtained, contraceptive implant users experienced the highest changes in menstrual patterns, reaching 60-70% of acceptors, followed by injection users at 50-60% and pill users at 30-40% of acceptors (BKKBN, 2024).

Research conducted by Sisilvia et al. (2022) shows that the results of statistical tests using the Tukey HSD test on acceptors of hormonal contraception via injections, pills and implants show that at a significance value ($p > 0.05$), there is no significant difference in the duration of cycle disorders. menstruation between the three methods. However, there are similarities in the duration of menstrual cycle disorders between injection and implant use. Thus, of the three types of hormonal contraception, the duration of the occurrence of menstrual cycle disorders was fastest when using injectable contraceptives with a value of 3.64, followed by implants with a value of 4.67, and pills with a value of 7.70. In Adiesti & Wari (2020) research, the majority of respondents who used progestin hormonal contraception, 36 (85.70%) and more than half of the respondents who used combined hormonal contraception, 20 (52.60%) experienced abnormalities in the menstrual cycle. This shows that there is a relationship between the use of hormonal contraception and menstrual cycle disorders. This research aims to determine "The Effect of Use Hormonal Progestin Birth Control on Length of Use, Incidence of Menstrual Cycle Disorders in Birth Control Acceptors in Muara Enim District in 2024."

Method

This research employs a correlational design to explore the relationship between two key variables: the independent variable (duration of hormonal contraceptive use) and the dependent variable (incidence of menstrual cycle disorders). The correlational approach is suitable for examining associations, providing insights into how changes in one variable might correspond with changes in the other. In this study, a cross-sectional approach is applied, where data collection and observations are carried out at a single point in time. This method is particularly useful for analyzing the prevalence of certain conditions or behaviors within a defined population, offering a snapshot of the relationships between variables as they exist within the studied timeframe (Adiesti & Wari, 2020; Wardaningtyas & Achadi, 2022).

The population of this research consists of all hormonal birth control acceptors in Muara Enim sub-district, with a sample size determined using G Power software. The resulting sample consists of 853 participants, a number considered statistically representative of the population and sufficient for deriving reliable conclusions (Nency & Ramadhan, 2023; Oktarina et al., 2022). The selection of this sample size ensures that the study's findings can be generalized to the wider population with a high degree of confidence. Data analysis is performed using Spearman's rho, a non-parametric statistical test that measures the strength and direction of association between two ranked variables (Sugiyono, 2019). This test is particularly appropriate when the data does not follow a normal distribution or when ordinal scales are involved, which is often the case in studies examining health outcomes like menstrual irregularities. Spearman's rho provides a correlation coefficient ranging from -1 to 1, where a positive value indicates a direct relationship between the variables, while a negative value suggests an inverse relationship (Baziad, 2008; Notoatmodjo, 2020).

The analysis revealed a significant p-value of 0.000, which is less than the threshold of 0.05, indicating that the relationship between the use of hormonal birth control and menstrual cycle disorders is statistically significant. The correlation coefficient of 0.28 signifies a fairly strong and positive relationship, suggesting that

as the duration of hormonal contraceptive use increases, the likelihood of experiencing menstrual cycle disorders also rises (Andryani et al., 2021; Beltz et al., 2022; Hampson et al., 2022). Further analysis focusing on the duration of contraceptive use confirmed this trend. The p-value of 0.000, along with a correlation coefficient of 0.394, highlights a moderate and positive correlation. The findings suggest that longer durations of hormonal contraceptive use are associated with a higher incidence of menstrual irregularities, with the relationship moving in the same direction. These results underscore the importance of healthcare providers offering clear and comprehensive guidance to patients regarding the potential risks of progestin-based hormonal contraceptives. By better understanding the relationship between contraceptive use and menstrual cycle changes, healthcare professionals can provide more tailored advice, helping users make informed decisions about their contraceptive choices while managing expectations regarding possible menstrual disturbances (Armean Wright et al., 2020; Conte et al., 2021; Shaw, 2021).

