JKM (Jurnal Kebidanan Malahayati),Vol 9, No. 1. January 2023,
ISSN (Print) 2476-8944 ISSN (Online) 2579-762X, Hal 1-14

DR. H. ABDUL MOELOEK HOSPITAL ANTIBIOTIC RESISTANCE PATTERN

Nita Sahara[1], Hidayat[2], Gusti Mauladi[3], Tessa Sjahriani[4*]

[1]Department of Pathology of Anatomical, Faculty of Medicine, Universitas Malahayati
[2]Department of Clinical Pathology, Dr. H. Abdul Moeloek Hospital
[3]Medical Program, Faculty of Medicine, Universitas Malahayati
[4*]Department of Microbiology, Faculty of Medicine, Universitas Malahayati
*Email : tessasah@malahayati.ac.id

ABSTRAK : POLA RESISTENSI ANTIBIOTIK DI RS DR. H. ABDUL MOELOEK

Infeksi nosokomial adalah masalah luas yang memperpanjang durasi pemulihan, meningkatkan biaya perawatan, dan meningkatkan angka kematian pasien. Antibiotik digunakan untuk mengobati infeksi bakteri yang menyebabkan kondisi tersebut. Di Indonesia, seperti halnya di negara-negara lain, penggunaan antibiotik sudah meluas dan berlebihan, bahkan banyak yang disalahgunakan. Penelitian ini bertujuan untuk mengetahui pola resistensi antibiotik di RSUD Dr. H. Abdul Moeloek periode Januari sampai Maret 2018 dan mengetahui pola resistensi bakteri terhadap antibiotik. Penelitian ini menggunakan penelitian deskriptif. Sampel diambil dari rekam medik pasien yang mendapatkan pengobatan antibiotik yang memiliki hasil uji sensitivitas. Hasil yang diperoleh Kloramfenikol, Sulbaktam-ampi, dan Cephalexin memiliki rata-rata resistensi tertinggi (98%), diikuti oleh Cefadroxil (94%), Cefixime (91%), dan Trimethoprim (90%). Bakteri juga ditemukan paling sensitif terhadap Amikacin (> 93%), kecuali Streptococcus sp., yang ditemukan paling sensitif terhadap Amox-Clavulanic Acid (91%) dan Meropenem (82%). Kesimpulannya adalah sebagian besar bakteri yang diuji paling resisten terhadap Sulbaktam-Ampi (>97%) dan Penisilin (100%). Mayoritas bakteri yang teridentifikasi pada penelitian ini paling sensitif terhadap Amikasin (>92%), dengan rata-rata sensitivitas terhadap Amikasin sebesar 89% (kecuali Streptococcus sp.). Oleh karena itu harapannya data ini dapat dimanfaatkan untuk meningkatkan penggunaan antibiotik secara bijaksana dalam rangka mengatasi infeksi nosokomial.

.

Kata kunci : Antibiotik, pola bakteri, nosokomial, resistensi

ABSTRACT

Nosocomial infections are a widespread issue that prolong recovery durations, raise maintenance costs, and raise patient mortality rates. antibiotics are used to treat the bacterial infection that caused the condition. In Indonesia, as in other nations, the use of antibiotics has become widespread and excessive, with many of them being misused. This study aim to determine the antibiotic resistant pattern on Dr. H. Abdul Moeloek hospital from January to March 2018 and to determine the bacterial resistance pattern of antibiotic. This study was using a descriptive study. The samples were taken from medical records of patients who received antibiotic treatment which has a sensitivity test results. The result obtained Chloramfenicol, Sulbactam-ampi, and Cephalexin had the highest average resistance (98%), followed by Cefadroxil (94%), Cefixime (91%), and Trimethoprim (90%). They were also found to be most sensitive to Amikacin (> 93%), with the exception of *Streptococcus sp.*, which was found to be the most sensitive to Amox-Clavulanic Acid (91%) and Meropenem (82%). The conclusion is most of the bacteria tested were most resistant to Sulbactam-Ampi (> 97%) and Penicillin (100%). The majority of the bacteria identified in this study were most sensitive to Amikacin (> 92%), with an average sensitivity to Amikacin of 89% (with the exception of *Streptococcus sp*.,). Therefore, it can be utilized to increase the prudent use of antibiotics in order to overcome the nosocomial infections.

.

Keywords **:** Antibiotic, bacterial pattern, nosocomial, resistance.

INTRODUCTION

Nosocomial infection are a worldwide problem, occurring primarily in undeveloped and underdeveloped nations where infectious diseases are still prevalent as their primary cause. The incidence of nosocomial infection was 10% (Bouza *et al*., 2019). Nosocomial infections lengthen treatment times, increase maintenance expenses, and increase the risk of patient death (Khan, Baig, Mehboob, 2017). Antibiotics are frequently used to

treat infectious infections. High accuracy is needed when choosing antibiotics because there are more clinically beneficial drugs available because to technological advancements. The evolution of bacterial resistance and limited antibiotic efficiency against some bacteria are two consequences of improper antibiotic choice. Antibiotic-resistant bacteria have a significant clinical impact. After a few years, a bacterium that was initially sensitive to an antibiotic can develop resistance, making the treatment process more challenging because it is challenging to find drugs that can eliminate the bacteria (Firizky, 2014).

The Centers for Disease Control and Prevention estimate that two million Americans contract antibiotic-resistant bacteria each year, and at least 23,000 of them pass away as a direct result of this resistance. Antibiotics are kept in homes 86% of the time without a prescription, with Lampung province having the second-highest rate at 92% after Central Kalimantan (93.4%). This demonstrates that there is still a lack of public understanding of the advantages, uses, and effects of using antibiotics, as evidenced by the alarming amount of antibiotic use in Indonesia (Riskesdas, 2013).

