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Outbreak Investigation of Ceftriaxone Resistant *S. Typhi* in Hyderabad, Pakistan

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Background

On Nov 30 2016, clinical laboratory of Aga Khan University Hospital reported a case of a child admitted to Aga Khan Maternal & Child Center Hyderabad with ceftriaxone resistant *S. Typhi*.

AKMCC is a private hospital with mainly a middle class clientele



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Background

The microbiologist was alerted by this unusual susceptibility, thinking it is misclassified as *S. Typhi* rather than iNTS

- Repeat identification and MIC.



Background - MIC

- Identification of *S. Typhi* was confirmed with API 20E and serology
- MIC were performed on Vitek2 and it showed resistance to:
 - ✓ Ampicillin, Cotrimoxazole & Ciprofloxacin (high MIC)
 - ✓ Ceftriaxone MIC of $>64 \mu\text{g/ml}$
- Susceptible to:
 - ✓ Imipenem
 - ✓ Meropenem
 - ✓ Azithromycin



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Background

- Within the week, 2 more cases were identified from the same hospital
- Alarm was raised
- Government officials were informed

Outbreak investigation team

A team was formed to investigate the outbreak

1. Aga Khan University

- Infectious disease specialist
- Clinical microbiologist
- Epidemiologist
- Community health workers

2. CDC-FELTP Fellows working at Department of Health, Sindh





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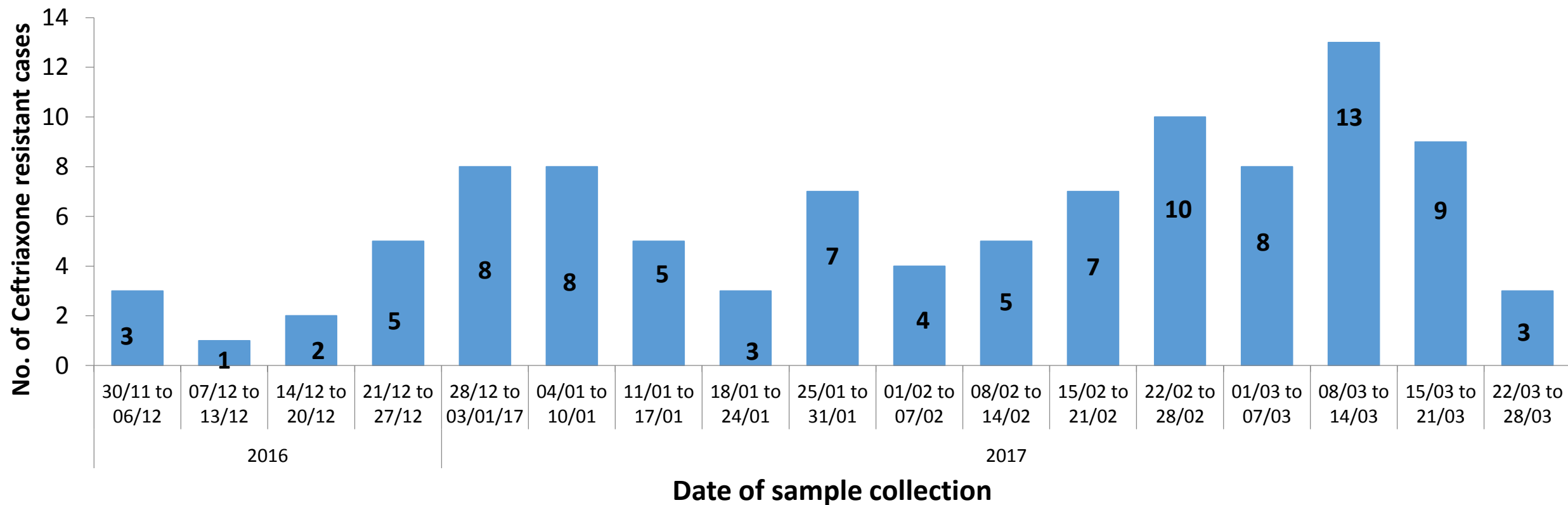
Preliminary findings

- To date, 113 blood culture confirmed ceftriaxone resistant *S. Typhi* cases have been identified since Nov 30, 2016 from 2 Talukas in Hyderabad
- The investigation is underway and cases continue to be identified



