Antimicrobial resistance surveillance in Clinical isolates from GMH - Bombo and Bwera hospital

2nd NAMRIP Symposium

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INTRODUCTION (1)

- Antimicrobial resistance is becoming a serious threat to public health and undermining the power of antimicrobial agents to control infectious diseases

- WHO Antimicrobial Resistance Global Report on surveillance which noted
  - Very high rates of resistance in bacteria that cause common HAI & CAI (e.g. urinary tract infection, pneumonia) in all WHO regions

  - Significant gaps in surveillance, and a lack of standards for methodology, data sharing and coordination (WHO 2014)

INTRODUCTION (2)

- One of the 5 strategic objectives of the Global Action Plan is to strengthen the evidence base through enhanced AMR surveillance & research.

- AMR surveillance is the cornerstone for
  - assessing the burden of AMR
  - for providing the necessary information for action in support of local, national & global strategies

- With support from the GEIS, In 2012 MUWRP initiated an AMR surveillance programme at 2 hospital sentinel sites
  - GMH-Bombo
  - Bwera Hospital

GOALS AND OBJECTIVES

- **Goal is**
  - to strengthen the capacity of hospital labs to conduct AMR surveillance for clinically important bacteria in Uganda
  - contribute to global efforts for resistance containment strategies

- **Specific objectives**
  - Strengthen the capacity of hospital labs to undertake AST & provide reliable susceptibility data on clinically important pathogens
  - Monitor the prevalence and trends of AMR in clinically important pathogens
  - Provide reliable data to policy makers & stakeholders for the design and monitoring of interventions for the containment of AMR
  - Improve awareness for infection control to reduce transmission of HAI

METHODS (1)

- Evaluation of the labs for AMR surveillance
  - Human resource in the labs (personnel), Utilities (Electricity, water), Equipment & Supplies
- Training of clinical staff & laboratory staff at each selected health facility undertaken for
  - appropriate sample collection, analysis, data compilation and achieving / referral of isolates
- Standard clinical & laboratory materials, equipment and reagents were provided to each hospital laboratory, as assessed and required
- Support laboratories with
  - SOPs for samples analysis, training sample analysis

METHODS (2)

- All testing were conducted at the health-care facility labs
  - in accordance with the SOPs
- AST was undertaken using Kirby Bauer disk diffusion methods
  - according to Clinical and Laboratory Standards Institute (CLSI) guidelines CLSI M02-A10 (2008)
- Performance Standards for Antimicrobial Disk Susceptibility Tests;
  - Approved Standard- Tenth Edition at the sentinel laboratories with relevant ATCC control strains
- Isolates were classified as susceptible, intermediate or resistant using the CLSI Standards

METHODS (3)

- Routine internal QC testing with a range of control strains was done as part of the quality assurance process

- Culture and Drug susceptibility results for isolates are generated
  - Individual patient results are issued to guide patient management
  - Monthly reports are generated
  - Multidrug Resistant isolates (MRSA, VISA, CREs) are archived for further characterisation
    - especially for the ESKAPE pathogens
  - Reports generated for stakeholders

RESULTS1 SPECIMENS SUBMITTED

	GMH OPD	Bwera OPD	GMH IPD	Bwera IPD	Total submitted
Blood culture	455	9	157	47	668
Urine	359	119	107	60	645
Pus aspirate/swab	104	62	152	53	346
Stool / rectal swab	127	46	37	112	322
Endocervical / Cervical swab	61	26	30	18	135
Sputum	20	28	12	27	87
Cerebrospinal Fliud (CSF	2	0	35	34	71
Urethral swab	7	36	4	3	50
Pleural	1	1	1	14	17
Ascitic fluid	2	1	8	4	15
Knee aspirate	-	3		10	13
Ear swab	0	5	1	-	6
Eye swab	-	3		1	4
Peritoneal	-	-		3	3
Total collected	**1,138**	**339**	**544**	**442**	**2,463**