The majority of antibiotic use happens in hospitals, so to increase the wise use of antibiotics, there should be a program to control infection, control resistant bacteria, monitor antibiotic use in hospitals, make new guidelines for the use of antibiotics and prophylaxis on an ongoing basis, and monitor antibiotic use in hospitals. The hospital tracks the susceptibility pattern by documenting susceptibility test laboratory results, which may then be used to create guidelines for the use of antibiotics and identify those that are still effective. Antibiotic use can be done in a proper, safe, and efficient manner with superior clinical results. In order to execute antibiotic management and supervision, preliminary study on antibiotic sensitivity is required (WHO, 2001). This study aim to determine the antibiotic resistant pattern on Dr. H. Abdul Moeloek hospital. This study's hypothesis is that the Dr. H. Abdul Moeloek Hospital has bacterial resistance, which leads to antibiotic resistance.

METHOD

This study employs descriptive research techniques, information were gathered from the outcomes of tests conducted using the laboratory examination register book. The Gram staining, Nutrient Agar and Mac Conkey medium was launched. After determining the genus/species of the bacteria, the Kirby Bauer diffusion method antibiotic susceptibility test was conducted. In this, Mueller Hinton agar with 23 different antibiotics were used. Followed by a resistance test using a VITEK 2 machine, and CLSI guidelines (Clinical and Laboratory Standards Institute), the inhibition zone diameter formed is interpreted as indicating bacterial sensitivity to antibiotics (CLSI, 2012).

Between January and March 2018, this study was carried out at the Clinical Pathology Laboratory of the Regional General Hospital Dr. H. Abdul Moeloek in Lampung Province. Using information from medical records, specifically the findings of an investigation of culture and resistance, the sample employed is total sampling.

RESULT

Tree hundred samples, including those made from blood, urine, pus, sputum, body fluids, and swabs, yielded *Alcaligenes sp, Escherichia coli, Enterobacter sp, Klebsiella sp, Proteus sp, Pseudomonas sp, Staphylococcus sp* and *Streptococcus sp.*

Frequency Distribution of Specimen Type

The frequency distribution of each type of specimen are shown in Table 1.

Table 1
Frequency Distribution of Specimen Type

Specimen type	January	February	March	n	Percentage (%)
	n	n	n		
Blood	29	15	4	48	16
Urine	7	9	12	28	9
Pus	53	41	47	141	47
Sputum	19	27	8	54	18
Body fluid	4	4	1	9	3
Swab	6	12	2	20	7

According to Table 1, the majority of specimen types has 141 samples, making up 47% of

 DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

the entire sample. 48 blood samples (16%), 28 urine samples (9%) 54 sputum samples (18%), 9 body fluid samples (3%), and 20 swabs (7%).

Frequency Distribution of Bacterial Growth

The frequency distribution of bacterial growth are shown in Table 2.

Table 2
Frequency Distribution of Bacterial Growth

Bacterial Growth	January	February	March	n	Percentage (%)
	n	n	n		
Positive	118	108	74	300	50
Negative	88	120	96	304	50

Based on Table 2 above, it was determined that there were 300 samples of bacterial growth with a percentage (50%) and that there was no bacterial growth or sterile, i.e. 304 samples with a percentage (50%) from the findings of the bacterial culture.

Distribution of Bacterial Growth Frequency by Room

Based on the results of the culture examination, it was discovered that the following was the distribution of Bacterial Growth Frequency by room:

Table 3.
Distribution of Bacterial Growth Frequency by Room

Room	Specimen						Total	%
	Blood	Urine	Pus	Sputum	Body fluid	Swab		
ICU	14	18	4	25	1	0	62	21
Alamanda	21	1	1	2	2	0	27	9
Mawar	1	0	21	0	0	0	22	7
Kutilang	1	1	22	0	0	0	24	8
Vip A	1	1	1	0	0	0	3	1
PBHB	1	0	2	0	1	0	4	1
Murai	1	3	11	1	0	1	17	6
Kenanga	3	2	15	0	0	0	20	7
Maha Munyai	2	0	2	0	0	0	4	1
Aster	1	0	0	0	0	0	1	0
Tulip	1	0	0	0	0	0	1	0
Melati	1	2	20	19	5	19	66	22
Gelatik	0	0	12	0	0	0	12	4
Kemuning	0	0	8	0	0	0	8	3
Delima	0	0	7	0	0	0	7	2
VIP B	0	0	4	2	0	0	6	2
Anyelir	0	0	2	0	0	0	2	1
UGD	0	0	1	0	0	0	1	0
PBHA	0	0	1	1	0	0	2	1
SMC	0	0	7	4	0	0	11	4

According to Table 3 above, up to 66 samples (22%) from the Melati room contained bacterial growth.

Figure 1 shows the three specimens that were collected most frequently: pus, sputum, and blood. While the previous study obtained the most specimens, it only obtained 75% of the isolates from pus isolates, 78% from sputum isolates, and 95% from blood isolates (Hayati, 2019).

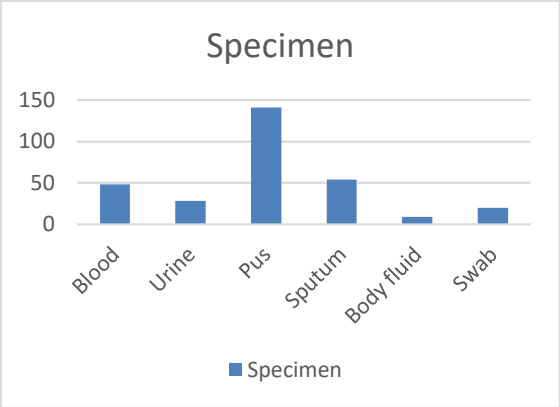

Figure 1. Specimen Distribution

Bacterial Frequency Distribution Based on Bacterial Culture Results

The bacteria identified on bacterial culture results were as follows:

This study found *Enterobacter sp* on 98 samples (33%), *Alcaligenes sp* 57 samples (19%), *Proteus sp* samples 43 (14%), *Klebsiella sp* 39 samples (13%), *Pseudomonas sp* 38 samples (13%), *Streptococcus sp* 11 samples (4%), *Staphylococcus sp* 9 samples (3%), dan *Escherichia coli* 5 samples (2%).

