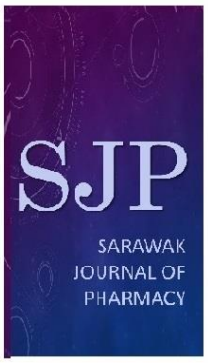
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Antibiotic Sensitivity and Spectrum of Bacterial Isolated in Hospital Kanowit: A Retrospective Study.

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INTRODUCTION: One of the most serious public health issues around the globe nowadays are antimicrobial resistance. High oral antibiotics uses are ampicillin ,penicillin VK, cloxacillin, erythromycin, and amoxicillin in Kanowit Hospital. One of the ways to reduce antibiotic usage is to know the local microbial culture and sensitivity. This study aims to identify the common bacteria that isolated in Hospital Kanowit Laboratory and to determine the antibiotic sensitivity of the common bacteria.

METHODS: All positive bacteria growth culture and sensitivity samples from In-patient and outpatient isolated from June 2013 to June 2014 included for this retrospective study.

RESULT & DISCUSSION: The antimicrobial resistance patterns of the various bacteria described here refer to clinical isolates encountered in our hospital laboratory. This study does not distinguish between the antimicrobial resistance patterns of bacteria in community acquired and hospital acquired infections, neither does it cover only the clinically significant isolates. The resistance rates described here only based on *in vitro* tests.

There are total of 435 specimens show bacterial growth recorded in this research, there are 360 total frequencies of resistances toward antibiotics found. The highest percentage frequencies of resistance was Ampicillin [143(39.72%) resistance], Augmentin [49(13.61%) resistance], and Co-trimaxazole [48(13.33%) resistance]. This might due to high usage of these antibiotics.

CONCLUSION: The most common bacteria isolated for sputum, urine, stool, swab, and pus culture and sensitivity are ***Klebsellia sp.***, ***Escherichia Coli, Escherichia Coli, Staphylococcus Aureus*** and ***Escherichia Coli*** respectively. These are correspondent to National Antibiotic Guidelines 2014. Similar study recommended to be implemented to all hospital especially in district hospital whereby our local setting bacterial culture and sensitivity might vary with tertiary hospital.

KEY WORDS: Antibiotic sensitivity; Spectrum of Bacterial Isolated

Introduction:

One of the most serious public health issues around the globe nowadays are antimicrobial resistance. Although the concerns may be different by region or country, clearly Asian countries are the epicentres of resistance. As we could observed that prevalence of resistance of major pathogens are increasing in these locations. However, "the public health infrastructure to combat this problem is very poor." [1] This alarmed us that we need to have a proper monitoring system on antibiotic sensitivity trend and usage from our own local setting.

The injudicious use of broad spectrum antibiotics had exacerbated developing resistance to many first line antibiotics. Different antibiotic policies in various regions have resulted in different degree of antibiotic resistance. [2] Nowadays, the prevalence rates of methicillin-resistant *Staphylococcus aureus* (MRSA), macrolide-resistant Streptococcus pneumoniae, and multidrug-resistant enteric pathogens are high. This due to the recent emergence of extremely drug-resistant gram-negative bacilli in Asia. Due to antimicrobial options for these pathogens extremely limited, infections caused by antimicrobial-resistant bacteria often associated with inappropriate antimicrobial therapy and poor clinical results. [1]

Thus, Knowledge of the local antimicrobial resistance patterns of bacteria indeed a valuable guide to empirical antimicrobial therapy and formulating antibiotic guidelines. It is also an important prerequisite for the control of emerging antimicrobial resistance in hospital which tend to provide an excellent environment for the emergence and spread of resistant bacteria. [3] Physicians should be aware of the current epidemiological status of resistance and understand the appropriate use of antimicrobial agents in clinical practice. [1]

Apart from that, such surveillance information would be of tremendous value to general practitioners as well to facilitate antimicrobial therapy. However **individual countries would have to generate their own national data as resistance rates vary considerably** between countries. [4] This give us an idea that this is rational, whereby there are possibility of vary resistance rate tertiary and district hospital even in the same country.

