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Assessing the Effectiveness of the Antibiotic Regimen Ceftriaxone 2g, Metronidazole 1500mg, Doxycycline 200mg in the Medical Treatment of Adnexal Abscess: A Study Conducted at a Medical Center in Vietnam

Khiet Van Phan
Student, Vo Truong Toan University, Hau Giang Province 910000, Vietnam

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ABSTRACT: This study aimed to determine the failure rate of medical treatment and identify factors associated with treatment failure in cases of adnexal abscess at a medical center in Vietnam. A retrospective case series was conducted involving 101 female patients diagnosed with adnexal abscess and treated at the Obstetrics and Gynecology Department of Vinh Cuu District Medical Center, Dong Nai Province, from January 2023 to February 2024. The failure rate of medical treatment using the prescribed antibiotic regimen was 20.79% [95% CI: 0.14–0.30]. Key factors associated with treatment failure included persistent fever after antibiotic administration and elevated leukocyte counts at admission, with an optimal cut-off point of 14.3/mm³. Developing a risk-stratification protocol is crucial for optimizing treatment plans. For patients with fever and high leukocyte counts, close clinical monitoring, additional diagnostic tests, and early consideration of alternative treatment methods are recommended.

KEYWORDS: adnexal abscess, antibiotics, medical treatment, medical center.

I. INTRODUCTION

Pelvic inflammatory disease (PID) is an infection of the upper female genital tract, including the uterus, fallopian tubes, and ovaries [1]. Without appropriate treatment, the condition may lead to aadnexal abscess, a severe inflammatory mass involving the fallopian tubes, ovaries, and surrounding structures, which can pose life-threatening risks [2]. Historically, the mortality rate for adnexal abscessreached up to 50%, but with the advent of broad-spectrum antibiotics and modern surgical techniques, the mortality rate for unruptured abscesses has been nearly eliminated [3] [4]. However, ruptured abscesses still report mortality rates ranging from 1.7% to 3.7% according to earlierstudies. This condition can also result in serious complications such as fallopian tube damage, infertility, ectopic pregnancy, chronic pelvic pain, and thromboembolic events [3][5][6].

Treatment methods for adnexal abscess include antibiotics, minimally invasive drainage, surgery, or a combination of these approaches. Antibiotic therapy is effective in approximately 69.4% of cases [7]. In other cases, antibiotic resistance or treatment failure necessitates drainage or surgical intervention. Intravenous antibiotic regimens for adnexal abscessdiffer among international guidelines. These regimens typically target enteric bacteria, streptococci, anaerobic organisms, and sexually transmitted pathogens, with variations in dosage and duration [1].

Given the discrepancies in treatment protocols across international organizations, additional considerations should include the degree of antibiotic penetration into the abscess and evaluation of local treatment data. Since 2015, medical centers in Vietnam have used an antibiotic regimen to treat adnexal abscess, consisting of Ceftriaxone (2 g/day), Metronidazole (1500 mg/day), and Doxycycline (200 mg/day) for 14 days, transitioning to oral medication after the intravenous phase. To assess the effectiveness of this regimen, research focuses on treatment failure rates and associated factors.

II. SUBJECTS AND METHODS

2.1. Subjects

Women diagnosed with adnexal abscess and treated in the Obstetrics and Gynecology Department of Vinh Cuu District Medical Center, Dong Nai Province between January 1, 2023, and February 9, 2024.

Patients included in the study met the following criteria: 1) Indicated for conservative medical treatment using the antibiotic regimen Ceftriaxone 2 g, Metronidazole 1500 mg, and

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Doxycycline 200 mg; 2) Hemodynamically stable (blood pressure ≥ 90/60 mmHg, pulse rate 60–100 beats/min, temperature 36.5°C–37.9°C); 3) No signs of ruptured abscess; 4) Abscess size < 7 cm; 5) Premenopausal status.

Exclusion criteria: 1) Patients who refused to continue treatment during the study period; 2) Patients whose postoperative diagnosis, based on pathological results, was not adnexal abscess.

Sample size: 101 cases meeting the inclusion criteria were enrolled and analyzed.

2.2. Methods

2.2.1. Research design

A retrospective case series analysis was conducted based on a data collection sheet.

2.2.2. Data collection

- Tools: Microsoft Excel 365 software.
- Content: Epidemiological factors (age, residence, occupation, and participation in health insurance); Medical history (BMI, immunodeficiency status, use of antibiotics within 180 days prior to admission, history of surgeries, gynecologic and obstetric procedures, ectopic pregnancy, tubal ligation, pelvic inflammatory disease, infertility, and intrauterine device usage); Clinical characteristics (duration of abdominal pain, fever at admission, fever post-antibiotic treatment, nausea, vomiting, diarrhea, abnormal uterine bleeding, abdominal wall tenderness, and cervical motion tenderness); Laboratory and imaging data (abscess diameter, white blood cell count at admission, and CRP levels at admission); treatment outcomes (treatment response and any complications observed).