Table 4.
Frequency Distribution Based on Bacterial Culture Results

Name of bacteria	n	Percentage (%)
Pseudomonas sp	38	13
Enterobacter sp	98	33
Proteus sp	43	14
Alcaligenes sp	57	19
Staphylococcus sp	9	3
Klebsiella sp	39	13
Escherichia coli	5	2
Streptococcus sp	11	4

Bacterial Frequency Distribution Based on Specimen Type

Bacterial culture result from specimen type were shown below:

Table 5.
Bacterial Frequency Distribution on Blood, Urine and Pus

Name of bacteria	Blood		Urine		Pus		n
	n	%	n	%	n	%	
Pseudomonas sp	6	13	0	0	25	18	31
Enterobacter sp	19	40	16	57	43	30	78
Proteus sp	2	4	1	4	27	19	30
Alcaligenes sp	15	31	8	29	22	16	45
Staphylococcus sp	5	10	1	4	2	1	8
Klebsiella sp	1	2	0	0	21	15	22
Escherichia coli	0	0	0	0	0	0	0
Streptococcus sp	0	0	2	7	1	1	3

From blood specimen, *Pseudomonas sp* was found on 6 samples (13%), *Enterobacter sp* 19 samples (40%), *Proteus sp* 2 samples (4%), *Alcaligenes sp* 15 samples (31%), *Staphylococcus sp* 5 samples (10%), *Klebsiella sp* 1 samples (2%), and negative for *Escherichia coli* and *Streptococcus sp*. On urine specimen, *Enterobacter sp* was found on 16 samples (57%), *Proteus sp*, *Staphylococcus sp* 1 sample (10,7%), *Alcaligenes sp* 8 samples (29%), *Klebsiella sp* 1 sample (3,6%). *Streptococcus sp* 2 sample (7%), and negative for *Pseudomonas sp, Klebsiella sp, Escherichia coli.*

The culture of pus specimen found *Pseudomonas sp* 25 samples (18%), *Enterobacter sp* 43 samples (30%), *Proteus sp* 27 samples (19%), *Alcaligenes sp* 22 samples (16%), *Staphylococcus sp* samples 2 (1%), *Klebsiella sp* 21 samples (15%), *Staphylococcus sp* 1 samples (1%), and negative for *Escherichia coli*.

DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

Table 6.
Frequency Distribution on Sputum, Body Fluid and Swab

Name of bacteria	Sputum		Body fluid		Swab		n
	n	%	n	%	n	%	
Pseudomonas sp	2	4	2	22	3	15	7
Enterobacter sp	14	26	2	22	4	20	20
Proteus sp	9	17	2	22	2	10	13
Alcaligenes sp	8	15	3	33	1	5	12
Staphylococcus sp	0	0	0	0	1	5	1
Klebsiella sp	16	30	0	0	1	5	17
Escherichia coli	4	7	0	0	1	5	5
Streptococcus sp	1	2	0	0	7	35	8

Bacterial culture result obtained from sputum were *Pseudomonas sp* 2 samples (4%), *Enterobacter sp* 14 samples (26%), *Proteus sp* 9 samples (17%), *Alcaligenes sp* 8 samples (15%), *Klebsiella sp* 16 samples (30%), *Escherichia coli* and *Streptococcus sp* 1 sample (2%), none for *Staphylococcus sp*. Based on specimen obtained from body fluid, *Pseudomonas sp, Enterobacter sp,* and *Proteus sp* was found on 2 samples (22%), *Alcaligenes sp* sebanyak 3 (33%), negative for*, Staphylococcus sp, Klebsiella sp, Escherichia coli* and *Streptococcus sp*.

While *Pseudomonas sp* obtained from 3 samples (15%), *Enterobacter sp* 4 samples (20%), *Proteus sp* 2 samples (10%), *Alcaligenes sp, Staphylococcus sp,Klebsiella sp, Escherichia coli sp* and *Streptococcus sp* 1 sample (5%) on swab specimen.

The Results of Resistance of Antibiotics Test in Bacterial Groups

Table 7 conducted the results of the resistance pattern distribution.

Pseudomonas sp

The results of resistance pattern distribution of *Pseudomonas sp*:

Table 7
Resistance Pattern Distribution of *Pseudomonas sp*

Antibiotic	Resistant		Intermediate		Sensitive	
	n	%	n	%	n	%
Aztreonam	13	33	0	0	27	68
Trimetoprim	35	88	0	0	5	13
Amikacin	5	13	0	0	35	88
Meropenem	21	53	0	0	19	48
Ceftazidime	12	30	0	0	28	70
Cefixime	37	93	0	0	3	8
Amoxisillin	40	100	0	0	0	0
Ceftriaxone	28	70	1	3	11	28
Chloramphenicol	40	100	0	0	0	0
Netilmicin	18	45	0	0	22	55
Cefpodoxime	36	90	0	0	4	10
Cefoperazone	13	33	1	3	26	65
Ampisilin	39	98	0	0	1	3
Sulbactam-Ampi	40	100	0	0	0	0
Amox-Clavulanic Acid	29	73	0	0	11	28
Sulactum-Cefpirom	20	50	0	0	20	50
Cefotaxime	22	55	5	13	13	33
Streptomicin	37	93	0	0	3	8
Cefadroxil	40	100	0	0	0	0
Gentamicin	31	78	0	0	9	23
Tetracyclin	38	95	0	0	2	5

Cephalexin	39	98	0	0	1	3
Penisillin	40	100	0	0	0	0

Based on Table 7, *Pseudomonas sp*. have the highest resistance to several antibiotics, namely Amoxicillin (100%), Sulbactam-Ampi (100%), Cefadroxil (100%) and Penicillin (100%) and were still sensitive to Amikacin (88%).