More important, we able to monitor the increasing trends of resistance to specific antibiotics can also serve as early warnings and national policies may then taken to arrest or reverse such trends. [4]

An example of a successful intervention is in Finland. A national effort to reduce the use of macrolides succeeded in lowering macrolide usage from 2.44 defined daily doses (DDD)/1000 inhabitants/day to 1.44 DDD/1000 inhabitants/day with an accompanying decrease in macrolide resistance in *Streptococcus pneumoniae* from 19% to 9% ($p < 0.001$). [4]

According to the data summated from January 2014 till June 2014, Antibiotic usage in term of DDD (Defined daily dose) per 100 patient admissions our Hospital is highest among all district t hospital without specialist. While DDD for 1000 patient stay in our wards are the third highest among all district hospital without specialist. Ampicillin subactam, injection ceftriaxone, injection cefoperazone, and injection ciprofloxacin are the high usage antibiotics in Hospital Kanowit for year 2014. While oral antibiotic usage for outpatient ampicillin are the most commonly use antibiotic followed by penicillin VK, cloxacillin, erythromycin, amoxicillin, and others.(Data of oral antibiotic usage only recorded for March 2014;only recorded Medical assistant oral antibiotic usage). This alarmed us there is a need to monitor our antibiotic usage in Kanowit Hospital. One of the ways to reduce antibiotic usage is to know the local microbial culture and sensitivity.

On top of that, we also observed that many inappropriate antibiotic usages among the medical prescribers. Thus the need of an antibiotic guideline or policy which fit to our local community especially needed to standardise or serve as a guideline to all medical prescribers to be more confident and accurately in prescribing antibiotics.

Therefore, this study focuses on describing the epidemiology or spectrum of common isolated bacteria and the antibiotic sensitivity in our local community and clinical antibiotic use according to the antimicrobial-resistant bacterial infections in Sarawak Kanowit region, aiming to create and keep our antibiotic policy up-to-date.

Methods:

This is a retrospective epidemiological study to see the prevalence of the common bacterial isolated and bacterial antibiotic resistant in local community from June 2013 till June 2014

All positive bacteria culture and sensitivity samples isolated in the period from June 2013 till June 2014 included for this study.

All **positive bacteria growth culture and sensitivity** samples from Inpatient and outpatient isolated from June 2013 to June 2014 included for this study. Sample that sent to lab for culture and sensitivity but showed no growth of pathogen excluded.

The data collected from our laboratory, to trace back all the culture and sensitivity records from June 2013 till June 2014. All the pathogen isolated categorised by sample source and their sensitivity against relevant antibiotic tested recorded into the data collection forms. One bacterium isolated possible to show resistance to more than one antibiotic, so we were interpreting the percentage of resistance frequency of the isolated bacteria toward respective antibiotic.

Reliability and Validity of the measurement tools

The data collecting form created base on the objective of this research, to collect the name of pathogen isolated, and their sensitivity particularly their resistance against relevant antibiotic tested on them according to laboratory guidelines and policy. Pilot testing done on the data collection form to assure the reliability and validity of the data collection form.

Statistical Analysis

Bacterial isolates and percentage of antibiotic resistant analysed by using the Statistical Package for the Social Sciences (SPSS) version 15. There isn't any biostatical analysis involved in this study served as an epidemiological study to explore the prevalence of the culture and sensitivity in Kanowit region.

Ethical Consideration

There is no human test subject involved, as this is a retrospective research we are only collecting data from the culture and sensitivity results documented in Laboratory Hospital Kanowit. No patient demographic data collected in this study. All the data only restricted to the principal investigators and used for research purposed only.

Results and discussion

Source of Infection and Spectrum of Bacterial Isolates:

The sources of infection categorised conveniently according to disease location. The frequency of commonly isolated bacteria interpreted in percentage of total cultures. The results summarised in Table 1. We found total of 435 bacteria isolated during the data collection period of time. Highest bacteria isolated were *Escherichia Coli* 244, follow by *Klebsellia sp.* 107, *staphylococcus aureus* 34, *pseudomonas sp.* 33, and *proteus sp*. 17.

Antimicrobial Sensitivity:

The sensitivity of bacterial isolates to antibiotics summarised according to the origin of the specimen in Table 2, Table 3, Table 4, Table 5 and Tablet 6. Top three antibiotic resistances in Hospital Kanowit summarised into Table 7. There were no cases of multiple resistance organism isolated such as ESBL, CRE, VRE or MRSA.