2.2.3. Data processing and analysis

- Tools: R software version 4.2.3.
- Content: Descriptive statistics (frequency and percentage distributions); analytical statistics (Chi-square test, Fisher's Exact Test, Mann-Whitney U test, and logistic regression analysis).
- Confidence level: 95% (statistical significance defined as p-value < 0.05).

III. RESULTS

3.1. Treatment outcomes

Table 1: Treatment outcomes

Outcomes	n	%
Successful	80	79.2
Failure	21	20.8

According to **Table 1**, among the 101 cases analyzed, 80 cases (79.21%) achieved successful treatment with the antibiotic regimen [95% CI 0.70–0.86], while 21 cases (20.79%) [95% CI 0.14–0.30] experienced treatment failure, requiring additional interventions such as escalation of antibiotics, drainage procedures, or surgery.Cases of treatment failure are detailed in **Table 2**.

Table 2: Characteristics of treatment failure cases

Outcomes	n	%
Fever not resolved	7	33,3
Pelvic pain not relieved or worsened	7	33,3
Larger adnexal abscess mass	3	14,3
White blood cell count not reduced or increased	4	19,0

3.2. Univariate analysis

3.2.1. Relationship between epidemiological factors and treatment outcomes

Chart 1 indicates that the age variable does not follow a normal distribution. The Mann-Whitney U test for the age variable yielded the following results: W = 571, p = 0.024. This suggests that the patient's age significantly impacts treatment outcomes.

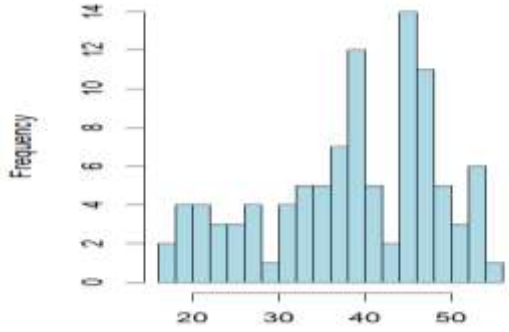

Chart 1: Age frequency distribution

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In contrast, the analysis of other epidemiological factors, including residence, occupation, and health insurance participation, showed no statistically significant differences and did not affect treatment outcomes (see **Table 3**).

Table 3: Results of the test for the relationship between epidemiological factors and treatment outcomes

Epidemiological characteristics	**Pearson's Chi-squared Test**			**Fisher's Exact Test**	
	X^2	**df**	**p**	**OR**	**p**
Residence	2.152	1	0.142		
Occupation				-	0.378
Health insurance participation status	1.710	1	0.191		

3.2.2. Relationship between medical history and treatment outcome

According to the data in **Table 4**, a history of immunodeficiency creates a significant difference between the successful and failed antibiotic treatment groups, with p = 0.004. Other medical history factors were not found to be related to treatment outcomes.

Table 4: Results of the test for the relationship between medical history characteristics and treatment outcomes

Epidemiological characteristics	**Pearson's Chi-squared Test**			**Fisher's Exact Test**	
	X^2	**df**	**p**	**OR**	**p**
BMI				-	0.265
Immunodeficien-cy				11.75	**0.004**
Use of antibiotics within the past 180 days				2.43	0.234
Surgical intervention				1.73	0.430
Obstetric and gynecological surgery				1.10	1.000
Ectopic pregnancy				1.93	0.507
Tubal ligation				0.00	1.000
Pelvic inflammatory disease				6.33	0.059
Infertility				1.28	1.000
Intrauterine device insertion	0.947	1	0.331		

3.2.3. Clinical and paraclinical characteristics

The average diameter of the abscess in the study group was 48 ± 16 mm. **Chart 2** shows that the diameter of the abscess did not follow a normal distribution. The mean diameter of the largest abscess in the successful treatment group was 45.49 ± 16.24 mm, while in the treatment failure group it was 57.57 ± 10.18 mm. The Mann-Whitney U test for the abscess diameter variable yielded the following results: W = 462.5, p = 0.001584. This indicates that the abscess diameter observed on imaging has an impact on treatment outcomes.

