

Changing epidemiology and antimicrobial resistance in *Vibrio cholerae*: findings of a decade from national AMR surveillance

Ms. Nisha Rijal
Microbiologist
National Public Health Laboratory
NEPAL

Objectives



- To monitor the changing serotype of *V.c* prevalent in Nepal
- To assess the change in antimicrobial susceptibility trend of *V.cholerae* over a period of 11 years (2006-2016)

Epidemiology of Cholera in Nepal

- Cholera is **endemic** in Nepal.
- nearly 20% of the population at risk
- Every year, there are reports of cholera outbreaks from rural and urban areas , including areas that are remote and difficult to access .
- The hill districts are particularly at high risk due to poor sanitation and hygiene.



<http://www.gettyimages.com>

Status of cholera in Nepal

- The first recorded cholera epidemic took place in **1823**, followed by a series of epidemics occurring in the Kathmandu Valley in 1831, 1843, 1856, 1862, and 1887.
- Major cause of Diarrheal outbreaks in 2003, 2005, 2007, 2009, 2012, 2014 and recently in 2016



Courtesy: borgenproject.org



Courtesy: borgenmagazine.com

Status contd..

- Nepal has a weekly reporting of six priority diseases including Acute Gastroenteritis(AGE) through a network of Early Warning and Reporting System(EWARS) in 63 hospitals
- It focuses on **immediate reporting (to be reported within 24 hours of diagnosis) of one confirmed case of Cholera**

Status contd..

AGE cases suspected to be cholerae claim the lives of many, before being laboratory confirmed and treated.

Year	Total suspected AGE cases	Districts affected	Deaths reported
2009	71341	27	378
2010	101	3	9
2011	10	1	0
2012	2678	5	15
2014	600	2	0

Source: Epidemiology and Disease control division, annual reports (www.edcd.gov.np)

Research

BRIEF REPORTS

Journal of Tropical Pediatrics Vol. 42 October 1996

Outbreaks of Cholera in Kathmandu Valley in Nepal

by Tohru Ise,* MD, PhD, Bharat Mani Pokharel,** Saraswat Rawal,** Ram Sunder Shrestha,** and J. R. Dhakhwa,*** MBBS, DCH
*Medical Education Project and **Department of Bacteriology, Tribhuvan University Teaching Hospital (TUTH), Maharajjung, Kathmandu, Nepal
***National Kanti Children's Hospital

Kathmandu University Medical Journal (2005) Vol. 3, No. 2, Issue 10, 138-142

Original Article

An outbreak of El Tor cholera in Kavre district, Nepal

Tamang MD¹, Sharma N², Makaju RK³, Sarma AN⁴, Koju R⁵, Nepali N⁶, Misl
^{1,4}Kathmandu University Medical School, ^{2,3,5,6,7}Kathmandu University Teaching

[World Journal of Microbiology and Biotechnology](#)

August 2012, Volume 28, [Issue 8](#), pp 2671–2678

Phenotypic and genetic characterization of *Vibrio cholerae* O1 clinical isolates collected through national antimicrobial resistance surveillance network in Nepal

Original Article

Nepal Med Coll J 2011; 13(2): 84-87

*Resistotypes of *Vibrio cholerae* O1 Ogawa Biotype El Tor in Kathmandu, Nepal*

R Karki,¹ DR Bhatta,¹ S Malli,¹ SP Dumre,^{2,3} BP Upadhyay,¹ S Dahal¹ and D Acharya¹



An Outbreak of *Vibrio cholerae* in 2012, Kathmandu, Nepal

Sher Bahadur Pun^{1*}, Rosina Maharjan², Dina Shrestha², Deepak Pokharel³, Yogesh Shah⁴, Anup Bastola¹ and Rajesh Shah¹

¹Sukraraj Tropical and Infectious Disease Hospital, Kathmandu, Nepal

²Kantipur College of Medical Sciences, Tribhuvan University, Kathmandu, Nepal

³Kathmandu College of Science and Technology, Kathmandu, Nepal

⁴National Zoonoses and Food Hygiene Research Center, Kathmandu, Nepal

Gupta et al. *Antimicrobial Resistance and Infection Control* (2016) 5:23
DOI 10.1186/s13756-016-0122-7

