



Disease Alert

प्रकोप चेतावनी

A monthly Surveillance Report from Integrated Disease Surveillance Programme
National Health Mission

September 2016

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Diphtheria outbreak Investigation, Kozhikode district, Kerala

Background

An outbreak of Diphtheria was reported to Central Surveillance Unit, IDSP from Kerala on 10.08.2016. In response to the Diphtheria outbreak, a visit was made by a team of officials from National Centre for Disease Control, Delhi and Immunization Division, MoHFW to Kozhikode and Malappuram Districts and the State Headquarters, Kerala from 17th to 19th August, 2016. The team composition is as follows:

1. Dr. K. Regu, Joint Director, NCDC Calicut Branch, Kerala, Calicut
2. Dr. Sanket V Kulkarni, Assistant Director NCDC, Delhi
3. Dr. Mahesh H Waghmare, Assistant Director NCDC, Delhi
4. Dr. Yashika Negi, Technical Officer, Immunization Division, MoHFW, Delhi

Kozhikode or Calicut district and city in the state of Kerala in southern India is located on the Malabar Coast. Calicut city is the 3rd largest urban area in the state of Kerala and 195th largest urban area in the world. The city lies about 275 kilometers west of Bangalore. Malappuram district, with its headquarters at Malappuram, is also a district in the state of Kerala, India. This district was formed on 16 June 1969. Malappuram district is composed of portions of the former Palakkad and Kozhikode districts: Ernad taluk and portions of Tirur taluk of Kozhikode district, and portions of Perinthalmanna and Ponnani taluks of Palakkad district. Both the districts were affected heavily in the current outbreak.

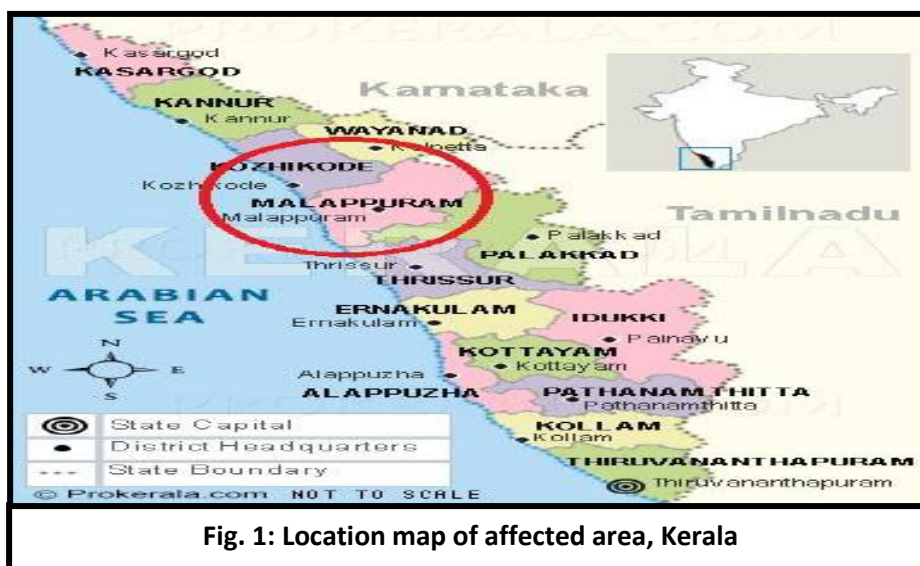


Fig. 1: Location map of affected area, Kerala

Objectives

- To determine the magnitude of the outbreak.
- To determine epidemiological characteristics of the outbreak.
- To determine logistics status for control of this outbreak and prevention of future outbreaks

Methods

Case Definition: (IDSP case def. was used)

An illness of the upper respiratory tract characterized by the following:

- Laryngitis or Pharyngitis or Tonsillitis
- And adherent membranes of tonsils, pharynx, and/or nose.

Line list of cases was prepared and analyzed for Time, Place & person.

Investigation findings:

Immunization coverage in Kerala

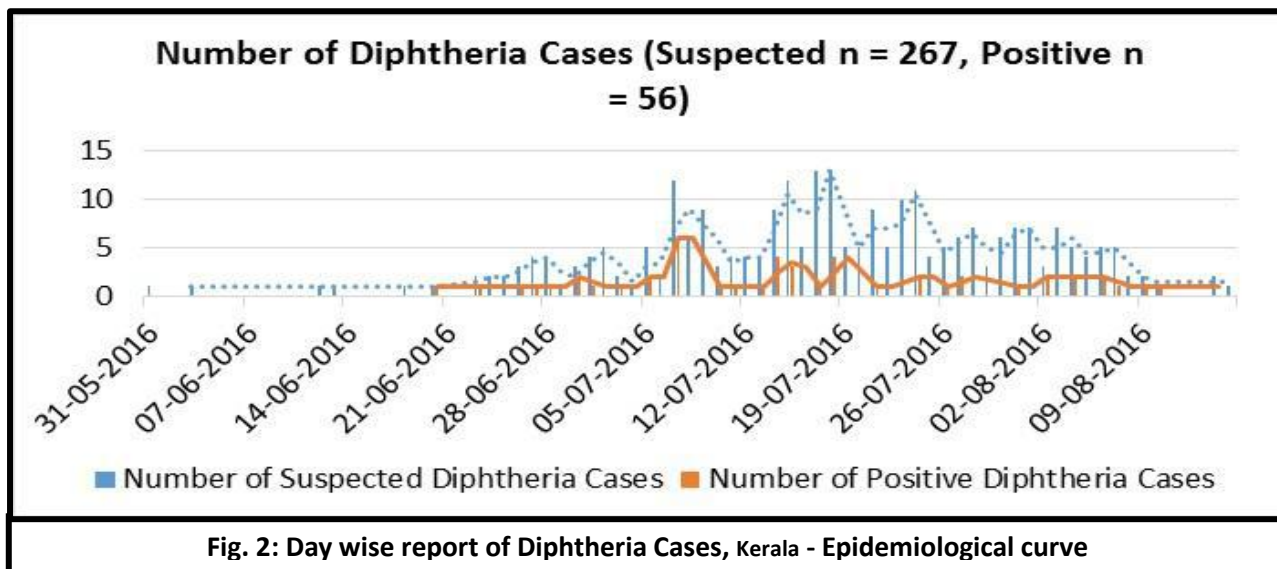
As per the District Level Household Survey- 4 (DLHS-4, 2012-13), the full immunization coverage for the state is 82.5% and DPT3 coverage is 92.7%. The trend in immunization status of Kerala is depicted below:

Name of District	Full Immunization		
	DLHS 2 (2002-2004)	DLHS 3 (2007-2008)	DLHS 4 (2012 - 2013)
ALAPPUZHA	83.4	92.2	94.9
ERNAKULAM	71.7	77.4	70.9
IDUKKI	75.2	85.5	na
KANNUR	90.5	81.7	81
KASARAGOD	92.6	87.3	40.5
KOLLAM	80.8	84.5	83.3
KOTTAYAM	81.3	89.3	77
KOZHIKODE	93.3	65	87.2
MALAPPURAM	53.7	63.9	82.2
PALAKKAD	66.3	69.6	100
PATHANAMTHITTA	86	88.4	-
THIRUVANANTHAPURAM	81.8	91.2	96.6
THRISSUR	80.5	80.8	87.8
WAYANAD	87	78.3	84.4
	78.6	79.6	82.5

Time and Place Distribution: The first case of this outbreak was reported from District Malappuram on 6th June 2016. Of the total 14 districts, diphtheria cases were being reported from eight districts. In the initial phase the cases with laryngitis, pharyngitis or tonsillitis with a membrane were referred to Kozhikode Medical College from both worst affected districts i.e. Malappuram and Kozhikode. Then the cases started getting reported from other neighbouring districts like Wayanad, Palakkad, Kannur etc.

The State had initially planned for confirmation of the outbreak at 2 laboratories viz. Kozhikode Medical College and State Public Health Laboratory at Thiruvananthapuram. Later in July 2016 one more laboratory was strengthened at Manjeri Medical College at Malappuram.

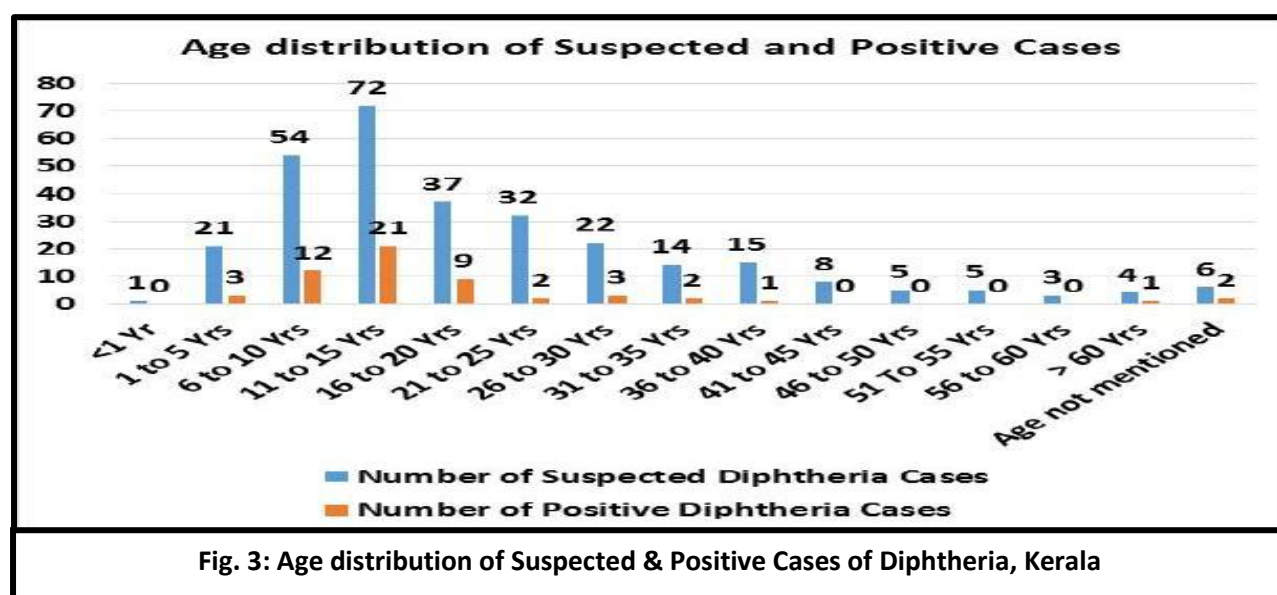
The outbreak was confirmed by culture of *C. diphtheria* in the throat swab samples collected. Throat swabs from all 303 suspected cases were subjected to culture of which 56 samples were laboratory confirmed for *C. diphtheria*. Many of the cases were initiated on empirical treatment with antibiotic Erythromycin even before the throat swab sample was taken.



Out of the 56 samples tested, 16 samples were sent for *tox* gene identification at State Public Health Laboratory, Trivandrum. It was observed that out of 16, 14 were found positive for *tox* gene which confirmed the outbreak caused by toxigenic strain of *C. diphtheria*. The line list of these tested positive cases is given in the table below:

Person Distribution:

Majority of the cases are more than 10 years of age, depicting accumulation of previous year’s unimmunized lot, 7% belong to the age group of 5-10 years and 3% of the cases belong to the age group of less than 5 years. Also, majority of the cases were unimmunized.