Result and Discussion

Results

Table 1. Frequency Distribution of Hormonal Birth Control Use in Muara Enim District in 2024

Use of Hormonal Birth Control	F	%
Progestin		
- Pil	205	24
- Inject	358	42
- Implants	77	9.00
- IUD	48	5.60
Non progestin		
- Combination pills	61	7.20
- Combination injection	104	12.20
Total	853	100

Based on the data in table 1, looking at the frequency distribution, it is clear that the majority of respondents use progestin-injectable hormonal birth control, 358 people (42%).

Table 2. Frequency Distribution of Length of Hormonal Birth Control Use in Muara Enim District in 2024

Duration of Hormonal Birth Control Use	F	%
>1 year	494	57.90
≤ 1 year	359	42.10
Total	853	100

Based on the data in Table 2, looking at the frequency distribution, it is clear that the majority of respondents have used hormonal contraceptives for >1 year, as many as 494 people (57.90%).

Table 3. Frequency Distribution of Menstrual Cycle Disorders in Muara Enim District in 2024

Menstrual Cycle Disorders	F	%
Of	483	56.60
No	370	43.40
Total	853	100

Based on the data in Table 3, looking at the frequency distribution, it is clear that the majority of respondents experienced menstrual cycle disorders, 483 people (56.60%).

Based on the data in Table 4, it shows that the majority of respondents who use progestin birth control pills experience menstrual cycle disorders as much as 82.40%, more than half (51.40%) of those using progestin injections experience menstrual cycle disorders and more than half (55.80%) of those who use implants experience problems. The menstrual cycle and the use of IUD contraceptives were more likely to not experience menstrual cycle disorders as much as 52.10%. Meanwhile, more than half of those using combination pills (55.70%) did not experience menstrual cycle disorders and more people using combination contraceptive injections (64.40%) did not experience menstrual cycle disorders. The results of statistical tests using Spermman's Rho show a Sig value. (2-tailed), namely 0.000<0.05, so it can be concluded that there is a relationship between the use of hormonal birth control and menstrual cycle disorders. The correlation coefficient obtained is 281, indicating that the relationship is quite strong and has a positive pattern, so the relationship between the two variables is in the same direction (Elliott-Sale et al., 2020; Ratten et al., 2021).

Based on the data in Table 5, it shows that the majority of respondents with a duration of using hormonal contraceptives > 1 year mostly experienced menstrual cycle disorders as much as 73.30%. Meanwhile, respondents with a duration of using hormonal contraceptives ≤ 1 year mostly did not experience menstrual cycle disorders, 66.30%. The results of statistical tests using Spermman's Rho show a Sig value. (2-tailed), namely 0.000<0.05, so it can be concluded that there is a relationship between the length of use of hormonal birth control and menstrual cycle disorders. The correlation coefficient was obtained with a value of 394, indicating that the relationship is quite strong and has a positive pattern, so the relationship between the two variables is in the same direction

(Engseth et al., 2022; Merki-Feld et al., 2020; Römer et al., 2021).

Table 4. Influence Use of Hormonal Birth Control Against Menstrual Cycle Disorders in Muara Enim District in 2024

KB Hormonal	Menstrual Cycle Disorders						Correlation Coefficient	*P Value*
	Of		No		Total			
	f	%	f	%	f	%		
Progestin							281	0.000
- Pil	169	82.40	36	17.60	205	100		
- Inject	184	51.40	174	48.60	358	100		
- Implants	43	55.80	34	44.20	77	100		
- IUD	23	47.90	25	52.10	48	100		
Non Progestin								
- Combination pills	27	44.30	34	55.70	61	100		
- Combination injection	37	35.60	67	64.40	104	100		
Total	483	56.60	370	43.40	853	100		

Table 5. Old Influence Use of Hormonal Birth Control Against Menstrual Cycle Disorders in Muara Enim District in 2024

Length of Use	Menstrual Cycle Disorders						Correlation Coefficient	*P Value*
	Of		No		Total			
	f	%	f	%	f	%		
>1 year	362	73.30	132	26.70	494	100	394	0.000
≤ 1 year	121	33.70	238	66.30	359	100		
Total	483	56.60	370	43.40	853	100		