Table 1: Source of Infection and Spectrum of Bacterial Isolates:

Origin of the	Number of Positive Culture:	Common Bacteria	Percentage %

specimens	(Total Culture n=435)	Isolated(n)	
SPUTUM Culture and Sensitivity	**97**	***Klebsiella sp. (88)***	20.23%
		Pseudomonas sp.(9)	2.07%
URINE Culture and Sensitivity	**145**	***Escherichia Coli (139)***	31.95%
		Pseudomonas sp.(4)	0.92%
		Proteus sp.(1)	0.23%
		Klebsiella sp.(1)	0.23%
STOOL culture & sensitivity	**59**	***Escherichia Coli(59)***	13.56%
SWAB culture & Sensitivity	**74**	**Throat:**	
		Klebsiella sp.(18)	4.14%
		Wound:	
		Pseudomonas sp.(10)	2.30%
		Escherichia Coli (12)	2.76%
		Staphylococcus Aureus(20)	4.60%
		Genital:	3.22%
		***Escherichia Coli* (14)**	
PUS Culture and Sensitivity	**60**	***Proteus sp.(16)***	3.68%
		Pseudomonas sp.(10)	2.30%
		Escherichia Coli(20)	4.60%
		Staphylococcus Aureus(14)	3.22%
BLOOD Culture and Sensitivity	**No Bacterial Isolated**		

Table 2: Number of Resistance for Sputum Culture and sensitivity

Sample/Source	Isolated Bacteria	Numbers of Isolated case	Number of Resistance(Percentage	Resistance to Antibiotic

			of resistance frequency toward specific antibiotic)	
SPUTUM Culture and Sensitivity	***Klebsiella sp.***	88	**50 (56.8%)**	**Ampicillin**
			14(15.9%)	Amoxicillin
			2 (2.27%)	Cefuroxime
			1(1.1%)	Cefotaxime
			3(3.4%)	Co-trimaxazole
	Pseudomonas sp.	9	0	No resistance

Table 3: Number of Resistance for URINE Culture and sensitivity

Sample/Source	**Isolated Bacteria**	**Numbers of Isolated case**	**Number of Resistance(Percentage**	**Resistance to Antibiotic**

			of resistance frequency toward specific antibiotic)	
URINE Culture and Sensitivity	***Escherichia Coli***	139	**47(33.8%)**	**Ampicillin**
			33 (23.74%)	**Augmentin**
			8 (5.7%)	Gentamicin
			4 (2.88%)	Ciprofloxacin
			31(22.3%)	**Co-trimaxazole**
			5 (3.6%)	Ceftriaxone
			7 (5.04%)	Cefuroxime
			4 (2.88%)	Nitrofurantoin
			1 (0.72%)	Meropenem
	Pseudomonas sp.	4	3(75%)	Augmentin
			1(25%)	cefuroxime
	Proteus sp.	1	1 (100%)	Co-trimaxazole
			1(100%)	Cefuroxime
			1(100%)	Gentamicin
	Klebsiella sp.	1	1(100%)	Ciprofloxacin
			1(100%)	Co-trimaxazole
			1(100%)	Ampicillin

Table 4: Number of Resistance for STOOL Culture and sensitivity

Sample/Source	Isolated Bacteria	Numbers of Isolated case	Number of Resistance(Percentage of resistance frequency toward specific antibiotic)	Resistance to Antibiotic
Stool culture & sensitivity	***Escherichia Coli***	59	**25(42.37%)**	**Ampicillin**
			4(6.78%)	Augmentin
			2(3.39%)	Cefoperazone
			12(20.34%)	**Co-trimaxazole**
			1(1.69%)	Gentamicin
			5(8.47%)	Cefuroxime
			1(1.69%)	Ceftazidime
			1(1.69%)	Ceftriaxone

Table 5: Number of Resistance for SWAP Culture and sensitivity

Sample/Source	Isolated Bacteria	Numbers of Isolated case	Number of Resistance(Percentage of resistance frequency toward specific antibiotic)	Resistance to Antibiotic
Swab culture		74		

