Antimicrobial Resistance from a One Health Perspective in Zambia: A Systematic Review

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Introduction

Antimicrobial resistance (AMR) is widely acknowledged as a global health problem, yet its magnitude is not well understood. Many countries have begun to implement antimicrobial stewardship programmes and enhanced surveillance, specifically devised to curb its spread. AMR prevalence is poorly understood, particularly in lower- and middle-income countries (LMICs). It is challenging to implement policies without focusing on local healthcare systems, therefore a baseline assessment of the AMR prevalence is a priority.

Aim

This study reviewed published studies of AMR prevalence across human-animal-environmental domains in Zambia.

Methodology

- **Databases searched:** PubMed, Cochrane Libraries, African Journals Online, Medical Journal of Zambia
- **Search Terms**: "*multiresistant* OR *multi-drug resistant* OR *antimicrobial resistance* OR *drug resistance* OR *bacterial resistance*" "AND *Zambia*", with spelling variations included.

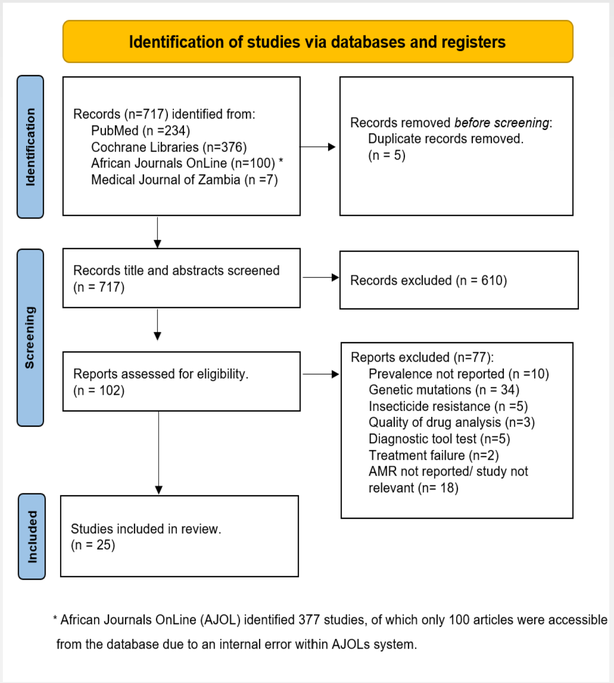

Figure 1: A PRISMA diagram illustrating the search strategy for the review

Results

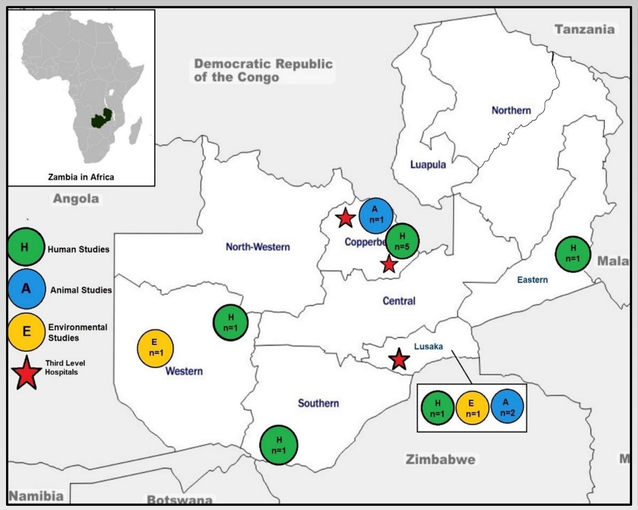

Figure 2:Distribution of studies in Zambia

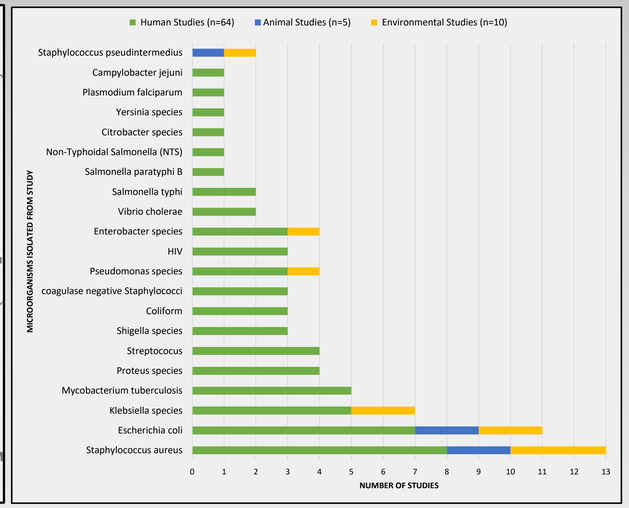

Figure 3: Microorganisms Isolated by Sector

Table 1: An example of resistance rates against antibiotics used for two widely surveyed pathogens: *E. coli* and *Klebsiella spp.*