Enterobacter sp

While the results of resistance pattern distribution of *Enterobacter sp* were shown on Table 8:

Table 8
Resistance Pattern Distribution of *Enterobacter sp*

Antibiotic	Resistant		Intermediate		Sensitive	
	n	%	n	%	n	%
Aztreonam	60	63	2	2	33	35
Trimetoprim	82	86	0	0	13	14
Amikacin	6	6	1	1	88	93
Meropenem	49	52	0	0	46	48
Ceftazidime	56	59	2	2	37	39
Cefixime	85	89	1	1	9	9
Amoxisillin	80	84	0	0	15	16
Ceftriaxone	71	75	1	1	23	24
Chloramphenicol	92	97	0	0	3	3
Netilmicin	36	38	0	0	59	62
Cefpodoxime	81	85	1	1	13	14
Cefoperazone	64	67	5	5	26	27
Ampisilin	84	88	0	0	11	12
Sulbactam-Ampi	92	97	0	0	3	3
Amox-Clavulanic Acid	44	46	1	1	50	53
Sulactum-Cefpirom	62	65	0	0	33	35
Cefotaxime	60	63	3	3	32	34
Streptomicin	83	87	0	0	12	13
Cefadroxil	87	92	0	0	8	8
Gentamicin	70	74	0	0	25	26
Tetracyclin	81	85	0	0	14	15
Cephalexin	92	97	0	0	3	3
Penisillin	94	99	0	0	1	1

According to Table 8, *Enterobacter sp*. were still sensitive to Amikacin (93%), although having the highest resistance of Penicillin (99%).

Proteus sp

The results of resistance pattern distribution of *Proteus sp* were shown on Table 9:

Table 9
Resistance Pattern Distribution of *Proteus sp*

Antibiotic	Resistant		Intermediate		Sensitive	
	n	%	n	%	n	%
Aztreonam	25	58	1	2	17	40
Trimetoprim	42	98	0	0	1	2
Amikacin	2	5	0	0	41	95
Meropenem	12	28	0	0	31	72
Ceftazidime	24	56	1	2	18	42
Cefixime	37	86	1	2	5	12
Amoxisillin	41	95	0	0	2	5

 DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

Ceftriaxone	36	84	0	0	7	16
Chloramphenicol	43	100	0	0	0	0
Netilmicin	16	37	1	2	26	60
Cefpodoxime	40	93	0	0	3	7
Cefoperazone	34	79	2	5	7	16
Ampisilin	38	88	0	0	5	12
Sulbactam-Ampi	43	100	0	0	0	0
Amox-Clavulanic Acid	28	65	1	2	14	33
Sulactum-Cefpirom	24	67	0	0	12	33
Cefotaxime	27	63	1	2	15	35
Streptomicin	32	74	0	0	11	26
Cefadroxil	43	100	0	0	0	0
Gentamicin	32	74	0	0	11	26
Tetracyclin	35	81	0	0	8	19
Cephalexin	42	98	0	0	1	2
Penisillin	43	100	0	0	0	0

According to Table 9, *Proteus sp*. were still sensitive to Amikacin (95%), but resistance to the following antibiotics: Chloramphenicol (100%), Sulbactam-Ampi (100%), Cefadroxil (100%), and Penicillin (100%).

Alcaligenes sp

The results of the resistance pattern distribution of *Alcaligenes sp* obtained the following results:

Table 10
Resistance Pattern Distribution of *Alcaligenes sp*

Antibiotic	Resistant		Intermediate		Sensitive	
	n	%	n	%	n	%
Aztreonam	31	51	1	2	29	48
Trimetoprim	59	97	0	0	2	3
Amikacin	10	16	1	2	50	82
Meropenem	22	36	0	0	39	64
Ceftazidime	33	54	2	3	26	43
Cefixime	58	95	0	0	3	5
Amoxisillin	55	90	0	0	6	10
Ceftriaxone	45	74	1	2	15	25
Chloramphenicol	58	95	0	0	3	5
Netilmicin	31	51	0	0	30	49
Cefpodoxime	52	85	0	0	9	15
Cefoperazone	45	74	1	2	15	25
Ampisilin	54	89	0	0	7	11
Sulbactam-Ampi	61	100	0	0	0	0
Amox-Clavulanic Acid	39	64	1	2	21	34
Sulactum-Cefpirom	39	64	0	0	22	36
Cefotaxime	43	70	2	3	16	26
Streptomicin	53	87	0	0	8	13
Cefadroxil	57	93	0	0	4	7
Gentamicin	46	75	0	0	15	25
Tetracyclin	55	90	0	0	6	10
Cephalexin	61	100	0	0	0	0
Penisillin	61	100	0	0	0	0

Based on Table 10, *Alcaligenes sp*. have the highest resistance to Sulbactam-Ampi (100%), Cephalexin (100%), Penicillin (100%) and were still sensitive to Amikacin (82%).

Staphylococcus sp

The results of resistance pattern distribution of *Staphylococcus sp* were obtained as follows:

Table 11
Resistance Pattern Distribution of *Staphylococcus sp*

Antibiotic	Resistant		Intermediate		Sensitive	
	n	%	N	%	n	%
Aztreonam	6	67	0	0	3	33
Trimetoprim	9	100	0	0	0	0
Amikacin	1	11	0	0	8	89
Meropenem	6	67	0	0	3	33
Ceftazidime	4	44	1	11	4	44
Cefixime	9	100	0	0	0	0
Amoxisillin	4	44	0	0	5	56
Ceftriaxone	6	67	1	11	2	22
Chloramphenicol	9	100	0	0	0	0
Netilmicin	7	78	0	0	2	22
Cefpodoxime	7	78	0	0	2	22
Cefoperazone	5	56	0	0	4	44
Ampisilin	5	56	0	0	4	44
Sulbactam-Ampi	9	100	0	0	0	0
Amox-Clavulanic Acid	6	67	0	0	3	33
Sulactum-Cefpirom	6	67	0	0	3	33
Cefotaxime	5	56	0	0	4	44
Streptomicin	8	89	0	0	1	11
Cefadroxil	7	78	0	0	2	22
Gentamicin	6	67	0	0	3	33
Tetracyclin	4	44	0	0	5	56
Cephalexin	8	89	0	0	1	11
Penisillin	9	100	0	0	0	0

Based on Table 11, *Staphylococcus sp*. has the highest resistance to Trimethoprim (100%), Cefixime (100%), Chloramphenicol (100%), Sulbactam-Ampi (100%), Penicillin (100%), and were still sensitive to Amikacin (89%).