Antimicrobial Resistance
and Infection Control

Cholera outbreak caused by drug resistant *Vibrio cholerae* serogroup O1 biotype EITor serotype Ogawa in Nepal; a cross-sectional study



Pappu Kumar Gupta¹, Narayan Dutt Pant^{2*}, Ramkrishna Bhandari³ and Padma Shrestha¹

Multiple drug resistant *Vibrio cholerae*, *Salmonella* and *Shigella* from Nepalgunj Cholera outbreak and different hospitals of Nepal

Binod Kumar Shah^{1*}, Sapana Sharma¹, Gita Shakya² and Bishnu Prasad Upadhyay²

**Year : 2012 | Volume : 4 | Issue :
12 | Page : 657-658**

**Cholera: Small outbreak in winter season of
Eastern Nepal**

**Sanjay Gautam¹, Pramod Jha¹, Basudha
Khanal¹, Dipesh Tamrakar², DK Yadav²**

Research at molecular level

[World Journal of Microbiology and Biotechnology](#)

August 2012, Volume 28, [Issue 8](#), pp 2671–2678

Phenotypic and genetic characterization of *Vibrio cholerae* O1 clinical isolates collected through national antimicrobial resistance surveillance network in Nepal

Kansakar et al

Objective: **characterization for toxigenic *ctxB* gene and MLVA typing**

Result: 2 different variants of cholera toxins revealed. Ogawa strains (2007,2010) harbored CTX whereas Inaba Strains and few Ogawa strains harbored CTX 3b-type .
MLVA analysis showed circulation of four different groups of altered *V. cholerae* O1 El Tor strains

mBioVolume 2, Issue 4, 2011, Pages e00157-00111

Population genetics of *Vibrio cholerae* from Nepal in 2010: evidence on the origin of the Haitian outbreak.

Hendriksen, R.S

Objective: **evaluate the suggested epidemiological link with the Haitian outbreak**

Result: The Nepalese isolates were divided into four closely related clusters. One cluster contained **three Nepalese isolates and three Haitian isolates that were almost identical, with only 1- or 2-bp differences.**

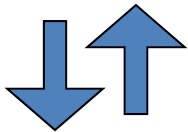
Methodology for sample collection/transport and isolation of *Vibrio* at Laboratory

National AMR surveillance Network



National Reference Lab

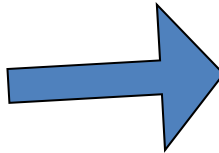
Send feedback



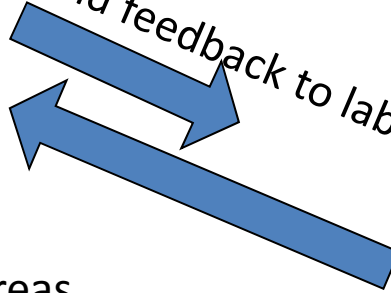
Collect Samples from outbreak areas



Epidemiology and disease Control Division



Send feedback to lab

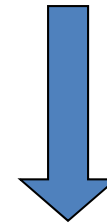


Send to NRL for confirmation



21 sentinel Lab

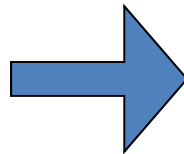
Culture and identification



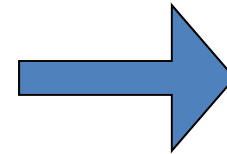
Laboratory diagnosis



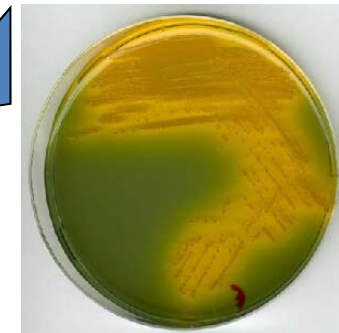
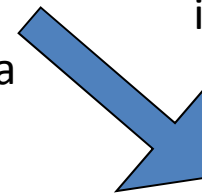
Stool is collected from
Outbreak sites (fresh or in
transport media)



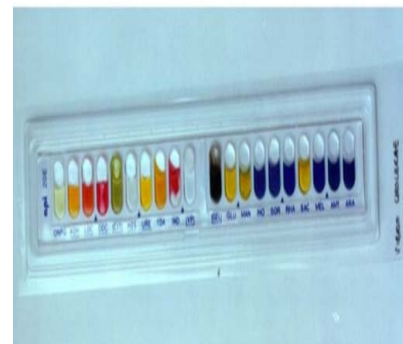
Transported maintaining a
cold chain to the
laboratory



