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Original Article

Bacterial patterns and antibiotic sensitivity among neonatal sepsis patients in Dr. H. Abdul Moeloek Hospital, Lampung

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Abstract

Background Neonatal infections cause more than 550,000 deaths each year worldwide. Sepsis is a serious neonatal infection, defined as a severe form of infection that causes organ dysfunction. The incidence of neonatal sepsis in Dr. H. Abdul Moeloek Hospital, Lampung, increased by 25% from 2017 to 2018 and by 30% from 2018 to 2019. Inappropriate use of antibiotics as therapy can lead to bacterial resistance to the medication. Understanding the most common bacterial patterns and using the guidance of antibiotic sensitivity tests can help health workers determine the empirical antibiotics needed to achieve optimal management, especially in neonatal sepsis patients.

Objective To identify bacteria and their antibiotic sensitivity patterns in neonatal sepsis patients at Dr. H. Abdul Moeloek Hospital, Lampung between January and June 2024.

Method Descriptive study was conducted using medical record data from neonates suspected of having sepsis in Dr. H. Abdul Moeloek Hospital Lampung between January and June 2024. Blood culture data and antibiotic sensitivity testing was obtained from medical records.

Results Of 65 blood culture of neonates suspected of having sepsis, 31 results were positive (47.6%). The most common microorganisms found were *Klebsiella pneumoniae* (23%), *Burkholderia cepacia* (19%), *Acinetobacter baumannii* (10%), *Pseudomonas aeruginosa* (10%), *Enterococcus faecium* (10%) *Staphylococcus aureus* (10%), *Staphylococcus epidermidis* (6%), *Enterococcus faecalis* (6%), *Escherichia coli* (3%), and *Enterobacter cloacae* (3%). Based on the sensitivity data calculated using weighted averages, ciprofloxacin (64.7%) and tigecycline (61.1%) showed highest sensitivity across more than five bacterial species. In contrast, ampicillin/sulbactam (96.0%), gentamicin (94.2%), and ceftriaxone (87.7%) had the highest resistance rates.

Conclusion The most common bacteria causing neonatal sepsis were *Klebsiella pneumoniae* and *Burkholderia cepacia*. Among more than five bacterial species, the highest overall sensitivity was observed to ciprofloxacin and tigecycline, while the highest resistance rates were observed to ampicillin/sulbactam, gentamicin, and ceftriaxone. **[Paediatr Indones. 2025;65:297-306; DOI: https://doi.org/10.14238/pi65.4.2025.297-306].**

Keywords: *bacterial patterns; antibiotic sensitivity; neonatal sepsis; blood culture*

Infection is one of the leading causes of infant mortality worldwide. According to the WHO, neonatal infections are mainly caused by bacteria, and result in more than 550,000 deaths each year.[1] In Indonesia, 18,281 neonatal deaths were recorded throughout 2022.[2] According to Lampung's health profile data in 2022, the number of neonatal deaths reached 451 neonates, of which 17 (3.8%) were caused by infection. Infections in neonates are generally caused by bacteria and viruses, and rarely by fungi or parasites.[3] The WHO reported the most

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common diagnosis, such as pneumonia, sepsis, and meningitis, are mostly caused by bacteria.[1]

Diagnosis of infection in neonates includes two important components: clinical manifestations (obtained from history-taking and physical examination) and supporting examinations. Clinical manifestations in neonates who experience infection vary greatly, depending on the affected organs, potentially involving the bloodstream, lungs, heart, meninges, urinary tract, peritoneum, digestive organs, conjunctivae, and skin.[4] Signs and symptoms of patients can include temperature instability, tachycardia, apnea or tachycardia, hypotension, irritability, bleeding, lethargy, and symptoms of poor perfusion such as pallor and cyanosis.[5] However, clinical manifestations of infection in neonates are generally nonspecific. This makes establishing the diagnosis of infection in neonates challenging for medical personnel.[6] Therefore, supporting examinations play an important role in determining the diagnosis of infection in neonates.