Preliminary findings

Distribution of confirmed CRO cases according to date of blood sample collection



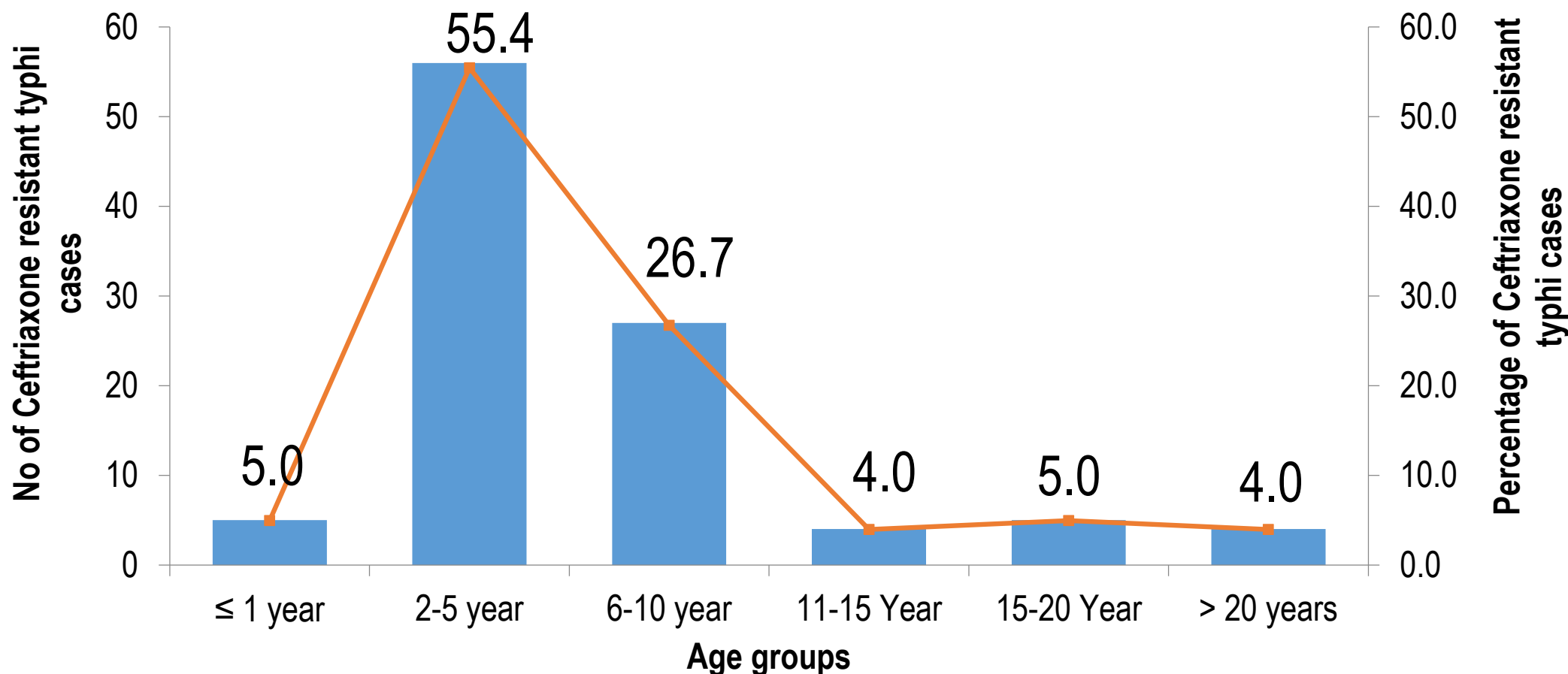


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Preliminary findings

Distribution of cases according to different age group





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Preliminary findings

- About 60% of the cases were admitted to hospital and 40% were treated as outpatients
- All the patients recovered
- No mortality observed to date