Klebsiella sp

The results of resistance pattern distribution of *Klebsiella sp* were obtained as follows:

Table 12
Resistance Pattern Distribution of *Klebsiella sp*

Antibiotic	Resistant		Intermediate		Sensitive	
	n	%	n	%	n	%
Aztreonam	15	38	1	3	24	60
Trimetoprim	34	85	0	0	6	15
Amikacin	3	8	0	0	37	93
Meropenem	6	15	0	0	34	85
Ceftazidime	26	65	0	0	14	35
Cefixime	36	90	0	0	4	10
Amoxisillin	38	95	0	0	2	5
Ceftriaxone	30	75	0	0	10	25
Chloramphenicol	40	100	0	0	0	0
Netilmicin	15	38	0	0	25	63

 DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

Cefpodoxime	31	78	0	0	9	23
Cefoperazone	28	70	1	3	11	28
Ampisilin	38	95	0	0	2	5
Sulbactam-Ampi	40	100	0	0	0	0
Amox-Clavulanic Acid	26	65	0	0	14	35
Sulactum-Cefpirom	29	73	0	0	11	28
Cefotaxime	30	75	2	5	8	20
Streptomicin	32	80	0	0	8	20
Cefadroxil	37	93	1	3	2	5
Gentamicin	29	73	0	0	11	28
Tetracyclin	35	88	0	0	5	13
Cephalexin	39	98	1	3	0	0
Penisillin	40	100	0	0	0	0

Based on Table 12, *Klebsiella sp*. has the highest resistance to Chloramphenicol (100%), Sulbactam-Ampi (100%), Penicillin (100%), and were still sensitive to Amikacin (93%).

Escherichia coli

The results of resistance pattern distribution of *Escherichia coli* were obtained as follows:

Tabel 13.
Resistance Pattern Distribution of *E. coli*

Antibiotic	Resistant		Intermediate		Sensitive	
	n	%	n	%	n	%
Aztreonam	1	100	0	0	0	0
Trimetoprim	1	100	0	0	0	0
Amikacin	0	0	0	0	1	100
Meropenem	0	0	0	0	1	100
Ceftazidime	1	100	0	0	0	0
Cefixime	1	100	0	0	0	0
Amoxisillin	1	100	0	0	0	0
Ceftriaxone	1	100	0	0	0	0
Chloramphenicol	0	0	0	0	1	100
Netilmicin	0	0	0	0	1	100
Cefpodoxime	1	100	0	0	0	0
Cefoperazone	0	0	0	0	1	100
Ampisilin	0	0	0	0	1	100
Sulbactam-Ampi	0	0	0	0	1	100
Amox-Clavulanic Acid	0	0	0	0	1	100
Sulactum-Cefpirom	0	0	0	0	1	100
Cefotaxime	0	0	1	100	0	0
Streptomicin	1	100	0	0	0	0
Cefadroxil	1	100	0	0	0	0
Gentamicin	1	100	0	0	0	0
Tetracyclin	1	100	0	0	0	0
Cephalexin	1	100	0	0	0	0
Penisillin	1	100	0	0	0	0

Based on Table 13 *E. coli* has the highest resistance to Aztreonam (100%), Trimethoprim (100%), Ceftazidime (100%), Cefixime (100%), Amoxicillin (100%), Ceftriaxone (100%), Cefpodoxime (100%), Streptomicin (100%), Cefadroxil (100%), Gentamicin (100%), Tetracyclin (100%), Penicillin (100%), and was still sensitive to Amikacin (100%), Meropenem (100%), Chloramphenicol (100%), Netilmicin (100%), Cefoperazone (100%), Ampicillin (100%), Sulbactam-Ampi (100%), Amox-Clavulanic Acid (100%), Sulactum-Cefpirom (100%).

Streptococcus sp

The results of resistance pattern distribution of *Streptococcus sp* were obtained as follows:

Table 14
Resistance Pattern Distribution of *Streptococcus sp*

Antibiotic	Resistant		Intermediate		Sensitive	
	n	%	n	%	n	%
Aztreonam	9	82	0	0	2	18
Trimetoprim	8	73	0	0	3	27
Amikacin	3	27	0	0	8	73
Meropenem	2	18	0	0	9	82
Ceftazidime	5	45	0	0	6	55
Cefixime	9	82	0	0	2	18
Amoxisillin	9	82	0	0	2	18
Ceftriaxone	8	73	0	0	3	27
Chloramphenicol	11	100	0	0	0	0
Netilmicin	3	27	0	0	8	73
Cefpodoxime	6	55	0	0	5	45
Cefoperazone	3	27	0	0	8	73
Ampisilin	9	82	0	0	2	18
Sulbactam-Ampi	10	91	0	0	1	9
Amox-Clavulanic Acid	1	9	0	0	10	91
Sulactum-Cefpirom	9	82	0	0	2	18
Cefotaxime	7	64	1	0	3	27
Streptomicin	8	73	0	0	3	27
Cefadroxil	10	91	0	0	1	9
Gentamicin	5	45	0	0	6	55
Tetracyclin	11	100	0	0	0	0
Cephalexin	11	100	0	0	0	0
Penisillin	11	100	0	0	0	0

Based on Table 14 *Streptococcus sp* have the highest resistance to antibiotics Chloramphenicol (100%), Tetracyclin (100%), Cephalexin (100%), Penicillin (100%). Table 7 to Table 14 show that the majority of the tested microorganisms were mostly resistant to penicillin (100%) and sulbactam-ampi (> 96%). The majority of the bacteria identified in this study were most sensitive to amikacin (> 92%), the average sensitivity to amikacin was 89%. With the exception of *Streptococcus sp*., which was discovered to be the most sensitive to amox-clavulanic acid (91%) and meropenem (82%).