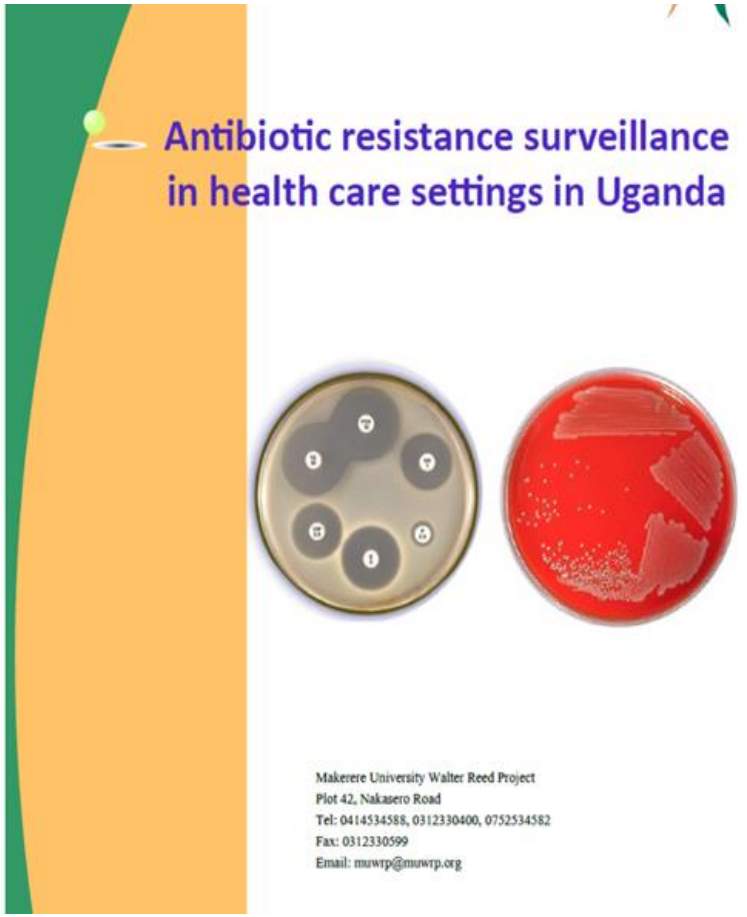
RESULTS 2: ISOLATES RECOVERED

Bacterial isolate	GMH	Bwera	Total	% of all
Staphylococcus aureus	164	90	254	26.5%
Escherichia coli	87	46	133	13.9%
Coagulase –ve Staphylococci)	68	13	81	8.4%
Klebsiella spp	59	16	75	7.8%
Vibrio cholerae		47	47	4.9%
Other Streptococcus spp	17	23	40	4.2%
Shigella spp	26	11	37	3.9%
Neisseria gonorrhoeae	4	29	33	3.4%
Streptococcus pyogenes	2	26	28	2.9%
Citrobacter freundii	17	9	26	2.7%
Proteus mirabilis	12	12	24	2.5%
Pseudomonas aeruginosa	14	10	24	2.5%
Acinetobacter spp	15	4	19	2.0%
Proteus vulgaris	14	2	16	1.7%
Unidentified Gram Negative rod	14	2	16	1.7%
Enterobacter spp	9	6	15	1.6%