One serious neonatal infection is sepsis, which is defined as a severe form of infection in which the body experiences dysregulation, causing organ dysfunction.[7] The WHO (2020) stated that there were an estimated 1.3 to 2.9 million cases of neonatal sepsis and 400,000 to 700,000 deaths each year worldwide.[8] In addition, 84% of neonatal sepsis patient deaths due to infection can be prevented with early diagnosis and appropriate clinical management.[8] A previous study at Dr. H. Abdul Moeloek Hospital, Lampung, found the incidence of neonatal sepsis was increased every year from 2017 to 2019, with 193 cases in 2017, 242 cases in 2018, and 317 cases in 2019. This represents an increase in the number of neonatal sepsis cases by 25% from 2017 to 2018 and 30% from 2018 to 2019.[9]

In general, the diagnosis of neonatal sepsis is confirmed by clinical manifestations and supporting evaluations. Complete blood count, C-reactive protein (CRP), blood culture, urine culture, procalcitonin (PCT), interleukin-8 (IL-8), and lumbar puncture are laboratory tests that can be performed to diagnose neonatal sepsis. The blood culture is the gold standard.[10] Although several studies stated that blood culture is time-consuming and tends to give false negative results, it remains the gold standard evaluation for neonatal sepsis because of its' ability to identify the causative agent of infection, which further facilitates medical personnel in determining the appropriate antibiotic to be given to each patient.[11]

Several studies from different countries over the past 13 years have stated that Klebsiella spp. and Staphylococcus spp. were the two most common types of bacteria found in patients with neonatal sepsis.[12-15] A 2023 study conducted in West Sumatra, Indonesia found that *Klebsiella pneumoniae* and *Staphylococcus haemolyticus* were the most common causative agents of neonatal sepsis.[16] This shows that over time, the types of bacteria that cause neonatal sepsis in several countries around the world remain largely similar. A previous study conducted at the same hospital as our study, noted that in the Perinatology Unit, *Klebsiella spp.* were the most common type of bacteria isolated (27%), followed by *Staphylococcus spp*. (11.9%), *Pseudomonas spp*. (11%), and *Proteus spp*. (6.5%).[17]

Antibiotics are the most widely used drugs to treat neonatal sepsis. However, the use of antibiotics is often inappropriate, resulting in the development of resistant strains. Pathogen resistance to many antibiotics impedes the successful management of neonatal sepsis patients.[18] Identifying antibiotics to which the bacteria have high sensitivity is crucial in improving neonatal sepsis management. A 2023 Balinese study stated that ampicillin and gentamicin remain to be the empirical therapies for neonatal sepsis.[19]

A study in Suzhou, China reported that gram-positive bacteria such as Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus haemolyticus were sensitive to vancomycin, tigecycline, and teicoplanin and resistant to penicillin, oxacillin, and erythromycin.[20] Meanwhile, gram-negative bacteria such as *Klebsiella pneumoniae* and *Escherichia coli* were sensitive to carbapenems, quinolones such as ciprofloxacin, and levofloxacin, as well as aminoglycosides such as gentamicin and amikacin. Some of these antibiotics resemble the results of a study from West Sumatra, Indonesia, which reported that *Staphylococcus haemolyticus* was sensitive to vancomycin, tigecycline, nitrofurantoin, linezolid, and quinupristin/dalfopristin, while *Klebsiella pneumoniae* was sensitive to tigecycline, meropenem, ertapenem, and amikacin.[16]

On the other hand, a study at Dr. H. Abdul Moeloek Hospital Lampung found that the four most common types of bacteria, namely *Klebsiella spp.*,

Staphylococcus spp., *Pseudomonas spp.*, and *Proteus spp.* had the highest sensitivity to meropenem. Furthermore, the most prevalent resistance pattern in the four most common bacteria was against penicillin.[17]

Although there are many similarities in bacterial patterns and antibiotic sensitivities across regions and countries, bacterial patterns and antibiotic sensitivities can change over time. These changes in bacterial patterns can affect antibiotic selection. In addition, changes in bacterial sensitivity to antibiotics can also affect patient prognosis.

We aimed to identify bacteria and the antibiotic sensitivity patterns in neonatal sepsis patients at Dr. H. Abdul Moeloek Hospital, Lampung between January and June 2024. Our findings can help healthcare providers empirically select antibiotics for neonatal sepsis patients at Dr. H. Abdul Moeloek Hospital, Lampung to ultimately improve patient management in an effort to reduce morbidity and mortality in infants, especially in Indonesia.