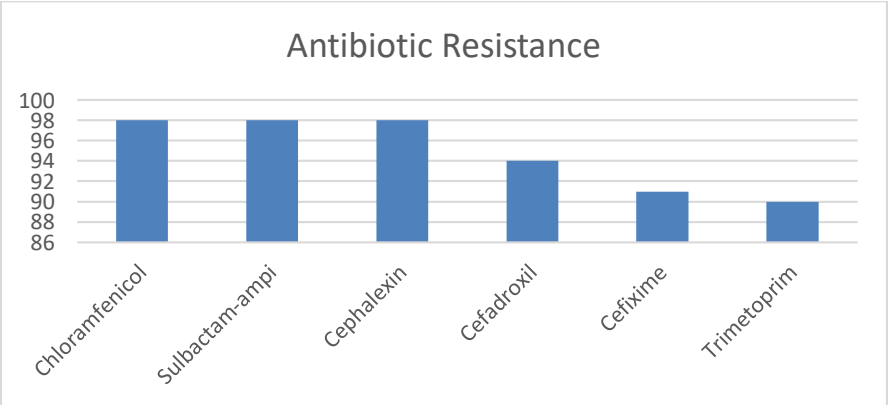

Figure 2. Antibiotic resistance

DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

Chloramfenicol, Sulbactam-ampi, and Cephalexin had the highest average resistance (98%), followed by Cefadroxil (94%), Cefixime (91%), and Trimethoprim (90%), as shown on Figure 2.

DISCUSSION

Frequency Distribution of Specimen Type

Based on analysis of bacterial culture tests performed in the Clinical Pathology Laboratory at Dr. H. Abdul Moeloek Hospital's Microbiology Devision, on January to March 2018, a variety of specimens, including blood, urine, pus, sputum, body fluids, and swab specimens; of these, 141 pus samples (47%) of the entire sample, were taken. Fourty eight blood samples (16%), 28 urine samples (9%), 54 sputum samples (18%), 9 body fluid samples (3%), and 20 swabs (7%). Numerous bacterial species, including *Enterobacter, Alcaligenes sp, Proteus sp, Klebsiella sp, Pseudomonas sp, Staphylococcus sp, Streptococcus sp*, and *E. coli*, were isolated from all specimens. Pus specimens were evidently the most prevalent specimens in cultures conducted.

The greatest threat from gram-positive bacteria right now comes from a pandemic of resistant *S. aureus* and *Enterococcus sp*. MRSA kills (CDC, 2013; Rossolini, 2014) more Americans year than AIDS, Parkinson's, emphysema, and homicide put together. Vancomycin-resistant enterococci as well as an increasing number of other infections, are becoming resistant to several popular medicines, according to (Gross, 2013; Golkar, Bagazra, Pace, 2014). Drug resistance among common respiratory infections, such as *Streptococcus pneumoniae* and *Mycobacterium* TB, is rampantly spreading around the globe (Ventola, 2015).

Gram-negative infections pose a special threat because they are increasingly resistant to almost all of the existing antibiotic medication alternatives, evoking conditions from the time before antibiotics were developed (CDC, 2013; Golkar, Bagazra, Pace, 2014; Rossolini, 2014). Every area of medicine has been impacted by the advent of Multi Drugs Resistance (and increasingly pan-resistant) gram-negative bacteria (Golkar, Bagazra, Pace, 2014). The most dangerous strains of gram-negative bacteria, including *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and Acinetobacter, are most frequently seen in healthcare settings. Gram-negative bacteria with resistance to (CDC, 2013; Rossolini, 2014) antibiotics are also growing in the population (Rossolini, 2014).

These include *Neisseria gonorrhoeae* and *Escherichia coli* that produce extended-spectrum beta-lactamases (Ventola, 2015). *Staphylococcus aureus* was resistant to antibiotics Penicillin G (100%), Gentamicin (41.67%), Ciprofloxacin (41.67%), and Ceftriaxone (50%) according to the pattern of microbial resistance in RSUD Dr. Moewardi from January to July 2015 regarding to prior study (Sulistianingrum, 2015).

Frequency Distribution of Bacterial Growth

The results of the bacterial culture study, which demonstrate that there is no bacterial growth in up to 304 samples but bacterial growth in up to 300 samples, reveal the presence of bacterial growth. *Enterobacter sp* had a growth rate of up to 98 (33%), which was the maximum. This is due to the widespread distribution of *Enterobacter sp* bacteria in the environment, food, water, soil, and vegetables. As opportunistic infections, *Enterobacter sp* can infect a person when their immune system is compromised.

When 141 samples were gathered for Pajariu *et al*.'s study at RSUD Dr. Kariadi Semarang in 2010, *Escherichia coli* accounted for up to 57.4% of the bacteria, whereas in the study mentioned above, *Enterobacter sp*. accounted for up to 98 (33%) (Pajariu A., Firmanti S. C., Isbandrio B., 2010). The researcher contends that this happens because the samples in each study were not the same number or from the same geographic region.

Distribution of Bacterial Growth Frequency by Room

In the completion of the culture investigation, it was discovered that the Melati room had the highest proportion of bacterial growth, with 66 samples (22%), followed by the ICU with 62 samples (21%), Alamanda with 27 samples (9%). In ICU rooms, bacteria were isolated from clothing, walls, floors, beds, equipment, and the air, according to earlier research (Hidayat, 2014; Khadoura, 2014; Hailemariam, 2016).

According to researchers, the Jasmine room was a lung disease treatment room where the majority of lung disease transmission occurs through the air, making it easier for bacterial growth to spread from patient to patient.

Bacterial Frequency Distribution Based on Bacterial Culture Result

Pseudomonas sp. have the highest levels of resistance to various antibiotics, including Amoxicillin, Sulbactam-Ampi, Cefadroxil, and Penicillin (100%) but it was still sensitive to Amikacin (88%). The *Enterobacter sp*. were still sensitive to Amikacin (93%), while having the highest Penicillin resistance (99%). Chloramphenicol, Sulbactam-

Ampi, Cefadroxil, and Penicillin were the antibiotics to which *Proteus sp*. were most resistant (100%) whereas Amikacin (95%) were still sensitive. *Alcaligenes sp* were still sensitive to Amikacin (82%), although having the maximum resistance to Sulbactam-Ampi, Cephalexin, and Penicillin (100%).