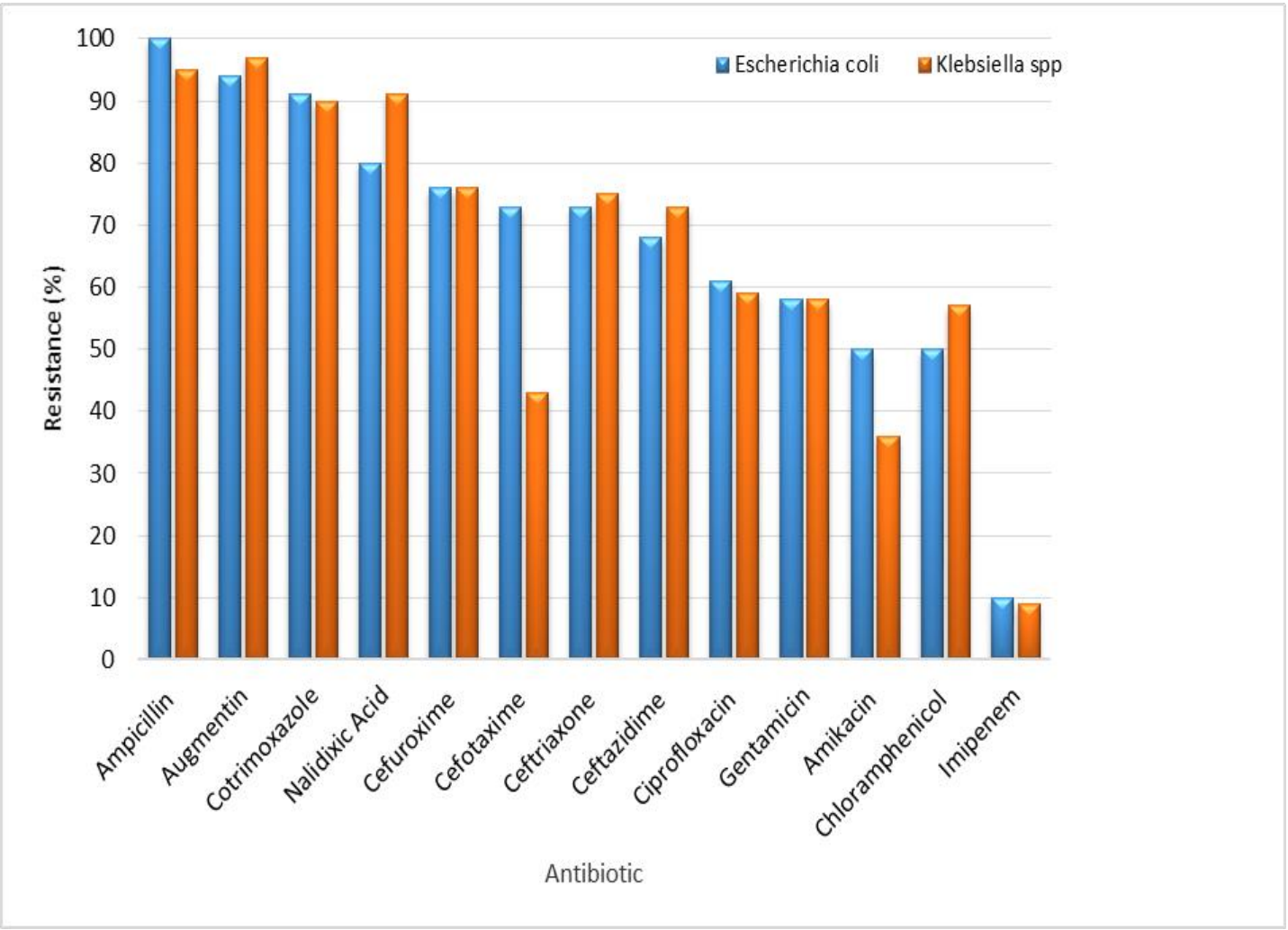
Bacterial isolate	GMH	Bwera	Total	% of all
Enterococcus spp	12		12	1.3%
Morganella morganii	10	2	12	1.3%
Salmonella paratyphi A	12		12	1.3%
Salmonella spp	5	5	10	1.0%
Streptococcus pneumoniae	7	3	10	1.0%
Listeria monocytogenes	8		8	0.8%
Salmonella typhi	7		7	0.7%
Providencia spp	5		5	0.5%
Alcaligenes spp	4		4	0.4%
Pseudomonas (other) spp	3	1	4	0.4%
Serratia marcescens	2		2	0.2%
Group B Streptococcus	2		2	0.2%
Unidentified Gram Positive rod	2		2	0.2%
Moraxella catarrhalis	1		1	0.1%
Rhodococcus spp	1		1	0.1%
Total	**603**	**357**	960	100%

RESULTS 3

- a total of 2,463 samples
  - 1,682 GMH Bombo & 781 Bwera hospital
- 960 clinically significant isolates were recovered & tested for drug susceptibility
  - Most of the isolates exhibited high levels of resistance to multiple antibiotics
- The most common bacteria were
  - *Staphylococcus aureus* (26.5%)
  - *Escherichia coli* (13.9%)
  - *Klebsiella* spp (7.8%)
- *Vibrio cholera* were recovered from the Cholera outbreak in Kasese during the period