Discussion

Based on statistical tests carried out on progestin and non-progestin hormonal contraceptive acceptors on the duration of use and the incidence of menstrual cycle disorders, p 0.000> 0.05, meaning there is an effect of use Progestin hormonal birth control on the duration of use of menstrual cycle disorders. The correlation coefficient shows that the relationship is quite strong and has a positive pattern (Ghorbanizamani et al., 2024; Luo et al., 2024; Rocca et al., 2021). Progestin hormonal contraception is a method of contraception that contains progestin, a synthetic progesterone hormone that has a similar function to the natural hormone progesterone. Progestins can be used in various forms of contraception, such as pills, injections, intrauterine devices (IUD) and implants. Hormonal contraception affects the menstrual cycle in different ways depending on the type of contraception used. For example, progestin-only pills can cause changes in menstrual patterns, progestin injections can cause amenorrhea, and implants and hormonal IUDs can affect the duration and volume of menstruation (Manuaba, 2018).

Menstrual pattern disorders that commonly occur in hormonal contraceptive users include spotting or spotting bleeding, irregular bleeding, amenorrhea, and changes in the frequency, duration and amount of blood lost. With long-term use, menstrual cycle changes are the most common side effect. Users of contraceptive injections, such as Depo-Provera, often experience irregular bleeding or spotting (Contini et al., 2019; Gurvich et al., 2020; Yang et al., 2022; Zhang et al., 2019). After one year of using birth control injections, around 50% of women experience amenorrhea (no menstruation). Menstruation will usually return after the injection is stopped (Sisilvia et al., 2022). Menstrual disorders or menstrual disorders are often caused by an imbalance in the hormones that regulate the menstrual cycle, although other medical conditions can also play a role. The amount of bleeding can be influenced by the size and number of open blood vessels and intravascular pressure. The duration of bleeding is influenced by the wound's healing power or reduced regeneration ability, which can be caused by infection, myoma, polyps, or cancer (Sisilvia et al., 2022).

The results of the research show that in the analysis of menstrual cycle disorders, the majority are those using birth control pills, injections and implants. In line with research findings (Sujiyatini & Kurniati, 2019), the incidence of menstrual cycle disorders based on the results of the 3-month univariate injection contraceptive test was 95 (26.20%) who experienced a change in menstrual cycle lengthening > 35 days, 70 (35.50%) %), implants with 83 respondents (22.90%) experienced a prolonged menstrual cycle > 35 days 66 (33.30%), 1 month injections with 93 respondents (25.60%) also experienced changes to the normal menstrual cycle of 23-35 days 52 (39.10%), pills with 92 respondents (25.30%) the majority experiencing a normal menstrual cycle of 23-35 days as many as 62 (66.00%). According to the theory of 3-month injection contraceptive acceptors,

menstrual disorders are generally caused by an imbalance of the hormones FSH (follicle-stimulating hormone) and LH (luteinizing hormone) (Azenkot & Schwarz, 2022; Fiore et al., 2022; Young & Huh, 2021), which causes changes in estrogen and progesterone levels. 3-month injectable contraception also causes thinning of the endometrial wall and an increase in the viscosity of cervical mucus, which functions as a barrier to spermatozoa, thereby causing menstrual disorders. Birth control pills, especially progestin-only pills, can cause thinning of the endometrial wall (uterine lining). This reduces the amount of blood released during menstruation and may result in amenorrhea.

One relevant theory is the Baziat theory which states that menstrual irregularities in recipients of the Depo-Provera injection contraceptive are not yet fully understood. However, it is thought that an imbalance between the hormones estrogen and progesterone at the peripheral level plays an important role. These hormones play a role in the endometrial changes necessary for a normal menstrual cycle (Edelman et al., 2021; Laissue, 2015; Shoupe, 2021). Explains that the longer Depo-Provera is used, the greater the likelihood of changes in menstrual duration. In many cases, contraceptive acceptors can experience increasingly shorter periods, or even no periods at all, which is caused by the gestagen effect in Depo-Provera. The gestagen in Depo-Provera causes changes in the endometrium that can disrupt the regular menstrual cycle. During the first few months of use, hormonal IUD users often experience spotting bleeding. This is because the endometrium adapts to hormonal changes. Implants containing etonogestrel, a form of progestin, also cause endometrial thinning. As a result, menstruation may become lighter or not occur at all after several months of use (Roelens et al., 2020; Tolstanova, 2022; Visser et al., 2024). Implant users often experience significant changes in menstrual patterns, including irregular bleeding, spotting, or amenorrhea. This effect is caused by a disruption in the hormonal balance that regulates the menstrual cycle (Parenthood, 2022).

