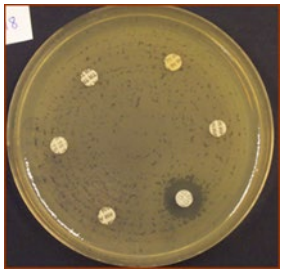

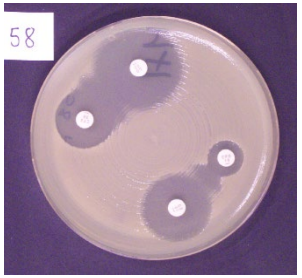

High prevalence of multidrug resistant ESBL- and plasmid mediated AmpC- producing clinical isolates of *Escherichia coli* at Maputo Central Hospital (MCH), Mozambique

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Durban October 22, 2019

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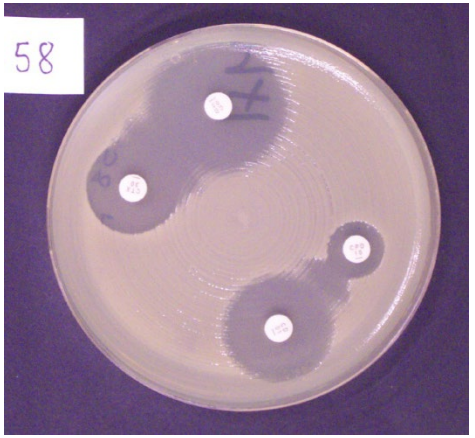
Structure of the presentation

- Introduction
- Aim and objectives
- Methods
- Results and discussion
- Limitations
- Conclusion and recommendation
- Acknowledgements



Introduction

- Antibiotic resistance is one of the main public health problems worldwide
- Epidemiological data of cephalosporin-resistant *Enterobacteriaceae* in Sub-Saharan África is still limited, and in particular in Mozambique
    - ESBL
    - AmpC

[Mandomando *et al.,* 2010, Moon *et al.,* 2013]

Research question

- What is the prevalence of ESBL- and plasmid mediated AmpC- production in clinical isolates of *Escherichia coli* at Maputo Central Hospital, Mozambique?

Study objectives

- Isolate and confirm clinical isolates of *E. coli* processed from urine and blood samples
- Ascertain their antibiotic susceptibility
- Phenotypic detection of ESBL- and/or increased AmpC-production
- Identification of ESBL-/ pAmpC-encoding genes by PCR