Legend	Gram Negative Bacteria																
	E. coli										***Klebsiella***						
	Human							Animal	Environment		Human					Environment	
100%	**Mainda *et al.***	**Chiyangi *et al.***	**Mainda *et al.***	**Kabwe *et al.***	**Chanda *et al.***	**Chanda *et al.***	**Chanda *et al.***	**Mainda *et al.***	**Songe *et al.***	**Mwamun-gule *et al.***	**Kabwe *et al.***	**Chanda *et al.***	**Chanda *et al.***	**Chanda *et al.***	**Ziwa *et al.***	**Ziwa *et al.***	**Mwamun-gule *et al.***
50-99%	Stool	Stool	Stool	Blood	Blood	Urine	Wound	Cattle	Fish Markets	Healthcare worker Coats	Blood	Blood	Urine	Wound Swab	Wound Swab	Hydro therapy Bathtub	Healthcare worker Coats
10-49%																	
0-9%																	
Gentamycin	27%		1%	**100%**				1%	91%	4%	96%				30%	30%	0%
Streptomycin		34%							88%								
Kanamycin	99%																
Amikacin	47%														20%	20%	
Cefpodoxime	29%	67%	1%					2%							**100%**	**100%**	
Cefotaxime	25%	67%		**100%**					**100%**		96%				**100%**	**100%**	
Cefalexin										**100%**							50%
Ceftriaxone	24%			**100%**							94%				40%	40%	
Ceftazidime	28%	67%		**100%**	40%		50%		95%		97%		69%		**100%**	**100%**	
Ampicillin	61%	67%	8%	**100%**				6%	**100%**	50%	99%				**100%**	**100%**	
Amoxcillin-clavulanic acid	46%			50%							93%						
Trimethoprim-Sulfamethoxazole			5%	**100%**				4%	74%		**100%**						
Co-trimoxazole	57%	**100%**			67%	**100%**						**100%**	0%		90%	90%	**100%**
Ciprofloxacin	20%		0%	80%	57%	63%	**100%**	0%	95%	0%	71%	33%	68%	**100%**	28%	28%	
Nalidixic acid		16%			43%	76%			93%			33%	56%				
Ceftazidime						61%						50%					
Norfloxacin					30%	62%	**100%**		91%			33%	40%				
Erythromycin				**100%**							92%				32%	32%	
Imipenem				0%							1%				0%	0%	
Nitrofurantoin					33%	48%	0%					33%	75%				
Tetracycline	51%	50%	14%					11%	91%	0%					40%	40%	50%
Chloramphenicol	22%	16%		60%	67%	26%			81%	0%	71%	0%	44%	**100%**	21%	21%	50%

Discussion

- Lusaka province has >50% of studies.
- Many provinces in Zambia had no AMR data.
- *S. aureus* isolates were the most common, followed by Gram Negative: *E. coli* and *Klebsiella spp.*
- The studies are diverse in samples type, study design and identified data and no standardized tool was used.
- AMR is prominent in gram-negative organisms in Zambia across human-animals-environment.
- Many studies found resistance of >50% suggesting high resistance or possible sampling/testing errors.

Conclusion

- The level of resistance to commonly prescribed antibiotics is often extremely high.
- To conserve our current arsenal of antibiotics it is imperative to (1) address the gaps in AMR diagnostic standardization and reporting; (2) improve surveillance, stewardship, infection control, and implementations of updated treatment guidelines and monitoring.
- More AMR data is needed for many provinces.
- There is a bias across many reference centers that don't reflect the disease condition or where majority of the people are treated.
- More studies of zoonotic diseases should be conducted using the One Health approach to better understand the mechanisms of resistance transfer.

References

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