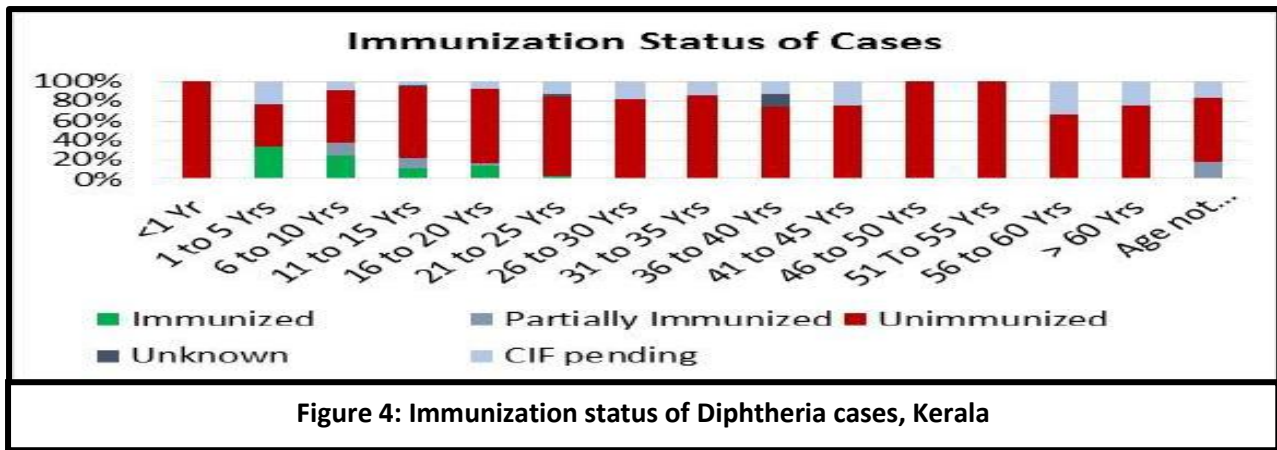


Figure 4: Immunization status of Diphtheria cases, Kerala

Religion wise distribution of cases:

Around 65% of the cases were from Muslims and 32% were from Hindus as shown in the figure below.

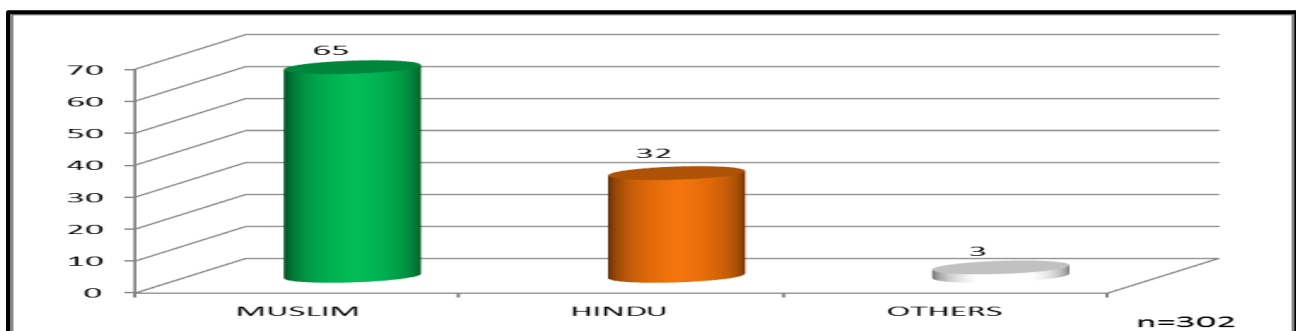


Table 5: Religion wise distribution of Diphtheria cases in Kerala

At the time of the visit, the outbreak was in declining phase, i.e. the occurrence of new cases was declining. The district-wise list of diphtheria cases, as on 18th August 2016, is as follows:

Table 2. District-wise list of diphtheria cases in Kerala (As on 18th August 2016)			
S. No.	Districts	Diphtheria cases reported	Full Immunization Coverage (DLHS 4)
1	Malappuram	103 (2 deaths)	82.2
2	Kozhikode	130	87.2
3	Kannur	40	81.0
4	Wayanad	12	84.4
5	Kasargod	1	40.5
6	Palakkad	13	100
7	Thrissur	2	87.8
8	Ernakulam	2	70.9
	TOTAL	303	82.5

A total of 6 throat swabs and 6 culture specimens were collected by the Microbiologist to be tested at NCDC, out of which none of the throat swabs and 2 culture tested positive for toxic strains of *C. diphtheria*.

Action taken by the state to control the outbreak

- State Rapid Response Team (RRT) involving State officials and technical experts from Medical Colleges investigated the outbreak at Malappuram on 25-06-2016 and recommendation for immediate containment were issued.
- Inter-sectoral meeting called by Hon'ble Minister for Health and Social Justice, Govt. of Kerala with religious leaders, professional organizations (IMA, IAP, and Kerala Govt. Medical Officers Association), and community NGOs where action plan to vaccinate large cohort of unimmunized children drawn up.
- Orders placed for Td vaccine and Diphtheria anti-toxin.
- State Technical Advisory Group on Immunization (STAGI) constituted to advise the state Government on policies, practices and implementation of immunization programme.
- Protocol for Diphtheria outbreak management and case treatment prepared and uploaded on the website of Directorate of Health Services, Kerala.
- Training of appropriate health officials for managing the outbreak.
- Hon'ble Minister for Health, Family Welfare and Social Justice participated in open debate on visual media.
- Enhanced IEC activities for vaccination campaigns conducted by the State.
- Vaccination drive to be continued for next few months to complete backlog of vaccination.

Td vaccine status

By the time of visit, around 2, 71,710 doses of Td vaccine had been administered in the entire state, with around 2, 04,751 doses administered in Malappuram district and around 54,839 doses administered in Kozhikode till the visit. There is adequate stock of 2.67 lakh doses available at the district as well as state level. The school Td vaccination is on-going.

Anti-toxin status

The State has procured 800 vials of Diphtheria anti-toxin, out of which, 500 vials were distributed to Malappuram District/Regional Store for use. At the time of visit, there was a balance stock of 268 vials at Malappuram store and 300 vials at State store, clearly indicating adequate stock of diphtheria anti-toxin at the State as well as district level.

Risk factors/ factors that may have predisposed to diphtheria infection:

- Partial or unimmunized cohort.
- Children aged between 10-15 years of age who had not received booster vaccinations were more susceptible to contract the disease from carriers.
- Travel to or from other States or regions.

Recommendations:

1. Strengthen the Routine Immunization in order to prevent future outbreaks and also bring down the number of unprotected lots.
2. Inter-sectoral coordination needs to be strengthened and continued to be used for strengthening Routine Immunization.
3. Integration of existing IDSP surveillance system with Immunization division at the State and District level for Vaccine Preventable Diseases (VPDs) which would help in detection of early warning signals and prompt response.

4. Strengthening and utilization of referral Labs for timely identification of the VPD outbreaks. The lab strengthening is already supported under IDSP and this situation may be used to strengthen these labs in phase wise manner.
5. Drawing up a detailed line list of cases with requisite details on immunization history of the case (number of doses of the vaccine and date of last vaccine administered, among other details) and other social determinants for vaccination.



**Surveillance data of Enteric Fever, Acute Diarrhoeal Disease, Viral Hepatitis A & E, Dengue
Leptospirosis and Chikungunya During September 2014-2016***

* Data extracted from IDSP Portal (www.idsp.nic.in) as on 30 January, 2017.

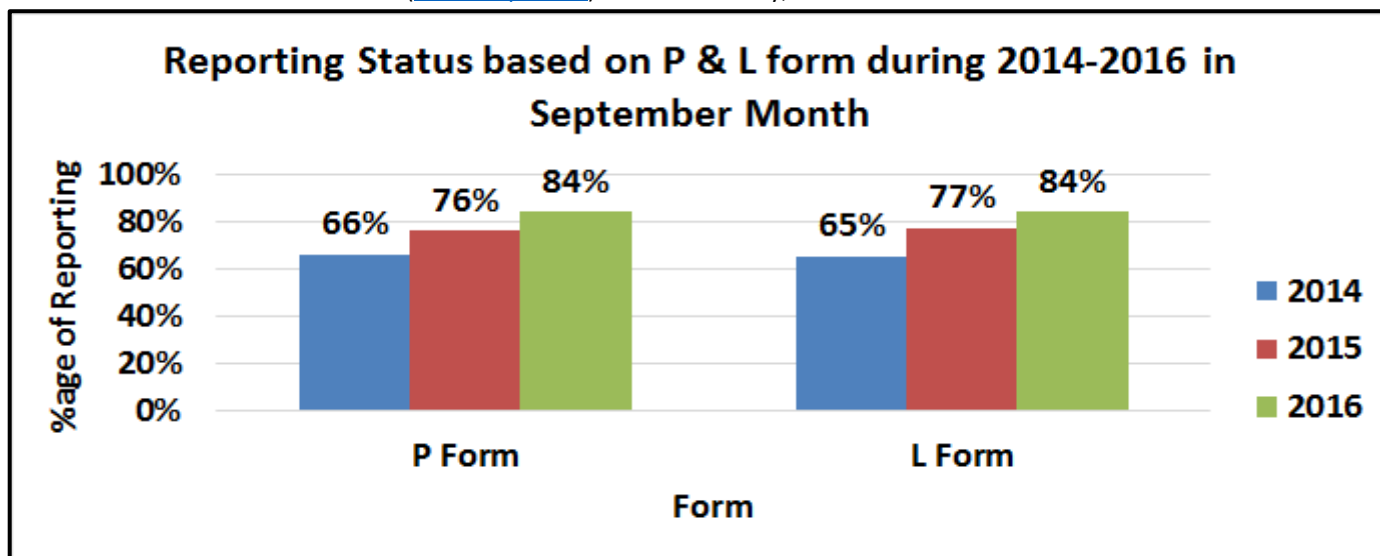


Fig. 6: Reporting Status based on P & L form during September 2014-2016

As shown in fig 6, in September 2014, 2015 and 2016, the 'P' form reporting percentage (i.e. % RU reporting out of total in P form) was 66 %, 76% and 84% respectively across India, for all disease conditions reported under IDSP in P form. Similarly, L form reporting percentage was 65%, 77% and 84% respectively across India for all disease conditions, during the same month for all disease conditions reported under IDSP in L form. The completeness of reporting has significantly increased over the years in both P and L form, thereby improving the quality of surveillance data.