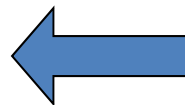
Enriched in APW and
incubated for 6 hrs



Plated on MA and TCBS



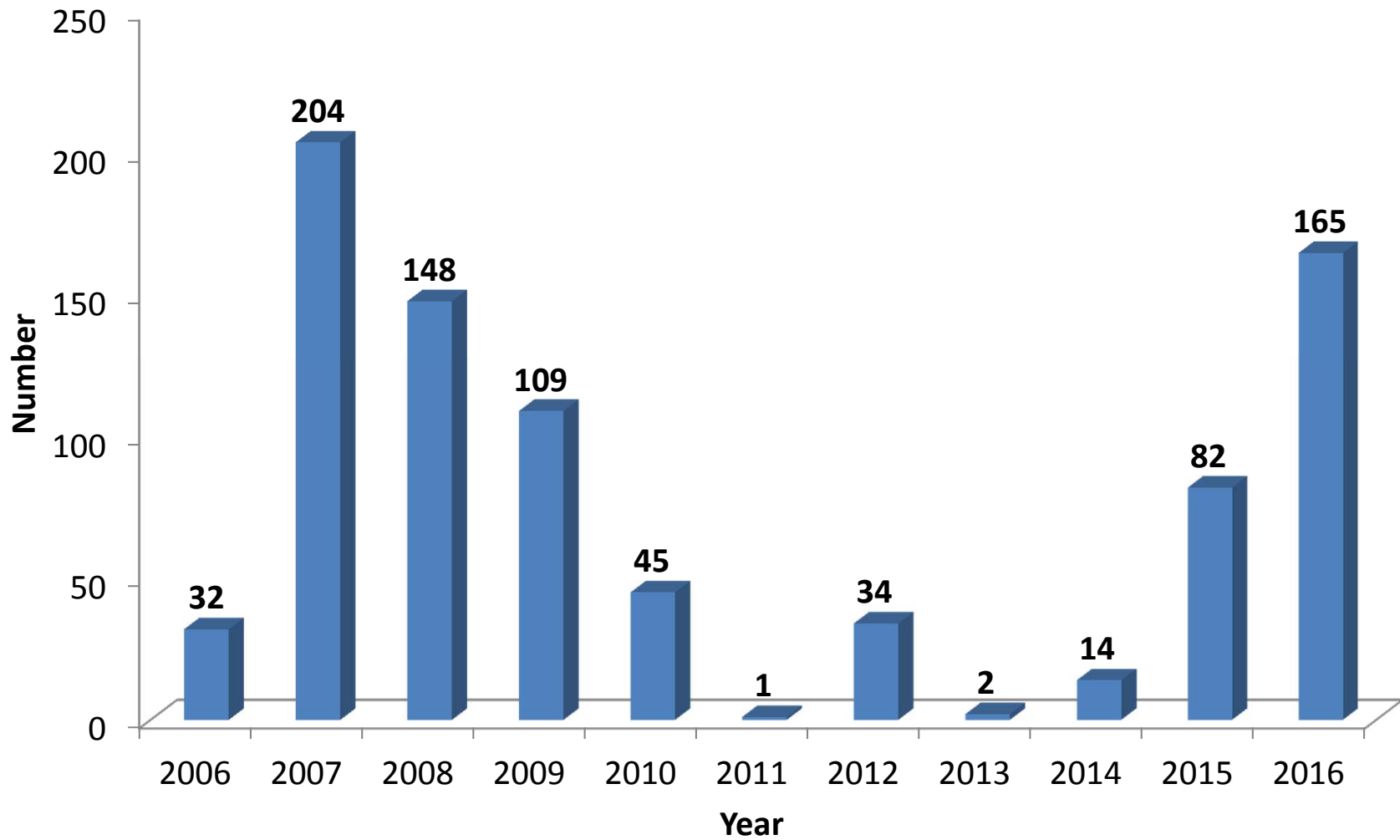