Methods

This descriptive study was conducted in neonatal sepsis patients between January and June 2024. Data were obtained from patient medical records at Dr. H. Abdul Moeloek Hospital, Lampung. The inclusion criteria were neonates suspected of having sepsis who underwent culture examinations and antibiotic sensitivity testing on blood specimens. Patients with incomplete medical records were excluded. The data obtained were collected and processed using Microsoft Excel.

The percentage of isolate sensitivity or resistance to a given antibiotic was calculated by dividing the number of isolates of a specific bacterial species that were sensitive or resistant to the antibiotic (numerator) by the total number of isolates of that species tested against the antibiotic (denominator). Overall sensitivity and/or resistance rates for each antibiotic were calculated using a weighted average method, in which the percentage for each organism was multiplied by the number of isolates tested, and then divided by the total number of isolates tested for that antibiotic. Sensitivity and/or resistance rates were not calculated for bacterial types represented by a single isolate, due to insufficient sample size.

Results

Of 65 blood culture examinations of neonates suspected of sepsis, 31 results were positive (47.6%). The most common microorganisms found were *Klebsiella pneumoniae* (23%), *Burkholderia cepacia* (19%), *Acinetobacter baumannii* (10%), *Pseudomonas aeruginosa* (10%), *Enterococcus faecium* (10%), *Staphylococcus aureus* (10%), *Staphylococcus epidermidis* (6%), *Enterococcus faecalis* (6%), *Escherichia coli* (3%), and *Enterobacter cloacae* (3%) (**Table 1**).

Table 2 shows the antibiotic sensitivities of the various bacteria cultured from subjects, while **Table 3** shows the antibiotic resistances. *Klebsiella pneumoniae* was most sensitive to ciprofloxacin (71.4%, 5/7 isolates tested), tigecycline (66.7%, 4/6 isolates tested), and trimethoprim/sulfamethoxazole (60%, 3/5 isolates tested). Meanwhile, it exhibited 100% resistance to almost all beta-lactam group antibiotics (ampicillin, amoxicillin, penicillin, ticarcillin, imipenem, doripenem, cefazolin, cefadroxil, cefoperazone, cefoxitin, cefuroxime, and oxacillin), except for meropenem with 66.7% resistance (4 of 6 tested). It also exhibited 100% resistance to the macrolide group (erythromycin, azithromycin, clarithromycin), quinolone group (ofloxacin and levofloxacin), aminoglycosides group (streptomycin), glycopeptides group (vancomycin), tetracycline group (doxycycline), and other antibiotics (quinupristin, fosfomycin, rifampicin, and linezolid).

Burkholderia cepacia exhibited good sensitivity to ceftazidime, meropenem, and trimethoprim/

Table 1. Types of bacteria causing sepsis

Types of bacteria, n	(N=31)
Klebsiella pneumoniae	7
Burkholderia cepacia	6
Acinetobacter baumannii	3
Pseudomonas aeruginosa	3
Enterococcus faecium	3
Staphylococcus aureus	3
Staphylococcus epidermidis	2
Enterococcus faecalis	2
Escherichia coli	1
Enterobacter cloacae	1

Table 2. Antibiotic sensitivity patterns

Antibiotics	Antibiotic sensitivity, %								Overall sensitivity, %
	K. pneumoniae	*B. cepacia*	*A. baumannii*	*P. aeruginosa*	*E. faecium*	*S. aureus*	*S. epidermidis*	*E. faecalis*	
Amikacin	28.6		33.3	33	100	50			45
Ampicillin									
Ampicillin/sulbactam			33.3						33
Amoxicillin								50	50
Azithromycin									
Aztreonam	28.6			33					30
Cefazolin									
Cefadroxil									
Cefepime	14.3		66.7	67					39
Cefixime	14								14
Cefoperazone									
Cefotaxime									
Cefoxitin									
Ceftazidime	14.3	100	67	67					58
Ceftriaxone	16.7		33						22
Cefuroxime									
Ciprofloxacin	71.4	83.3	100	33	50	33		50	65
Clarithromycin									
Doripenem									
Doxycycline						100	100	100	100
Erythromycin								50	50
Ertapen	33.3								33
Fosfomycin									
Gentamicin	16.7								17
Genta high level (synergy)								50	50
Imipinem								50	50
Levofloxacin						33			33
Linezolid					100	50	100	100	85
Meropenem	33.7	100		33		33			54
Nitrofurantoin	20.0				50	100	100	100	99
Ofloxacin						100			100