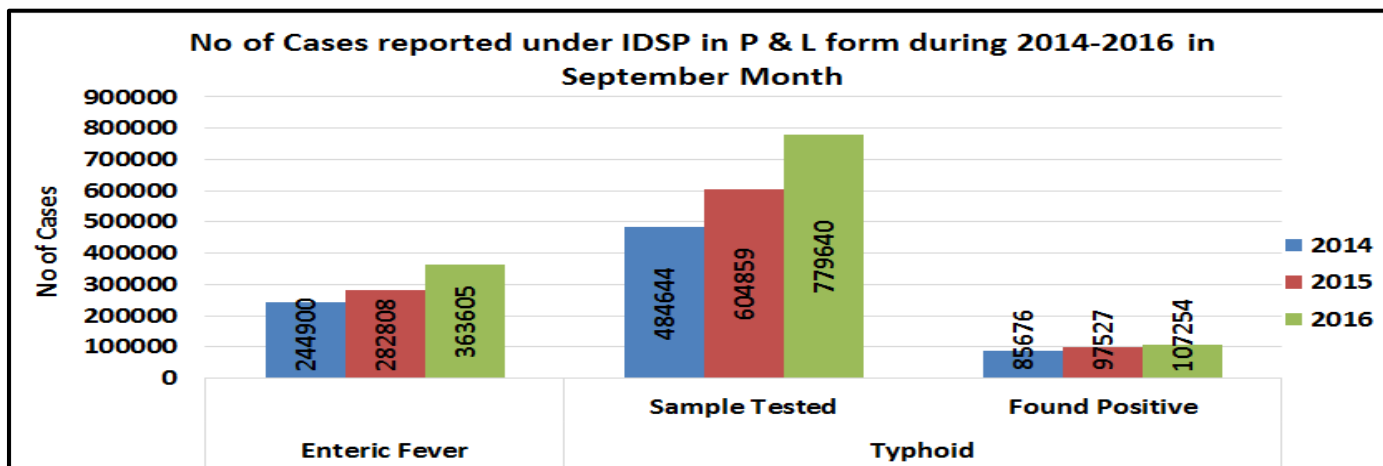


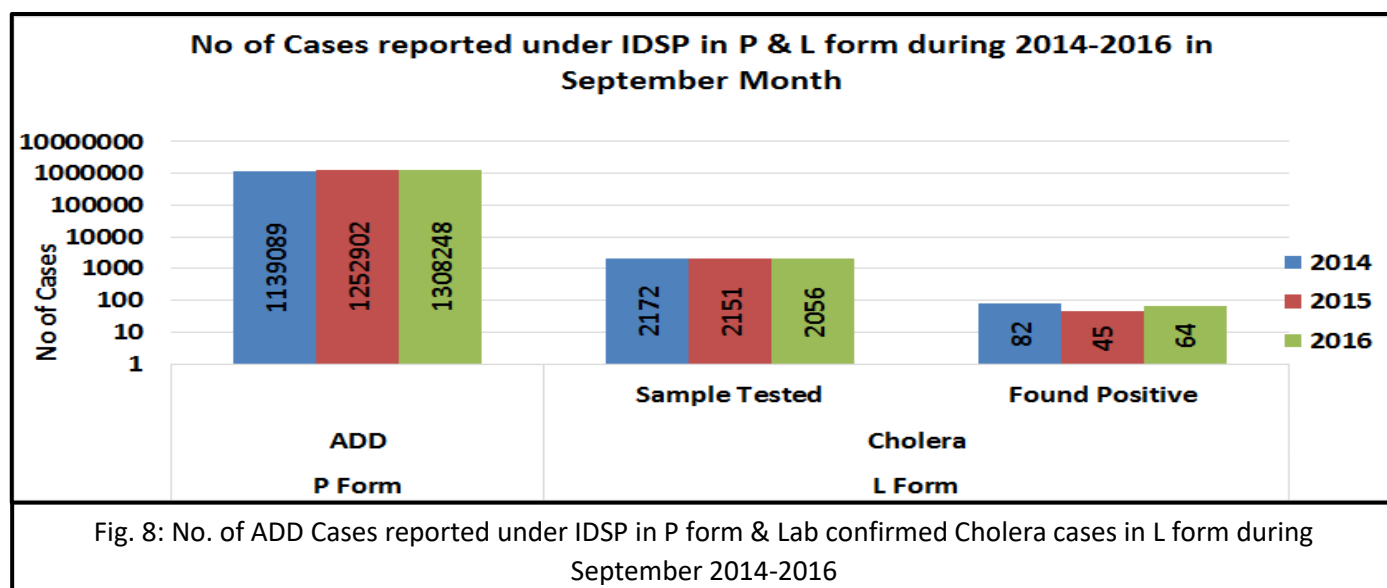
Fig. 7: No. of Enteric Fever Cases reported under P & L form during September 2014-2016

As shown in fig 7, number of presumptive enteric fever cases, as reported by States/UTs in 'P' form was 244900 in September 2014; 282808 in September 2015 and 363605 in September 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in September 2014; 484644 samples were tested for Enteric fever, out of which 85676 were found positive. In September 2015; out of 604859 samples, 97527 were found to be positive and in September 2016, out of 779640 samples, 107254 were found to be positive.

Sample positivity has been 17.7%, 16.1% and 13.8% in September month of 2014, 2015 & 2016 respectively.

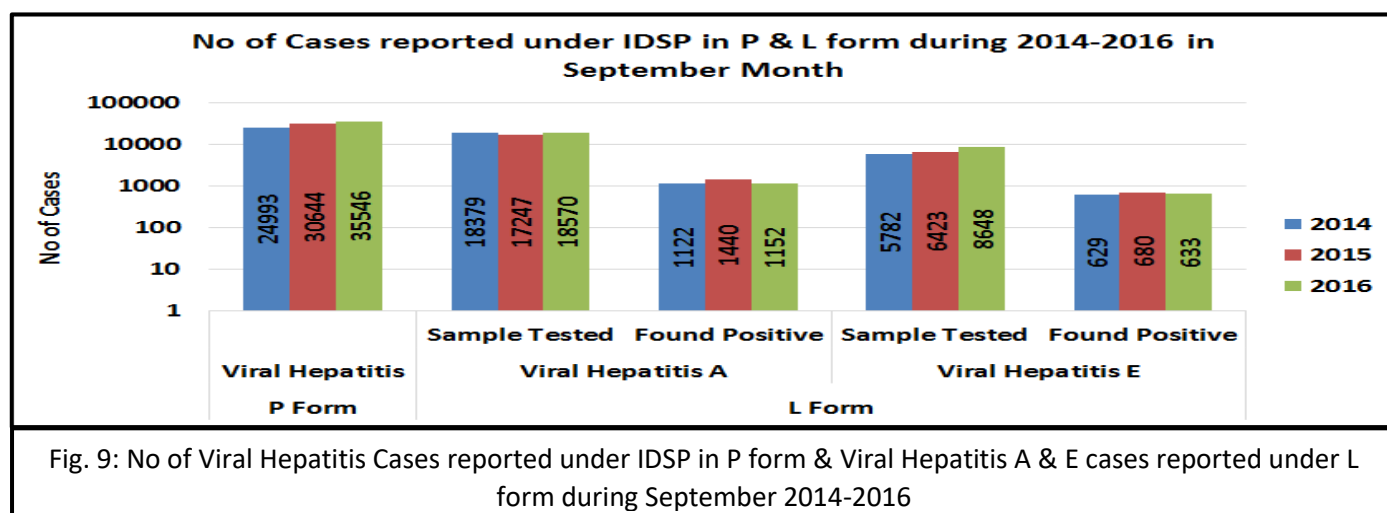
Limitation: The test by which above mentioned samples were tested could not be ascertained, as currently there is no such provision in L form.



As shown in fig 8, number of Acute Diarrhoeal Disease cases, as reported by States/UTs in 'P' form was 1139089 in September 2014; 1252902 in September 2015 and 1308248 in September 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in September 2014, 2172 samples were tested for Cholera out of which 82 tested positive; in September 2015, out of 2151 samples, 45 tested positive for Cholera and in September 2016, out of 2056 samples, 64 tested positive.

Sample positivity of samples tested for Cholera has been 3.8%, 2.1% and 3.1% in September month of 2014, 2015 & 2016 respectively.



As shown in fig 9, the number of presumptive Viral Hepatitis cases was 24993 in September 2014, 30644 in September 2015 and 35546 in September 2016. These presumptive cases were diagnosed on the basis of case definitions provided under IDSP.

As reported in L form for Viral Hepatitis A, in September 2014; 18379 samples were tested out of which 1122 were found positive. In September 2015; out of 17247 samples, 1440 were found to be positive and in September 2016, out of 18570 samples, 1152 were found to be positive.

Sample positivity of samples tested for Hepatitis A has been 6.1%, 8.3% and 6.2% in September month of 2014, 2015 & 2016 respectively.

As reported in L form for Viral Hepatitis E, in September 2014; 5782 samples were tested out of which 629 were found positive. In September 2015; out of 6423 samples, 680 were found to be positive and in September 2016, out of 8648 samples, 633 were found to be positive.

Sample positivity of samples tested for Hepatitis E has been 10.9%, 10.6% and 7.3% in September month of 2014, 2015 & 2016 respectively.

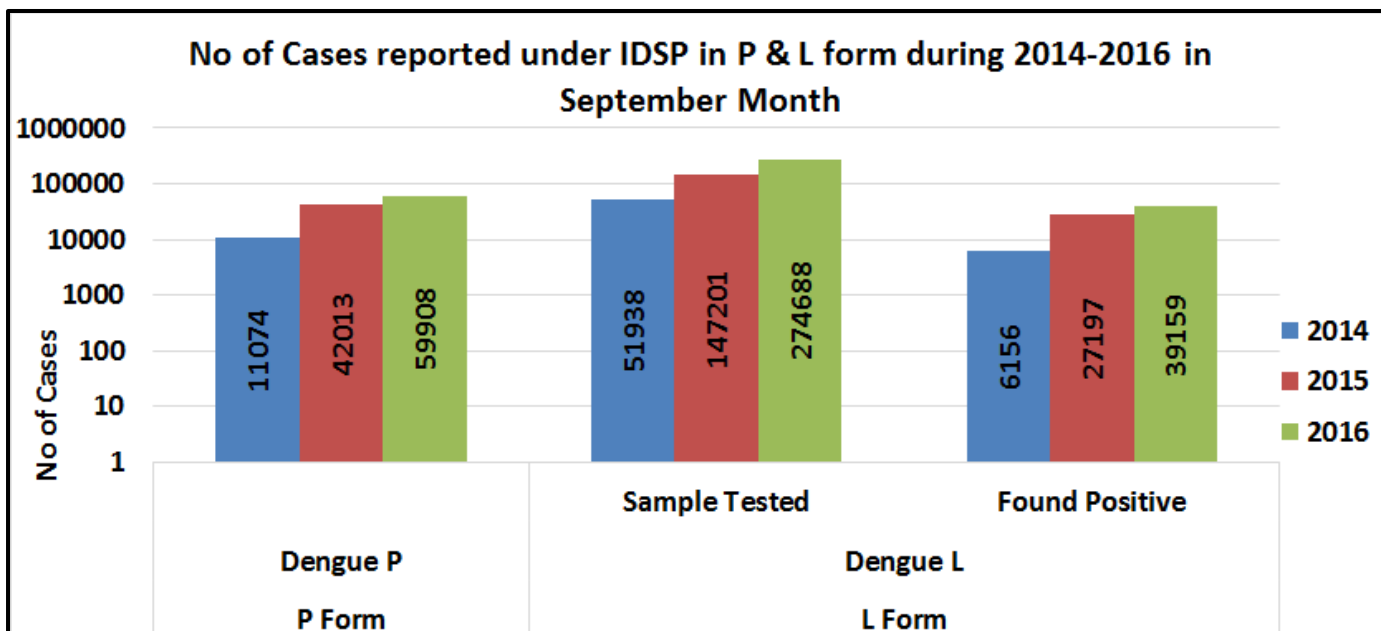


Fig. 10: No. of Dengue Cases reported under IDSP in P & L form during September 2014-2016

As shown in fig 10, number of presumptive Dengue cases, as reported by States/UTs in 'P' form was 11074 in September 2014; 42013 in September 2015 and 59908 in September 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in September 2014; 51938 samples were tested for Dengue, out of which 6156 were found positive. In September 2015; out of 147201 samples, 27197 were found to be positive and in September 2016, out of 274688 samples, 39159 were found to be positive.