Biochemical Testing



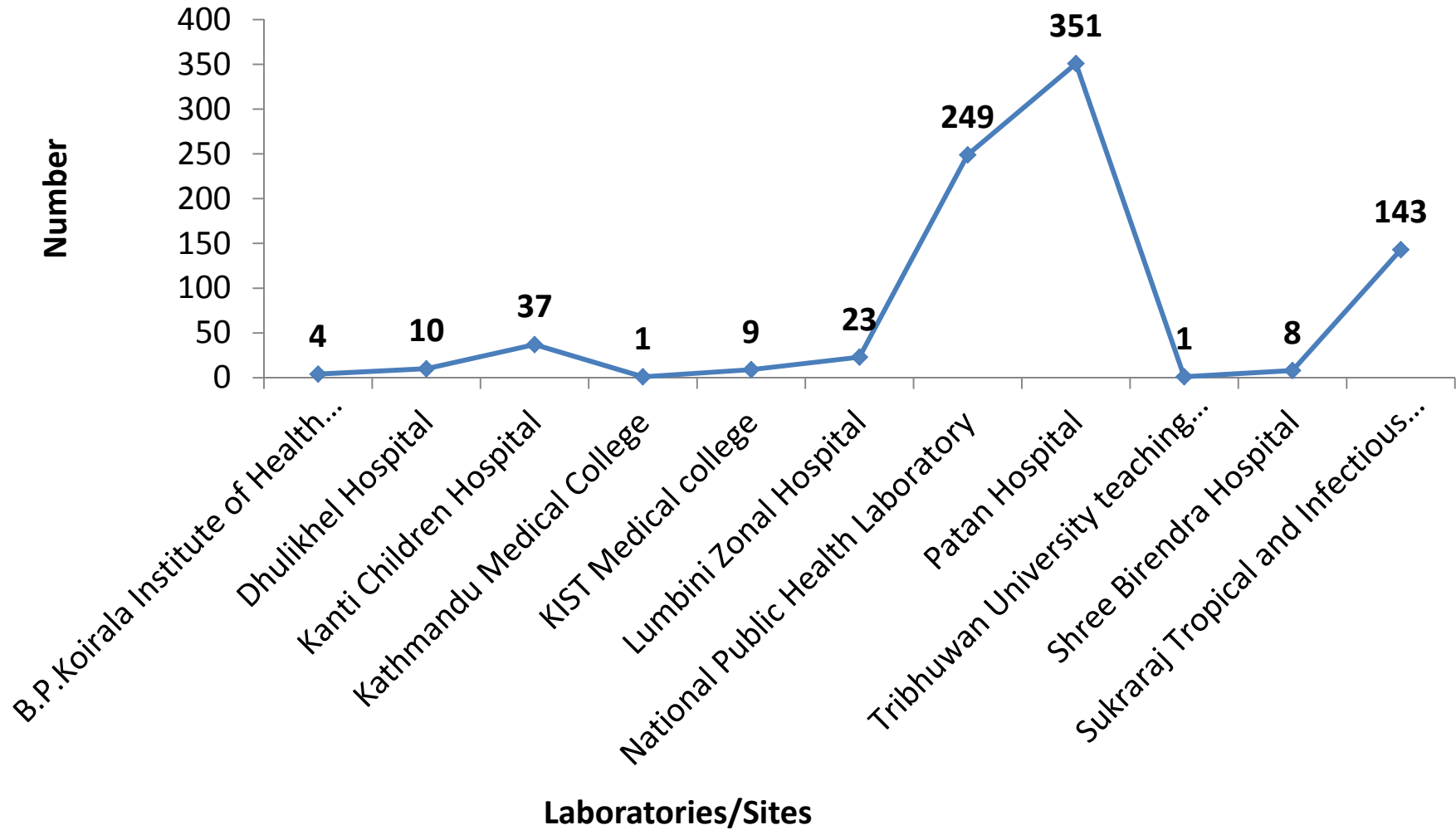
Confirmed by serotyping

FINDINGS(2006-2016)