Table 2. Antibiotic sensitivity patterns

Antibiotics	Antibiotic sensitivity, %								Overall sensitivity, %
	K. pneumoniae	*B. cepacia*	*A. baumannii*	*P. aeruginosa*	*E. faecium*	*S. aureus*	*S. epidermidis*	*E. faecalis*	
Oxacillin									
Penicillin									
Piperacillin tazobactam						33		50	40
Quinupristin						100	100	50	86
Rifampicin						50	50		50
Streptomycin high level (synergy)					100			100	100
Tetracycline						100	100	50	75
Ticarcillin									
Ticarcillin/clavulanic									
Tigecycline	66.7	16.7	33		100		100	100	59
Trimethoprim/sulfamethoxazole	60	100	67						76
Vancomycin					100	67		100	88

sulfamethoxazole (100% for all). On the other hand, it exhibited 100% resistance to some antibiotics from the aminoglycoside group (amikacin, gentamicin), penicillin group (aztreonam and piperacillin), and cephalosporin group (cefepime and ceftriaxone). *Acinetobacter baumannii* exhibited high sensitivity to ciprofloxacin (100%), followed by ceftazidime and trimethoprim/sulfamethoxazole with 67% each. Meanwhile, *A. baumannii* cultures were resistant to gentamicin (100%) and meropenem (67%). *Pseudomonas aeruginosa* was most sensitive to cefepime and ceftazidime, with 67% each, and showed 100% resistance to ampicillin/sulbactam, tigecycline, and piperacillin.

Enterococcus faecium isolates were susceptible (100%) to amikacin, linezolid, tigecycline, vancomycin, and exhibited no high-level resistance to streptomycin. Meanwhile, it exhibited 100% resistance to the penicillin group (ampicillin, ampicillin/sulbactam, amoxicillin, aztreonam, ertapenem, imipinem, and meropenem), cephalosporin group (cefepime, cefotaxime, ceftazidime, and ceftriaxone), macrolide group (erythromycin), aminoglycoside group (gentamicin), quinolone group (levofloxacin), and other (trimethoprim, tazobactam) antibiotics. *Enterococcus faecalis* was most sensitive to doxycycline, linezolid, nitrofurantoin; *Enterococcus faecalis* isolates demonstrated the highest sensitivity (100%) to doxycycline, linezolid, nitrofurantoin, tigecycline, and vancomycin. Furthermore, all isolates lacked high-level resistance to streptomycin. Meanwhile, it was 100% resistant to ampicillin/sulbactam.

Staphylococcus aureus was most sensitive to tetracycline (100%), but 100% resistant to the beta-lactam group antibiotics. *Staphylococcus epidermidis* exhibited high sensitivity to tetracycline, quinupristin, doxycycline, linezolid, nitrofurantoin, and tigecycline (100% for all). Meanwhile, it exhibited 100% resistance to the beta-lactam group antibiotics.

Based on the overall sensitivity data calculated using weighted averages, ciprofloxacin (65%) and tigecycline (59%) showed the highest sensitivity across more than five bacterial species. In contrast, ampicillin/sulbactam (96%), gentamicin (94%), and ceftriaxone (87%) had the highest resistance rates.

Table 3. Antibiotic resistance patterns

Antibiotics	Antibiotic resistance, %								Overall resistance. %
	K. pneumoniae	*B. cepacia*	*A. baumannii*	*P. aeruginosa*	*E. faecium*	*S. aureus*	*S. epidermidis*	*E. faecalis*	
Amikacin	57.1	100	66.7	33		50			72
Ampicillin	100				100			50	92
Ampicillin/sulbactam	100		66.7	100	100	100	100	100	96
Amoxicillin	100				100	100	100	50	94
Azithromycin	100					100	100		100
Aztreonam	71.4	100			100				88
Cefazolin	100					100	100		100
Cefadroxil	100					100	100		100
Cefepime	71.4	100	33.3	33	100	100	100		78
Cefixime						100	100		100
Cefoperazone	100					100	100		100
Cefotaxime	16.7				100	100	100		61
Cefoxitin	100					100	100		100
Ceftazidime	85.7		33	33	100	100	100		76
Ceftriaxone	83.3	100	33		100	100	100		87
Cefuroxime	100					100	100		100
Ciprofloxacin	28.6			33	50	67	100	50	47
Clarithromycin	100					50	100		88
Doripenem	100					100	100		100
Doxycycline	100								100
Erythromycin	100				100	100	100	50	94
Ertapenem	50				100	100	100		82
Fosfomycin	100					100			100
Gentamicin	83.3	100	100				100		94
Genta high level (synergy)	100				100			50	92
Imipinem	100				100	100	100	50	94
Levofloxacin	100				100	67	100	50	88
Linezolid	100					50			85
Meropenem	66.7		33	33	100	67	100		65
Nitrofurantoin	20.0				50				29
Ofloxacin	100								100
Oxacillin	100					100	100		100