& Sensitivity				
Throat	***Klebsiella sp.***	18	**11(61.11%)**	**Ampicillin**
			4(22.22%)	Co-trimaxazole
			3(16.67%)	Cefuroxime
			5(27.78%)	Augmentin
			1(5.56%)	Gentamicin
wound	***Pseudomonas sp.***	10	2(20.00%)	Ceftazidime
			3(30.00%)	Ciprofloxacin
	Escherichia Coli	12	2(16.67%)	Ampicillin
			3(25.00%)	Cefuroxime
			1(8.33%)	Ciprofloxacin
			1(8.33%)	**Meropenem**
			1(8.33%)	**Ceftriaxone**
			4(33.33%)	Co-trimaxazole
			3(25.00%)	**Augmentin**
			1(8.33%)	Cefoperazone
			1(8.33%)	Gentamicin
			1(8.33%)	**Ceftazidime**
			1(8.33%)	**Imipenem**
	Staphylococcus Aureus	20	**5(25.00%)**	**Penicillin G**
			8(40.00%)	**Vancomycin**
			2(10.00%)	Gentamicin
			2(10.00%)	Co-trimaxazole
			1(5.00%)	Fusidic acid
			1(5.00%)	Rifampicin
HVS(genital swab)	***Escherichia Coli***	14	2(14.3%)	Ampicillin

Table 6: Number of Resistance for PUS Culture and sensitivity

Sample/Source	**Isolated Bacteria**	**Numbers of Isolated case**	**Number of Resistance(Percentage of resistance frequency toward specific**	**Resistance to Antibiotic**

			antibiotic)	
Pus Culture and Sensitivity	***Proteus sp.***	16	**1**(6.25%)	**Meropenem**
			1(6.25%)	Cefoperazone
	Pseudomonas sp.	10	**1(10.00%)**	**Ceftazidime**
			2(20.00%)	Ciprofloxacin
			1(10.00%)	**Imipenem**
			2(20.00%)	**Meropenem**
	Escherichia Coli	20	5(25.00%)	Ampicillin
			1(5.00%)	Cefuroxime
			1(5.00%)	Ciprofloxacin
			3(15%)	Co-trimaxazole
			1(5.00%)	Augmentin
			1(5.00%)	Cefoperazone
			1(5.00%)	Gentamicin
			1(5.00%)	**Imipenem**
	Staphylococcus Aureus	14	**5(35.71%)**	**Penicillin G**
			2(14.29%)	**Vancomycin**
			1(7.14%)	Gentamicin
			1(7.14%)	Co-trimaxazole
			1(7.14%)	Fusidic acid
			1(7.14%)	Rifampicin
			1(7.14%)	Erythromycin

Table 7: Summarised total number of bacterial resistant to specific antibiotic (top10)

Antibiotic	Total number of Resistance	Total number of bacteria resistant to specific antibiotic	Percentage of resistant of bacteria to specific antibiotic
Ampicillin	**360**	**143**	**39.72%**
Augmentin	**360**	**49**	**13.61%**

Co-trimaxazole	**360**	**48**	**13.33%**
Cefuroxime	**360**	**23**	**6.39%**
Gentamicin	**360**	**16**	**4.44%**
Amoxicillin	**360**	**14**	**3.89%**
Ciprofloxacin	**360**	**12**	**3.33%**
Vancomycin	**360**	**10**	**2.78%**
Penicillin G	**360**	**10**	**2.78%**
Ceftraxone	**360**	**7**	**1.94%**

Tablet 2 shows sputum culture and sensitivity, we can observed that out of 88 samples isolated with Klebsiella sp. of them was resistant to ampicillin, followed by amoxicillin, cefuroxime, cefotaxime, and for co-trimaxazole. Nine sample of sputum culture and sensitivity isolated Pseudomonas sp. but none of them show any resistant.

There is a possibility due to high usage of ampicillin which lead to ampicillin resistant in Hospital Kanowit. Further studies which link the usage of antibiotic (DDD) in Hospital Kanowit with the culture of sensitivity recommended to prove the hypothesis. For now we still recommended try avoid using ampicillin for empirical treatment, especially in outpatient setting, whereby at the state of uncertain of is it a bacterial infection or viral fever. Besides, avoid ampicillin for patient complaining condition such as, Upper respiratory tract infection (URTI), tonsillitis and etc., to treat if really indicated.