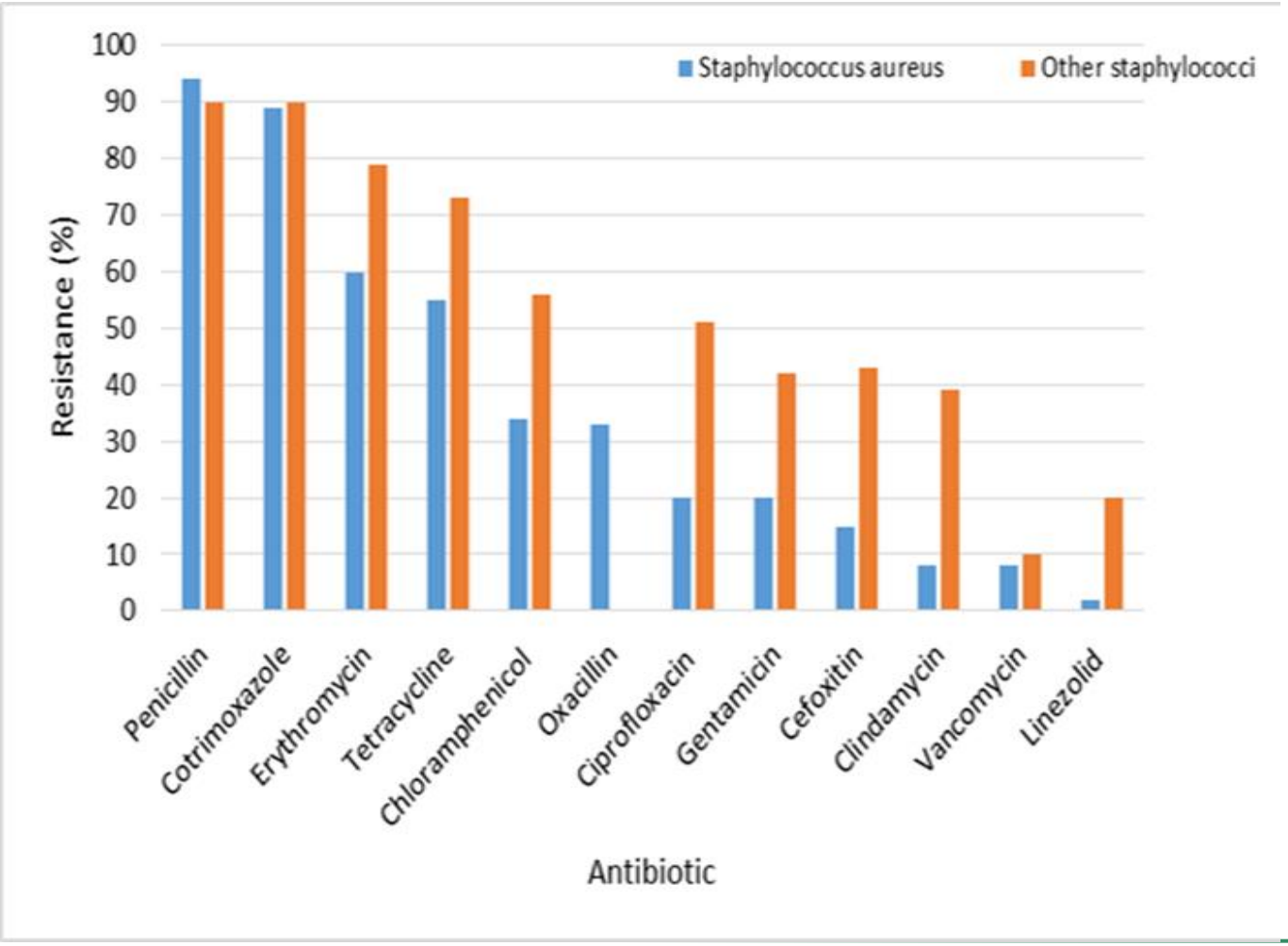
RESULTS 4 – ANTIMICROBIAL SUSCEPTIBILITY