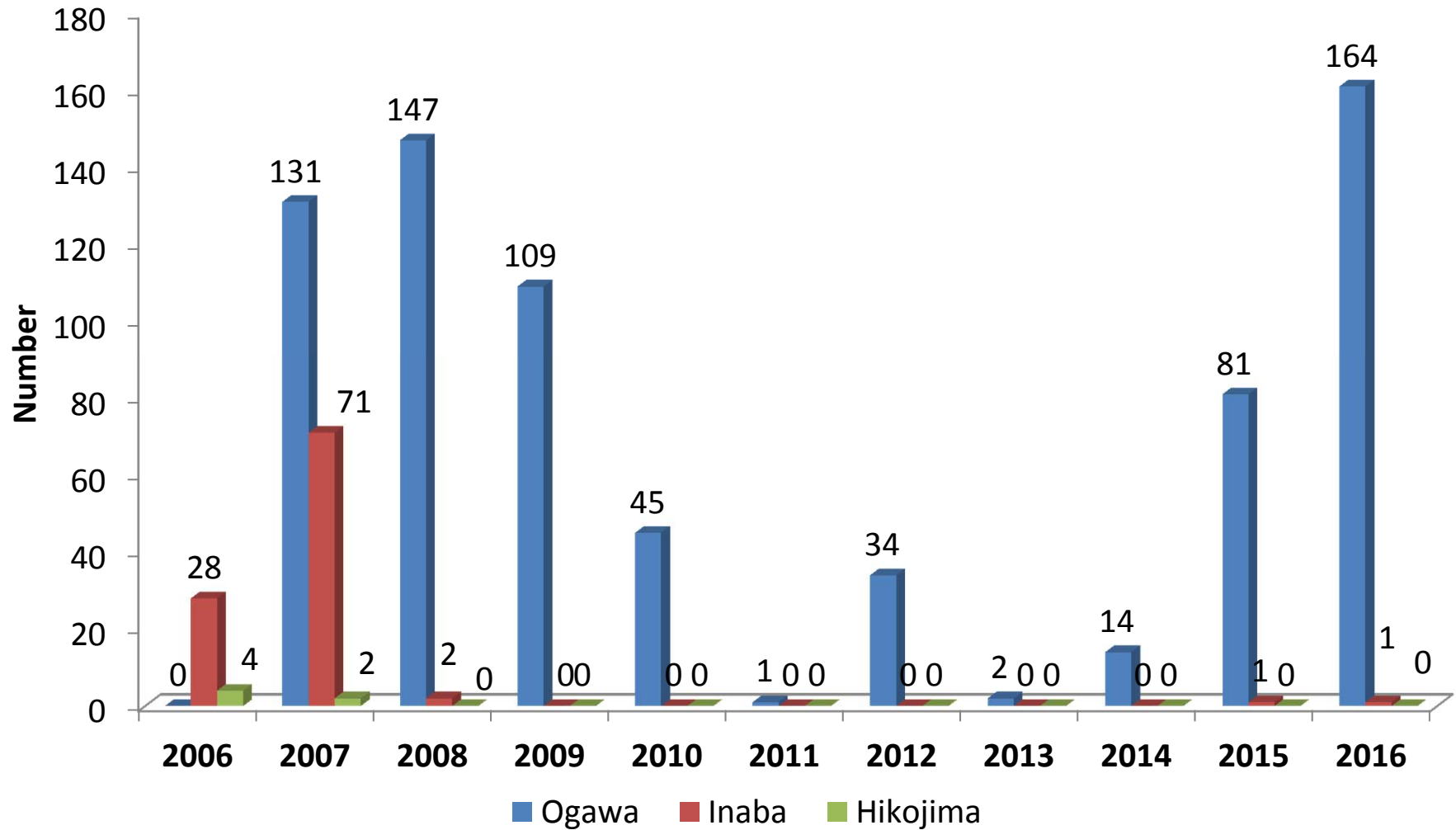
Total number of *V.cholerae* isolates reported(2006-2016)



