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Analysis of The Incidence of Uterine Leiomyoma Based on Body Mass Index and Neutrophil-Lymphocyte Ratio

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Abstract

Leiomyoma is the most common benign uterine tumor in the female with an incidence rate of 70-80%. The cause of these tumors is still unknown, but one of the known causes is that they grow in response to hormonal stimulation. Lymphocytic infiltration in this disease has been identified as an unusual finding. This suggests a potential role for lymphocytes in the development of such tumors. A bibliometric analysis of various sources found minimal research on the Neutrophil-Lymphocyte Ratio (NLR) in uterine leiomyoma, especially in Indonesia. This study analyzed the incidence of uterine leiomyoma based on Body Mass Index (BMI) and Neutrophil-Lymphocyte Ratio (NLR). This study used an observational analytic method with a case-control design. The sampling technique used was consecutive sampling and 129 samples were obtained in the form of 65 uterine leiomyoma case groups and 64 adenomyosis control groups. BMI variable parameters were obesity (>25kg/m2) and not obese (≤25kg/m2), while NLR was at risk (>3.53) and not at risk (≤3.53). Data analysis consisted of univariate, bivariate with a Chi-Square test, and continued with multivariate using logistic regression analysis. There was a significant relationship between BMI and uterine leiomyoma incidence (p = 0.028). There was also a significant relationship between NLR and uterine leiomyoma (p = 0.017). NLR had a 3,688-fold more association with the incidence of uterine leiomyoma than BMI. In conclusion, a relationship exists between BMI and NLR in the incidence of uterine leiomyoma. NLR can be a predictor of uterine leiomyoma, especially in women of reproductive age.

Introduction

Benign uterine tumors, also known as uterine leiomyoma, are abnormal and monoclonal growths of myometrial smooth muscle cells that are non-cancerous. Leiomyoma is the most common benign uterine tumor in the female reproductive system with an incidence rate of 70-80% (Koltsova et al., 2023). Uterine tumors are a frequent female reproductive health problem in the world with frequencies ranging from 23.33% to 32.6% (Anwar et al., 2023). According to the World Health Organization (WHO) in 2010, these tumors affected 20-25% of women worldwide with cases increasing to 9,643,336 occurrences in 2019 (Chen et al., 2022).

The prevalence of uterine leiomyoma in Indonesia is 2.39-11.87% of all gynecological patients treated. The incidence of this disease ranks second in gynecology cases after cervical cancer (Jariah et al., 2022). *Survei Demografi dan Kesehatan Indonesia* (SKDI) in 2015 stated that there were cases of uterine myoma at 20 per 1000 adult women. Approximately 49,598 women

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experienced uterine myoma in the last year 2018 (Laning et al., 2019). Medical records at RSUD Dr. H. Moch Ansari Saleh Banjarmasin found that the number of cases of uterine myoma in 2014 was 245 cases, in 2015 it was 224 cases, then increased again in 2016 to 383 cases (Ningrum et al., 2018). The results of another study, at Dr. Moewardi Surakarta Hospital of 114 women who experienced uterine leiomyoma showed that 53 women 46.49% had uterine myoma due to obesity (Laning et al., 2019).

Uterine leiomyoma and adenomyosis are often present together. Adenomyosis is characterized by uterine enlargement caused by ectopic endometrium with both glands and stroma within the myometrium. The diagnosis is usually based on histopathologic findings in different specimens. The prevalence of adenomyosis uteri together with leiomyoma uteri has been reported in the literature to range from 15-57%, according to the evaluation of uterine specimens of women with leiomyoma uteri. Uterine leiomyoma is found in the reproductive period and uterine adenomyosis is found in the late reproductive period (Alfarizan & Marindawati, 2020).

The cause of uterine leiomyoma is still unknown, but one of the known causes is that it grows in response to stimulation (Ernest et al., 2016). Some risk factors associated with an increased risk of uterine leiomyoma include parity, age, family history, hormonal factors, racial and genetic factors, age at menarche, stress, hypertension, and body mass index (BMI). The dominant factor of these risk factors is still difficult to determine (Lubis, 2020).