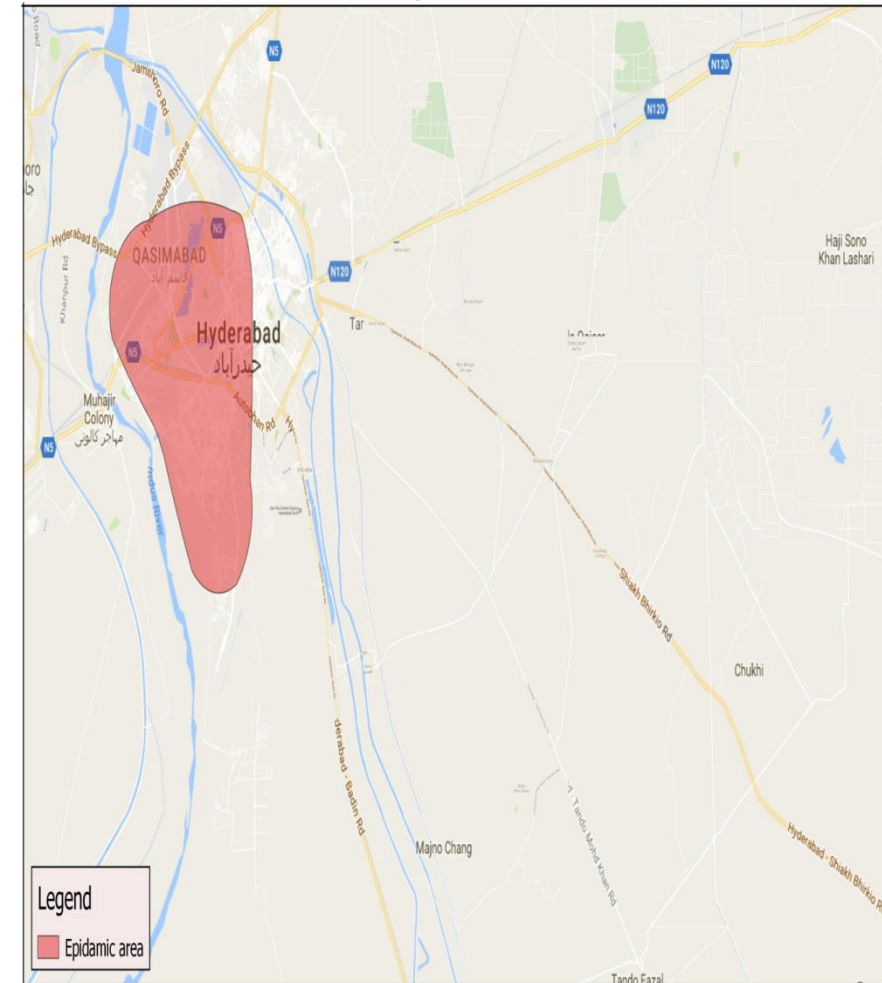
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Geospatial mapping

- 38 cases have been visited and mapped
- Complete addresses of all the cases have been retrieved
- Majority of the cases belong to middle income families living in two talukas (Qasimabad and Latifabad approx. pop of 900,000) located in Hyderabad city