Methods

Ethical considerations

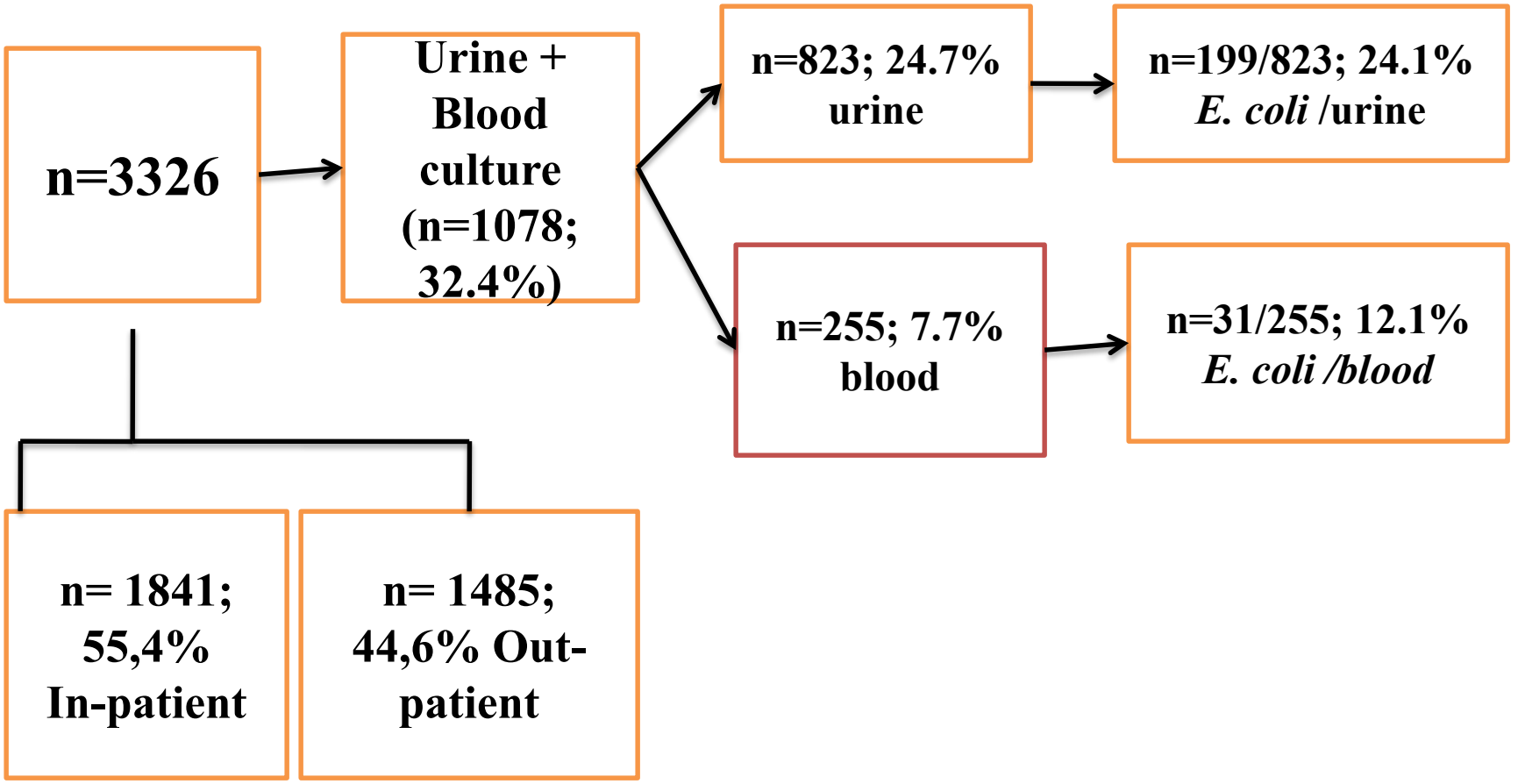
- This study was approved by the Biomedical Research Ethics Committee of the UKZN (BE 030/16) and the Institutional Bioethics Committee for Health-CIBS- ISCISA (TFCMCSCE 02/15).