BMI has a role in the occurrence of uterine leiomyoma. Women with higher BMI tend to be at risk of developing uterine leiomyoma (Qin et al., 2021). Research conducted by Ridwan et al. (2021) showed that women with obesity experienced uterine myoma at 58.3% compared to women who were not obese at 41.9% (Ridwan et al., 2021). Another study also showed that the proportion of obese mothers experienced more uterine leiomyoma, namely 64.3% with a value of $p = 0.000$ (Ningrum et al., 2018). In contrast to the research conducted by Laning et al. (2019) at Prof. Dr. W.Z. Johannes Kupang Hospital which showed that as many as 74.39% of women with low BMI experienced uterine myoma. Idah et al. (2021) with their research at Abdul Wahab Sjahranie Samarinda Hospital also stated that BMI has no relationship with the incidence of uterine myoma. This could be because the weight measured in patients does not necessarily indicate the amount of fat in the patient (Idah et al., 2021).

Neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) have been identified as inflammatory biomarkers of uterine leiomyoma that can be determined easily using a complete blood count test. Lymphocytic infiltration within the uterine leiomyoma has been identified as unusual. This suggests a potential role for lymphocytes in leiomyoma progression (Wasyluk et al., 2019). Tumor disease can occur due to autoimmune disease, malignant neoplasm, or benign neoplasm. Lymphocyte counts can be relatively decreased and neutrophil counts increased due to chronic inflammation (Madendag et al., 2018). An existing systematic review and meta-analysis highlighted the potential value of neutrophils and lymphocytes as assessment tools in differentiating uterine leiomyoma from other gynecologic diseases (Tabatabaei et al., 2024).

A simple bibliometric analysis conducted using the Scopus database with the keywords (“NLR” OR “neutrophil to lymphocyte ratio”) AND (“leiomyoma” OR “uterine fibroid” OR “myoma” OR “fibroid”) only obtained 38 documents from 2016 to 2024. Searches using PUBMED only obtained 14 documents with a range of years 2018 - 2024. While searching with Google Scholar from 2010 - 2024 only obtained as many as 620, but none of the studies were conducted in Indonesia. Therefore, research on NLR on the incidence of uterine leiomyoma in Indonesia is still very limited. Based on the description above, then will study the relationship between body mass index and neutrophil-lymphocyte ratio in the incidence of uterine leiomyoma. This study aims to analyze the relationship between body mass index and

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neutrophil-lymphocyte ratio in the incidence of uterine leiomyoma. The results of the study can be one reference for the study.

Methods

Research Design

An observational analytic study with a case-control design by comparing uterine leiomyoma as the case group and adenomyosis as the control group. Case-control research design is an analytical study that retrospectively studies the causes of events, which in this case is a benign uterine tumor. The selection of this design is based on finding out other factors besides the variables studied that can cause benign uterine tumors, especially leiomyoma uteri in one study.

Tumor diagnosis is based on histopathological examination in the anatomical pathology laboratory. Based on this, histopathological preparations equally derived from benign tumors in the uterine are sought. Therefore, in addition to leiomyoma uteri, adenomyosis is the second most common uterine benign tumor. Adenomyosis is another common benign uterine tumor in which glands and endometrial stroma grow inside the uterine muscle layer or myometrial tissue (Kurniati *et al*., 2024). Data were obtained from medical records with limited availability. In addition, based on the specified exclusion criteria, it may result in a dropout of data.

Population

The population in the study were medical records that have passed the gold standard test of histopathology preparations in uterine leiomyoma and adenomyosis cases at the Anatomical Pathology Laboratory of PKU Muhammadiyah Surakarta Hospital. The samples in this study were medical records of histopathology preparations with a final diagnosis of a benign tumor in the uterus from 2019 to 2024.