However, *Staphylococcus sp*. were still susceptible to Amikacin (89%), despite having the highest level of resistance to Trimethoprim, Cefixime, Chloramphenicol, Sulbactam-Ampi, and Penicillin (100%). While *Klebsiella sp*. was remained sensitive to Amikacin (93%), it had the maximum resistance to Chloramphenicol, Sulbactam-ampicillin, and Penicillin (100%). *Escherichia coli* has the highest resistance to antibiotics Aztreonam, Trimethoprim, Ceftazidime, Cefixime, Amoxicillin, Ceftriaxone, Cefpodoxime, Streptomicin, Cefadroxil, Gentamicin, Tetracyclin and Penicillin (100%), still sensitive to Amikacin, Meropenem, Chloramphenicol, Ampicillin, Netilamphenicol, Sulbactam-Ampi, Amox-Clavulanic Acid, and Sulactum-Cefpirom (100%) otherwise. While *Streptococcus sp* had the highest resistance to Chloramphenicol, Tetracyclin, Caphalexin, Penicillin (100%) however it was still sensitive to Amox-Clavulanic Acid (91%) and Meropenem (82%).

Chloramfenicol, Sulbactam-ampi, and Cephalexin had the highest average resistance (98%), followed by Cefadroxil (94%), Cefixime (91%), and Trimethoprim (90%). The majority of the bacteria identified in this study were most sensitive to amikacin (> 92%). On the other side, the average of antibiotic resistance levels for *Klebsiella pneumoniae, E. coli*, and *Staphylococcus aureus* were 56.82%, 54.55%, and 45.45%, respectively. With average bacterial resistance of *Klebsiella pneumonia* (56.82%), *E. coli* (54.55%), *P. vesicularis* (52.27%), *Proteus mirabilis* (46.97%), *Pseudomonas aeroginosa* (45.45%), *Enterobacter sp* (42.41%), and *Proteus morganii* (41.67%) were all gram-negative bacteria that were resistant to antibiotics. Gram-positive bacteria with an average level of resistance include *Staphylococcus aureus* (45.4%) and *Staphylococcus epidermidis* (50.01%) (Tuntun, 2022).

They have observed sulfamethoxazole, chloramphenicol, erythromycin, clindamycin, trimethoprim, and ampicillin were no longer effective for killing bacteria, with resistance rates ranging from 33.3% to 100%. Only three antibiotics, ciprofloxacin against bacteria *Pseudomonas aeruginosa, P. vesicularis, E. coli, Staphylococcus aureus*, and *Staphylococcus epidermidis*, still have 100% efficacy to kill bacteria. *Pseudomonas aeroginosa* was completely resistant to the antibiotics erythromycin and clindamycin. Trimethropim-resistant strains of *Proteus mirabilis* and *Yersinia sp*. (Tuntun, 2022).

The antibiotics ceftriaxone, erythromycin, clindamycin, and trimethoprim are all completely ineffective against *E. coli*. A hundred percent resistance to the drugs trimethoprim and clindamycin in *Enterobacter sp*. Meropenem is effective against *Proteus morganii* bacterium, *Klebsiella pneumoniae*, and *Staphylococcus aureus*. *Staphylococcus epidermidis* was completely resistant to the drugs of clindamycin and trimethoprim. Sulfamethoxazole, chloramphenicol, and ceftriaxone were all completely ineffective against *Klebsiella pneumonia*. *Klebsiella pneumoniae* was also found completely resistant to ceftriaxone (Tuntun, 2022). Even earlier studies discovered that *Staphylococcus aureus* was resistant to methycilin (MRSA) (Ekrami *et al*., 2011).

According to data from World Health Organization (WHO), 87 countries have seen third-generation cephalosporin resistance. Most nations indicate that more than 30% of *Klebsiella pneumoniae* have third-generation cephalosporin resistance; some even report more than 60% (Barai, 2010; WHO, 2014). The WHO report stated that had occurred resistance of *E. coli* to ciprofloxacin up 50% in five countries (WHO, 2014). Resistance *E. coli* to ciprofloxacin increased 5 times higher in 2010 than 2000 in the United States (Davis, 2015). This is contrary to the results research, which found that *E. coli* is still sensitive to ciprofloxacin which was a fluoroquinolone antibiotic (Tuntun, 2022).

In contrary with this study showed that typical bacteria were still sensitive to Amikacin, as is in line with a study carried out by Nurmala from 2011 to 2013 at RSUD Soedarso, Pontianak, Meropenem (82.89%) and Amikacin (76.34%) had the highest antibiotic sensitivity of all the microorganisms analyzed (Nurmala, 2015). Prior research revealed that while most strains of *Klebsiella pneumonia* and *Escherichia coli* that produce ESBL are still susceptible to Amikacin and Meropenem, they are already resistant to third-generation cephalosporins (Hayati, 2019).

According to the study's findings, the antibiotic Amikacin is the most sensitive. A semisynthetic Kanamycin called Amikacin is more resistant to the several enzymes that can break down other Aminoglycosides. Of the Aminoglycoside family, Amikacin possesses the largest breadth of antibacterial activity. Amikacin has a specialized resistance to the enzymes that activate Aminoglycosides and is effective against the majority of Gram-negative aerobic bacilli both outside of hospitals and in them. The majority of the *Serratia, Proteus*, *and P. aeruginosa* strains were among

 DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

them. In order to prevent the emergence of resistant strains, some hospitals restrict their use. Almost all strains of Klebsiella, Enterobacter, and *E. coli* that are resistant to Tobramycin and Gentamicin are sensitive to Amikacin (Goodman & Gilman, 2012).

This study conducted some bacteria were resistant to antibiotics. This demonstrates that in order to prevent treatment from being ineffective, antibiotics must be used to treat bacteria that have developed resistance to them. This demonstrates that the issue of resistance is a serious one that requires consideration from all stakeholders in order to be able to prevent and foresee it. Due to extrinsic and intrinsic factors, these Gram-negative bacteria are able to create a self-defense mechanism against antibiotics. Extrinsic variables can include things like overusing antibiotics, using medications at odd times, using the wrong dosage, and giving antibiotics to the wrong people. The existence of a plasmid-mediated intrinsic microbiological factor plasmid-mediated processes are responsible for bacteria's capacity to create metabolites, such as resistance to Trimethoprim and Chloramphenicol (Pelczar and Chan, 1988).

