Disease Alert
प्रकोप चेतावनी

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

Inside

Cholera outbreak investigation, Mandla District, Madhya Pradesh, India, July-August 2016

Authors

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Background

On 18 August 2016, Central Surveillance Unit (CSU), Integrated Disease Surveillance Programme (IDSP) at National Centre for Disease Control, Delhi received information of a suspected outbreak of Cholera in the Ghughri block of Mandla district, Madhya Pradesh. On 19 August, a Central team with Officers from CSU, IDSP and India Epidemic Intelligence Service (EIS) Programme, joined the district team to confirm the outbreak, describe the epidemiological characteristics and determine risk factors, to guide control and prevention measures.

Methods

Outbreak confirmation: IDSP acute diarrheal disease (ADD) data from June to August for last three years (2013-16) was analysed to confirm the outbreak.

Case finding: A case was defined as acute watery diarrhea (3 or more episodes in 24 hours) or death from acute watery diarrhoea in any resident of Ghuguri block, Mandla, Madhya Pradesh between 20 July - 19 August 2016.

Enhanced passive surveillance by searching the out-patient and in-patient register of Community Health Centre (CHC) Ghughri was conducted. Active surveillance by house to house visit in 28 villages of the Ghuguri block where there was clustering of cases was done.

Villages where deaths were reported were visited and interview of next available relatives and also of ADD cases around the death cases was conducted for signs, symptoms, hygienic practices, treatment history, etc. Medical review of the patients admitted to the CHC Ghughri was also conducted on the days of visit and interview of the treating physicians of CHC Ghuguri about symptoms was also done.

Case control study: An unmatched case control study to identify the risk factors associated with the outbreak was done. Based on 95% confidence interval (CI), 80% power, estimated 50% exposure of risk among controls, odds ratio

(OR) of 3, we calculated a sample size of 50 cases and 100 controls. Cases were selected randomly from the linelist and controls were selected from the nearest neighbors of cases enrolled. One control per household was selected. A structured questionnaire in local language was used by the Health Workers for interview of the cases and controls.

Data analysis: Data analysis was done using Microsoft Excel (2010) and Epi Info 7.1.

Laboratory investigation: A total of 18 stool and 16 rectal swab samples from 34 patients were collected during 15- 23 August 2016 from the admitted ADD patients at Ghuguri CHC for culture of common gram negative entero-pathogens like *Shigella, Salmonella, Vibrio cholerae* followed by antibiotic succeptibility analysis.

Environmental investigation: From 15 - 23 August 2016, 25 water samples from drinking water sources (9 samples from hand pump, 8 from well and 8 from jhiriyas near paddy field) were tested for residual chlorine by orthotoludine test and fecal contamination by culture. We also evaluated accessibility to safe water and toilet facilities.