Table 3. Antibiotic resistance patterns

Antibiotics	Antibiotic resistance, %							Overall resistance, %
	K. pneumoniae	*B. cepacia*	*A. baumannii*	*P. aeruginosa*	*E. faecium*	*S. aureus*	*S. epidermidis*	*E. faecalis*	
Penicillin	100								100
Piperacillin tazobactam	83.3	100	67	100	100	67	100	50	86
Quinupristin	100				100			50	92
Rifampicin	100					50	50		79
Streptomycin high level (synergy)	100								100
Tetracycline					100				100
Ticarcillin	100					100	100		100
Ticarcillin/clavulanic	100					100	100		100
Tigecycline	33.3	83	67	100					65
Trimethoprim/sulfamethoxazole	40		33		100	100	100		66
Vancomycin	100					33	50		75

Discussion

In this study, 47.6% of subjects had blood cultures with positive bacterial growth. This result was lower than a previous study at our facility, which showed 79.69% positive growth.[17] Our lower positive culture results could have been influenced by several factors, such as our small sample size, bacteria that are difficult to grow to culture except in media with specialized nutritional requirements, specimen collection methods, inadequate blood volume, methods used, or patient selection criteria for blood cultures that varied from hospital to hospital.[21]

Klebsiella pneumoniae, a gram-negative, non-motile, and typically encapsulated bacillus from the Enterobacteriaceae family, is a dominant pathogen in neonatal sepsis. Local infections or colonization of the urinary tract, gastrointestinal tract, or respiratory tract often spread into the bloodstream.[22] The most common microorganism in neonatal sepsis patients was *Klebsiella pneumoniae* (23%). This aligned with two previous studies at our facility, which identified *Klebsiella pneumoniae* as the most common cause of sepsis (17.4%23 and 30.4%17). Furthermore, hospital studies found Klebsiella sp. in 79.2% of cases in Padang,24 46.4% of cases in Africa,25 and 16.2% of cases in Jakarta.[23]

Klebsiella pneumoniae was found most sensitive to ciprofloxacin (71.43%), tigecycline (66.67%), and trimethoprim/sulfamethoxazole (60%). This differed from a previous study at Dr. H. Abdul Moeloek Hospital, Lampung, where *K. pneumoniae* was most sensitive to tigecycline (87.5%), meropenem (50%), and amikacin (50%).[24] This difference might have been caused by the emergence of resistant strains due to irrational use of antibiotics.[17] *Klebsiella pneumoniae* was most resistant to antibiotics that belong to the beta-lactam group. This could be attributed to *K. pneumoniae*'s ability to produce enzyme known as ESBL (extended-spectrum beta lactamase) that hydrolyzes beta-lactam antibiotics containing oxyimino groups, such as ceftazidime, ceftriaxone, cefotaxime or aztreonam.[25]

Burkholderia cepacia exhibited good sensitivity to ceftazidime, meropenem, and trimethoprim/sulfamethoxazole, all at 100%. Similar findings were reported, where *Burkholderia cepacia* most sensitive to meropenem, ceftazidime, trimethoprim/

sulfamethoxazole with each 100%.[25] Carbapenem antibiotics, such as meropenem, are the therapeutic option for *Burkholderia cepacia*. On the other hand, *Burkholderia cepacia* exhibits the highest resistance to beta lactam antibiotics because it contains modified lipopolysaccharides, which lead to intrinsic polymyxin resistance.[26]