Sampling Technique and Sample Size Determination

The study used a consecutive sampling technique, in which all individuals who met the inclusion criteria were added to the study until the required number of subjects was reached. Medical record data obtained 237 samples and performed exclusion to obtain a total of 129 benign uterine tumors, 65 cases of leiomyoma uteri, and 64 cases of adenomyosis. Some of the reasons for using consecutive sampling techniques are that it allows researchers to utilize existing data in medical records, making data collection more efficient. It is also effective for investigating risk factors for relatively rare diseases such as leiomyoma uteri and is more efficient in terms of time and cost than cohort studies, as it can be done retrospectively. Although not a probability method, consecutive sampling can be considered close to random sampling if the sampling period is long enough to meet the assumptions for certain statistical analyses (Etikan, 2016; Martínez-Mesa et al., 2016; Rahim, 2020).

The sample size is calculated using the hypothesis test formula for two population proportions used to calculate the sample size for nominal data, where the values of P1 and or P2 must be known from previous studies (Sastroasmoro & Ismael, 2011). The sample size formula used in this study adheres to Dahlan by using the unpaired categorical analytical formula.

In the study of Ridwan (2021), the prevalence of uterine leiomyoma patients in the obese group was 58.3%, while the prevalence of other benign tumors nonleiomyoma uteri was 41.7%. The odds ratio (OR) in the data was 2.965 and p-value = 0.007. Then the prevalence of other benign tumors non-leiomyoma uteri was entered into the formula as P2 or proportion in the group whose value was already known. Based on this, the study sample size was 129 samples.

Restriction criteria

Inclusion criteria in other studies are medical record data in the identity section filled in completely in women of reproductive age (18-49 years) and have PA histopathology results

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with conclusions following uterine leiomyoma as a case group and adenomyosis as a control group. The exclusion criteria are respondents who have a diagnosis of benign uterine tumors accompanied by cysts and/or obgyn malignancies, accompanied by infectious diseases, and histopathological preparations derived from curettage. This is because these preparations cannot show the intact structure of the uterus. After all, they come from scrapings, so they are not the gold standard for determining histopathological diagnosis.

Measurement

The type of data used in this study is secondary data. The variables studied were body mass index (BMI) with obesity (>25 kg/m^2) and non-obesity (≤25 kg/m^2) criteria and neutrophil-lymphocyte (NLR) ratio with risk (>3.53) and non-risk (≤3.53) criteria. BMI measurement was obtained by dividing body weight (kg) and height (m) into squares, while the NLR calculation was obtained by dividing the absolute neutrophil count by the absolute lymphocyte count from the routine hematology examination at the first consultation with the obgyn before surgery.

Statistical analysis

Univariate analysis was performed to determine the distribution of sample characteristics. Bivariate analysis of the effect between independent and dependent variables was performed using the Chi-Square test with a 95% confidence level (p-value <0.05) referred to a statistically significant correlation. Multivariate analysis was performed using a logistic regression test to find out the riskier variable in this study.

Ethical clearance

Researchers have obtained a research permit from the Faculty of Medicine, University of Muhammadiyah Surakarta with No.3031./C.8-III/FK/V/2024 and approval of the health ethics code through the *Komite Etik Penelitian dan Pengembangan Kesehatan* (KEPK) of PKU Muhammadiyah Surakarta Hospital with No.15/KEPK/RS.PKU/VI/2024.

Results and Discussion

Samples were taken from histopathology medical records with a final diagnosis of uterine leiomyoma between 2019 and 2024 using consecutive sampling techniques. A total of 129 samples were obtained consisting of 65 samples of uterine leiomyoma and 64 samples of non-leiomyoma uteri benign tumors with a final diagnosis of adenomyosis. Secondary data collected in this study included BMI, age, parity, menarche age, and neutrophil-lymphocyte ratio. The research data were analyzed using SPSS 26.0 for Windows software consisting of univariate analysis to determine frequency distribution, bivariate analysis using the Chi-Square test, and multivariate analysis using the logistic regression test. The following are the results of the data analysis:

Univariate Analysis Results

Table 1. Frequency Distribution Based on Body Mass Index (BMI), Neutrophil-Lymphocyte Ratio (NLR), Age, Parity, and Menarche Age

Variable	(n)	(%)
Uterine Leiomyoma (n=65)		
BMI		
Obesity (≥25)	42	64,6
No obesity (<25)	23	35,4
NLR		
Risky (>3,53)	37	56,9
No risk (≤3,53)	28	43,1
Age		