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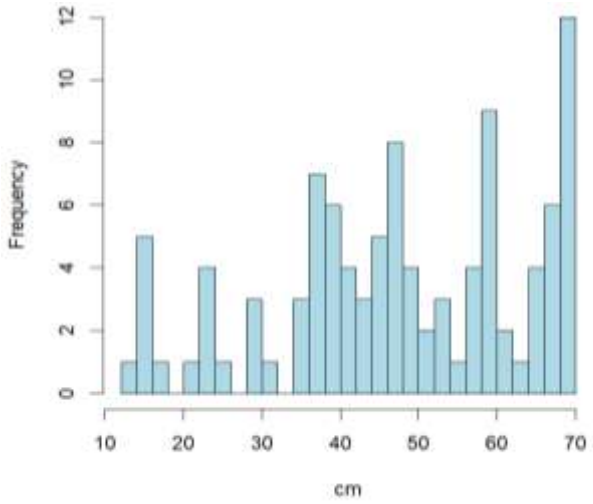

Chart 2: Abscess mass diameter frequency distribution

According to the data in **Table 5**, clinical characteristics such as the duration from the onset of abdominal pain to examination, symptoms like nausea, vomiting, diarrhea, abnormal vaginal bleeding, and physical signs such as abdominal tenderness and cervical motion tenderness showed no significant differences between the successful and failed treatment groups. Only the presence of fever at admission ($p = 0.02$) and fever after antibiotic treatment ($p < 0.05$) created a statistically significant difference between the two groups.

Table 5: Results of the test for the relationship between clinical characteristics and treatment outcomes

Clinical characteristics	**Pearson's Chi-squared Test**			**Fisher's Exact Test**	
	X^2	**df**	**p**	**OR**	**p**
Duration of abdominal pain	3.06	1	0.080		
Fever at admission	5.27	1	**0.021**		
Fever after antibiotic treatment				37.35	**0.000**
Nausea and vomiting				2.67	0.277
Diarrhea				2.80	0.668
Abnormal uterine bleeding				1.57	0.633
Abdominal wall tenderness				8.07	0.109
Cervical motion tenderness				2.54	0.348

The average white blood cell count at the time of admission in the study group was 14.51 ± 5.01 /mm³, with the highest being 31.69 /mm³ and the lowest being 5.3 /mm³. **Chart 3** shows that the white blood cell count at admission did not follow a normal distribution. The average white blood cell count in the successful treatment group was 13.7 ± 4.57 /mm³, while in the failure group it was 17.59 ± 5.52 /mm³. The Mann-Whitney U test for the white blood cell count variable yielded the following results: $W = 477.5$, $p = 0.002451$. Therefore, this difference is statistically significant.

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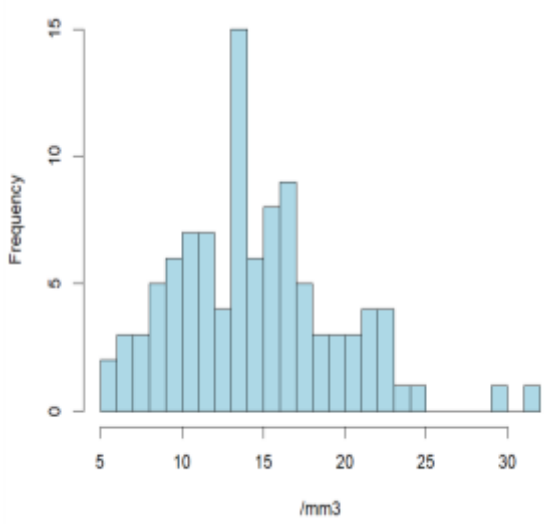

Chart 3: White blood cell count at admission frequency distribution

At the time of admission, the average CRP (C-reactive protein) level of the patients in the study was 110.17 ± 87.12 mg/l, with the highest level being 364.9 mg/l. **Chart 4** shows that the CRP level at admission did not follow a normal distribution. The average CRP level at admission in the successful treatment group was 97.75 ± 82.97 mg/l, while in the failure group it was 157.49 ± 88.27 mg/l. The Mann-Whitney U test for the CRP level variable yielded the following results: W = 495, p = 0.00394. Therefore, the CRP level at admission has an impact on treatment outcomes.