Sample positivity of samples tested for Dengue has been 11.9%, 18.5% and 14.3% in September month of 2014, 2015 & 2016 respectively.

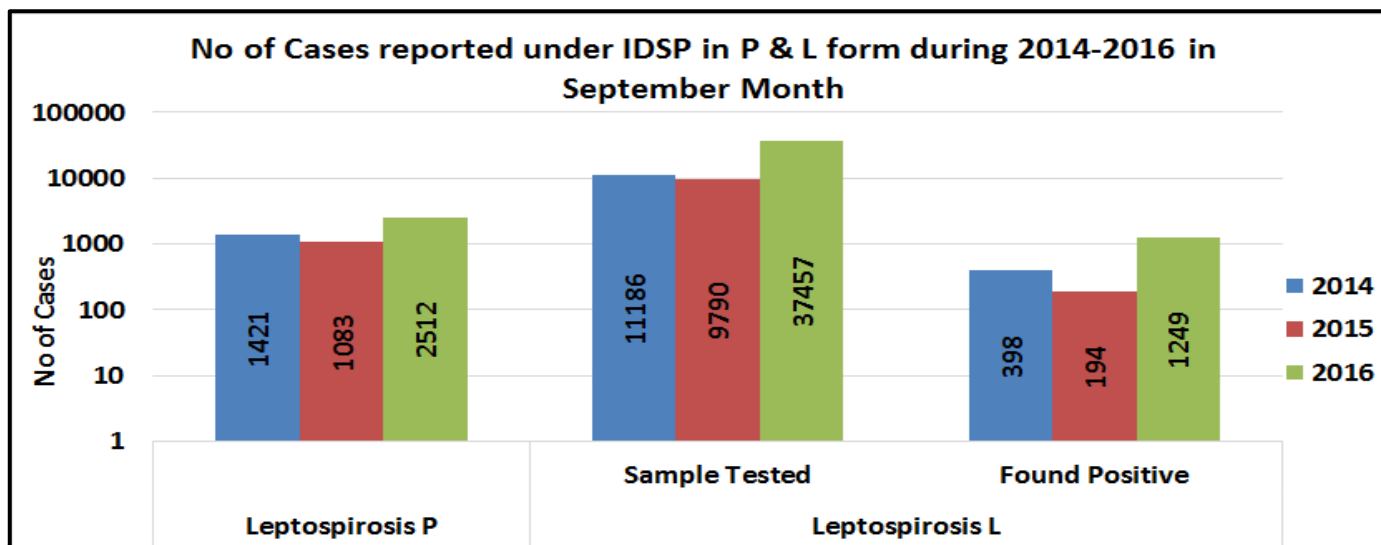
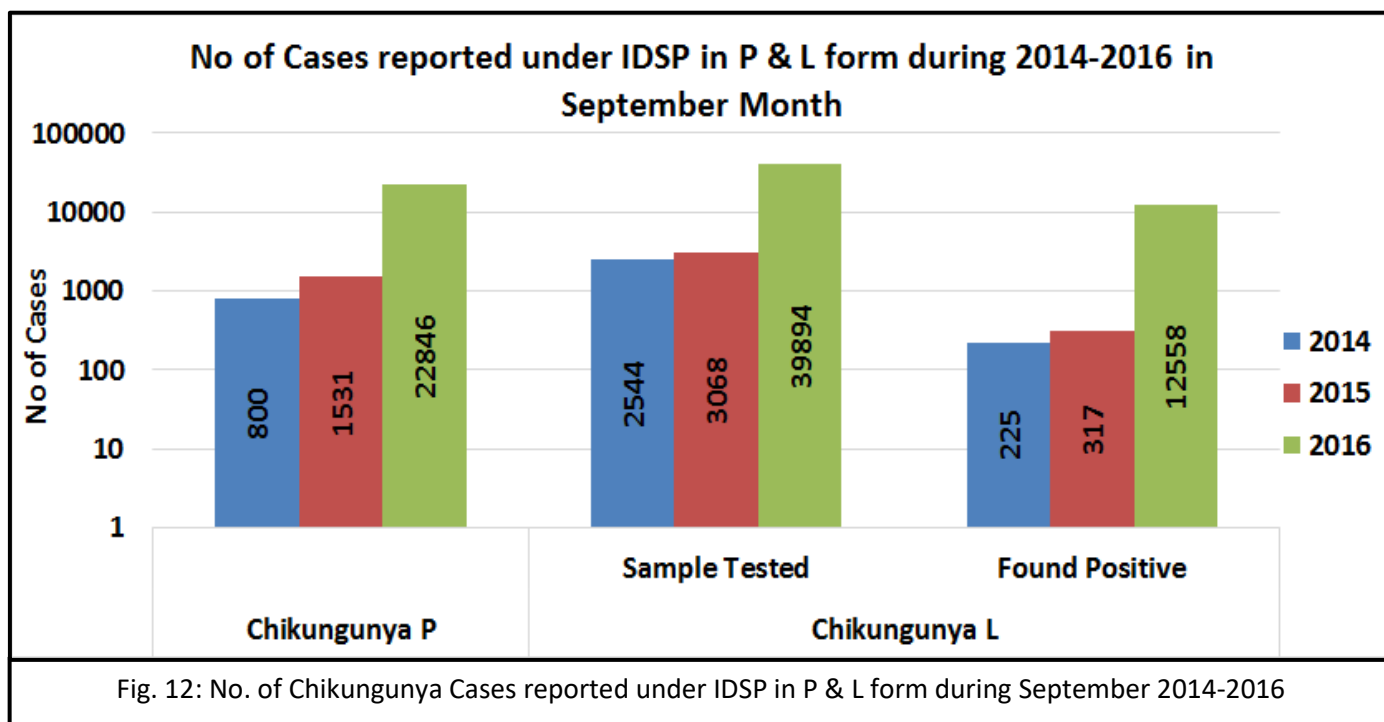


Fig. 11: No. of Leptospirosis Cases reported under IDSP in P & L form during September 2014-2016

As shown in fig 11, number of presumptive Leptospirosis cases, as reported by States/UTs in 'P' form was 1421 in September 2014; 1083 in September 2015 and 2512 in September 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in September 2014; 11186 samples were tested for Leptospirosis, out of which 398 were found positive. In September 2015; out of 9790 samples, 194 were found to be positive and in September 2016, out of 37457 samples, 1249 were found to be positive.

Sample positivity of samples tested for Dengue has been 3.6%, 2.0% and 3.3% in September month of 2014, 2015 & 2016 respectively.



As shown in fig 12, number of presumptive Chikungunya cases, as reported by States/UTs in 'P' form was 800 in September 2014; 1531 in September 2015 and 22846 in September 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in September 2014; 2544 samples were tested for Chikungunya, out of which 225 were found positive. In September 2015; out of 3068 samples, 307 were found to be positive and in September 2016, out of 39894 samples, 12558 were found to be positive.

Sample positivity of samples tested for Chikungunya has been 8.8%, 10.3% and 31.5% in September month of 2014, 2015 & 2016 respectively.