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Non-reproductive (>49 years)	10	15,4
Reproductive (15 – 49 years)	55	84,6
Parity		
Nuliparous & primiparous	27	41,5
Multiparous	38	58,5
Age of menarche		
Risky (< 11 years)	0	0
No risk (≥11 years)	65	100
Adenomyosis (n=64)		
BMI		
Obesity (≥25)	29	45,3
No obesity (<25)	35	54,7
NLR		
Risky (>3,53)	23	35,9
No risk (≤3,53)	41	64,1
Age		
Non-reproductive (>49 years)	12	18,8
Reproductive (15 – 49 years)	52	81,3
Parity		
Nuliparous & primiparous	30	46,9
Multiparous	34	53,1
Age of menarche		
Risky (< 11 years)	0	0
No risk (≥11 years)	64	100

Based on table 1, respondents with uterine leiomyoma had the highest incidence of the disease in obese women as many as 42 (64.6%) and women who had risky NLR (more than 3.35) with a frequency of 37 (56.9%). Respondents in the univariate results above the majority occurred at a reproductive age of 55 (84.6%). The frequency of multiparous parity in respondents was 38 (58.6%). In addition, based on the age of menarche, all uterine leiomyoma respondents had an age of menarche that was not at risk, namely 65 (100%). Meanwhile, in the control group with a final diagnosis of adenomyosis, the majority of respondents had a non-obese BMI of 35 (54.7%), a non-risky NLR of 41 (64.1%), and reproductive age of 52 (81.3%). In addition, the highest number of respondents in multiparity was 53.1% and all had an age of menarche that was not at risk (100%).

Results of Bivariate Analysis

Table 2. Analysis of the Incidence of Uterine Leiomyoma Based on BMI

BMI	**Type of Benign Uterine Tumours**				**OR**	**CI 95%**		**P**
	Uterine Leiomyoma		**Adenomyosis**			***Lower***	***Upper***	
	F	**%**	**F**	**%**				
Obesity	42	64,6	29	45,3	2,204	1,086	4,472	0,028
No Obesity	23	35,4	35	54,7				
Total	65	100	64	100				

Table 2. shows that significant results were obtained based on the Chi-Square test on the relationship between BMI and uterine leiomyoma with a p-value of 0.028 (p<0.05). In the bivariate analysis above, more respondents with uterine leiomyoma were found to be obese as many as 42 samples (64.6%). Meanwhile, respondents with adenomyosis were more likely to be found in those who were not obese, as many as 35 samples (54.7%).

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Table 3. Analysis of The Incidence of Uterine Leiomyoma Based on NLR

NLR	Type of Benign Uterine Tumours				OR	CI 95%		P
	Uterine Leiomyoma		Adenomyosis			*Lower*	*Upper*	
	F	%	F	%				
Risky	37	56,9	23	35,9	2,356	1,160	4,783	0,017
No risk	28	43,1	41	64,1				
Total	65	100	64	100				

Table 3. shows significant results in the Chi-Square test on the relationship between NLR and uterine leiomyoma with p value=0.017 (p<0.05). In the bivariate analysis, it was found that respondents with uterine leiomyoma had more risky neutrophil-lymphocyte ratios of 56.9% (37). While adenomyosis respondents were found to have a neutrophil-lymphocyte ratio that was not at risk in as many as 41 samples (64.1%).

Table 4. Analysis of The Incidence of Uterine Leiomyoma Based on BMI and NLR

Variable	Coefficient	p-value	*OR* (ExpB)	CI 95%		*Negelkerke R-square*
				Lower	*Upper*	
BMI	1,257	0,003	3,514	1,540	8,017	0,152
NLR	1,305	0,002	3,688	1,620	8,397	
Constant	-3,843	0,000	0,021			

Based on Table 4, the BMI and NLR variables both have significant results on the incidence of uterine leiomyoma with the NLR factor being more influential (0.002<0.003). The multivariate analysis showed that the Odds Ratio (*OR*) for NLR was 3.688 and BMI was 3.514. This means that the NLR factor has a more influential relationship to the occurrence of uterine leiomyoma than BMI by 3.688 times. The BMI and NRL factors have a 15.2% relationship, so there are still 84.8% other factors that can affect the incidence of this disease.