Conclusion

The results of the frequency distribution showed that the majority of respondents used progestin-injectable hormonal contraception as many as 358 people (42%), the duration of hormonal contraceptive use was >1 year as many as 494 people (57.9%) and the majority of respondents experienced menstrual cycle disorders as many as 483 people (56.6%). The results of statistical tests using Spermman's Rho show a p value of 0.000<0.05 so it can be concluded that there is a relationship between the use of hormonal birth control and menstrual cycle disorders. The correlation coefficient obtained is 281, indicating that the relationship is quite strong and has a positive pattern, so the relationship between the two variables is in the same direction. The results of statistical tests using Spermman's Rho show a p value of 0.000<0.05 so it can be concluded that there is a relationship between the length of use of hormonal birth control and menstrual cycle disorders. The correlation coefficient was obtained with a value of 394, indicating that the relationship is quite strong and has a positive pattern, so the relationship between the two variables is in the same direction.

Acknowledgments

We would like to express our deepest gratitude to our advisor who has guided us throughout the research process and to the respondents who have made significant contributions to the success of this study. Your support, guidance, and participation have been invaluable, and we greatly appreciate your effort and dedication. Thank you for your continuous encouragement and for making this research possible.

Author Contributions

The following statements should be used Conceptualization ON, DPU, DPD, LF, MS, MF, N, RJ, LAS contributed to the data collection process, data processing, article writing.

Funding

This research was funded by personal funds.

Conflicts of Interest

The authors declare no conflict of interest.

References

Adiesti, F., & Wari, F. E. (2020). Hubungan Kontrasepsi Hormonal Dengan Siklus Menstruasi. *Jurnal Riset Kebidanan Indonesia*, *4*(1), 6–12. https://doi.org/10.32536/jrki.v4i1.71

Andryani, Z. Y., Alkautzar, A. M. ah, Alza, N., Taherong, F., Firdayanti, Diarfah, A. D., Liantanty, F., Nontji, W., & Arifuddin, S. (2021). The relation of estradiol conditions and usage length to sexual dysfunction in progesterone acetate medroxepo acceptories at Bara-Baraya public health center of Makassar. *Gaceta Sanitaria*, *35*, S475–S478. https://doi.org/10.1016/j.gaceta.2021.10.075

Armean Wright, A., Fayad, G. N., Selgrade, J. F., & Olufsen, M. S. (2020). Mechanistic model of hormonal contraception. *PLoS Computational Biology*, *16*(6), 1–23. https://doi.org/10.1371/journal.pcbi.1007848

Azenkot, T., & Schwarz, E. B. (2022). Special Considerations for Women of Reproductive Age on Anticoagulation. *Journal of General Internal*

Medicine, *37*(11), 2803–2810. https://doi.org/10.1007/s11606-022-07528-y

Baziad, A. (2008). *Kontrasepsi Hormonal*. Jakarta: PT Bina Pustaka.

Beltz, A. M., Loviska, A. M., Kelly, D. P., & Nielson, M. G. (2022). The Link Between Masculinity and Spatial Skills Is Moderated by the Estrogenic and Progestational Activity of Oral Contraceptives. *Frontiers in Behavioral Neuroscience*, *15*(January), 1–12. https://doi.org/10.3389/fnbeh.2021.777911

BKKBN. (2024). *Peraturan Badan Kependudukan dan Keluarga Berencana Nasional Nomor 1 Tahun 2024*. BKKBN RI. Retrieved from https://peraturan.bpk.go.id/Details/282164/perka-bkkbn-no-1-tahun-2024

Conte, F., van Buuringen, N., Voermans, N. C., & Lefeber, D. J. (2021). Galactose in human metabolism, glycosylation and congenital metabolic diseases: Time for a closer look. *Biochimica et Biophysica Acta - General Subjects*, *1865*(8), 129898. https://doi.org/10.1016/j.bbagen.2021.129898

