

Antibiotic Use in Pediatric Pharyngitis at Juanda Samarinda Public Health Center from January-December 2023

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ABSTRACT

Pharyngitis is an infection or inflammation of the pharyngeal (throat) region, primarily caused by bacteria and viruses. The most common bacterial cause is Group A Streptococcus. Management of bacterial pharyngitis involves the use of antibiotics aimed at eradicating the causative pathogen. Quantitative analysis of antibiotic use can be conducted using the Defined Daily Dose (DDD) method, which is useful for assessing both the pattern and volume of drug consumption. This study aims to quantify the use of antibiotics in pediatric pharyngitis patients using the ATC/DDD method at Juanda Samarinda Public Health Center in 2023. This research is classified as a descriptive quantitative study and employs a non-experimental, retrospective design. Data were collected from antibiotic usage reports and medical records of pediatric pharyngitis patients treated in 2023. Data processing was performed using descriptive and quantitative analysis, with all results processed using Microsoft Excel 2019 and presented in tabular format. Based on the findings, the antibiotic with the highest usage in pediatric pharyngitis patients at Juanda Samarinda Public Health Center was Amoxicillin, with an average of 38.5 DDD/1,000 patient-days (KPRJ), while the lowest was Cefadroxil, with an average of 4.9 DDD/1,000 patient-days (KPRJ).

Keywords: pharyngitis, antibiotics, ATC/DDD

Introduction

Pharyngitis is an infection or inflammation of the pharynx (throat). The pharynx is the tube that connects the nose and mouth to the lungs (Tombeng & Cjg, 2022). Pharyngitis is classified as an acute respiratory infection, which includes infections of the respiratory tract that begin in the throat or nose and may progress to the lungs, with symptoms lasting no more than 14 days (Dhrik et al., 2021). Pharyngitis accounts for 1–2% of visits to polyclinics or emergency departments, and it is estimated that 11–18 million individuals seek medical care for pharyngitis each year in the United States (Mustafa & Ghaffari, 2020). According to Basic Health Research (RISKESDAS), the prevalence of upper respiratory tract infections, including acute pharyngitis, in

Indonesia is 25.0%. Provinces with the highest acute respiratory infection rates include Papua (10.5%), Bengkulu (8.9%), West Papua (7.5%), East Nusa Tenggara (7.3%), and Central Kalimantan (6.2%). Similar to global patterns, acute respiratory infection cases in Indonesia are most prevalent among children aged 1–4 years (Novita, 2024).

Management of bacterial pharyngitis focuses on eradicating the causative organism, with Group A Streptococcus (GAS) being the most common pathogen (Dhrik et al., 2021). Antibiotic therapy is highly recommended for GAS pharyngitis to alleviate acute symptoms and prevent complications (Lestari et al., 2022). According to Cots et al. (2015), the primary goal of antibiotic administration in pharyngitis is to shorten the disease course. Antibiotic treatment can begin to eliminate GAS bacteria within 16 hours, with greater symptom relief observed in adolescents and young adults within two days of treatment. Additionally, antibiotic administration within the first 24 hours results in 97% of cases testing culture-negative, thereby significantly reducing transmission. Antibiotics have also been shown to reduce the incidence of both suppurative and non-suppurative complications, such as rheumatic fever.

Drug utilization evaluation (DUE), particularly in pharyngitis patients, involves monitoring antibiotic usage patterns, identifying causative microbes and their sensitivity, and maintaining regular reporting. The evaluation of antibiotic use in patients, including those with pneumonia, is crucial to ensure appropriate prescribing, control distribution, and monitor associated treatment costs (Ministry of Health of the Republic of Indonesia, 2017). Quantitative evaluation of drug use can be performed using the Defined Daily Dose (DDD) method to assess patterns and quantities of antibiotic usage. The World Health Organization (WHO) supports the use of this standardized method in DUE, classifying medications using the Anatomical Therapeutic Chemical (ATC) system. A high DDD/1,000 outpatient visits (KPRJ) value indicates a higher level of antibiotic consumption (Ministry of Health of the Republic of Indonesia, 2015).