Fig 13: State/UT wise P form completeness % for September 2016

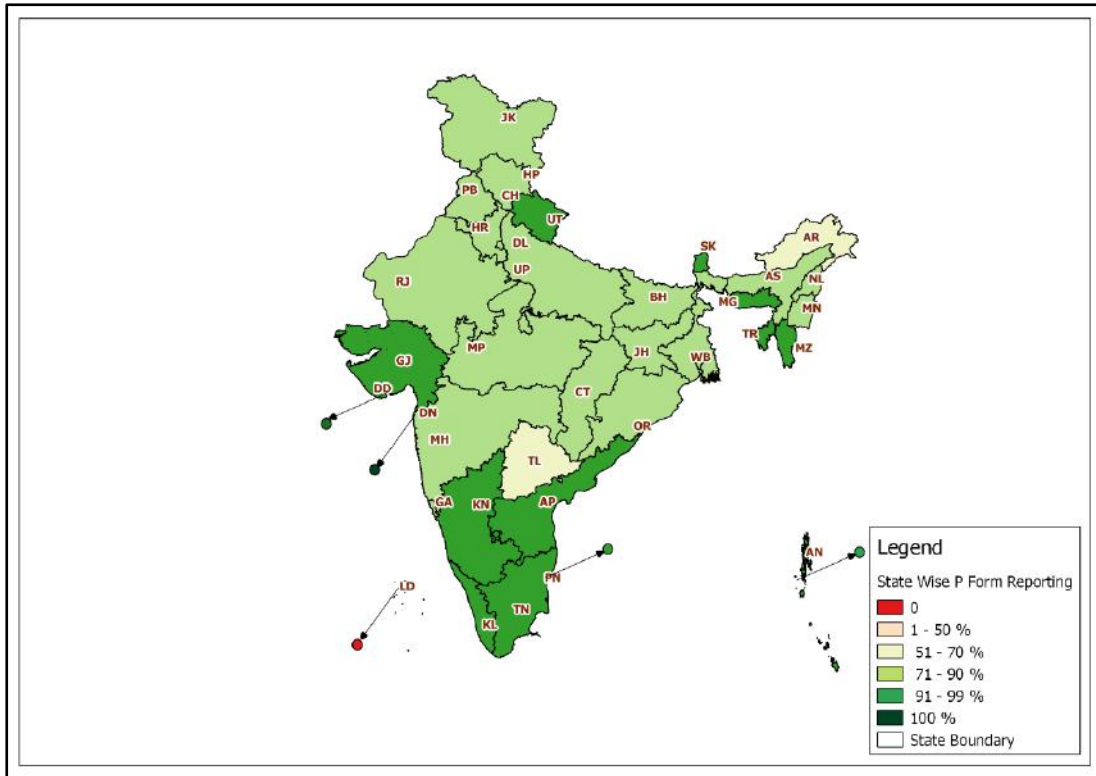


Fig 14: State/UT wise L form completeness % for September 2016

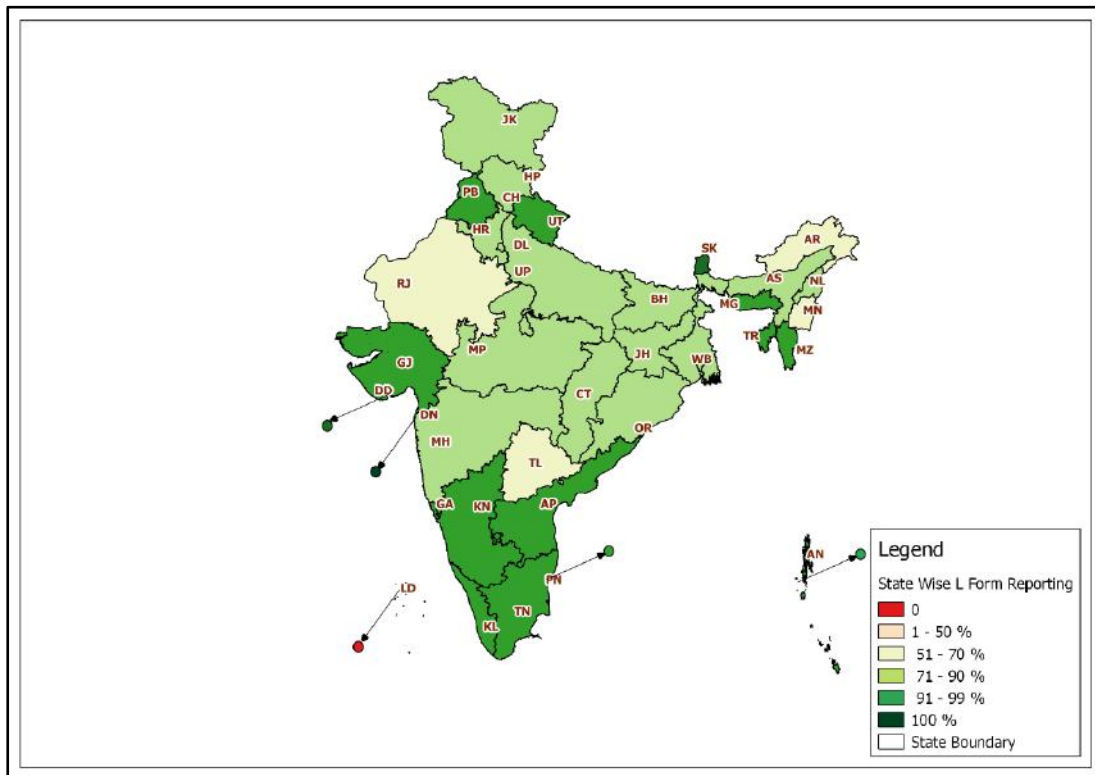


Fig 15: State/UT wise Presumptive Enteric fever cases and outbreaks for September 2016

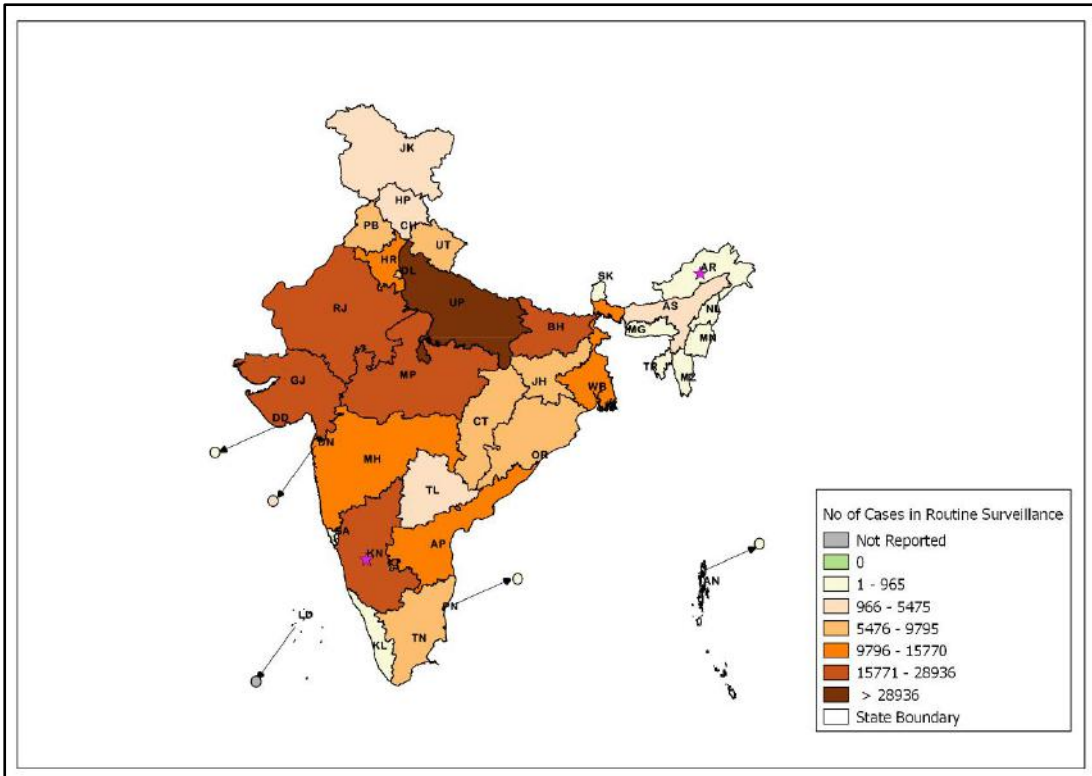


Fig 16: State/UT wise Lab Confirmed Enteric Fever cases and outbreaks for September 2016

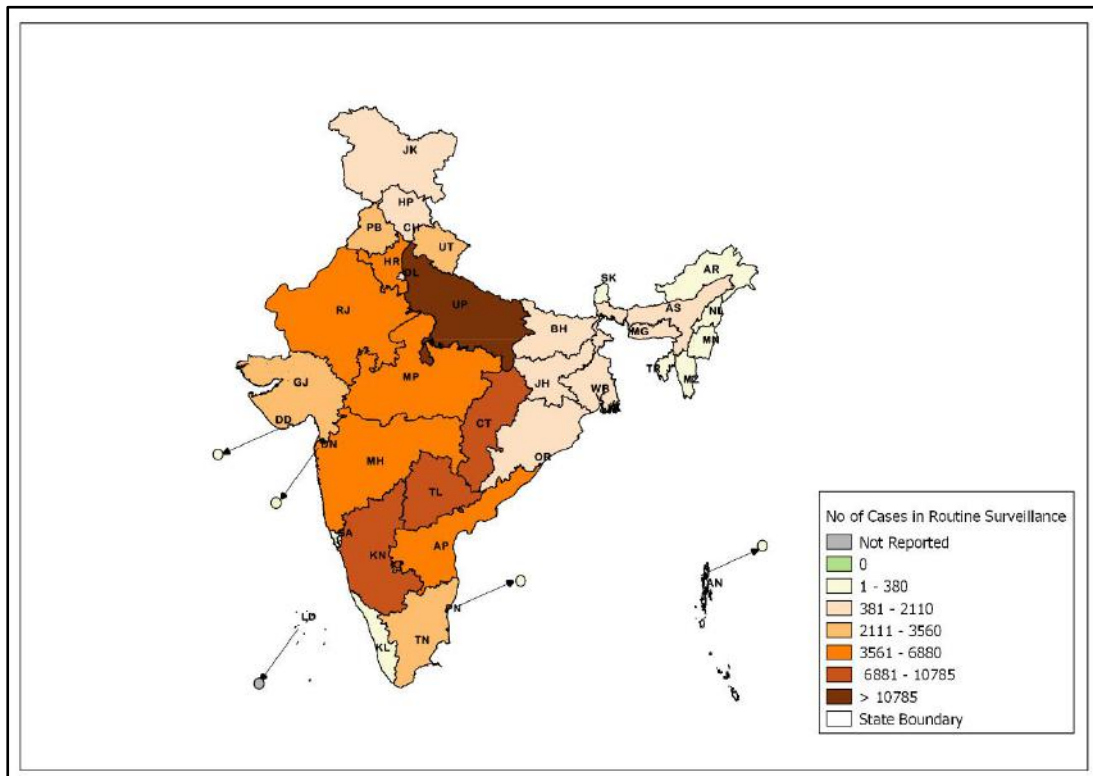


Fig 17: State/UT wise Presumptive ADD cases and outbreaks for September 2016

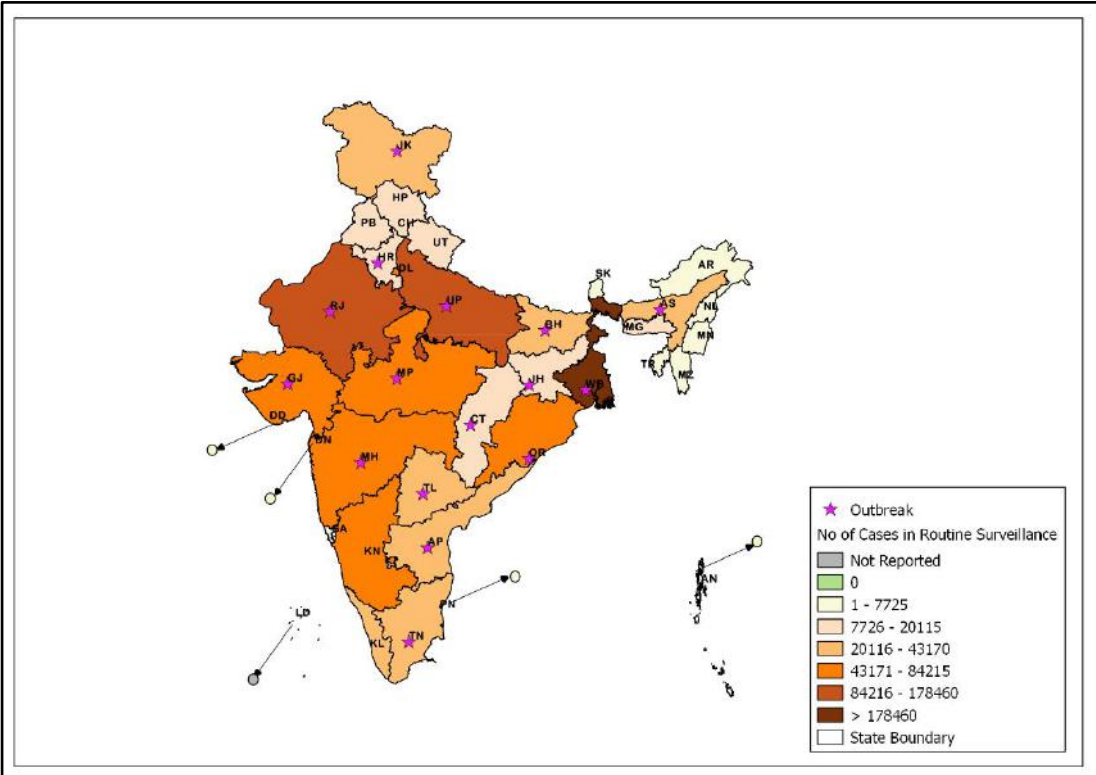


Fig 18: State/UT wise Lab Confirmed Cholera cases and outbreaks for September 2016