Analysis of The Incidence of Uterine Leiomyoma Based on BMI

The results of the study in Table 2 show that respondents with uterine leiomyoma were found to be more obese as many as 42 respondents (64.6%). Meanwhile, respondents with adenomyosis were more likely to be found in those who were not obese, as many as 35 respondents (54.7%). The Chi-Square calculated value showed significant results between BMI and the incidence of uterine leiomyoma with a p-value of 0.028 (p-value <0.05). This means that BMI has a relationship with the incidence of uterine leiomyoma.

This study follows that conducted by Ningrum et al. (2018) at the Obstetrics Clinic of Regional Public Hospital (RSUD) Dr. H. Moch. Amsari Saleh Banjarmasin states that there is a relationship between obesity and the incidence of uterine leiomyoma. In this study, the p-value=0.000 was obtained with the highest proportion of uterine leiomyoma in obese respondents (BMI≥27) of 64.3% (Ningrum et al., 2018). Another study was conducted at the Regional Public Hospital of Jend. A. Yani Metro City and Public Hospital (RSU) of Muhammadiyah Metro City, Lampung from May to October 2020 on 101 uterine leiomyoma respondents and control groups. Statistical tests in this study obtained a value of p= 0.007, which means that there is a relationship between obesity and the incidence of uterine leiomyoma. The proportion of obese respondents who experienced uterine myoma was 58.3% with a frequency of 28 (Ridwan et al., 2021). In contrast to research by Laning et al. (2019) at Regional Public Hospital of Prof. W. Z. Johannes, Kupang City, 82 respondents stated that there was no relationship between obesity and the incidence of uterine leiomyoma (p value=0.312). The results of the analysis showed that most respondents were respondents who were not at risk (BMI ≤25), namely 61 respondents (74.39%). This occurs due to various

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factors, one of which is menopause due to the lack of estrogen hormone levels in the body (Laning et al., 2019).

Leiomyoma uteri occurs more in women who are obese (Sulastriningsih et al., 2019). Obesity occurs due to an imbalance between energy expended by the body (energy expenditures) and incoming energy intake, causing excess energy stored in the form of fat tissue (Umar et al., 2023). Obesity occurs because the energy obtained through food exceeds the energy expended. This results in an imbalance in the body's metabolism, thermoregulation, and physical activity (Ridwan et al., 2021). Prawirohardjo (2014) suggests that the size of uterine leiomyoma can also be influenced by the number of calories in the body. The fatter a person is, the more calories they accumulate and make myoma grow faster (Prawirohardjo, 2014). BMI above normal can increase the risk of uterine myoma due to increased conversion of adrenal androgens to estrogen and decreased sex hormone-blinding globulin (SHBG) which causes changes in estrogen metabolism (Ningrum et al., 2018). In addition, the development of leiomyoma is also dependent on high estrogen levels due to a specific relationship with obesity and the important role of dietary intake (Laning et al., 2019).

Analysis of The Incidence of Uterine Leiomyoma Based on NLR

Table 3 shows that 37 samples (56.9%) of leiomyoma uteri respondents had risky NLR. In contrast, adenomyosis respondents who had non-risky NLR amounted to 64.1% (41). In the bivariate analysis, there was a significant result (p value<0.05) between NLR and the incidence of uterine leiomyoma with a p-value = 0.017. This shows that there is an association between the incidence of uterine leiomyoma and the ratio of neutrophil-lymphocytes at risk.

This result is consistent with the study by Duan et al. (2023), which revealed a significant positive correlation between neutrophil-lymphocyte ratio, inflammatory response, and lipid metabolic rate in patients with uterine leiomyoma (Duan et al., 2023). Increased (abnormal) NLR may occur due to inflammatory factors, the environment, or functional enzyme problems in the vascular structure of the patient which may lead to higher pulse pressure in women with uterine leiomyoma (Farzaneh et al., 2024). A study conducted by Duan et al. (2023) found that patients with uterine leiomyoma had the highest NLR quartile (Q4) with higher platelet counts and lower lymphocytes. The study examined the relationship between NLR and PLR in patients with uterine leiomyoma, in which the overall NLR value increased as PLR increased (Duan et al., 2023).