Hyderabad



0 1 2 3 4 km



Date: March 30, 2017



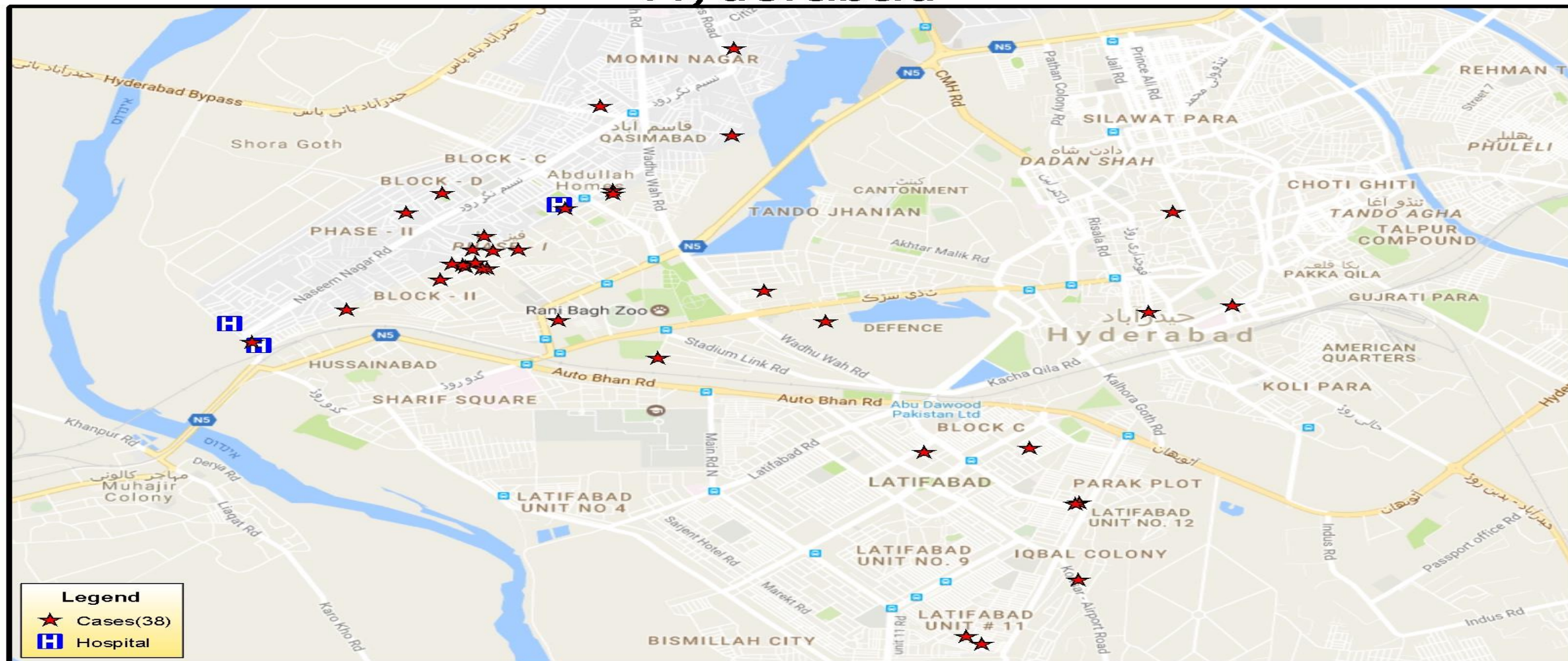
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Geographic distribution of initial 38 cases