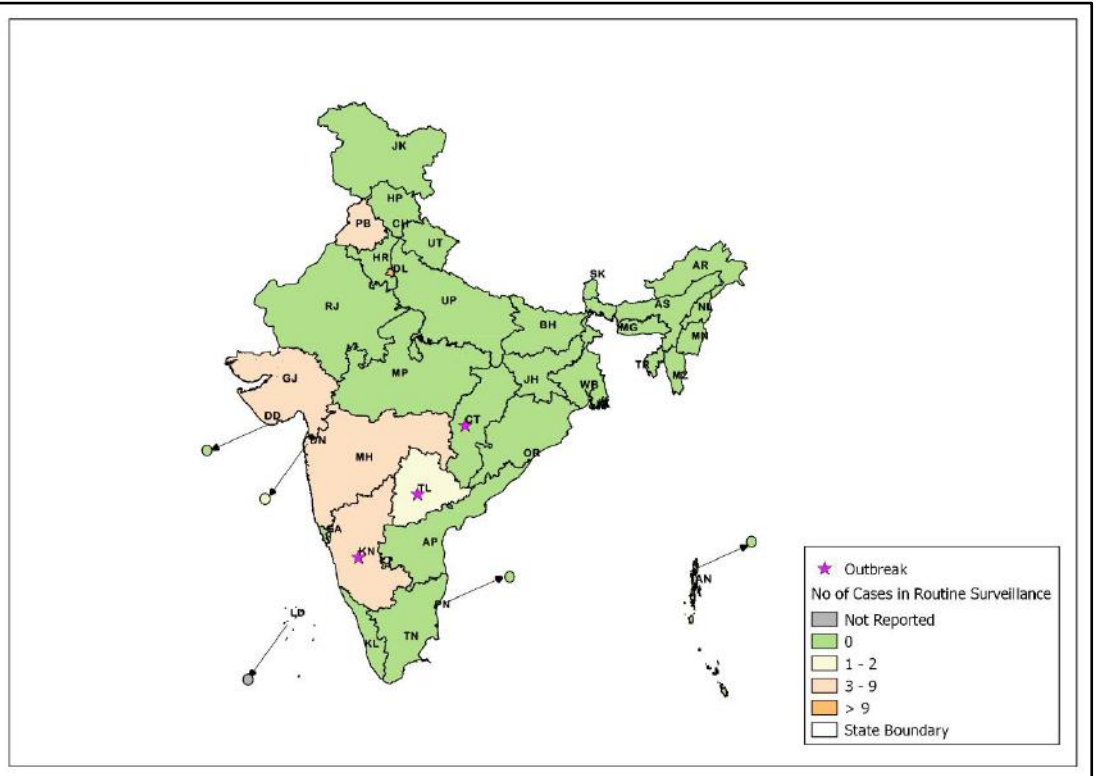


Fig 19: State/UT wise Presumptive Viral Hepatitis cases and outbreaks for September 2016