Contini, C., Winkler, B. S., Maass, N., Alkatout, I., Winkler, K., & Pecks, U. (2019). Concomitant intrauterine growth restriction alters the lipoprotein profile in preeclampsia. *Pregnancy Hypertension*, *15*(October 2018), 154–160. https://doi.org/10.1016/j.preghy.2018.12.006

Edelman, A., Hemon, A., Creinin, M., Borensztein, P., Scherrer, B., & Glasier, A. (2021). Assessing the pregnancy protective impact of scheduled nonadherence to a novel progestin-only pill: Protocol for a prospective, multicenter, randomized, crossover study. *JMIR Research Protocols*, *10*(6). https://doi.org/10.2196/29208

Elliott-Sale, K. J., McNulty, K. L., Ansdell, P., Goodall, S., Hicks, K. M., Thomas, K., Swinton, P. A., & Dolan, E. (2020). The Effects of Oral Contraceptives on Exercise Performance in Women: A Systematic Review and Meta-analysis. *Sports Medicine*, *50*(10), 1785–1812. https://doi.org/10.1007/s40279-020-01317-5

Engseth, T. P., Andersson, E. P., Solli, G. S., Morseth, B., Thomassen, T. O., Noordhof, D. A., Sandbakk, Ø., & Welde, B. (2022). Prevalence and Self-Perceived Experiences With the Use of Hormonal Contraceptives Among Competitive Female Cross-Country Skiers and Biathletes in Norway: The FENDURA Project. *Frontiers in Sports and Active Living*, *4*(April), 1–10. https://doi.org/10.3389/fspor.2022.873222

Fiore, M., Sentilhes, L., & d'Oiron, R. (2022). How I manage pregnancy in women with Glanzmann thrombasthenia. *Blood*, *139*(17), 2632–2641. https://doi.org/10.1182/blood.2021011595

Ghorbanizamani, F., Moulahoum, H., Zihnioglu, F., & Timur, S. (2024). Molecularly imprinted polymers-based biosensors for gynecological diagnostics and monitoring. *Talanta Open*, *10*(August), 100364. https://doi.org/10.1016/j.talo.2024.100364

Gurvich, C., Warren, A. M., Worsley, R., Hudaib, A. R., Thomas, N., & Kulkarni, J. (2020). Effects of oral contraceptive androgenicity on visuospatial and social-emotional cognition: A prospective observational trial. *Brain Sciences*, *10*(4). https://doi.org/10.3390/brainsci10040194

Hampson, E., Morley, E. E., Evans, K. L., & Fleury, C. (2022). Effects of oral contraceptives on spatial cognition depend on pharmacological properties and phase of the contraceptive cycle. *Frontiers in Endocrinology*, *13*(September), 1–19. https://doi.org/10.3389/fendo.2022.888510

Kemenkes, R. I. (2021). *Pedoman Pelayanan Kontrasepsi dan Keluarga Berencana*. Jakarta: Direktorat Kesehatan Keluarga, Kementerian Kesehatan Republik Indonesia.

Knoedler, J. R., Inoue, S., Bayless, D. W., Yang, T., Tantry, A., Davis, C. ha, Leung, N. Y., Parthasarathy, S., Wang, G., Alvarado, M., Rizvi, A. H., Fenno, L. E., Ramakrishnan, C., Deisseroth, K., & Shah, N. M. (2022). A functional cellular framework for sex and estrous cycle-dependent gene expression and behavior. *Cell*, *185*(4), 654-671.e22. https://doi.org/10.1016/j.cell.2021.12.031

Laissue, P. (2015). Aetiological coding sequence variants in non-syndromic premature ovarian failure: From genetic linkage analysis to next generation sequencing. *Molecular and Cellular Endocrinology*, *411*, 243–257. https://doi.org/10.1016/j.mce.2015.05.005

Luo, X., Jia, K., Xing, J., & Yi, J. (2024). The utilization of nanotechnology in the female reproductive system and related disorders. *Heliyon*, *10*(3), e25477. https://doi.org/10.1016/j.heliyon.2024.e25477

Manuaba, I. B. G. (2018). *Ilmu Kebidanan, Penyakit Kandungan dan Keluarga Berencana*. Jakarta: EGC.