A study conducted by Effendi and Evelin (2020) at the Beji Depok Health Center from January to June 2019 reported that the most frequent acute respiratory infection diagnosis was unspecified acute pharyngitis. The antibiotics prescribed included Amoxicillin 500 mg, Ciprofloxacin 500 mg, Cotrimoxazole 480 mg and 960 mg, Erythromycin 500 mg, and Thiamphenicol 500 mg. The DDD/1,000 patient values were: Amoxicillin (16.2062), Ciprofloxacin (1.1039), Cotrimoxazole 480 mg (0.4600), Cotrimoxazole 960 mg (0.3683), Erythromycin (0.2762), and Thiamphenicol (0.5524). The DU90% segment was dominated by Amoxicillin (85.44%) and Ciprofloxacin (5.83%). Another study by Apsari et al. (2017), conducted at a community health center in Bali, investigated adult patients with acute pharyngitis. The most frequently used antibiotic was Amoxicillin. The study reported that 31 patients over a three-day treatment period contributed to a total of 138.5 DDDs for Amoxicillin 500 mg. A lower DDD/1,000 KPRJ value indicates more rational antibiotic use, whereas higher values may suggest overuse.

The purpose of this study was to evaluate antibiotic use in pediatric pharyngitis patients at Juanda Samarinda Public Health Center in 2023, using the ATC/DDD

methodology. The analysis focused on the types and quantities of antibiotics used, expressed in DDD per 1,000 outpatient visits (DDD/1,000 KPRJ).

Methodology

This research is a quantitative descriptive study with data collected retrospectively. The study was conducted from December 2024 to January 2025. The study was conducted at Juanda Samarinda Public Health Center. The population of this study consisted of all pediatric pharyngitis patients at Juanda Samarinda Public Health Center, from January to December 2023. Based on service data from 2023, the total number of pediatric pharyngitis patients was 311. Therefore, the study population was 311 patients.

The sample for this study was selected from the population based on inclusion and exclusion criteria. The inclusion criteria were: 1) patients who visited the pediatric clinic and were diagnosed with pharyngitis, and who were prescribed antibiotic therapy during the period from January to December 2023; 2) patients with complete medical record data, including the patient's name, antibiotic name, antibiotic dose, and duration of antibiotic administration

The data collection was initiated by obtaining research authorization from the Juanda Samarinda Public Health Center. Data sources were obtained from patient prescriptions and Drug Usage Report and Medicine Request Sheet (LPLPO) from the Pharmacy Unit, as well as patient registration data from the Medical Records Unit of Juanda Samarinda Public Health Center. The instrument used for data collection was a data collection sheet. Data extracted from medical records included the patient's initials, age, gender, type of antibiotic, strength of the antibiotic preparation, number of doses, and the duration of antibiotic administration.

Antibiotic consumption was quantified in DDD/1000 KPRJ (number of outpatient visits) and calculated through the following steps. First, the total antibiotic doses were calculated by multiplying the quantity of antibiotics used by the drug formulation strength.

$$\text{Total antibiotic doses} = \text{quantity of antibiotic} \times \text{drug formulation strength}$$

The annual DDD was determined by dividing the total antibiotic doses (from the first step) by the WHO-defined DDD value.

$$\text{Annual DDD} = \frac{\text{Total antibiotic doses (g)}}{\text{DDD Value (WHO)}}$$

The DDD/1000 KPRJ was calculated by dividing the annual DDD (from the second step) by the total KPRJ (number of outpatient visits), then multiplying by 1000.

$$\text{DDD/1000 KPRJ} = \frac{\text{Annual DDD}}{\text{Total KPRJ}} \times 1000$$

The resulting data will be processed using Microsoft Excel 2019 and presented in tables and percentages.

Result and Discussion

1. Number of Patient Visits at Juanda Samarinda Public Health Center in 2023

Table 1. Number of Patient Visits at Juanda Samarinda Public Health Center In 2023 (Secondary Data, 2024)

Month	Number of Patient
January	949
February	962
March	1.018
April	854
May	1.110
June	942
July	1.102
August	1.237
September	1.108
October	1.171
November	1.119
December	1.042
Total	12.614

Table 1 shows that the number of outpatient visits (KPRJ) at Juanda Samarinda Public Health Center, varied from month to month in 2023. The highest number of visits occurred in August, with 1,237 patients, while the lowest was in April, with 854 patients. The total number of outpatient visits at Juanda Samarinda Public Health Center throughout 2023 was 12,614 patients.

The number of outpatient visits (KPRJ) serves as the reference data used to calculate antibiotic consumption, expressed in units of DDD/1,000 KPRJ. During data processing, the number of KPRJ is used in conjunction with the total DDD of each antibiotic to determine usage intensity. This data was obtained from the Medical Records Department of Juanda Samarinda Public Health Center and was categorized by month for the 2023 period.