Blood count examination is one of the important biomarkers and can be used for systemic inflammatory diseases (Zahorec, 2021). Blood count examination, especially neutrophils and lymphocytes, can be used to detect the presence of inflammatory processes. Neutrophils play a role in the body's response to inflammation by functioning as part of the immune system by targeting and destroying pathogens or foreign substances that cause inflammation, while lymphocytes act as a protective component against inflammation (Kurniati et al., 2024). NLR examination can be used as a reliable and easily available marker of immune response to various infectious and non-infectious stimuli. The neutrophil-lymphocyte ratio reflects the dynamic relationship between the innate immune response (neutrophils) and the adaptive immune response (lymphocytes) (Zahorec, 2021). A study mentioned that there was a significant difference in NLR values between patients with uterine leiomyomas measuring >5cm and those measuring <5cm (Çınar et al., 2016). Neutrophils play an important role in the innate immune response including phagocytosis and the release of various cytokines and molecular mediators (Zahorec, 2021). A neutrophil-lymphocyte ratio can be used as an additional tool to differentiate uterine myoma from other malignancies (Jeong et al., 2021; Ekine et al., 2015). In addition, the NLR value can also be used to evaluate the inflammatory reaction of uterine leiomyoma. Neutrophil activity increases the reexamination of various cell types involved in acute and chronic inflammation, thus activating pro-inflammatory effects.

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Upon activation, platelets release pro-inflammatory factors, such as recruiters and leukocyte activators that play a role in immune regulation and inflammatory functions (Çınar et al., 2016; Duan et al., 2023).

In contrast, a study by Madendag et al. (2018) found that NLR values were higher in the adenomyosis group than in the uterine leiomyoma group. The difference could be due to either chronic uterine peristaltic activity or microlocal trauma caused by the peristaltic phase at the myometrium-endometrium interface which activates tissue injury and repair (TIAR) mechanisms. Adenomyosis may cause a more advanced immune response than leiomyoma uteri due to different histopathological features (Madendag et al., 2018). This is what differentiates the NLR value in uterine leiomyoma and adenomyosis. To date, NLR is widely used and accepted to evaluate ongoing systemic inflammation during cancer progression, severity stratification, and prognosis of cancer disease (Zahorec, 2021).

Conclusion

Based on the results of the study on uterine leiomyoma respondents at PKU Muhammadiyah Surakarta Hospital, it can be concluded that obesity (BMI >25) and NLR at risk (>3.53) have a relationship with the incidence of leiomyoma uteri. Women with risky NLR have a 3.688-fold more influential relationship with uterine leiomyoma than BMI (OR=3.688). This study implies that NLR can be a predictor factor for the incidence of uterine leiomyoma, especially for women of reproductive age and multiparous. High BMI, in this case obese women, is significantly associated with uterine leiomyoma. Therefore, there is a need for periodic screening of obese women which may be done by ultrasound. In addition, women of reproductive age need to have their blood checked serially, to anticipate the onset of uterine leiomyoma if NLR levels continue to rise.

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References

Alfarizan, R., & Marindawati, M. (2020). Hubungan antara Perempuan Usia Reproduksi dengan Kejadian Leiomioma Uteri dan Adenomiosis Uteri di Rumah Sakit Umum Daerah Cengkareng Jakarta Barat Tahun 2017-2019. *Muhammadiyah Journal of Midwifery*, *1*(1).

Anwar, M., Khadim, M. T., Asif, M., Din, H. U., & Jamal, S. (2023). Pathology-Based Tumour Registry Analysis of Cases of Female Genital Tract Malignancies. *Pakistan Armed Forces Medical Journal*, *73*(1), 38–41. https://doi.org/10.51253/pafmj.v73i1.2993

Chen, H., Zhan, Y., Zhang, J., Cheng, S., Zhou, Y., Chen, L., & Zeng, Z. (2022). The Global, Regional, and National Burden and Trends of NAFLD in 204 Countries and Territories: An Analysis From Global Burden of Disease 2019. *JMIR Public Health and Surveillance*, *8*(12). https://doi.org/10.2196/34809

Çınar, M., Aksoy, R. T., Güzel, A. İ., Tokmak, A., Yenicesu, O., Sarıkaya, E., & Evliyaoğlu, Ö. (2016). The association between clinical parameters and uterine fibroid size in patients who underwent abdominal myomectomy. *Journal of Experimental Therapeutics & Oncology*, *11*(3), 195–198.