Distribution of Vibrio from various sentinel sites

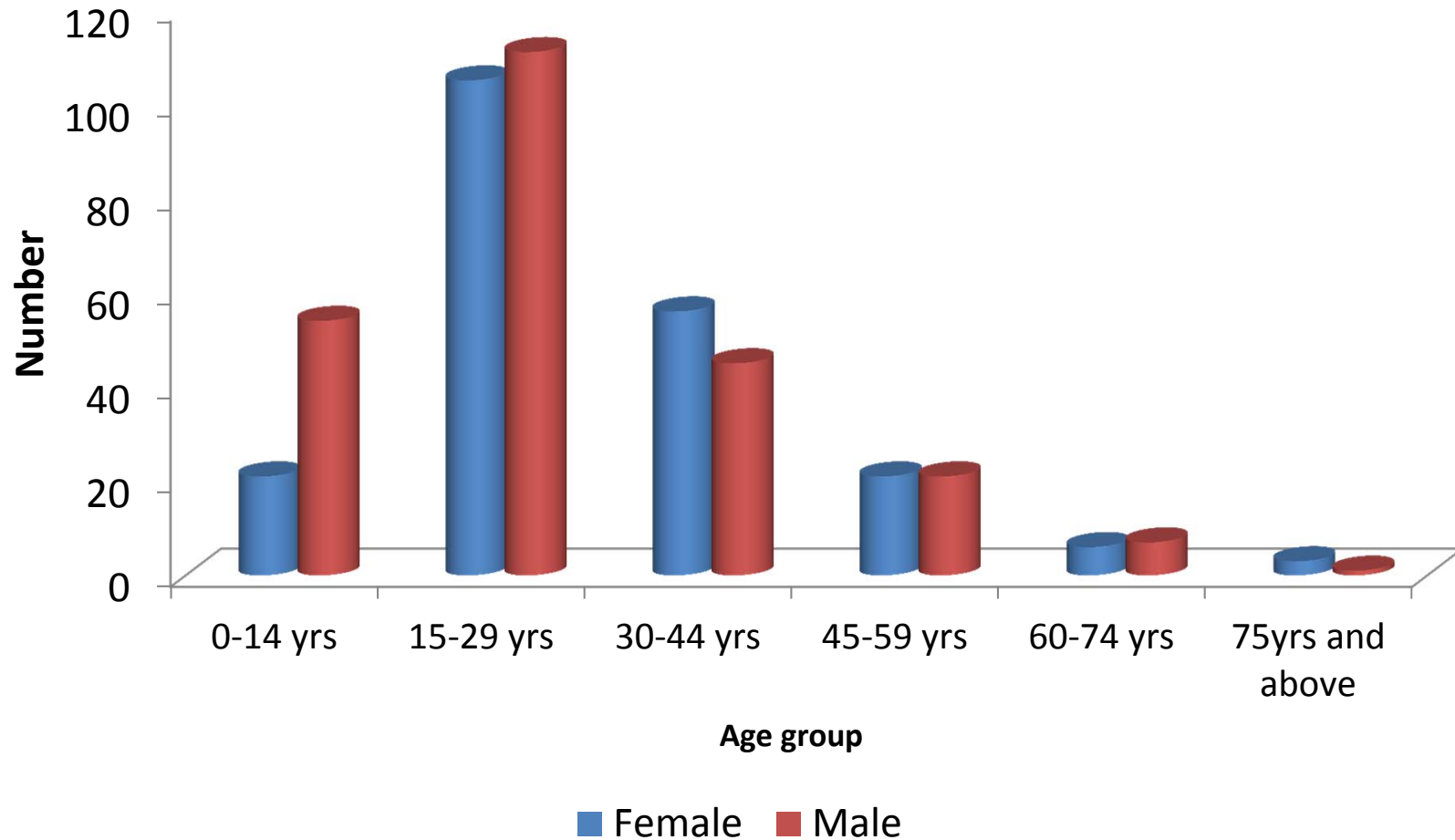


Distribution of various serotypes

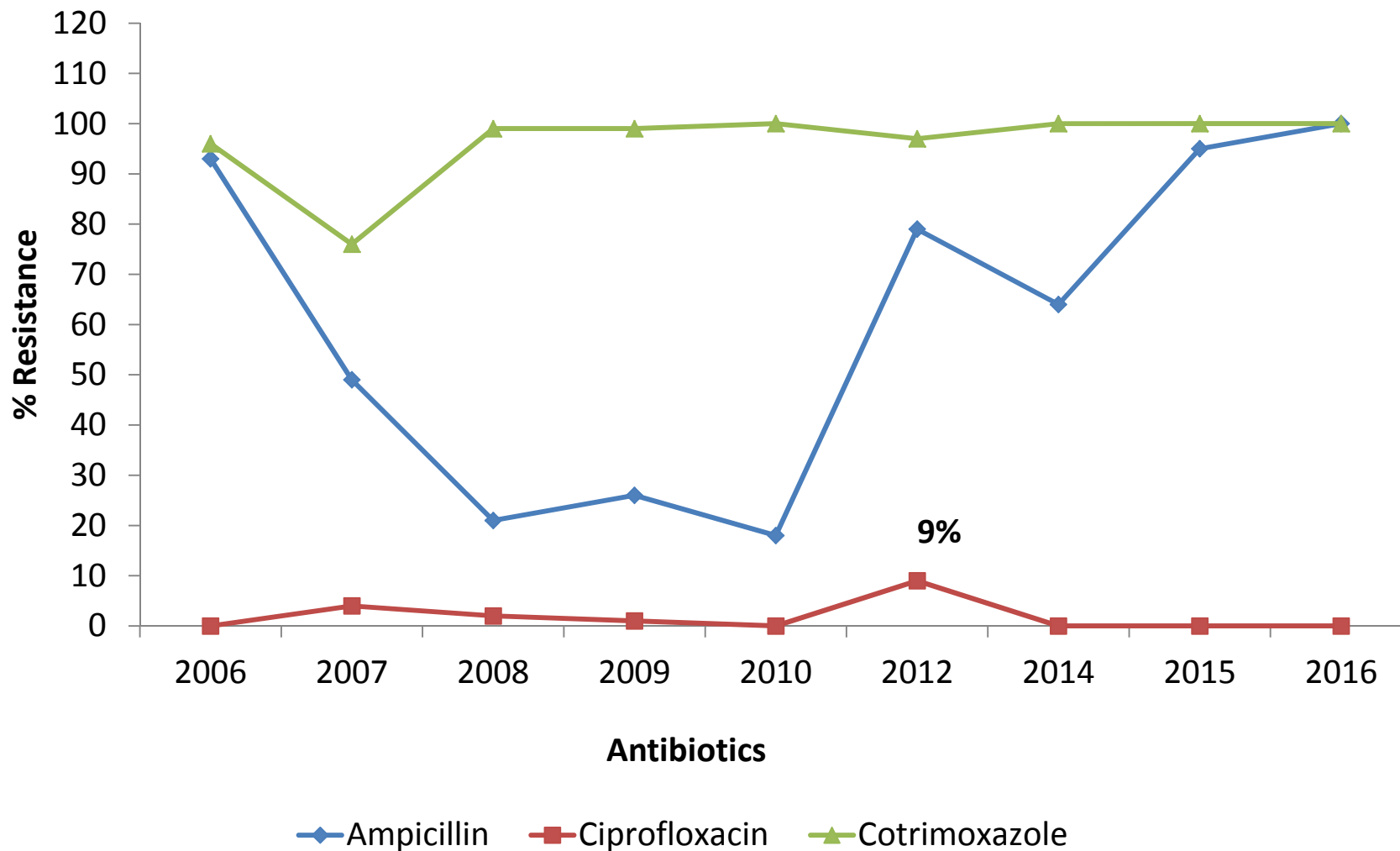


Serotypes

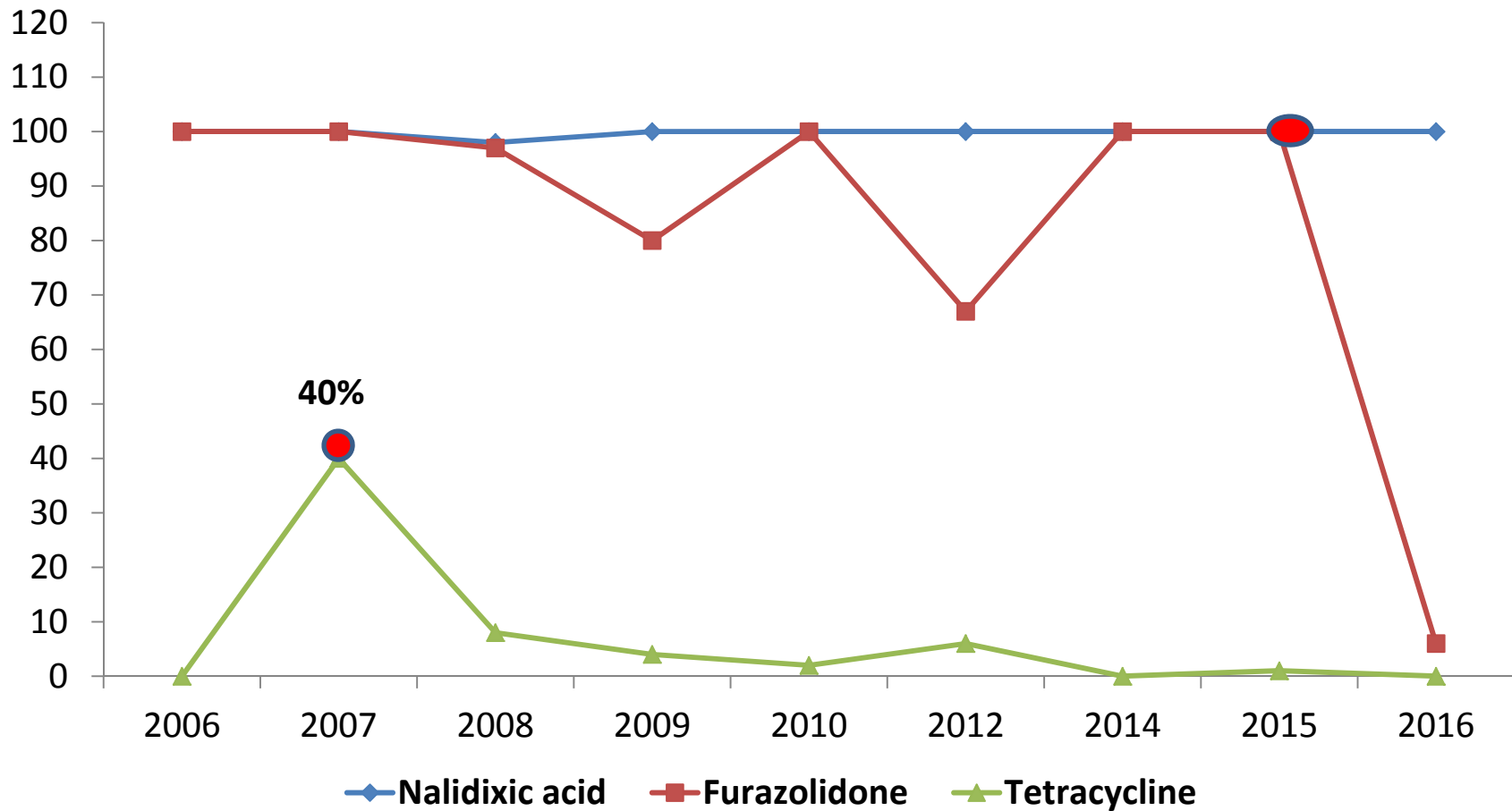
Age and Gender wise distribution of cases



Antimicrobial susceptibility results



Antimicrobial susceptibility results



Multidrug resistance

Antibiogram typing	Total number of isolates exhibiting resistance	
Amp/Cip/Cot/NA/FR	1	<p>Of the total Vibrio isolates 532 (63.6%) were MDR.