Recent research done by Little et. al. 2014 evaluated the effectiveness of delayed antibiotic prescribing strategies for respiratory tract infections in 889 United Kingdom primary care patients (age ≥3 y) assessed as not requiring immediate antibiotics. They reported that using strategies of either no or delayed prescription resulted in fewer than 40% of the patients across 25 practices using antibiotics. Furthermore, no or delayed prescription strategies associated with patients having less strong beliefs in the use of antibiotics, and **symptomatic outcomes were similar** to those observed in patients who **received immediate antibiotic prescription.** [5]

For pediatric patients, the usage of ampicillin need to strictly followed the guidelines whereby 10-25mg/kg QID for; severe infections 50mg/kg IV BD (1st week life); QID (2-4weeks life). This is to avoid any over dosing and under dosing especially come to pediatric patient which their dose calculated based on body weight. [6]

On the other hand, review article done by Cheol-in Kang et.al. 2013, very high prevalence rates of beta-lactam and macrolide resistance in *S. pneumoniae* (one of the most common bacteria to cause URTI) target have been found in Asian countries erythromycin resistance has increased dramatically in many Asian countries, where > 70% of clinical isolates were fully resistant. [1]

Fortunately in our local setting the resistances toward erythromycin are not common as we could see there is only single resistance (staphylococcus isolated from pus culture and sensitivity) toward macrolide in our study period of time. There is no single case of isolated streptococcus pneumonia cases show resistant to macrolide in our local setting.

From table III urine culture and sensitivity, the most common bacterial isolated was *Escherichia Coli*. we can observed that out of 139 sample isolated with *Escherichia Coli* **47(33.8%) of them are resistant to ampicillin**, followed by **33 (23.74%) resistant to Augmentin**, **31(22.3%) resistant to co-trimaxazole**, 7(5.04%) for cefuroxime, 4 (2.88%) for ciprofloxacin, and **1 (0.72%) resistant to Meropenem.**

4 sample of sputum culture and sensitivity isolated Pseudomonas sp. whereby 3 out of 4(75%) of them are resistance to Augmentin and 1(25%) are resistance to cefuroxime, 1 Proteus sp. which are resistance toward Gentamicin, co-trimaxazole, and cefuroxime. Last but not the least, 1 Klebsiella sp. isolated are resistance toward ciprofloxacin, co-trimaxazole, and ampicillin. We can conclude that most prominent bacteria isolated through urine culture and sensitivity is *Escherichia Coli* which is accordance to the likely organism suggested by national antibiotic guidelines 2014 in treating urinary tract infection. [7][8]

47 sample of *Escherichia Coli* isolated shows resistance towards Augmentin, this extended spectrum beta lactamases producing bacteria? Or is our local setting shows the increasing trend of resistance toward extended spectrum antibiotic?

The National Committee for Clinical Laboratory Standards (NCCLS) [9], developed standard disk diffusion method as screening tests using selected antimicrobial agents as listed in the table below. More antimicrobial agents used for screening will definitely improve the sensitivity of detection. However, due to cost constrain, suggested Cefpodoxime and ceftazidime show the highest sensitivity for ESBL detection. [9]

Any zone diameter within the "grey zone" for each *Klebsiella pneumoniae*, *K.oxytoca*, or *Escherichia coli* isolate then only considered as a potential ESBL-producer strain requiring **phenotypic confirmatory testing.**(please refer reference [9] the particular guideline for more details) This clearly shows that we not able to determine ESBL-producing organism until we performed the test mention above.

Table 8: Consesus Guidelines for the management of infections by ESBL-producing bacteria; Ministry of Health Malaysia, Academy of medicine of Malaysia, and Malaysia Society of infectious disease and chemotherapy Year 2001"

	Zone diameter for susceptible strains	Zone diameter for possible ESBL-producing strains	MIC for susceptible strains	MIC for possible ESBL-producing strains
Aztreonam 30 µg	≥ 22 mm	≤ 27 mm	≤ 8 mg/L	≥ 2 mg/L
Cefotaxime 30 µg	≥ 23 mm	≤ 27 mm	≤ 8 mg/L	≥ 2 mg/L
	≥ 21 mm	≤ 22 mm	≤ 8 mg/L	≥ 2 mg/L
Cefpodoxime 10 µg	≥ 18 mm	≤ 22 mm	≤ 8 mg/L	≥ 2 mg/L
Ceftazidime 30 µg	≥ 21 mm	≤ 25 mm	≤ 8 mg/L	≥ 2 mg/L
Ceftriaxone 30 µg				