Duan, Y., Guo, L., Peng, Y., Shi, X., Zhao, Y., Liu, K., Zhou, R., Fu, J., & Peng, C. (2023). Correlation between inflammatory marker and lipid metabolism in patients with uterine leiomyomas. *Frontiers in Medicine*, *10*.

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https://doi.org/10.3389/fmed.2023.1124697

Ekine, Atombosoba. A., Lawani, L. O., Iyoke, C. A., Jeremiah, I., & Ibrahim, Isa. A. (2015). Review of the Clinical Presentation of Uterine Fibroid and the Effect of Therapeutic Intervention on Fertility. *American Journal of Clinical Medicine Research*, *3*(1), 9–13. https://doi.org/10.12691/AJCMR-3-1-2

Ernest, A., Mwakalebela, A., & Mpondo, B. (2016). Uterine leiomyoma in a 19-year-old girl: Case report and literature review. *Malawi Medical Journal*, *28*(1), 31. https://doi.org/10.4314/mmj.v28i1.8

Etikan, I. (2016). Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, *5*(1), 1. https://doi.org/10.11648/j.ajtas.20160501.11

Farzaneh, F., Chayijan, S. H., Arab, H. N., Mansour, F. R., Keyvanfar, A. R., & Bakhtiyari, Z. (2024). Clinical, Laboratory and Imaging Characteristics of Women with Uterine Fibroid: A Cross-Sectional Study from Iran. *Journal of Obstetrics, Gynecology and Cancer Research*, *9*(1), 45–52. https://doi.org/10.30699/jogcr.9.1.45

Idah, S., Dzakwan, A., Ngo, N. F., Nugroho, H., Magdaleni, A. R., & Sawitri, E. (2021). Hubungan Paritas, IMT, Usia Menarche, Hipertensi, dan Riwayat Keluarga dengan Kejadian Mioma Uteri di RSUD Abdul Wahab Sjahranie Samarinda. *Verdure: Health Science Journal*, *3*(1), 45–56. https://jurnal.stikesmm.ac.id/index.php/verdure/article/view/140

Jariah, A., Abeng, A. T., Erawati, M., Kebidanan, D., & Masyarakat, K. (2022). Manajemen Asuhan Kebidanan pada Nona R dengan Mioma Uteri. *Window of Midwifery Journal*, 46–55. https://doi.org/10.33096/WOM.VI.377

Jeong, Y. Y., Lee, E. J., Cho, E. B., Ryu, J. M., & Choi, Y. S. (2021). The role of platelet-to-lymphocyte ratio and neutrophil-to-lymphocyte ratio as a supplemental tool for differential diagnosis of uterine myoma and sarcoma. *Clinical and Experimental Obstetrics and Gynecology*, *48*(4), 901–906. https://doi.org/10.31083/j.ceog4804142

Kurniati, Y. P., Romadhon, Y. A., & Parawansa, K. I. P. (2024). Analysis of Adenomyosis Incidence based on Age and Neutrophil-lymphocyte Ratio Factors. *JHeS (Journal of Health Studies)*, *8*(1), 37–45. https://doi.org/10.31101/jhes.3536

Laning, I., Manurung, I., & Sir, A. (2019). Faktor Risiko yang Berhubungan dengan Kejadian Penyakit Mioma Uteri. *Lontar : Journal of Community Health*, *1*(3), 95–102. https://doi.org/10.35508/ljch.v1i3.2174

Lubis, P. N. (2020). Diagnosis dan Tatalaksana Mioma Uteri. *Cermin Dunia Kedokteran*, *47*(3), 196–200. https://doi.org/10.55175/cdk.v47i3.352