Methods

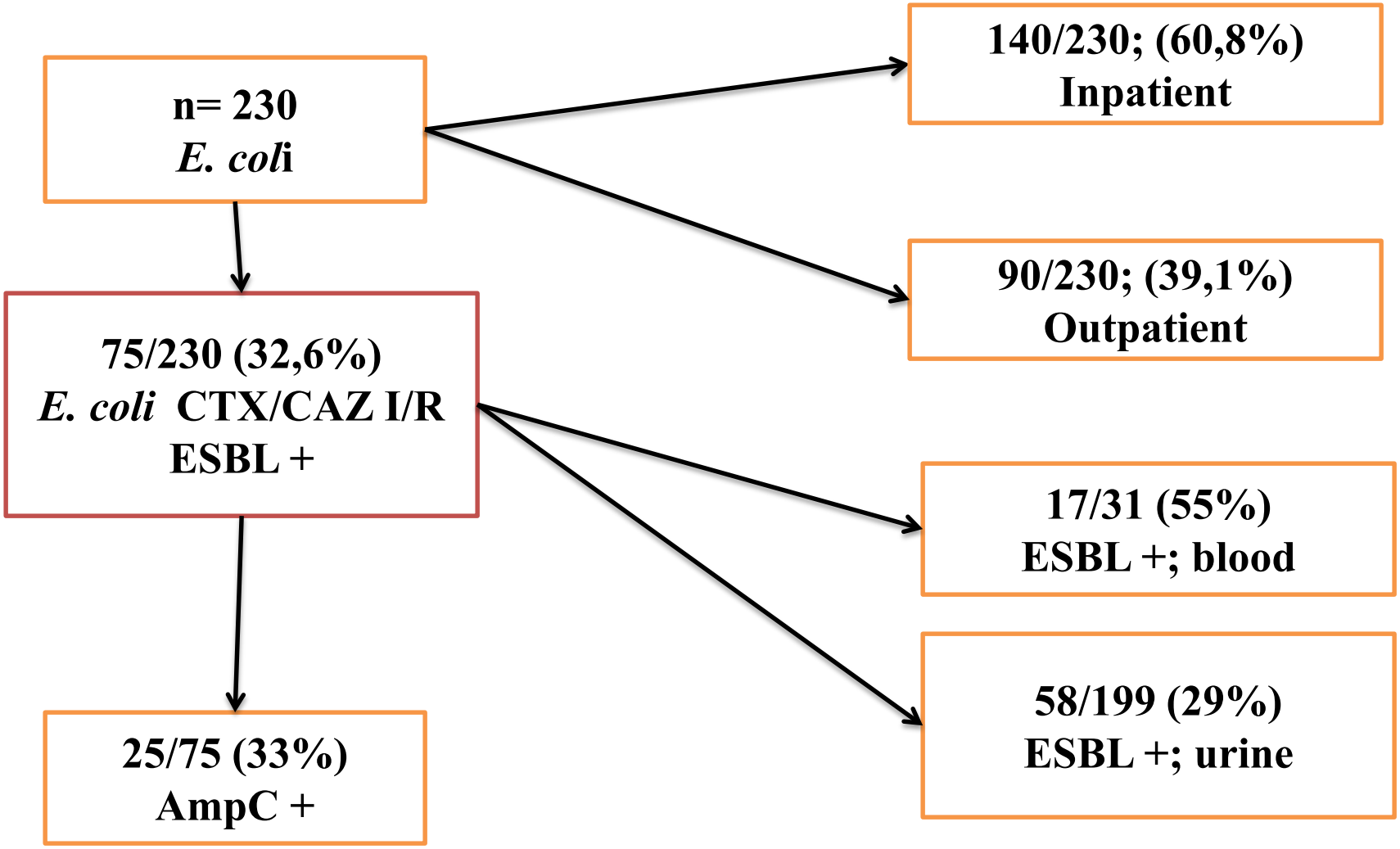
- **Study period:** August – November 2015, 3 months
- **Strain inclusion criteria:**
  - *E. coli* from urine and blood cultures from in- and outpatients
- **Criteria for ESBL- and AmpC-testing:**
  - ESBL: Reduced susceptibility (I or R) to cefotaxime (CTX) or ceftazidime (CAZ) by disc diffusion (EUCAST criteria)
  - AmpC: …. AND reduced susceptibility to cefoxitin
- **Phenotypic test for ESBL:** Combined disc method
- **Molecular analysis:**
  - ESBL CTX-M PCR and amplicon sequencing
  - TEM, SHV and pAmpC PCRs
  - ERIC PCR for clonal relatedness between strains

Results and discussion

Total of samples and *E. coli* from blood and urine



ESBL and AmpC detection



Multidrug resistance (MDR)

	Antibiotics		
Sample	**CIP (%)**	**GEN (%)**	**SXT (%)**
Blood	12/17 (70, 6%)	8/17 (47, 1%)	17/17 (100%)
Urine	40/ 58 (68, 9%)	27/ 58 (46, 5%)	55/58 (94, 8%)

Abbreviations: CIP- Ciprofloxacin; GEN- Gentamicin; SXT - Trimethoprim-sulfamethoxazole