Based on the findings we recommended first line for treating urinary tract infection (UTI), will be cephalexin in Kanowit region, due to high resistance of *Escherichia Coli* toward co-trimaxazole [31(22.3%)]. For severe infections (e.g. Urosepsis) suggesting cefuroxime, to avoid using ampicillin or Augmentin for UTI. Unless using Augmentin to cover URTI and UTI together, but must always trace the urine culture and sensitivity. To avoid under treating especially for acute complicated and uncomplicated pyelonephritis as the duration of treatment suggested by national antibiotic guidelines 2008 is 2weeks. [7]

Certain antimicrobials like quinolones promote emerging resistance more than others. Quinolone usage has linked to an increase in *Methicillin-ResistantStaphylococcus aureus* and with increased quinolones resistance in gram negative *bacilli*. [10] To avoid using Ciprofloxacin as a single agent in treating UTI or any complications that need the used more than 5 days duration to avoid resistant. Suggest combining with other agents to reduce the treatment durations. However, need discussion with relevant specialist for the use of ciprofloxacin.

The only bacteria isolated in stool culture and sensitivity (Table IV) is ***Escherichia Coli*** which is total of 59 cases. Again 25(42.37%) bacteria isolated show resistance toward ampicillin which is the highest, follow by 4(6.78%) resistant to Augmentin, 2(3.39%) resistant to cefoperazone, 12(20.334%) resistant to co-trimaxazole, 1(1.69%) resistant to Gentamicin, cefuroxime, ceftazidime, and ceftriaxone. Lastly 5 out of 59(8.47%) isolation is resistant to cefuroxime.

This is possible of contamination of the culture or exposures that result in illness include consumption of contaminated food, consumption of unpasteurized (raw) milk, consumption of water that has not disinfected, contact with cattle, or contact with the feces of infected people, further investigation need to be done. [11]

Suggest non-specific supportive therapy for E.coli cause diarrhea, including hydration, is important. Antibiotics should not be used to treat this infection. There is no evidence that treatment with antibiotics is helpful, and taking antibiotics may increase the risk of Hemolytic uremic syndrome (HUS). Antidiarrheal agents like Loperamide may also increase that risk. [11]

From our culture and sensitivity results show most of the time stool culture and sensitivity taken shows only ***Escherichia Coli***, this give us a guide not simply treat any diarrhea cases as anaerobic infections with metronidazole, unless there is culture and sensitivity shows other than E. Coli or suspecting others infections(e.g. Salmonella/typhoid).

For swap culture and sensitivity, different site of swap contribute to different type of bacteria. From our observation, all 18 **throat swap** the only bacteria isolated is ***Klebsiella sp.*** and 11(61.1%) of them are resistant to ampicillin. Again ampicillin is topping the resistance list. This followed by 5(27.78%) Augmentin, 4(22.2%) co-trimazaxole, 3(16.67%) cefuroxime, and 1(5.56%) Gentamicin.

For **wound swap culture and sensitivity**, the most prominent bacteria isolated were **staphylococcus aureus** (20 samples). 8 of them (40%) are resistant to vancomycin, 5 of them (25%) resistant to penicillin, 2 of them (10%) resistant to co-trimaxazole and Gentamicin respectively, 1 out of 20 (5%) of them resistant to fusidic acid and rifampicin respectively. We found 12 *Escherichia coli* isolated from the wound swap culture and sensitivity, there is 4 (33.33%) resistant to co-trimaxazole, 3 (25%) resistant to augmentine and cefuroxime, while 2 (16.67%) resistant to ampicillin, and 1 of them (8.33%) resistant to ciprofloxacin, meropenem, imipenem, Gentamicin, Augmentin, ceftazidime, and ceftriaxone respectively. Furthermore, there are 10 samples which are positive growth of *pseudomonas sp.* from wound swap culture and sensitivity. 3 out of 10(30%) of the *pseudomonas sp.* isolated are resistant to ciprofloxacin, while 2 out of 10 (20%) of them resistant to ceftazidime.