Madendag, Y., Sahin, E., Aydin, E., Col Madendag, I., Acmaz, G., & Karaman, H. (2018). Neutrophil to Lymphocyte Ratio and Platelet to Lymphocyte Ratio Can be Useful Markers for Distinguishing Uterine Adenomyosis and Leiomyoma. *Gynecology Obstetrics & Reproductive Medicine*, *24*(3), 147–150. https://doi.org/10.21613/gorm.2017.716

Martínez-Mesa, J., González-Chica, D. A., Duquia, R. P., Bonamigo, R. R., & Bastos, J. L. (2016). Sampling: how to select participants in my research study? *Anais Brasileiros de Dermatologia*, *91*(3), 326–330. https://doi.org/10.1590/abd1806-4841.20165254

Ningrum, N. W., Topan Aditya Rahman, R., Tinggi Ilmu Kesehatan Sari Mulia Banjarmasin, S., & Kebidanan Sari Mulia Banjarmasin, A. (2018). Hubungan Obesitas Dan Riwayat Keluarga Dengan Kejadian Mioma Uteri Di Ruang Poli Kandungan RSUD

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dr.H.Moch. Ansari Saleh banjarmasin Tahun 2016. In *Dinamika Kesehatan* (Vol. 9, Issue 1).

Prawirohardjo, S. (2014). *Ilmu Kandungan* (M. Anwar, A. Baziad, & P. Prabowo, Eds.; 3rd ed., Vol. 2). PT BINA PUSTAKA.

Qin, H., Lin, Z., Vásquez, E., Luan, X., Guo, F., & Xu, L. (2021). Association between obesity and the risk of uterine fibroids: a systematic review and meta-analysis. *Journal of Epidemiology and Community Health*, *75*(2), 197–204. https://doi.org/10.1136/jech-2019-213364

Rahim, Abd. R. (2020). *CARA PRAKTIS PENULISAN KARYA ILMIAH* (T. Paelori, Ed.; I). Zahir Publishing.

Ridwan, M., Lestari, G. I., & Fibrila, F. (2021). Hubungan Usia Ibu, Obesitas, dan Penggunaan Kontrasepsi Hormonal dengan Kejadian Mioma Uteri. *Jurnal Medikes (Media Informasi Kesehatan)*, *8*(1), 11–22. https://doi.org/10.36743/medikes.v8i1.268

Sulastriningsih, K., Yang Berhubungan Dengan Kejadian Mioma Uteri Pada Wanita, F.-F., & Bhakti Pertiwi Indonesia, Stik. (2019). Faktor-Faktor Yang Berhubungan Dengan Kejadian Mioma Uteri Pada Wanita di RSUD Pasar Rebo Tahun 2017. *Journal Educational of Nursing (JEN*, *2*(1), 110–125. https://ejournal.akperrspadjakarta.ac.id

Tabatabaei, F., Babadi, S., Nourigheimasi, S., Ghaedi, A., Khanzadeh, M., Bazrgar, A., Gargari, M. K., & Khanzadeh, S. (2024). Neutrophil to lymphocyte ratio as an assessment tool to differentiate between uterine sarcoma and myoma: a systematic review and meta-analysis. *BMC Cancer*, *24*(1). https://doi.org/10.1186/s12885-023-11775-5

Umar, M., Palinggi, M., Syahadat, D. S., & Aiman, U. (2023). Faktor Risiko Kejadian Mioma Uteri Pada Pasien Rawat Jalan di RSUD Undata Provinsi Sulawesi Tengah. *Ghidza: Jurnal Gizi Dan Kesehatan*, *7*(2), 245–259. https://doi.org/10.22487/ghidza.v7i2.872

Wasyluk, T., Obrzut, B., Gałazka, K., Zmuda, M., Obrzut, M., & Darmochwał-Kolarz, D. (2019). Uterine myoma with massive lymphocytic infiltration – case report. *Przegląd Menopauzalny = Menopause Review*, *18*(2), 123. https://doi.org/10.5114/PM.2019.86838

Zahorec, R. (2021). Neutrophil-to-lymphocyte ratio, past, present, and future perspectives. *Bratislava Medical Journal*, *122*(7), 474–488. https://doi.org/10.4149/BLL_2021_078

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