2. Characteristics of Pharyngitis Patients at Juanda Samarinda Public Health Center in 2023

According to the data presented in Table 2, the majority of patients were pediatric, with children aged 5–9 years accounting for 41.8% of cases, followed by adolescents aged 10–18 years at 28.3%. These findings are consistent with epidemiological data indicating that the age group most susceptible to bacterial pharyngitis is between 5 and 15 years (Lestari et al., 2022). Similar studies focusing specifically on pediatric patients have not previously been conducted at the community health center. However, a study on adult pharyngitis patients at Kedaton Health Center in Bandar Lampung reported that individuals aged 18–60 years were more likely (60%) to experience acute pharyngitis compared to those over 60 years of age (40%) (Sahdiah, 2023).

Regarding gender distribution, the percentage of male and female patients was approximately equal at 50%, indicating no significant difference in pharyngitis incidence between boys and girls. In general, pharyngitis affects both males and females equally, as there is no established correlation between gender and the incidence of pharyngitis (Anisa et al., 2022).

Table 2. Characteristics of Pharyngitis Patients at Juanda Samarinda Public Health Center in 2023 (Secondary Data, 2024)

Description	Number of Patient (n=311)	Percentage (%)
Age		
Neonate (0-28 day)	0	0
Baby (29 day-1 year)	8	2,6
Toddler (1-3 years)	57	18,3
Pre School (3-5 years)	28	9,0
Kindergarten (5-9 years)	130	41,8
Teenager (10-18 years)	88	28,3
Gender		
Male	159	51
Female	152	49

3. Profile of Antibiotic According to ATC/DDD Classification at Juanda Samarinda Public Health Center in 2023

The list of antibiotics used at Juanda Samarinda Public Health Center, in 2023 was obtained from the health center's information system. The classification of these antibiotics is presented in Table 3. The ATC (Anatomical Therapeutic Chemical) classification system categorizes antibiotics based on their site of action, with the ATC code 'J' representing anti-infectives for systemic use (WHO, 2024).

Table 3. Profile of Antibiotic According to ATC/DDD Classification at Juanda Samarinda Public Health Center in 2023 (Secondary Data, 2024)

Pharmacology Subgroup Code	Drug Classes	ATC Code	Drug Name	Dosage Form	DDD Definitive (g)*
J01D	Cephalosporins	J01DB05	Cefadroxil	Capsules	2
J01C	Penicillin	J01CA04	Amoxicillin	Caplets, Syrup	1,5

As shown in Table 3, two generic antibiotics were used at Juanda Samarinda Public Health Center, each classified into different subgroups and assigned distinct Defined Daily Dose (DDD) values. The DDD values were sourced from the official WHO website (2024) by entering the antibiotic names in the search field. All DDD values are presented in units of grams (g). The two antibiotics identified—Amoxicillin and Cefadroxil—are classified under the ATC subcategory J01 (antibacterials for systemic use) and are administered via the oral route. Both antibiotics are listed in the 2023 National Formulary for first-

level health facilities (Fasilitas Kesehatan Tingkat Pertama, FKTP), such as community health centers (Ministry of Health of the Republic of Indonesia, 2023).

4. Monthly Profile of Antibiotic Consumption Based on ATC/DDD Classification at Juanda Samarinda Public Health Center in 2023

The data collected in this study include the generic names of antibiotics, the frequency of antibiotic use, and the number of outpatient visits (KPRJ) at Juanda Samarinda Health Center in 2023. This data is further complemented with information on dosage form, dosage strength, and ATC code to determine the definitive Defined Daily Dose (DDD) value. The definitive DDD value of antibiotics is provided in grams (g) according to the ATC/DDD Index 2024 system. Data processing was carried out using Microsoft Excel, applying the formula set by the WHO Collaborating Center to calculate the number of doses, DDD usage, total DDD usage, and DDD/1000 KPRJ (Ministry of Health of the Republic of Indonesia 2017).

The number of drug doses was calculated by multiplying the drug's dosage strength by the quantity of the drug used. These results were used in the calculation of DDD usage using the formula (total drug strength / definitive DDD). If there were multiple formulations of the same generic drug, the DDD value for these preparations was summed. Additionally, the DDD/1000 KPRJ value was determined using the formula (total DDD usage x 1000) / number of KPRJ. The DDD/1000 KPRJ value represents the quantity of the drug used per 1000 patient visits, which is presented in Table 4.