</p> <p>Amp - Ampicillin Cip – Ciprofloxacin Cot – Cotrimoxazole NA – Nalidixic Acid FR – Furazolidone Tet- Tetracycline</p>
Amp/Cot/NA/Tet/FR	21	
Amp/Cip/Cot/NA/Tet	1	
Amp/Cot/NA/FR	140	
Cot/NA/Tet/FR	11	
Cip/Cot/NA /Tet	2	
Amp/Cip/NA/FR	1	
Amp/Cot/Tet/FR	1	
Amp/Cip/Cot/Tet	1	
Cot/NA/FR	136	
Amp/Cip/Cot	6	
Amp/Cot/NA	188	
Amp/NA/FR	16	
NA/Tet/FR	3	
Amp/Cot/ Tet	2	
Amp/Cot/FR	1	
Cot/Tet/FR	1	

Summary

- Shift in prevalent serotype is noted.
- Resistance to ampicillin decreased from 93% in 2006 to 18% by 2010 and again raised to 100% by 2016.
- Cotrimoxazole resistance remained at constant range(77-100%)
- Ciprofloxacin and tetracycline resistance emerged in 2007, reached a peak during 2010-2012 and declined to 0 by 2016.
- Susceptibility to Furazolidone has re-emerged.
- 63.6% of the isolates were Multi drug resistant.

Acknowledgements

- All sentinel sites participating in AMR surveillance
- Technical experts involved in AMR surveillance
- Patients
- National Public Health Laboratory
- WHO

THANK YOU FOR YOUR ATTENTION