CONCLUSION

Pseudomonas sp, Enterobacter sp, *Proteus sp, Alcaligenes sp, Staphylococcus sp, Klebsiella sp*, *E. coli* and *Streptococcus sp*. were resistant to Chloramfenicol, Sulbactam-ampi, and Cephalexin had the highest average resistance (98%), followed by Cefadroxil (94%), Cefixime (91%), and Trimethoprim (90%). Most of the bacteria tested were most resistant to Sulbactam-Ampi (> 97%) and Penicillin (100%). The majority of the bacteria identified in this study were most sensitive to amikacin (> 92%), with an average sensitivity to amikacin of 89% ((with the exception of *Streptococcus sp*.,). Therefore, it can be utilized to increase the prudent use of antibiotics in order to overcome the nosocomial infections.

SUGGESTION

In order to minimalizing nosocomial infection, reduce antibiotic resistance, decrease the length of stay and cost-effectiveness of care at H. Abdul Moeloek Hospital, it is hoped that stakeholders who use antibiotics at the hospital will abide by the guidelines for antibiotic use.

REFERENCE

Barai, L., Fatema, K., Haq, J. A., Faruq, M. O., Ahsan, A. A., Morshed, M. A. H. G., &Hossain, M. B. (2010). Bacterial profile and their antimicrobial resistance pattern in an intensive care unit of a tertiary care hospital of Dhaka. *Ibrahim Medical College Journal*, 4(2), 66–69.

Bouza, E., Alonso, S., Asensio, A., Juan, G.D., Lucio, C.G., Larossa, C., *et al*. (2019). Information on nosocomial infections in the mainstream media: an opinion document, *Rev Esp Quimioter*;32(2): 165-177.

Centers for Disease Control and Prevention (CDC). (2013). Office of Infectious Disease Antibiotic resistance threats in the United States. http://www.cdc.gov/drugresistance/threat-report-2013. Accessed September 28, 2021.

Clinical Laboratory Standards Institute (2012). Performance standards for antimicrobial susceptibility testing; twenty second information supplement. CLSI. 3: 1-183.

Davis SL, Neuhauser MM, McKinnon PS, Quinolones. (2015). Infectious disease and antimicrobial agents. www.antimicrobe.org/new/d17.asp. Accessed November 4, 2021.

Ekrami, A., Kayedani, A., Jahangir, M., Kalantar, E., & Jalali, M. (2011). Isolation of common aerobic bacterial pathogens from the environment of seven hospitals, Ahvaz, Iran. *Jundishapur Journal of Microbiology*, 4(2), 75–82.

Firizki F., (2014). Pola kepekaan Escherichia coli dan Klebsiella sp terhadap antibiotik sefalosporin periode tahun 2008-2012 di Bandar Lampung, Universitas Lampung. https://onesearch.id/Author/Home?author=FEBRIY+FIRIZKI.S%2C++. Accessed September 4, 2021.

Golkar Z, Bagazra O, Pace DG. (2014). Bacteriophage therapy: a potential solution for the antibiotic resistance crisis. *J Infect Dev Ctries*. 2014;8(2):129–136.

Goodman & Gilman (2012). *Dasar Farmakologi Terapi*, Edisi 10. Penerbit Buku Kedokteran EGC, Jakarta.

Gross M. (2013). Antibiotics in crisis, *Curr Biol*; 23(24):R1063–R1065.

Hailemariam, M. (2016). Intensive Care Units and Operating Rooms Bacterial Load and Antibiotic Susceptibility Pattern. Journal of Surgery, 4(2), 60.

Hayati, Z., Rizal S., Putri R., (2019). Isolation Of Extended-Spectrum B-Lactamase (ESBL) Producing Escherichia coli and Klebsiella pneumoniae From DR. Zainoel Abidin General Hospital, Aceh. *Int. J. Trop. Vet. Biomed. Res*., 4(1) : 16-22.

Hidayat, Silvia, E. (2014). Identification of Microbial Patterns in the Intensive Care Unit (ICU) in RSUD Dr. H. Abdul Moeloek Bandar Lampung. *Jurnal Ilmu Kedokteran dan Kesehatan*, 1(1).

Khadoura, K., & Afifi, S. A. (2014). Environmental Infection Control in Intensive Care Units at Gaza Governorates: KAP Study*. Journal of Biology, Agriculture and Healthcare*, 4(27), 301-309.

Khan, H.A., Baig, F.K., Mehboob, R., (2017). Nosocomial infections: Epidemiology, prevention, control and surveillance. *Asian Pacific Journal of Tropical Biomedicine,* 7(5):478-482.

Pajariu A., Firmanti S. C., Isbandrio B. (2010). Infeksi Oleh Bakteri Penghasil Extended-Spectrum Beta-Lactamase (ESBL) Di RSUP Dr. Kariadi Semarang. Universitas Diponegoro. http://eprints.undip.ac.id/23056/1/Agno.pdf. Accessed September 2, 2021.

Pelczar, M. J., Chan, E. C. S. (1988). *Dasar-Dasar Mikrobiologi*. Jakarta: Universitas Indonesia Press.

Riset Kesehatan Dasar (2013). Badan Penelitian dan Pengembangan Kesehatan Kementrian Kesehatan RI, Jakarta.

Rossolini GM, Arena F, Pecile P, Pollini S. (2014). Update on the antibiotic resistance crisis. *Clin Opin Pharmacol*.;18:56–60.

Sulistianingrum N. F. (2015). *Pola kuman dan uji sensitivitasnya terhadap antibiotic pada penderita infeksi luka operasi (ILO) di RSUD DR Moewardi.* Skripsi. Universitas Muhammadiyah Surakarta.

Tuntun, M. (2022). Pola Bakteri Kontaminan Serta Resistensinya di ICU dan Ruang Operasi. *Jurnal Analis Kesehatan*, 11(1):1-10.

Ventola C. L. (2015). The Antibiotic Resistance Crisis. *Pharmacy and Theurapeutics*, Vol. 40(4): 278-83.

World Health Organization (WHO). (2001). Global Strategy for Containment of Antimicrobial Resistance: 1–55. https://apps.who.int/iris/handle/10665/66860. Accessed September 12, 2021.

World Health Organization. (2014). Antimicrobial resistance: Global Report on Surveillance. Geneva 27, Switzerland. (www.who.int/about/licensing/copyright_form/en/index.html). Accessed September 12, 2021.