Merki-Feld, G. S., Caveng, N., Speiermann, G., & MacGregor, E. A. (2020). Migraine start, course and features over the cycle of combined hormonal contraceptive users with menstrual migraine - Temporal relation to bleeding and hormone withdrawal: A prospective diary-based study. *Journal of Headache and Pain*, *21*(1), 1–10. https://doi.org/10.1186/s10194-020-01150-1

Nency, O., & Ramadhan, I. M. (2023). Perbandingan Pemakaian KB Hormonal Terhadap Durasi Kejadian Gangguan Siklus Haid Pada Akeptor KB Di TPMB Siti Jaojiah. *Jurnal Keperawatan*

Muhammadiyah, *8*(3). https://doi.org/10.30651/jkm.v8i3.17762

Notoatmodjo, S. (2020). *Metodologi Penelitian kesehatan*. Jakarta: Rineka Cipta.

Oktarina, M., Ramadhaniati, Y., Andika, P., & Melati, M. (2022). Hubungan Pengetahuan dengan Pemilihan KB Suntik Di Wilayah Kerja UPTD Puskesmas Bumi Agung Kota Pagar Alam. *Ahmar Metastasis Health Journal*, *1*(4), 124–128. https://doi.org/10.53770/amhj.v1i4.89

Parenthood, P. (2022). The Birth Control Implant. In *Planned Parenthood*. Retrieved from https://www.plannedparenthood.org/learn/birth-control/birth-control-implant-nexplanon

Ratten, L. K., Plummer, E. L., Bradshaw, C. S., Fairley, C. K., Murray, G. L., Garland, S. M., Bateson, D., Tachedjian, G., Masson, L., & Vodstrcil, L. A. (2021). The Effect of Exogenous Sex Steroids on the Vaginal Microbiota: A Systematic Review. *Frontiers in Cellular and Infection Microbiology*, *11*(November). https://doi.org/10.3389/fcimb.2021.732423

Rocca, M. L., Palumbo, A. R., Visconti, F., & Di Carlo, C. (2021). Safety and benefits of contraceptives implants: A systematic review. *Pharmaceuticals*, *14*(6), 1–26. https://doi.org/10.3390/ph14060548

Roelens, C., Santos-Ribeiro, S., Becu, L., Mackens, S., Van Landuyt, L., Racca, A., De Vos, M., van de Vijver, A., Tournaye, H., & Blockeel, C. (2020). Frozen-warmed blastocyst transfer after 6 or 7 days of progesterone administration: impact on live birth rate in hormone replacement therapy cycles. *Fertility and Sterility*, *114*(1), 125–132. https://doi.org/10.1016/j.fertnstert.2020.03.017

Römer, T., Bitzer, J., Egarter, C., Hadji, P., Kiechle, M., Kramer, H., Oppelt, P. G., Peters, K., Stute, P., Schaudig, K., Wiegratz, I., & Regidor, P. A. (2021). Oral Progestins in Hormonal Contraception: Importance and Future Perspectives of a New Progestin Only-Pill Containing 4 mg Drospirenone. *Geburtshilfe Und Frauenheilkunde*, *81*(9), 1021–1030. https://doi.org/10.1055/a-1471-4408

Shaw, G. A. (2021). Mitochondria as the target for disease related hormonal dysregulation. *Brain, Behavior, and Immunity - Health*, *18*(September), 100350. https://doi.org/10.1016/j.bbih.2021.100350

Shoupe, D. (2021). The Progestin Revolution: progestins are arising as the dominant players in the tight interlink between contraceptives and bleeding control. *Contraception and Reproductive Medicine*, *6*(1), 1–9. https://doi.org/10.1186/s40834-020-00142-5

Sims, S. T., Ware, L., & Capodilupo, E. R. (2021). Patterns of endogenous and exogenous ovarian hormone modulation on recovery metrics across the menstrual cycle. *BMJ Open Sport and Exercise Medicine*, *7*(3), 1–9. https://doi.org/10.1136/bmjsem-2021-001047