Hyderabad

Overview



0 1.8 Kilometers

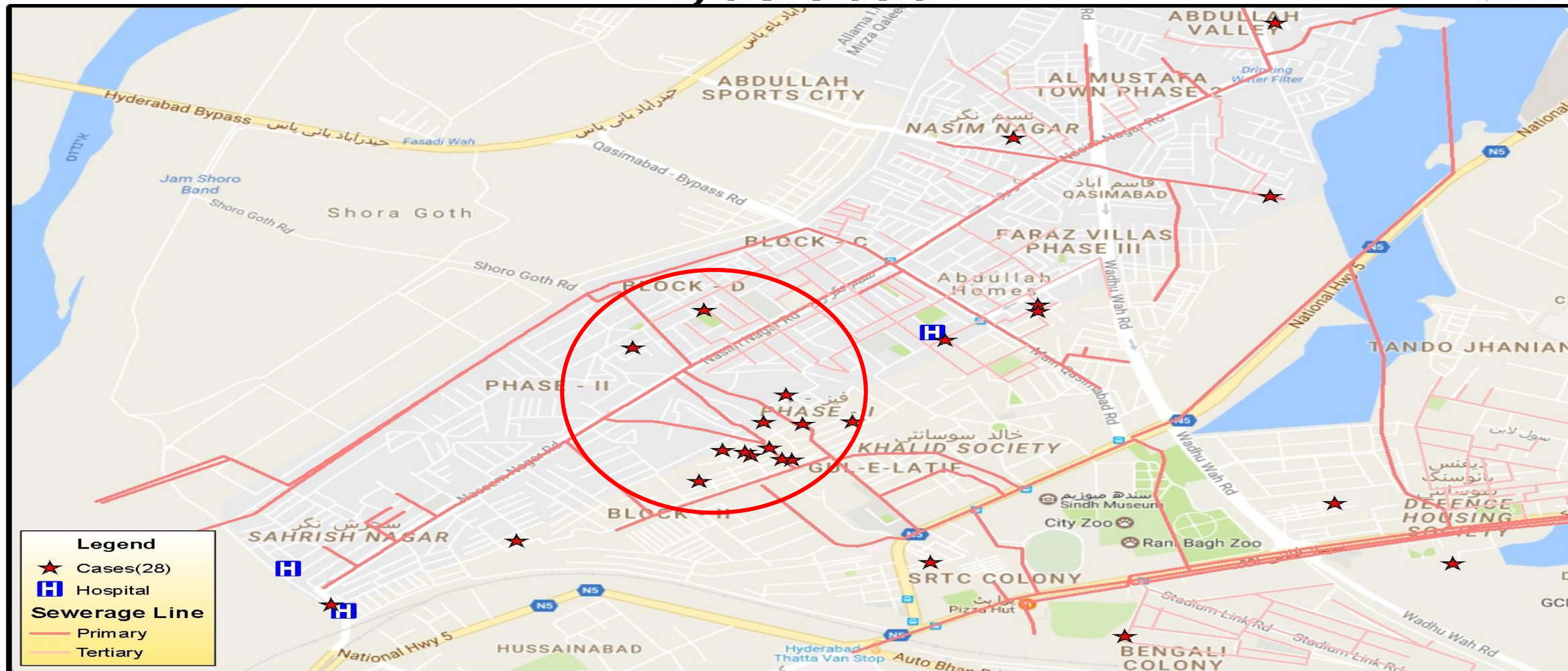


Date: March 30, 2017



Geographic distribution of the cases

Hyderabad



Legend

- ★ Cases(28)
- H Hospital
- Sewerage Line**
- Primary
- Tertiary



Date: March 30, 2017



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Current activities

- Surveillance ongoing for ceftriaxone resistant S. Typhi cases from:
 - ✓ Aga Khan University Laboratory
 - ✓ Civil Hospital Hyderabad
 - ✓ Bhattai Hospital Hyderabad
- Age matched case control study is ongoing (1:4)



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Current activities

- Other investigations ongoing
 - ✓ Clinical features
 - ✓ Household water cultures
 - ✓ Other source searching
 - ✓ Sanger sequencing of 80 isolates



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Outbreak control efforts

- Case management
 - ✓ Azithro for outpatient
 - ✓ Carbapenem for inpatient
 - ✓ Some received both (4-5 days of Carbapenem followed by 5-7 days of Azithromycin)
- Water and sanitation flyer – community education

ٹائفائیڈ سے بچائو ممکن ہے ٹائفائیڈ سان بچن ممکن آھی



- پینے کا پانی اُبال کر استعمال کریں۔
- کھانے سے پہلے اور قضائے حاجت کے بعد ہاتھ صابن سے دھوئیں۔
- پیئٹن جو پانی او باری کری استعمال کریو
- کانٹن کان پھریان ۽ باٹروم وہی کان پوء ہٹ صابن سان تو یو



- پھل اور فروٹ کھانے سے پہلے صاف پانی سے دھوئیں اور چھکا اُتاریں۔
- رنگ برنگی برف کی تافی اور گولا کڈا کھانے سے پرہیز کریں۔
- سبزی ۽ فروٹ کانٹن کان پھریان صاف پانی سان تو یو ۽ ان جون کلون لاهیو کان پرہیز کریو
- رنگ برنگی برف واری قلفی ۽ گولا کڈا کائٹ



- ٹائفائیڈ کے خاتمے کے لیے کمیونٹی کی تعلیم کریں۔
- گلیوں اور ٹھیلوں پر فروخت ہونے والی کھانے کی اشیاء اور مشروبات سے پرہیز کریں۔
- ٹائفائیڈ جا حفاظتی ٹکاکرايو
- گھٹی استالن تی و کرٹ وارن شین کان پرہیز کریو

احتیاط ہی زندگی ہے
احتیاط کرٹ ہی زندگی آھی



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Other outbreak control efforts

- Vaccines – TCV requested from BBIL
- Drug Regulatory Authority of Pakistan granted special permission to allow import of TCV for outbreak control
- Awaiting shipment of vaccines



Next steps

1. Molecular detection of possible environmental reservoir for eliciting transmission pathway
2. Impact assessment of TCV vaccination on control of Ceftriaxone resistant S.Typhi outbreak
3. Chronic carriage among cases of Ceftriaxone resistant isolates versus sensitive isolates
4. SaniPath approach to fecal exposure assessment (as presented by Dr. Christine Moe from Emory University)

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- Denise Garrett (Sabin Vaccine Institute)
- Gordon Dougan (Sanger Institute Wellcome Trust)
- Christine Moe (Emory University)

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