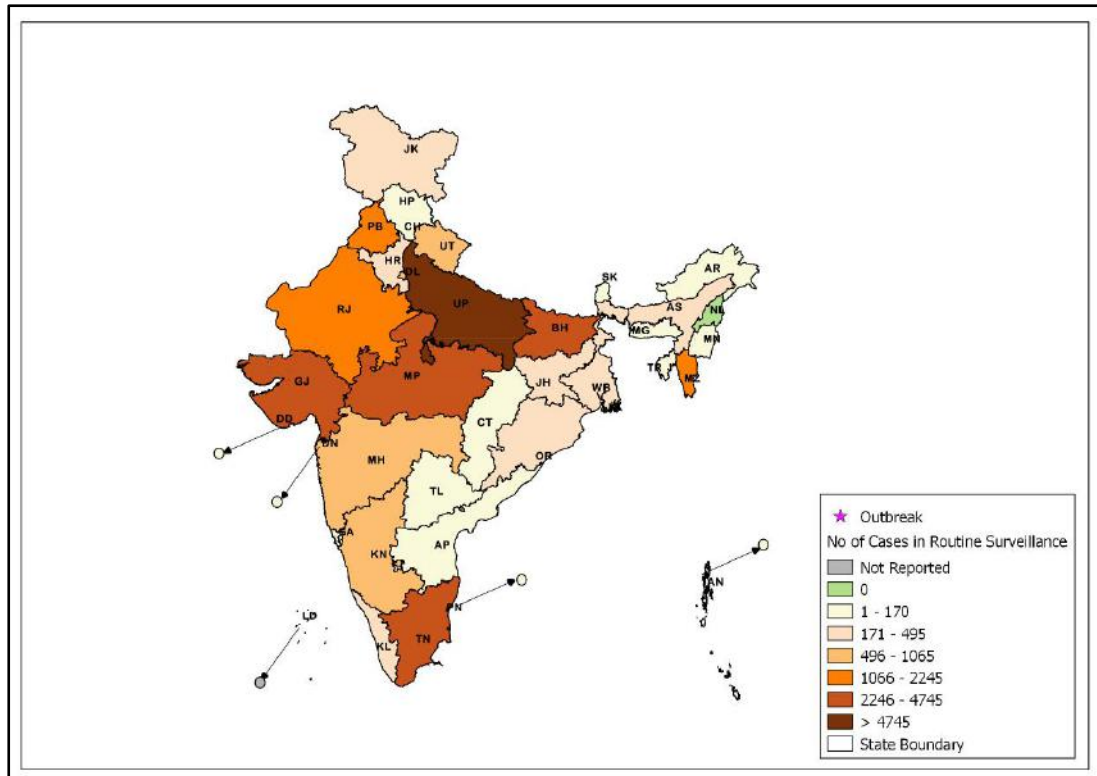


Fig 20: State/UT wise Lab confirmed Viral Hepatitis A cases for September 2016

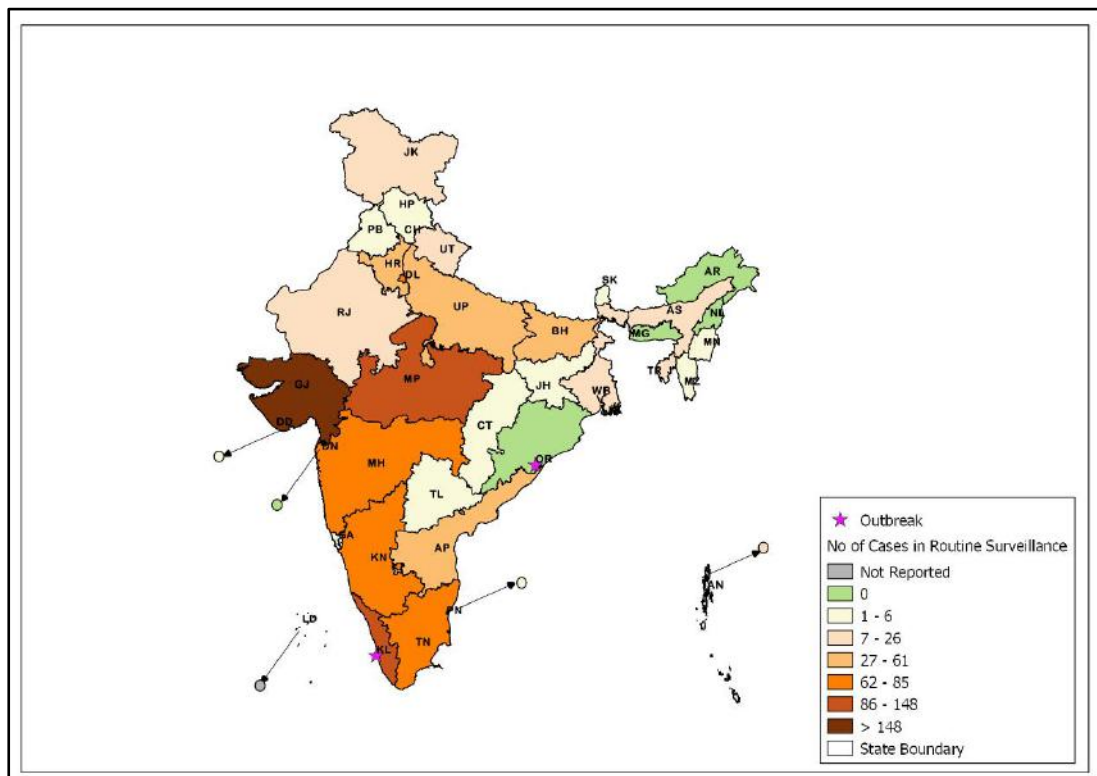


Fig 21: State/UT wise Lab confirmed Viral Hepatitis E cases for September 2016

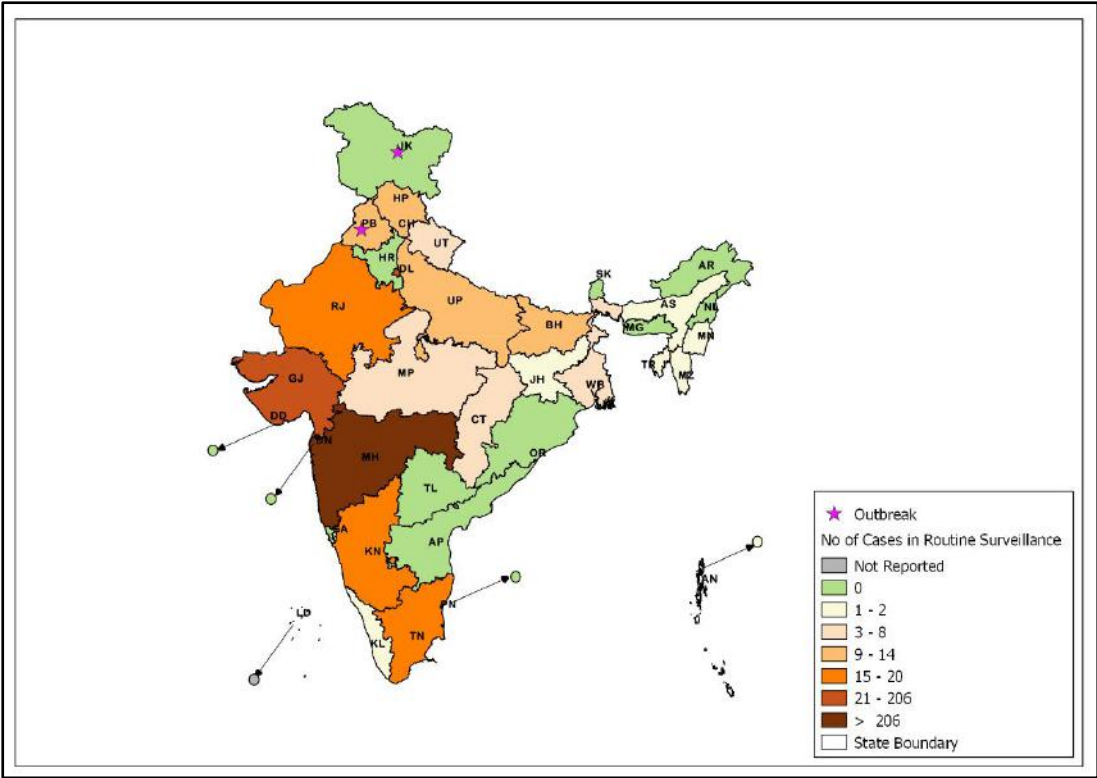


Fig 22: State/UT wise Presumptive Dengue cases & outbreaks for September 2016

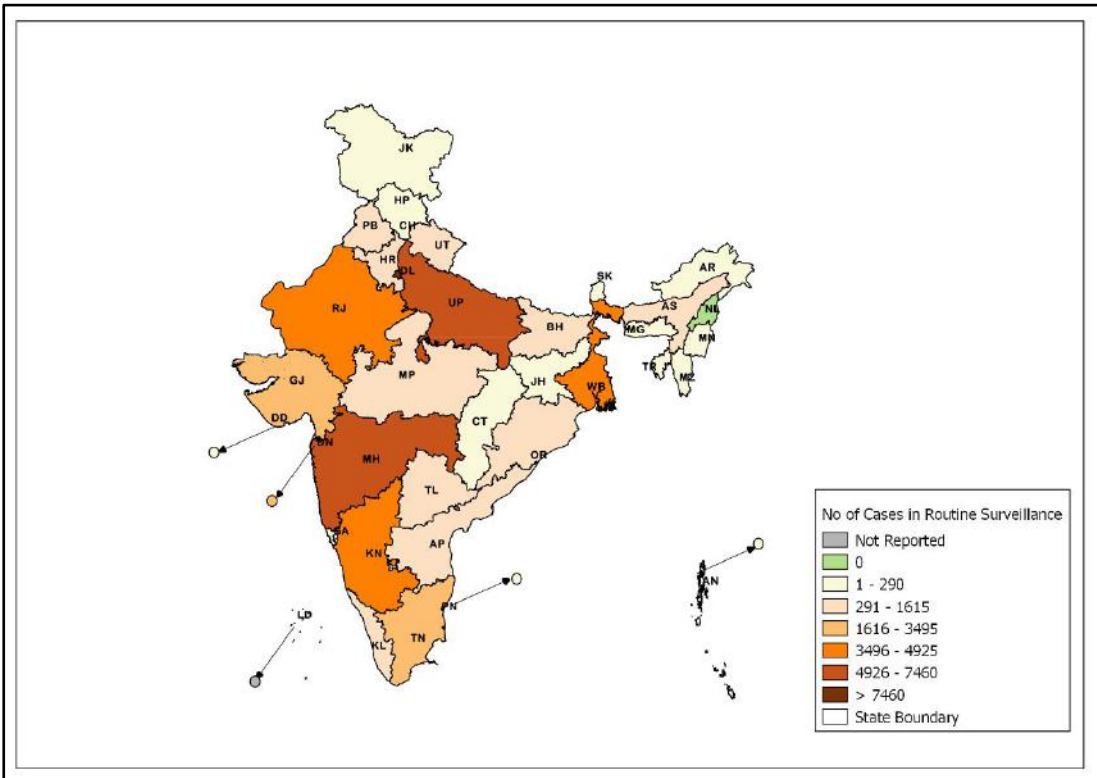


Fig 23: State/UT wise Lab confirmed Dengue cases for September 2016

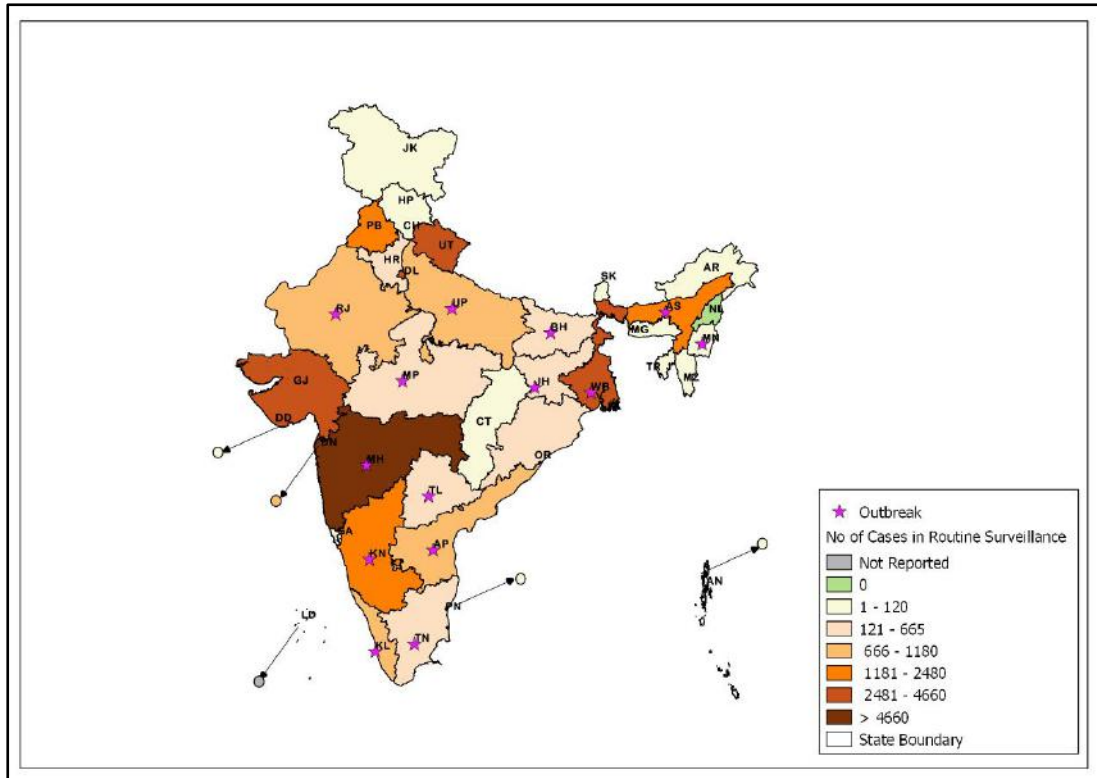


Fig 24: State/UT wise Presumptive Leptospirosis cases for September 2016

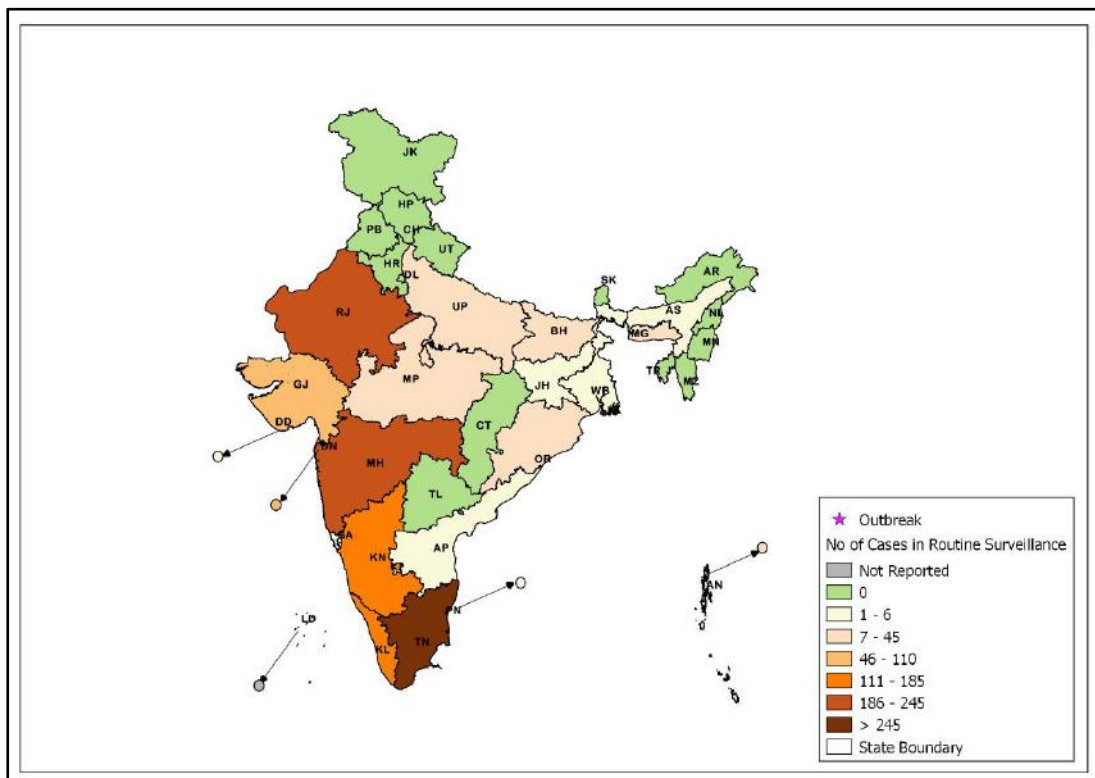


Fig 25: State/UT wise Lab Confirmed Leptospirosis cases & outbreaks for September 2016

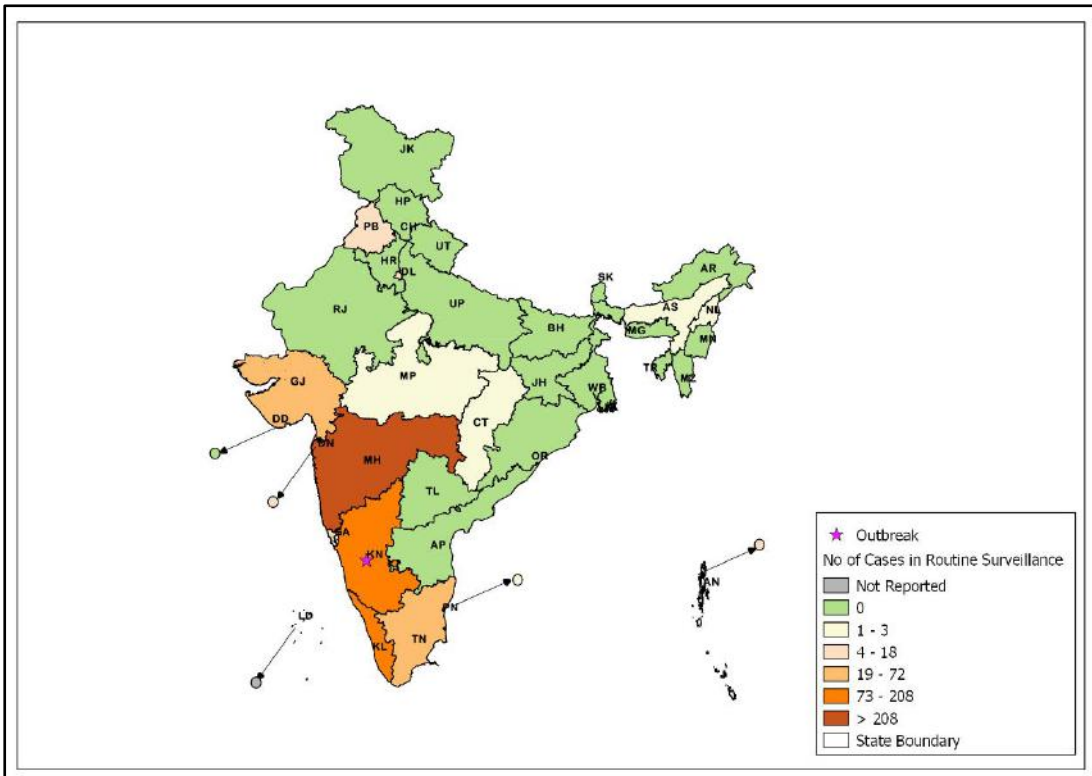


Fig 26: State/UT wise Presumptive Chikungunya cases & outbreaks for September 2016