A large proportion of the ESBL-producing strains also expressed resistance to fluoroquinolones, aminoglycosides and trimethoprim-sulfamethoxazole

ESBL and pAmpC genes

Genes	ESBL	Sequence	AmpC
*bla*CTX-M	58/75 (77 %)	CTX-M-15 (n= 24); CTX-M-28 (n=2);	
		CTX-M- 117 (n=1); CTX-M -36 (n=1);	
		CTX-M – 164 (n=1);	
		CTX-M – no typing (n= 29)	
*bla*SHV	39/75 (52 %)		
*bla*TEM	1/75 (0,1 %)		
*bla*MOX			22/75 (29 %)
*bla*FOX			24/75 (35 %)
*bla*DHA			13/75 (17%)
*bla*CMY			1/75 (0,1%)

CTX-Ms were the most dominant ESBL; FOX and MOX were the most dominant pAmpCs

Genes encoding ESBL and AmpC

Bla$_{\text{CTX-M}}$ was the most dominant ESBL-type, with $_{\text{CTX-M -15}}$ as the major subtype.

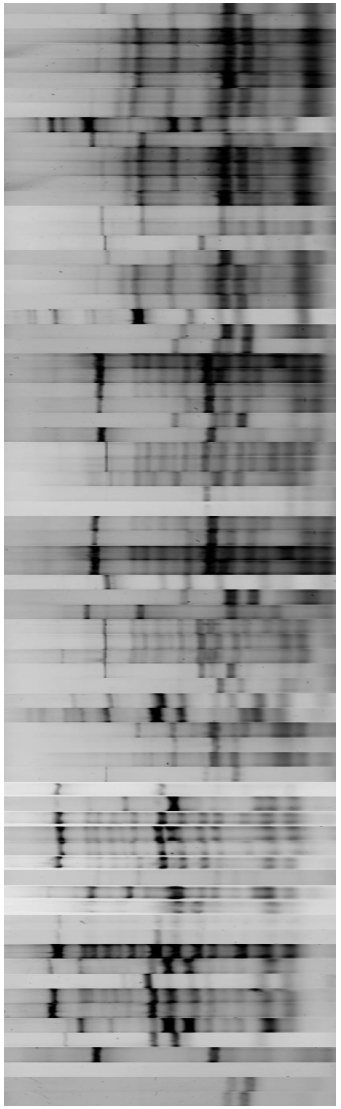
[Umaer and Sundsfjord 2011, Laxminarayn *et al.,* 2013].

Bla$_{\text{FOX}}$ and *bla*$_{\text{MOX}}$ were the most prevalent pAmpC genes. These observations contrast the worldwide observations of *bla*$_{\text{CMY}}$ as the most prevalent in *E. coli* populations.

[Cherif *et al.,* 2016, Egorova *et al.,* 2014].

ERIC – PCR Result

- No dominant clone of ESBL-/pAmpC positive *E. coli.*
- Several clusters with clonal relatedness indicating minor outbreaks between patients at specific departments.



Limitations

Limited resources precluded the final identification of some *bla*$_{\text{CTX-M}}$ and all *bla*$_{\text{SHV}}$ genotypes as well as more extensive comparative genetic analysis of strain relatedness.

Conclusion

- We have observed a high prevalence of MDR ESBL- and/or pAmpC-producing clinical *E. coli* isolates with *bla*$_{\text{CTX-M}}$ and *bla*$_{\text{FOX}}$/*bla*$_{\text{MOX}}$ as the major types, respectively.
- ERIC-PCR revealed genetic diversity and some clusters indicating within-hospital spread.

Recommendations

- Enhance bacterial culture and susceptibility testing to choose the correct antimicrobial treatment
- Improved infection control measures within the hospital at all level
- More studies should be done in order to minimize this problem

Acknowledgments

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- Microbiology Laboratory of **MCH** for providing isolates
- **UKZN** for providing space and reagents in the accomplishment of the molecular diagnosis
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  - MCH, UKZN, UiT and UNN