Table 4. Monthly Profile of Antibiotic Consumption Based on ATC/DDD Classification at Juanda Samarinda Public Health Center in 2023 (Secondary Data, 2024)

No	Months	DDD/1000 KPRJ Antibiotics Values in 2023		Total DDD/1000 KPRJ All Antibiotics
		Amoxicillin	Cefadroxil	
1	January	39,3	11,3	
2	February	26,0	5,2	
3	March	31,8	4,4	
4	April	34,4	5,3	
5	May	20,1	2,3	
6	June	49,9	0,0	
7	July	43,3	0,5	
8	August	82,7	2,0	
9	September	43,0	11,3	
10	October	64,1	14,9	
11	November	27,1	2,2	
12	December	0,0	0,0	
	Total	461,6	59,4	521,0

The fluctuations in the monthly DDD/1000 KPRJ values for each antibiotic from January to December 2023 were influenced by variations in both the quantity of drug utilization and the number of outpatient visits each month. Based on Table 4, the highest DDD/1000 KPRJ value of antibiotic use at Juanda Samarinda Health Center in 2023 was found in Amoxicillin, with an average usage of 38.5 DDD/1000 KPRJ. This indicates that, on average, 38 to 39 out of every 1,000 outpatients received Amoxicillin at a dose of 1,500 mg per day. Meanwhile, Cefadroxil ranked second with an average usage of 4.9 DDD/1000 KPRJ, meaning that 4 to 5 out of every 1,000 outpatients received Cefadroxil at a dose of 2 grams per day.

The high use of amoxicillin in health centers is due to its nature as a broad-spectrum antibiotic, making it a suitable option for the empirical treatment of pharyngitis (Apsari, 2017; Ihsan, 2019; Effendri, 2020; Sitepu, 2020). However, inappropriate antibiotic use remains a global concern. The administration of antibiotics for viral respiratory infections and the overuse of broad-spectrum antibiotics contribute significantly to the rising problem of antibiotic resistance (Pani et al., 2015). A lower DDD value indicates a lower likelihood of resistance development. A small quantity of antibiotic use suggests that physicians are more selective in their therapeutic choices, aligning with the principle of rational antibiotic use (Perdaka, 2020). A lower DDD/1000 KPRJ value reflects a reduced risk of resistance, which is in line with the principles of rational antibiotic selection and suggests a more selective prescribing pattern based on clinical diagnosis (Trisia et al., 2020).

The total antibiotic consumption at Juanda Samarinda Health Center in 2023 was 521.0 DDD/1000 KPRJ. This value is significantly higher than that reported by Sahdiah et al. (2023) at Kedaton Bandar Lampung Health Center, which was 106.34 DDD/1000 KPRJ. When averaged based on the type of antibiotic, the monthly average antibiotic use for pharyngitis patients at Juanda Samarinda Health Center was 43.4 DDD/1000 KPRJ.

Amoxicillin use at Juanda Samarinda Health Center (38.5 DDD/1000 KPRJ) was higher than the usage reported by Arbaini et al. (2024) at Sultan Imanuddin Pangkalan Bun Hospital, which was 18.83 DDD/1000 KPRJ. A similar trend was observed in the study by Effendi and Evelin (2020) at Beji Depok Health Center, where Amoxicillin use was 16.206 DDD/1000 KPRJ. The lower values in these studies may be attributed to the broader range of diagnoses under the acute respiratory infection category, resulting in a more diverse set of antibiotics used and thus lower individual DDD/1000 KPRJ values. In contrast, this study focused solely on acute pharyngitis cases, narrowing the spectrum of prescribed antibiotics and contributing to higher individual DDD values.

The DDD/1000 KPRJ of Cefadroxil was 4.9, which aligns closely with findings from a study by Ihsan et al. (2019) in Kendari, where Cefadroxil use averaged 5 DDD/1000 KPRJ across multiple health centers. This consistency reinforces the relevance of Cefadroxil as an alternative antibiotic in non-pneumonia acute respiratory infection cases.