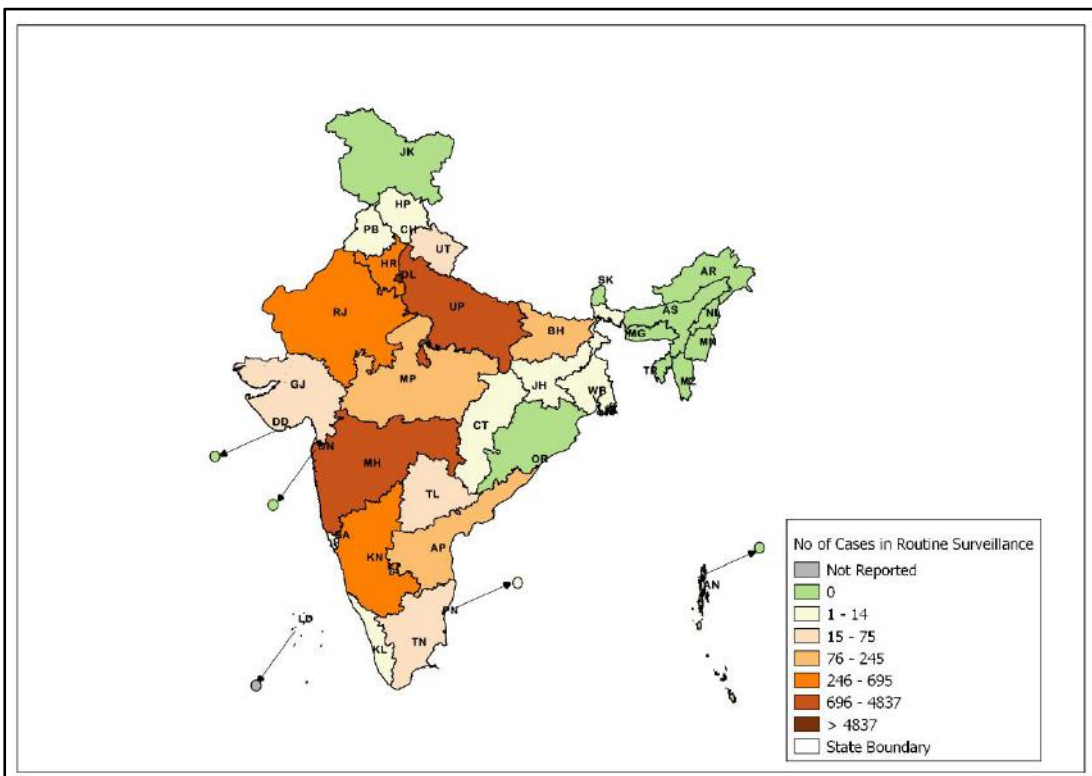
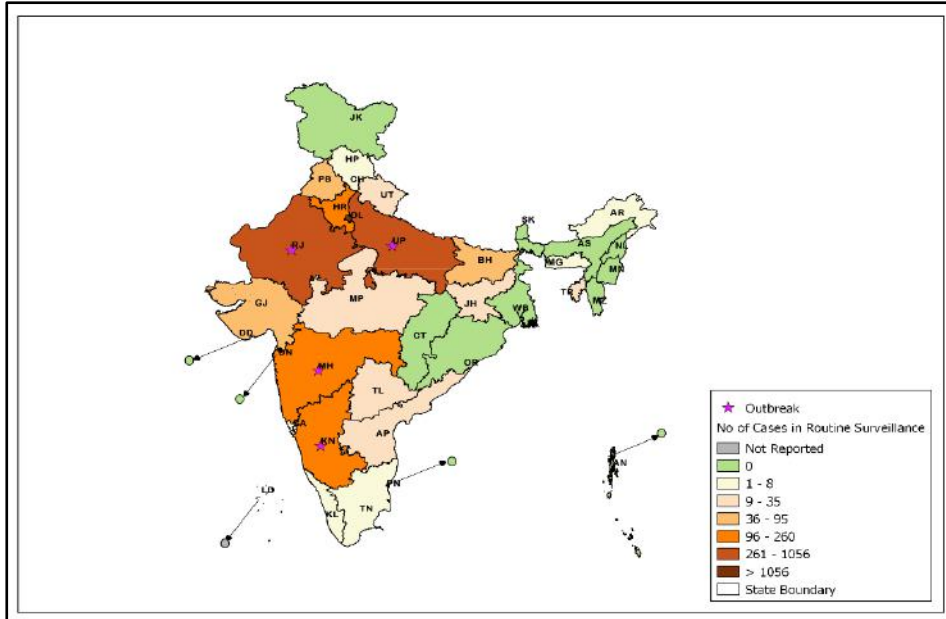


Fig 27: State/UT wise Lab Confirmed Chikungunya cases & outbreak for September 2016



Action from the field

- Dr Ranjeet Prasad reviewed the Districts (South and South East) units and MMMH Lab of IDSP Delhi, on 08 September 2016.
- Dr Sanket Kulkarni, Asstt. Director IDSP was in Raipur, Chhattisgarh for Third Annual National AEFI Committee meeting on 9 & 10 September 2016.
- Dr Ruchi Jain Asstt. Director IDSP was in Bilaspur, Chhattisgarh for AFP Surveillance cum UIP review from 18 to 25 September 2016.



- Dr Sanket Kulkarni, Asstt. Director IDSP was in Nagpur, Maharashtra for State IDSP review on 30.09.16.



- Dr Pradeep Khasnobis Sr. CMO & Officiating NPO IDSP & Dr Lata Kapoor, Deputy Director IDSP were in Pune, Maharashtra for State IDSP Review on 28.09.16.

Glossary:

- **P form:** Presumptive cases form, in which cases are diagnosed and reported based on typical history and clinical examination by Medical Officers.
- **Reporting units under P form:** Additional PHC/ New PHC, CHC/ Rural Hospitals, Infectious Disease Hospital (IDH), Govt. Hospital / Medical College*, Private Health Centre/ Private Practitioners, Private Hospitals*
- **L form:** Lab confirmed form, in which clinical diagnosis is confirmed by an appropriate laboratory tests.
- **Reporting units under L form:** Private Labs, Government Laboratories, Private Hospitals(Lab.), CHC/Rural Hospitals(Lab.),
- HC/ Additional PHC/ New PHC(Lab.), Infectious Disease Hospital (IDH)(Lab.), Govt. Hospital/Medical College(Lab.), Private Health Centre/ Private Practitioners(Lab.)
- **Completeness %:** Completeness of reporting sites refers to the proportion of reporting sites that submitted the surveillance report (P & L Form) irrespective of the time when the report was submitted.
- **State Code:**
Andaman & Nicobar Islands AN; Andhra Pradesh AP; Arunachal Pradesh AR; Assam AS; Bihar BH; Chandigarh CH; Chhattisgarh CT; Dadra & Nagar Haveli DN; Daman & Diu DD; Delhi DL; Goa GA; Gujarat GJ; Haryana HR; Himachal Pradesh HP; Jammu & Kashmir JK; Jharkhand JH; Karnataka KN; Kerala KL; Lakshadweep LD; Madhya Pradesh MP; Maharashtra MH; Manipur MN; Meghalaya MG; Mizoram MZ; Nagaland NL; Odisha OR; Puducherry PN; Punjab PB; Rajasthan RJ; Sikkim SK; Tamil Nadu TN; Telangana TL; Tripura TR; Uttar Pradesh UP; Uttarakhand UT; West Bengal WB.

Case definitions:

- **Enteric Fever: Presumptive:** Any patient with fever for more than one week and with any two of the following: Toxic look, Coated tongue, Relative bradycardia, Splenomegaly, Exposure to confirmed case, Clinical presentation with complications e.g. GI bleeding, perforation, etc. AND/OR Positive serodiagnosis (Widal test)
Confirmed: A case compatible with the clinical description of typhoid fever with confirmed positive culture (blood, bone marrow, stool, urine) of *S. typhi*/ *S. paratyphi*.
ARI/ ILI:-An acute respiratory infection with fever of more than or equal to 38° C and cough; with onset within the last 10 days.
- **Acute Diarrheal Disease: Presumptive Acute Diarrheal Disease (Including Acute Gastroenteritis):** Passage of 3 or more loose watery stools in the past 24 hours. (With or without vomiting).
Confirmed Cholera: A case of acute diarrhoea with isolation and identification of *Vibrio cholera* serogroup O1 or O139 by culture of a stool specimen.
- **Viral Hepatitis: Presumptive:** Acute illness typically including acute jaundice, dark urine, anorexia, malaise, extreme fatigue, and right upper quadrant tenderness.
Confirmed: Hepatitis A: A case compatible with the clinical description of acute hepatitis with demonstration of anti-HAV IgM in serum sample.
Confirmed: Hepatitis E: A case compatible with the clinical description of acute hepatitis with demonstration of anti-HEV IgM in serum sample.
- **Dengue: Presumptive:** An acute febrile illness of 2-7 days duration with two or more of the mentioned manifestations:
 - Headache, Retro-orbital pain, Myalgia, Arthralgia, Rash, haemorrhagic manifestations, leukopenia, or Non-ELISA based NS1 antigen/IgM positive. (A positive test by RDT will be considered as probable due to poor sensitivity and specificity of currently available RDTs.)

Confirmed: A case compatible with the clinical description of dengue fever with at least one of the following:

- Demonstration of dengue virus NS-1 antigen in serum sample by ELISA.
 - Demonstration of IgM antibodies by IgM antibody capture ELISA in single serum sample.
 - IgG seroconversion in paired sera after 2 weeks with fourfold increase of IgG titre.
 - Detection of viral nucleic acid by polymerase Chain reaction (PCR).
 - Isolation of the dengue virus (virus culture +ve) from serum, plasma, leucocytes.
- (Source – Dengue National guidelines, NVBDCP 2014)

• **Leptospirosis Case Definition: Presumptive Leptospirosis:** Acute febrile illness with headache, myalgia and prostration associated with a history of exposure to infected animals or an environment contaminated with animal urine With one or more of the following:

- Calf muscle tenderness
- Conjunctival suffusion
- Oliguria or anuria and/or proteinuria
- Jaundice
- Haemorrhagic manifestations (intestines, lung)
- Meningeal irritation
- GI symptoms (Nausea/ Vomiting/ Abdominal pain/Diarrhoea)

• And/or one of the following:-

- A positive result in IgM based immune- assays, slide agglutination test or latex agglutination test or immunochromatographic test.
- A Microscopic Agglutination Test (MAT) titre of 100/200/400 or above in single sample based on endemicity.
- Demonstration of leptospire directly or by staining methods

Lab Confirmed Leptospirosis: A case compatible with the clinical description of leptospirosis with at least one of the following:

- Isolation of leptospire from clinical specimen.
- Four fold or greater rise in the MAT titre between acute and convalescent phase serum specimens run in parallel. (Source: -National Guidelines on Diagnosis, Case Management Prevention and Control of Leptospirosis NCDC 2015)

• **Chikungunya case definition: Presumptive Case Definition:** An acute illness characterised by sudden onset of fever with any of the following symptoms: headache, backache, photophobia, severe arthralgia and rash.

- Lab confirmed: A case compatible with the clinical description of chikungunya fever with at least one of the following: Demonstration of IgM antibodies by IgM antibody capture ELISA in a single serum sample.
- Detection of viral nucleic acid by PCR.
- Isolation of chikungunya virus from clinical specimen. (Source – Mid Term Plan Guidelines, NVBDCP 2013)

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The data shown in the IDSP Surveillance bulletin are provisional, based on weekly reports to IDSP by State Surveillance Unit. Inquiries, comments and feedback regarding the IDSP Surveillance Report, including material to be considered for publication, should be directed to: Director, NCDC 22, Sham Nath Marg, Delhi 110054. Email: dirnicd@nic.in & idsp-npo@nic.in

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