According to study done by Cheol-in Kang et.al. 2013, vancomycin intermediate *Staphylococcus aureus* and Vancomycin resistance *Staphylococcus aurue*s are relatively low in Asia country. [1] However, from Table V Wound swap culture and sensitivity, the most prominent bacteria is *staphylococcus aureus*, and 8 sample out of 20 (40.00%) that resistant to Vancomycin. This shows great deviation from the reviewed article. So this make us wondering is these bacteria isolated are MRSA or not?

As according to same reviewed article, Asian countries have shown very high rates (> 50%) of MRSA, which is the most important cause of hospital-acquired infections such as pneumonia, surgical site infections (SSI), and bloodstream infections. [1]

This is a concern to our district hospital. Fortunately, these 8 cases are not methicillin resistance *staphylococcus aureus* (MRSA) cases whereby all of them are methicillin sensitive *staphylococcus aureus* (MSSA) however resistant toward vancomycin.

MRSA can only classified once the *staphylococcus aureus* isolated resistance to methicillin or oxacillin. According to the study done by Jose Maria Aguado et.al 2011**,** they found that, was the relatively high incidence of high vancomycin MIC among MSSA strains producing bacteremia (23.2%), a result similar to the percentage found for MRSA strains in their hospital. [12] Hence, these shows there are equally high possibilities of MSSA and MRSA which show resistance towards vancomycin which known as Vancomycin resistant *staphylococcus aureus* (VRSA) and yet this is happening in our local community.

However, we cannot rule out the possibilities of those vancomycin resistant *staphylococcus aureus* are isolated from patients that are referral back from Hospital Sibu. This suggest us a closer monitoring or further research on this particular topic are necessary. Last but not the least, for genital swap the only isolated bacterial was *Escherichia Coli* 2 out of 14 (14.3%) yet again shows resistance toward ampicillin.

For pus culture and sensitivity (Table VI), *Escherichia coli* remain as the most prominent bacteria isolated (20cases), 5 out of 20 (25%) resistant toward ampicillin, 3 out of 20 (15%) resistant to Co-trimaxazole, and 1 out of 20(5%) resistant to cefuroxime, ciprofloxacin, Augmentin, gentamicin, imipenem, cefoperazone.

Follow by *proteus sp.* (16cases isolated), 1 out of 16 of them (6.25%) is resistant to **meropenem** and cefoperazone. Furthermore, 14 samples isolated are *Staphylococcus aureus,* and **5 (35.71%) of them are resistant to penicillin**, **2 resistant to vancomycin**, and the chance of resistant to gentamicin, co-trimazaxole, fusidic acid, rifampicin, and resistance of erythromycin are 1 out of

14(7.14%). Lastly, the least isolated bacteria *Pseudomonas sp.* (10cases). 2 out of 10 cases (20%) of *Pseudomonas sp.* Isolated are resistance to **meropenam** and ciprofloxacin, while 1 out of 10cases (10%) of *Pseudomonas sp.* Isolated are resistance to **Imipenam and ceftazidime.**

Based on the finding, we could conclude here were most of the bacteria isolated from pus culture and sensitivity in Hospital Kanowit is **gram negative** bacteria. The only gram positive bacterium isolated was *staphylococcus aureus* there was 5(37.51%) of resistant toward penicillin G/V thus, would suggest avoiding Penicillin V for any **wound and pus culture** as ***Staphylococcus aurues*** are **commonly isolated** especially wound swap culture and sensitivity and both culture and sensitivity show high resistance toward Penicillin G/V. As for *Escherichia coli* and P*roteus sp.* isolated and their resistant trend are quite scatter and limited respectively.

For **pus and wound swap culture and sensitivity** we could observe there are many enterobacter such as *Escherichia coli* and proteus sp. and pseudomonas sp. is resistant to certain carbapenem as well as 3rd generation cephalosporin. Is this a carbapenem resistant *pseudomonas aureginosa* or enterobacteriacae? Again to avoid confusion, we like to show the criteria of CRE summarise in table 9.