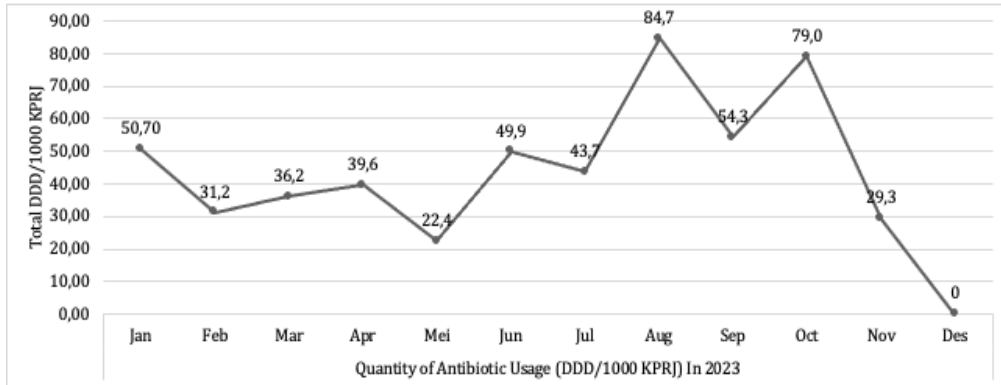


Figure 1. Monthly Antibiotic Consumption at Juanda Samarinda Public Health Center in 2023

Figure 1 illustrates the monthly distribution of total antibiotic consumption at the Juanda Samarinda Public Health Center in 2023, measured in DDD/1000 KPRJ. The highest level of antibiotic use was recorded in August, reaching 84.7 DDD/1000 KPRJ, while the lowest occurred in December with 0 DDD/1000 KPRJ. The absence of antibiotic use in December is attributable to the lack of pediatric pharyngitis cases during that month.

The peak in August coincides with the start of the new academic year, during which children aged 5–18 years return to school after the semester break. The increased social interaction within the school environment facilitates the transmission of infectious agents, including those responsible for acute pharyngitis. Although children in this age group possess relatively developed immune systems, they remain vulnerable to infection. Additionally, suboptimal personal hygiene practices, such as irregular handwashing, further contribute to the heightened incidence of pharyngitis.

This pattern is supported by the parallel increase in acute respiratory infection cases during the same period. In August 2023, the number of acute respiratory infection cases reported at the Juanda Samarinda Health Center rose to 104 cases, compared to only 9 cases in December 2023. These findings indicate a seasonal and behavioral influence on the prevalence of respiratory infections, which in turn affects antibiotic prescription patterns.

Conclusion

Based on the results of the study conducted at Juanda Samarinda Health Center, two types of antibiotics were identified: Amoxicillin and Cefadroxil. Among pediatric pharyngitis patients, Amoxicillin had the highest utilization, with an average of 38.5 DDD/1,000 outpatient visits (KPRJ), while Cefadroxil had the lowest, with an average of 4.9 DDD/1,000 KPRJ.

Declaration of Competing Interest

The authors declare that they have no competing interests

Reference

Anisa, F., Perangin-angin, M., Saputri, G.A.R., 2022. Evaluasi Penggunaan Antibiotik pada Pasien Faringitis Rawat Jalan di Puskesmas Bandar Lampung Tahun 2020. *Jurnal Farmasi Malahayati*. 5(1), 22-32

Apsari. D.P, Dwicandra, N.M.O, dan Jaelani, A.K. (2015). Pola Peresepan Antibiotik pada Manajemen Faringitis Akut Dewasa di Puskesmas. *Jurnal Endurance* 2(3), 252-257

Arbaini, N.H., Irawan, Y., Makani, M. (2024). Evaluasi Penggunaan Antibiotik dengan Metode ATC/DDD dan DU 90% pada Pasien Anak Rawat Jalan di RSUD Sultan Imanuddin Pangkalan Bun. *INNOVATIVE: Journal Of Social Science Research*. 4(6), 1280-1293.

Cots, J. M., Alós, J.-I., Bárcena, M., Boleda, X., Cañada, J. L., Gómez, N., Mendoza, A., Vilaseca, I., & Llor, C. (2015). Recommendations for Management of Acute Pharyngitis in Adults. *Acta Otorrinolaringologica (English Edition)*, 66(3), 159–170.

Dhrik, M., Prasetya, A. A. N. P. R., & Errawan, G. A. P. E. (2021). Pola Penggunaan Obat Pada Pasien Faringitis Dewasa di Praktek Dokter Bersama Apotek Kimia Farma Teuku Umar. *Acta Holistica Pharmacia*. 3(10), 14-23.