Gram negative bacteria

- most (80%) were resistant to ampicillin, augmentin, cotrimixazole & nalidixic
- 50-80% were resistant to cepharosporins (2nd & 3rd generation),ciprofloxacin, gentamycin & chloramphenicol
- 50% were resistant to amikacin about 10% were resistant to iminepem

RESULTS 5 ANTIMICROBIAL SUSCEPTIBILITY



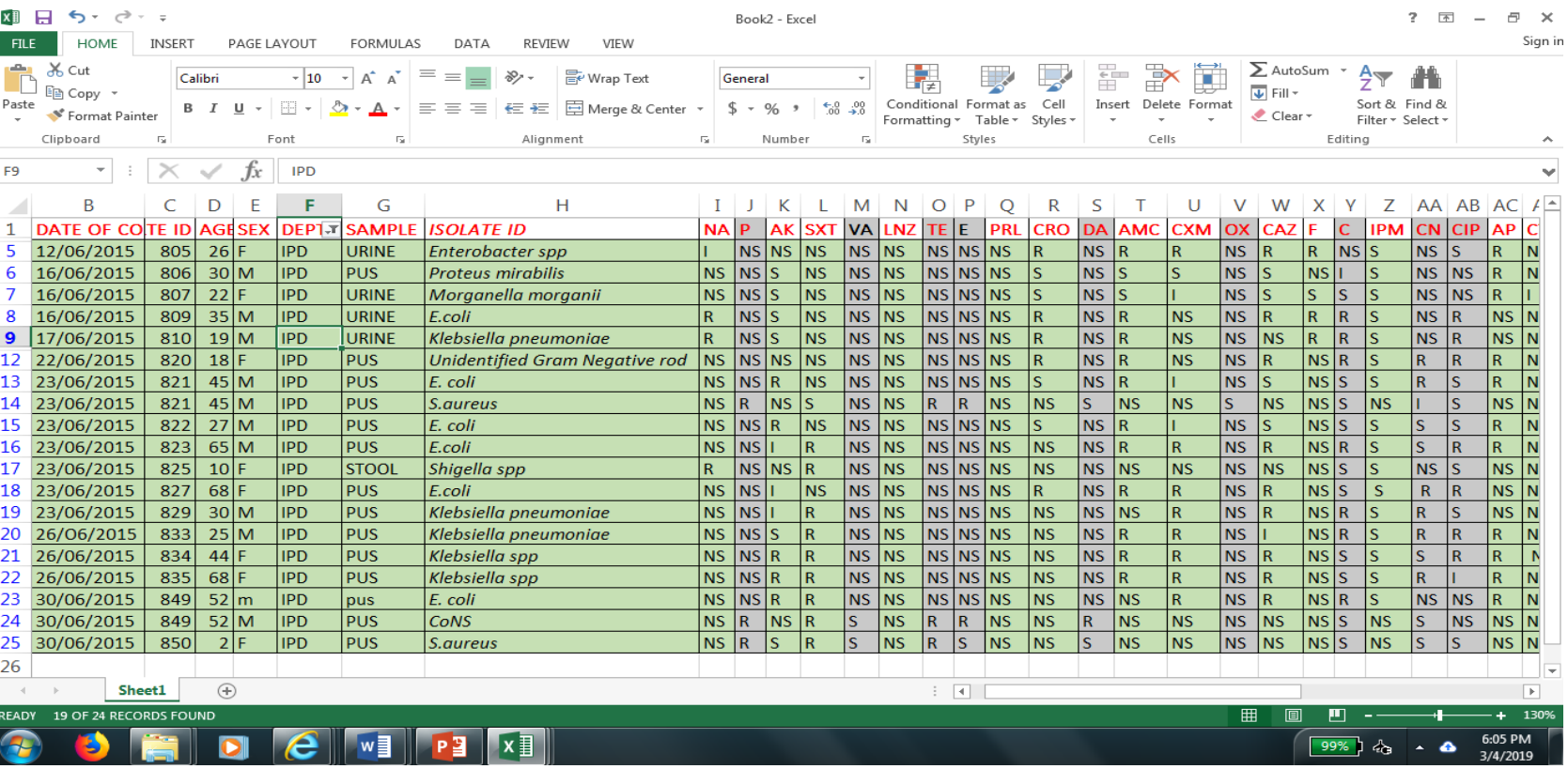
Gram positive bacteria

- the majority (80%) were resistant to penicillin & Cotrimoxazole
- 50-80% were resistant to erythromycin and tetracycline
- 10-50% were resistant to chloramphenicol, ciprofloxacin and gentamycin
- Most were sensitive to Linezolid, Vancomycin, & Clindamycin