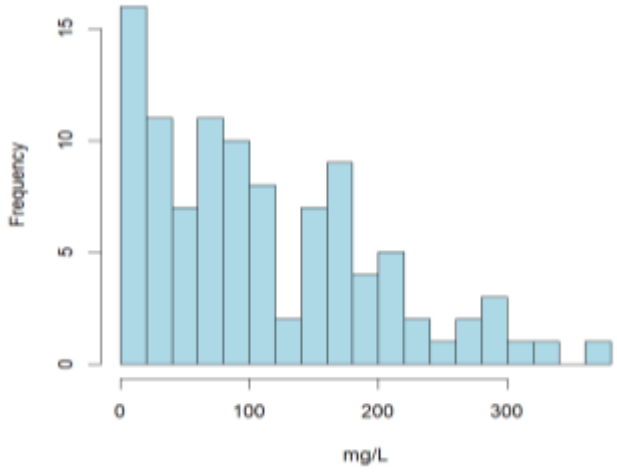

Chart 4:CRP levels at admission frequency distribution

3.3. Multivariate regression analysis

Thus, in the univariate regression analysis of the relationship between variables and treatment outcomes for patients with adnexal abscess treated with antibiotics, the statistically significant variables included: age, history of immunodeficiency, fever at admission, fever after antibiotic treatment, white blood cell count at admission, and CRP level at admission. Logistic regression analysis was performed to identify factors related to the lack of response to the antibiotic regimen for treating adnexal abscess. The dependent variable is the treatment outcome.

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Table 6: Results of the multivariate regression model summary

Model	Estimation	Std. error	z	p
(Constant)	-8.346555	2.454	-3.402	0.001
Age	0.011219	0.040	0.283	0.777
Immunodeficien-cy	2.173410	1.125	1.933	0.053
Fever at admission	1.075902	0.724	1.485	0.138
Fever after antibiotic treatment	3.359648	1.235	2.720	**0.007**
Abscess mass diameter	0.049625	0.028	1.745	0.081
White blood cell countat admission	0.176967	0.089	1.986	**0.047**
CRP levels at admission	0.001417	0.004	0.320	0.749

The results presented in **Table 6** show that the presence of fever after antibiotic treatment and an increase in white blood cell count at admission significantly increased the treatment failure rate. The variables of age, immunodeficiency status, fever at admission, abscess diameter, and CRP level at admission showed no statistically significant correlation with treatment outcomes in the study population.

The ROC curve determined that the optimal cutoff point for white blood cell count at admission in predicting treatment failure was 14.3 /mm³, with a sensitivity of 80.95% and specificity of 62.50%.

Table 7: Treatment outcomes with a white blood cell count cutoff of 14.3/mm³ at admission

White blood cell count at admission	Successful	Failure
< 14.3 /mm3	50	4
≥ 14.3 /mm3	30	17

IV. CONCLUSION

The treatment failure rate in this study was 20.79% [95% CI 0.14–0.30]. Compared to the results of Sweet et al., the antibiotic regimen used to treat adnexal abscess in the department yielded a lower failure rate, and this difference was statistically significant (p = 0.040; [95% CI -0.1813 - -0.0138]) [7]. However, the failure rate in our study was similar to the findings of Tran at Tu Du Hospital, which reported a 24.4% failure rate (p = 0.54; [95% CI 0.17–0.32]) [8]. The antibiotic regimen used in most cases in Tran's study was a combination of three drugs: Amoxicillin/Clavulanic Acid, Metronidazole, and Gentamicin[8].

Based on the collected data, the presence of fever after intravenous antibiotic treatment increased the risk of treatment failure by 28 times compared to patients who no longer had a fever. Güngördük's study also noted the correlation between fever and the failure of conservative treatment [9]. Fever is a common clinical sign when an infection occurs in the body and is one way the immune system fights against infection. If the fever is too high or prolonged, it signals that the immune system cannot fight the pathogen unless the infection site is removed from the body; at this point, surgery is necessary to resolve the issue.

Based on data analysis, a high white blood cell count at the time of hospital admission increased the risk of treatment failure with medical therapy. For every additional white blood cell count of 1/mm3, the patient's risk of treatment failure increased by 1.18 times. With a cutoff of 14.3/mm3, the sensitivity and specificity in predicting treatment failure were 80.95% and 62.50%, respectively. Flesh's study found that a white blood cell count > 16,000/mm3 predicted the failure of intravenous antibiotic therapy when used as the initial treatment for adnexal abscess [10].

V. CONCLUSION

From January 2023 to February 2024, a study of 101 patients with adnexal abscess at Vinh Cuu District Medical Centerfound a treatment failure rate of 20.79% with intravenous antibiotic therapy. Key factors influencing treatment failure included fever after treatment and a white blood cell count greater than 14.3/mm³ at admission. To improve outcomes, it is essential to closely monitor patients with fever and elevated white blood cell counts, implement a risk classification process, adjust antibiotic regimens for severe cases, and educate patients on reporting signs of fever. Additionally, further studies with better designs and

larger sample sizes are needed to enhance treatment effectiveness.

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