Effendi F. & Evelin, A. (2020). Evaluasi Penggunaan Antibiotik pada Pasien Infeksi Saluran Pernafasan Akut (ISPA) dengan Metode ATC/DDD di Puskesmas Beji Depok Periode Januari-Juni 2019. *Jurnal Farmamedika*. 5(1), 8-13

Ihsan, S., Sabarudin, Nuralifah, Kasmawati H., Leorita, M., Damu, R., Sudiman, A., Jamsir, A., Hasniar, W.O., Septiyana, W., Mardiani, S., Ariani, E.R. Ningsih, W.A. (2019). Evaluasi Penggunaan Antibiotik pada Pasien Pediatrik ISPA Non Pneumonia Menggunakan Sistem ATC/DDD di Seluruh Puskesmas Kota Kendari. *Jurnal Farmasi, Sains, dan Kesehatan*. 5(2), 25-29.

Lestari, D. L. P. A., Jayanti, N. P. S. D., Putra, T. W., Fridayanthi, P. U., Tjahyadi, I. G. K. D. P. P., Maharani, L. G. S., & Cahyawati, P. N. (2022). Diagnosis Dan Tatalaksana Faringitis Streptococcus Group A. *WICAKSANA: Jurnal Lingkungan Dan Pembangunan*. 6(2), 88-95.

Ministry of Health of the Republic of Indonesia. (2015). Peraturan Menteri Kesehatan Republik Indonesia Nomor 8 Tahun 2015 tentang Program Pengendalian Resistensi Antimikroba di Rumah Sakit. Jakarta: Menteri Kesehatan Republik Indonesia.

Ministry of Health of the Republic of Indonesia. (2017). Peraturan Menteri Kesehatan Republik Indonesia Nomor 27 Tahun 2017 tentang Pedoman Pencegahan dan Pengendalian Infeksi di Fasilitas Pelayanan Kesehatan. Jakarta: Peraturan Menteri Kesehatan Republik Indonesia

Ministry of Health of the Republic of Indonesia. (2023). Keputusan Menteri Kesehatan RI Nomor HK.01.07/MENKES/2197/2023 Tentang Formularium Nasional. Jakarta: Kementerian Kesehatan Republik Indonesia.

Mustafa, Z., & Ghaffari, M. (2020). Diagnostic Methods, Clinical Guidelines, and Antibiotic Treatment for Group A Streptococcal Pharyngitis: A Narrative Review. *Frontiers in Cellular and Infection Microbiology*. 15(10), 1–10

Novita. 2024. Faringitis. Diakses 15 September 2024 dari <https://www.alomedika.com/penyakit/telinga-hidung-tenggorokan/faringitis>

Pani, S., Barliana, M.I, Halimah, E., Pradipta, I.S., Annisa, N. (2015). Monitoring Penggunaan Antibiotik dengan Metode ATC/DDD dan DU 90%: Studi Observasional di Seluruh Puskesmas Kabupaten Gorontalo Utara . *Jurnal Farmasi Klinik Indonesia*. 4(4), hal 275-280.

Perdaka, W., Sagita, D., Pratama, S. (2020). Studi Penggunaan Antibiotik Berdasarkan ATC/DDD Dan Du 90% Di Puskesmas X Kota Jambi Periode 2017-2018. *Jurnal of Healthcare Technology and Medicine*. 6(1), 26-32

Sahdiah, L. (2023). Evaluasi Penggunaan Antibiotik pada Pasien Faringitis Akut di Poli Rawat Jalan Puskesmas Kedaton Bandar Lampung. Tugas Akhir. Lampung Selatan: Institut Teknologi Sumatera.

Sitepu, R, Cahyono, T.T, Monica, E. (2020). Evaluasi Penggunaan Antibiotik dengan Metode ATC/DDD dan PDD dengan DU 90% pada Penderita ISPA Non Pneumonia di Puskesmas Kabupaten Sampang. *Jurnal JKFT: Universitas Muhammadiyah Tangerang*. 5(1), 16-22

Tombeng, J. A., & Cjg, Z. (2022). Diagnostik Holistik Pasien Faringitis Fengan Hipertensi di Puskesmas Bahu. *Jurnal Kedokteran Komunitas Dan Tropik*. 10(1), 383–386.

Trisia, F. J., Sagita, D., Pratama, S. (2020). Evaluasi Penggunaan Antibiotik dengan Metode ATC/DDD dan DU 90% di Dua Puskesmas Kota Jambi Periode 2017-2018. *Jurnal of Healthcare Technology and Medicine*. 6(1), 125-138

WHO Collaborating Centre for Drug Statistics Methodology. (2024). Guidelines for ATC classification and DDD assignment 2024 27th Edition. Norway: WHO.