Resistance patterns of isolates (Percentage resistance is (# resistant over total tested shown in brackets)

Antibiotic	*Escherichia coli*	*Klebsiella spp*	*Proteus spp*	*Pseudomonas spp*	*Morganella morganii*	*Enterobacter spp*	*Citrobacter freundii*	*Salmonella spp*	*S. aureus*	*CoNS*	*Vibrio cholerae*
Imipenem	10 (9/89)	18 (9/51)	16 (3/19)	6 (1/16)	11 (1/9)	11 (1/9)	17 (3/18)	0 (0/18)	-	-	-
Chloramphenicol	49 (57/116)	55 (37/67)	76 (29/38)	-	56 (5/9)	50 (7/14)	58 (14/24)	52 (15/29)	34 (61/180)	56 (35/63)	91 (39/43)
Ciprofloxacin	58 (55/95)	57 (30/53)	25 (6/24)	11 (2/19)	71 (5/7)	50 (6/12)	26 (5/19)	18 (4/22)	20 (27/133)	51 (22/43)	16 (6/37)
Ceftriaxone	67 (50/75)	71 (34/48)	32 (7/22)	90 (9/10)	67 (6/9)	91 (10/11)	-	18 (4/22)	-	-	-
Amikacin	50 (23/46)	36 (12/33)	13 (2/15)	-	0 (0/7)	0 (0/3)	0 (0/7)	-	24 (8/34)	-	-
Cefotaxime	63 (15/24)	55 (6/11)	17 (2/12)	-	80 (4/5)	100 (2/2)	100 (7/7)	40 (2/5)	-	-	-
Ceftazidime	70 (67/96)	76 (37/49)	40 (12/30)	55 (11/20)	40 (4/10)	100 (11/11)	-	18 (4/22)	-	-	-
Gentamicin	56 (56/100)	53 (31/58)	20 (6/30)	27 (6/22)	80 (8/10)	-	33 (6/18)	-	20 (33/164)	42 (24/57)	-
Cefuroxime	77 (63/82)	77 (36/47)	42 (10/24)	-	89 (8/9)	89 (8/9)	-	-	-	-	-
Cotrimoxazole	89 (70/79)	84 (37/44)	84 (26/31)	-	89 (8/9)	-	-	-	89 (125/140)	90 (44/49)	91 (21/23)
Ampicillin	95 (75/79)	96 (51/53)	93 (26/28)	-	100 (8/8)	100 (10/10)	94 (16/17)	89 (16/18)	-	-	60 (27/45)
Augmentin	92 (94/102)	96 (52/54)	59 (17/29)	88 (14/16)	9 (9/10)	92 (12/13)	-	88 (22/25)	-	-	-
Nalidixic Acid	79 (49/62)	89 (25/28)	100 (2/2)	-	-	80 (4/5)	100 (5/5)	-	-	-	100 (25/25)
Cefoxitin	-	-	-	-	-	-	-	-	**15 (18/120)**	43 (6/14)	-
Oxacillin	-	-	-	-	-	-	-	-	**33 (33/99)**	-	-
Erythromycin	-	-	-	-	-	-	-	-	60 (102/171)	79 (48/61)	-
Tetracycline	-	-	-	-	-	-	-	-	55 (89/162)	73 (44/60)	91 (21/23)
Penicillin	-	-	-	-	-	-	-	-	94 (167/178)	90 (55/61)	-