Table 9: Criteria of CRE

Antibiotic	Zone of inhibition (mm) Disk Diffusion method			MIC (ug/mL)		
	S	I	R	S	I	R
Cephalosporins						
Ceftriaxone, 30 µg	≥23	20-22	≤19	≤1	2	≥4
Cefotaxime, 30 µg	≥26	23-25	≤22	≤1	2	≥4
Ceftazidime, 30 µg	≥21	18-20	≤17	≤4	8	≥16
Carbapenems						
Ertapenem 10 µg	≥22	19-21	≤18	≤0.5	1	≥2
Meropenem 10 µg	≥23	20-22	≤19	≤1	2	≥4
Imipenem 10 µg	≥23	20-22	≤19	≤1	2	≥4

Adopted from "Medical development department, Notification process and management guidelines on Carbapenem Resistant Enterobacteriaceae (CRE) in Hospital Ministry of Health Malaysia, third edition May 2013."

CRE suspected non-susceptibility (Intermediate/Resistance) to one of the following carbapenems: imipenem, meropenem, ertapenem (exclusion criteria please refer to the specific guidelines) and

Resistant to all ceftriaxone, cefotaxime, ceftazidime by disc diffusion test. The laboratory shall use ertapenem, meropenem and imipenem discs for the above test for all Enterobacteriaceae. [13]

For carbapenemase-producing non-lactose fermenting gram-negative species (e.g. Pseudomonas sp.) should consider altering this procedure to include characterisation of colonies with a morphology that is consistent with those species. [14]

For blood culture and sensitivity, there is no bacterial growth during the period of data collection. This mainly is due to the conventional method we are using now in most of the Sarawak district hospital is less sensitive to yield growth. This is proven by the research done by Sesli Cetin et.al 2007, as well as G Thuret et.al. 2002. Even though, both the research are detecting sterile body fluids and standard cornea organ culture medium respectively, but both of them given the similar outcome to shows that blood culture bottles (such as BACTEC) are superior in detecting bacterial growth compare with conventional method. [15][16]

Yield rate of the conventional method in hospital Kanowit for year 2014, whereby we collect total number of blood culture and sensitivity that yield positive pathogenic growth (9 samples) and divided to the total blood culture and sensitivity done(804 sample tested) are just 1.12%. There are needs to do a research on this topic to look for the cost effectiveness in using the BACTEC bottle against the conventional method we are using now.

Lastly, table VII are basically is the summary of the rank of antibiotic according to number of bacterial resistance. There are 360 total frequencies of resistances toward antibiotics found. The highest percentage frequencies of resistance was **Ampicillin [143(39.72%) resistance]**, **Augmentin [49(13.61%) resistance]**, and **Co-trimaxazole [48(13.33%) resistance],** which are concerning us. Strategic to reduce the use of the antibiotic mention above needed and some suggestion had already discussed in the earlier discussion.

Study Limitation:

The antimicrobial resistance patterns of the various bacteria described here refer to clinical isolates encountered in our hospital laboratory. This study does not differentiate between the antimicrobial resistance patterns of bacteria in community acquired and hospital acquired infections, neither does it cover only the clinically significant isolates. The resistance rates described here only based on *in vitro* tests.

The culture and sensitivity of antibiotic tested according to a standard guideline, there are possibility of the bacteria might resistant toward other antibiotic which not tested. Even though our hospital does not have some of the antibiotic use to test the culture and sensitivity, we will still test it as this is part of the guideline. So the results will still included in this research. There is the possibility of wrong culture and sensitivity results, as the MIC read by the lab technicians which are very subjective.

Conclusion

The most common bacteria isolated for sputum, urine, stool, swab, and pus culture and sensitivity are ***Klebsellia sp.***, ***Escherichia Coli, Escherichia Coli, Staphylococcus Aureus*** and ***Escherichia Coli*** respectively. These are correspondent to National Antibiotic Guidelines 2014. Fortunately in our local setting there are not much multiple drug resistance organisms. However out of 435 specimens show bacterial growth recorded in this research, there are 360 total frequencies of resistances toward antibiotics found. We shall continue our current effort to avoid increase resistance of microorganism.

Similar study recommended to be implemented to all hospital especially in district hospital whereby our local setting bacterial culture and sensitivity might vary with tertiary hospital. Besides, the antibiotic which available limited and there is a need to monitor antibiotic use or switching of antibiotic use based on the local culture and sensitivity.

Data collection of culture and sensitivity are recommended, proper documentation or tabulation of the data into standardises form which ease future referral needed. This will give us benefit

once we need to review the culture and sensitivity trend in respective hospital or these valuable data able to be collected easily national wide.

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