Sinaga, R. A. (2021). Hubungan Lama Pemakaian KB Suntik 3 bulan dengan Gangguan Mentruasi di BPS D Purba Desa Gersang. *Jurnal Ilmu Kesehatan*, *13*(1), 13–24. https://doi.org/10.37012/jik.v13i1.460

Sisilvia, S., Nadya, E., & Khotimah, S. (2022). Hubungan lama pemakaian kb suntik 3 bulan dengan gangguan menstruasi di wilayah kerja puskesmas koto baru jorong pinang gadang kabupaten dharmasraya tahun. *Jurnal Kesehatan Tambusai*, *3*(4), 665–669. https://doi.org/10.31004/jkt.v3i4.10435

Sugiyono. (2019). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: PT Alfabeta.

Sujiyatini, N., & Kurniati, A. (2019). *Asuhan Ibu Nifas Askeb III*. Yogyakarta: Cyrillus Publisher.

Tolstanova, G. (2022). Differentiated approach to the treatment of external genital endometriosis as prevention of recurrence. *Reproductive Health of Woman*, *2*(2), 66–72. https://doi.org/10.30841/2708-8731.2.2022.261813

UN. (2019). *Contraceptive Use by Method 2019 - Data Booklet*. Retrieved from https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/files/documents/2020/Jan/un_2019_contraceptiveusebymethod_databooklet.pdf

Vannuccini, S., Clemenza, S., Rossi, M., & Petraglia, F. (2022). Hormonal treatments for endometriosis: The endocrine background. *Reviews in Endocrine and Metabolic Disorders*, *23*(3), 333–355. https://doi.org/10.1007/s11154-021-09666-w

Visser, N., Silva, A. V., Tarvainen, I., Damdimopoulos, A., Davey, E., Roos, K., Björvang, R. D., Kallak, T. K., Lager, S., Lavogina, D., Laws, M., Piltonen, T., Salumets, A., Flaws, J. A., Öberg, M., Velthut-Meikas, A., Damdimopoulou, P., & Olovsson, M. (2024). Epidemiologically relevant phthalates affect human endometrial cells in vitro through cell specific gene expression changes related to the cytoskeleton and mitochondria. *Reproductive Toxicology*, *128*(July). https://doi.org/10.1016/j.reprotox.2024.108660

Wardaningtyas, A. W., & Achadi, A. (2022). Determinan Kejadian Putus Pakai Kontrasepsi Suntik Pada Wanita Usia Subur Di Jawa Barat. *JIM: Jurnal Ilmiah Mahasiswa Pendidikan Sejarah*, *8*(3), 2576–2582.

https://doi.org/10.24815/jimps.v8i3.26069

Yang, J., Wang, H., Du, H., Fang, H., Han, M., Wang, Y., Xu, L., Liu, S., Yi, J., Chen, Y., Jiang, Q., & He, G. (2022). Exposure to perfluoroalkyl substances was associated with estrogen homeostasis in pregnant women. *Science of the Total Environment*, *805*, 150360. https://doi.org/10.1016/j.scitotenv.2021.150360

Yang, Y., Zhang, D., Qin, H., Liu, S., & Yan, Q. (2019). poFUT1 promotes endometrial decidualization by enhancing the O-fucosylation of Notch1. *EBioMedicine*, *44*, 563–573. https://doi.org/10.1016/j.ebiom.2019.05.027

Yefimenko, O. (2020). Menopause. A problem that is not out of date: Specialist comment and updated data from the National Consensus on the Management of Patients in Menopause. *Reproductive Endocrinology*, *5*(1), 72–88. https://doi.org/10.18370/2309-4117.2020.51.72-88

Young, R. E., & Huh, D. D. (2021). Organ-on-a-chip technology for the study of the female reproductive system. *Advanced Drug Delivery Reviews*, *173*, 461–478. https://doi.org/10.1016/j.addr.2021.03.010

Zhang, J., Yang, Y., Liu, W., Schlenk, D., & Liu, J. (2019). Glucocorticoid and mineralocorticoid receptors and corticosteroid homeostasis are potential targets for endocrine-disrupting chemicals. *Environment International*, *133*(August), 105133. https://doi.org/10.1016/j.envint.2019.105133