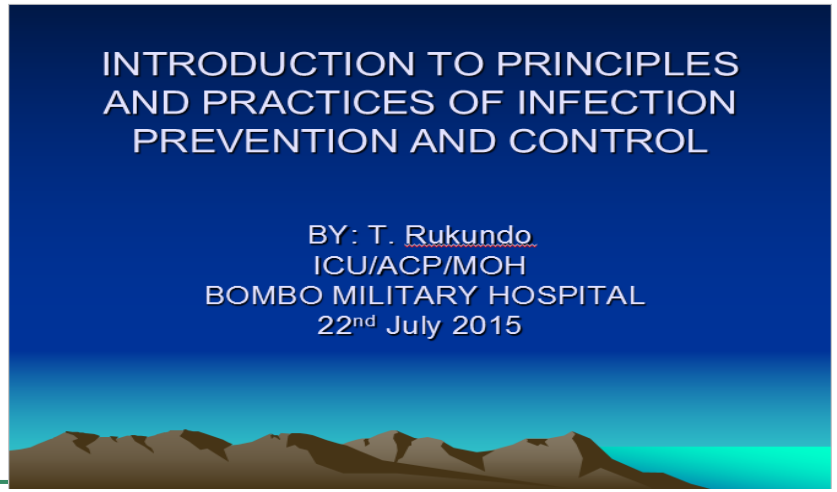
RESULTS 6. DATABASE OF DRUG SUSCEPTIBILITY



	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
1	DATE OF CO	TE ID	AGE	SEX	DEPT	SAMPLE	*ISOLATE ID*	NA	P	AK	SXT	VA	LNZ	TE	E	PRL	CRO	DA	AMC	CXM	OX	CAZ	F	C	IPM	CN	CIP	AP	C
5	12/06/2015	805	26	F	IPD	URINE	*Enterobacter spp*	I	NS	NS	NS	NS	NS	NS	NS	NS	R	NS	R	R	NS	R	R	NS	S	NS	S	R	N
6	16/06/2015	806	30	M	IPD	PUS	*Proteus mirabilis*	NS	NS	S	NS	NS	NS	NS	NS	NS	S	NS	S	S	NS	S	NS	I	S	NS	NS	R	N
7	16/06/2015	807	22	F	IPD	URINE	*Morganella morganii*	NS	NS	S	NS	NS	NS	NS	NS	NS	S	NS	S	I	NS	S	S	S	S	NS	NS	R	I
8	16/06/2015	809	35	M	IPD	URINE	*E.coli*	R	NS	S	NS	NS	NS	NS	NS	NS	R	NS	R	NS	NS	R	R	S	S	NS	R	NS	N
9	17/06/2015	810	19	M	IPD	URINE	*Klebsiella pneumoniae*	R	NS	S	NS	NS	NS	NS	NS	NS	R	NS	R	NS	NS	NS	R	R	S	NS	R	NS	N
12	22/06/2015	820	18	F	IPD	PUS	*Unidentified Gram Negative rod*	NS	NS	NS	NS	NS	NS	NS	NS	NS	R	NS	R	NS	NS	R	NS	R	S	R	R	R	N
13	23/06/2015	821	45	M	IPD	PUS	*E. coli*	NS	NS	R	NS	NS	NS	NS	NS	NS	S	NS	R	I	NS	S	NS	S	S	R	S	R	N
14	23/06/2015	821	45	M	IPD	PUS	*S.aureus*	NS	R	NS	S	NS	NS	R	R	NS	NS	S	NS	NS	S	NS	NS	S	NS	I	S	NS	N
15	23/06/2015	822	27	M	IPD	PUS	*E. coli*	NS	NS	R	NS	NS	NS	NS	NS	NS	S	NS	R	I	NS	S	NS	S	S	S	S	R	N
16	23/06/2015	823	65	M	IPD	PUS	*E.coli*	NS	NS	I	R	NS	NS	NS	NS	NS	NS	NS	R	R	NS	R	NS	R	S	S	R	R	N
17	23/06/2015	825	10	F	IPD	STOOL	*Shigella spp*	R	NS	NS	R	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	S	S	NS	S	NS	N
18	23/06/2015	827	68	F	IPD	PUS	*E.coli*	NS	NS	I	NS	NS	NS	NS	NS	NS	R	NS	R	R	NS	R	NS	S	S	R	R	NS	N
19	23/06/2015	829	30	M	IPD	PUS	*Klebsiella pneumoniae*	NS	NS	I	R	NS	NS	NS	NS	NS	NS	NS	NS	R	NS	R	NS	R	S	R	S	NS	N
20	26/06/2015	833	25	M	IPD	PUS	*Klebsiella pneumoniae*	NS	NS	S	R	NS	NS	NS	NS	NS	NS	NS	R	R	NS	I	NS	R	S	R	R	R	N
21	26/06/2015	834	44	F	IPD	PUS	*Klebsiella spp*	NS	NS	R	R	NS	NS	NS	NS	NS	NS	NS	R	R	NS	R	NS	S	S	S	R	R	N
22	26/06/2015	835	68	F	IPD	PUS	*Klebsiella spp*	NS	NS	R	R	NS	NS	NS	NS	NS	NS	NS	R	R	NS	R	NS	S	S	R	I	R	N
23	30/06/2015	849	52	m	IPD	pus	*E. coli*	NS	NS	R	R	NS	NS	NS	NS	NS	NS	NS	NS	R	NS	R	NS	R	S	NS	NS	R	N
24	30/06/2015	849	52	M	IPD	PUS	*CoNS*	NS	R	NS	R	S	NS	R	R	NS	NS	R	NS	NS	NS	NS	NS	S	NS	S	NS	NS	N
25	30/06/2015	850	2	F	IPD	PUS	*S.aureus*	NS	R	S	R	S	NS	R	S	NS	NS	S	NS	NS	NS	NS	NS	S	NS	S	S	NS	N
26																												