Acinetobacter baumannii has high sensitivity to ciprofloxacin (100%), followed by ceftazidime and trimethoprim/sulfamethoxazole (with 67% each), and amikacin (33.3%). *Acinetobacter baumannii* had 50% sensitivity to amikacin.[27] Similar findings were reported by a study in Doha; *A. baumannii* was most sensitive to amikacin and meropenem, both at 100%. *A. baumannii* was also resistant to gentamicin (100%) and meropenem (67%).[27] This aligned with a study that reported that *A. baumannii* was resistant to meropenem (33.3%).[25] *Pseudomonas aeruginosa* was most sensitive to cefepime and ceftazidime, each with 67%. Similar findings were reported by in a previous study, with cefepime sensitivity at 46% and ceftazidime at 75%. Meanwhile, *Pseudomonas aeruginosa* was 100% resistant to ampicillin/sulbactam, tigecycline, and piperacillin. *P. aeruginosa* was most resistant to penicillin group antibiotics, with 96%.[17]

Enterococcus faecium isolates were susceptible (100%) to amikacin, linezolid, tigecycline, vancomycin, and exhibited no high-level resistance to streptomycin. However, it was resistant to penicillin and cephalosporin antibiotics. *Enterococcus faecalis* isolates demonstrated the highest sensitivity (100%) to doxycycline, linezolid, nitrofurantoin, tigecycline, and vancomycin. Furthermore, all isolates lacked high-level resistance to streptomycin. However, it was 100% resistant to ampicillin/sulbactam. Serious enterococcal infections are often difficult to treat because the organisms show intrinsic resistance to a variety of antibiotics, including penicillins, cephalosporins, and sometimes to aminoglycosides, clindamycin, and lincosamides.[28]

Staphylococcus aureus was most sensitive to tetracycline (100%). *Staphylococcus epidermidis* exhibited high sensitivity to tetracycline, quinupristin, doxycycline, linezolid, nitrofurantoin, tigecycline (100% for all). Meanwhile, Staphylococcus sp. showed 100% resistance to the beta-lactam group antibiotics. Similar findings were reported by a previous study which reported that tetracycline had a sensitivity of 56%, while penicillin, the most resistant beta-lactam group antibiotic, showed 79% resistance against Staphylococcus sp.[17]

Based on the overall sensitivity data calculated using weighted averages, ciprofloxacin (65%) and tigecycline (59%) showed the highest sensitivity across more than five bacterial species. Based on the bacterial type, gram-negative bacteria were most sensitive to ceftazidime, cefepime, meropenem, tigecycline, ciprofloxacin, and trimethoprim/sulfamethoxazole. Meanwhile, gram-positive bacteria were most sensitive to doxycycline, linezolid, tetracycline, and tigecycline. On the other hand, the highest overall resistance were observed in bacterial isolates against ampicillin/sulbactam (96%), gentamicin (94%), and ceftriaxone (87%).

To date, the first line of antibiotics previously recommended by the WHO were a combination of narrow-spectrum penicillins (such as penicillin, ampicillin, or amoxicillin) and aminoglycosides (such as gentamicin or amikacin).[5] In Indonesia, ampicillin and gentamicin are still empirical therapies for neonatal sepsis.[19] However, the results of this study showed that the highest resistance was observed in isolates against ampicillin/sulbactam (96%) and gentamicin (94%). *K. pneumoniae* and *E. faecium* demonstrated 100% resistance to ampicillin, whereas *E. faecalis* showed 50% resistance.

With the results showing high resistance, the use of ampicillin/sulbactam and gentamicin should be reconsidered in treating neonatal sepsis, particularly at Dr. H. Abdul Moeloek Hospital in Lampung. However, because these data were primarily from the Lampung province, the results were influenced by local epidemiological conditions. Additionally, the relatively small sample size may not provide results that are truly representative in a broader context. Therefore, further research related to bacterial patterns and antibiotic sensitivity needs to be conducted routinely, with larger sample size, across various places, and at certain intervals, so that the treatment of neonatal sepsis remains as effective as possible for future sepsis patients.

In conclusion, the most common bacteria causing neonatal sepsis were *Klebsiella pneumoniae* and *Burkholderia cepacia*. Among more than five bacterial species, the highest overall sensitivity was observed to ciprofloxacin and tigecycline, while the

highest resistance rates were observed to ampicillin/sulbactam, gentamicin, and ceftriaxone.

Conflict of interest

None declared.

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