By looking at the spread sheet monthly

- you can quickly identify issues with infection control on the wards
- Initiate investigation into source surgical site infections



The health facilities were able taken action infection prevention and control practices on the wards

DISCUSSION 1

- The most common specimens submitted were Blood, Urine, Pus swab & Stool
  - This was subject to out breaks & ongoing sub-study (blood stream infection)
  - May of the specimens submitted were from out patients, not may specimens were collected from Hot areas for Health care Associated infections
  - No. of isolates recovered may have been low due to aerobic culture only

- The out come from samples analysis forms a basis for guiding the treatment of patients

- The AMR sentinel sites built capacity to quickly to investigate cause of outbreaks
  - In the community (Cholera in Bwera)
  - Surgical site infections (In patient wards GMH-Bombo) which also helped to awaken or improve infection prevention & infection control practices in the hospital

DISCUSSION 2

- Overall, most of the isolates were MDR
  - Most of the gram negatives were sensitive to Imipenem & Amikacin
  - The prevalence of MRSA was high (at least 15% of *S. aureus* isolates)
  - These results indicate that there is a growing problem in AMR

- Although the No. of some isolates are still few,
  - the high MDRO seen calls for more continued long term surveillance to generate sufficient data to make valid conclusions to inform appropriate interventions and curtail the spread of these MDROs

- With well motivated clinicians and laboratory personnel, AMR surveillance is possible & many of the bacterial pathogens can be identified

DISCUSSION 3: CHALLENGES

- Utilities especially
  - Irregular power supply to the hospitals greatly affects the
    - processing / analysis , TAT, Viability of isolates
  - Sometimes water

- Empirical treatment of patients
  - Under utilization of the microbiology laboratory

- Lack of sense of ownership by personnel at sentinel site
  - Reluctance to identify HAI cases

- Human resource
  - Frequent transfer of laboratory personnel from the sites
  - Lab personnel view isolation & drug susceptibility as labor intensive

CONCLUSION

- Many MDRO clinical isolates from the 2 sites (Bwera & GMH-Bombo)

- AMR surveillance is critical to provide
  - early warning of emerging problems
  - monitor the changing patterns of resistance
  - target and evaluate prevention and control measures

- Microbiology labs play a very central role in surveillance of AMR
  - provides data & help practitioners choose the right drug at the patient level
  - protect the consumer from drug resistant organisms

- For a successful and sustainable AMR surveillance programme,
  - there is need to have very well motivated and trained laboratory staff
  - good infrastructure & constant microbiological supplies including good constant electricity to run the samples

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