Results

- **Outbreak confirmation**: There was 50% increase in ADD cases of diarrhoea in July and August 2016 compared with the same period of previous years (2013-2016) confirming the ADD outbreak in Ghuguri, Mandla, Madhya Pradesh.
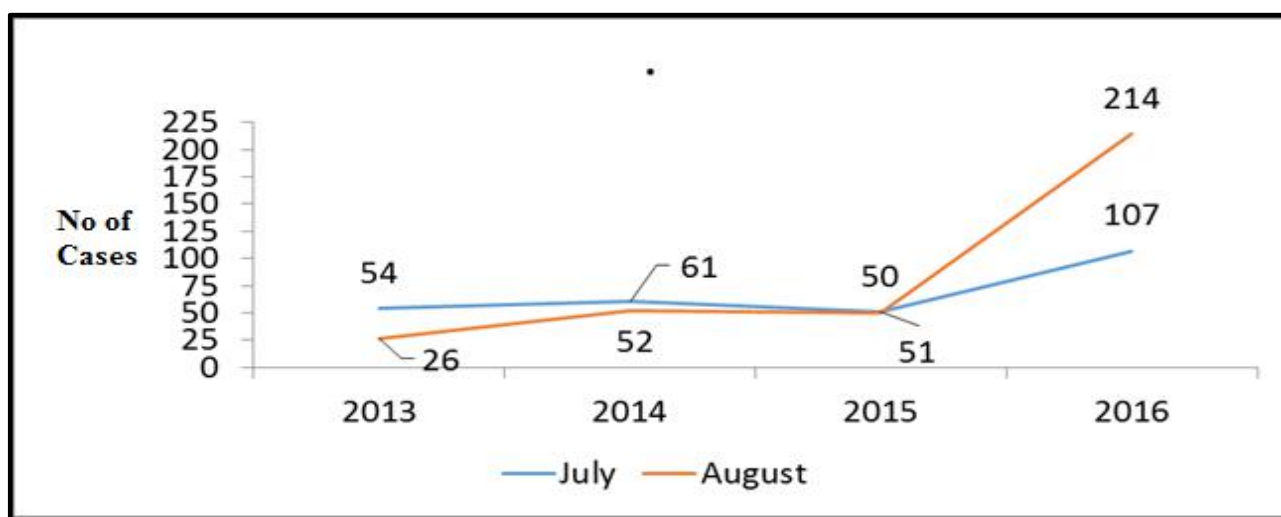

Fig. 1: Year wise ADD cases in CHC Ghuguri (IPD), Mandla, Madhya Pradesh

Descriptive epidemiology: Time distribution of the cases shown in figure 1 clearly indicates that the outbreak is due to multiple sources as there are multiple peaks. One peak is seen during 21st July, followed by another peak during 1st to 4th August. Subsequently another rise of cases was seen during 10th -11th August 2016.
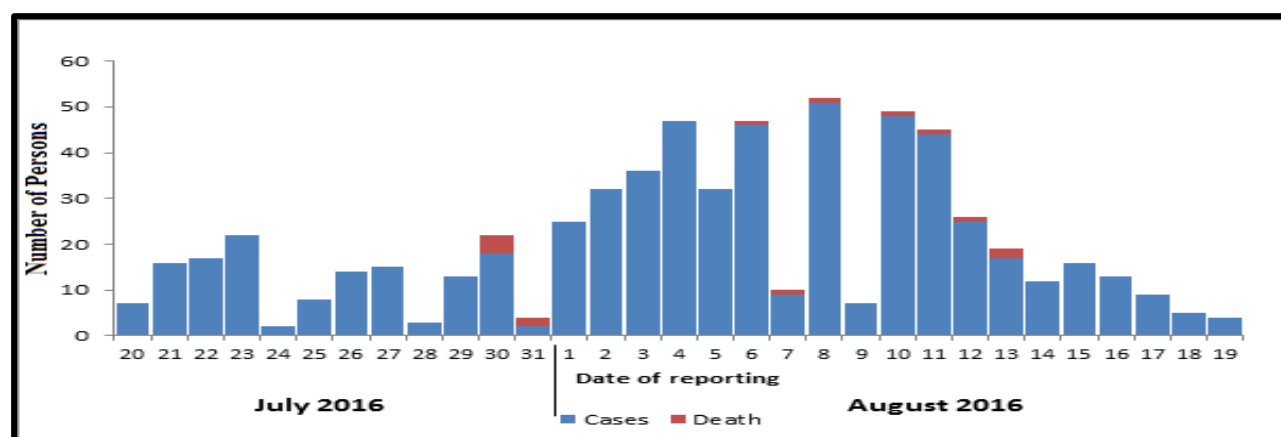

Fig. 2: Acute Diarrhoeal Disease cases Ghuguri, Mandla, Madhya Pradesh, 20 July- 19 Aug, 2016 (N= 628)

Geographically the cases have been as far as 15 to 30 km away from each other (Figure 2). These peaks can be correlated with the rainfall as during this period there have been heavy rainfall in the entire district. Cases were reported from 139 villages out of 244 villages covering all geographical area of the block.
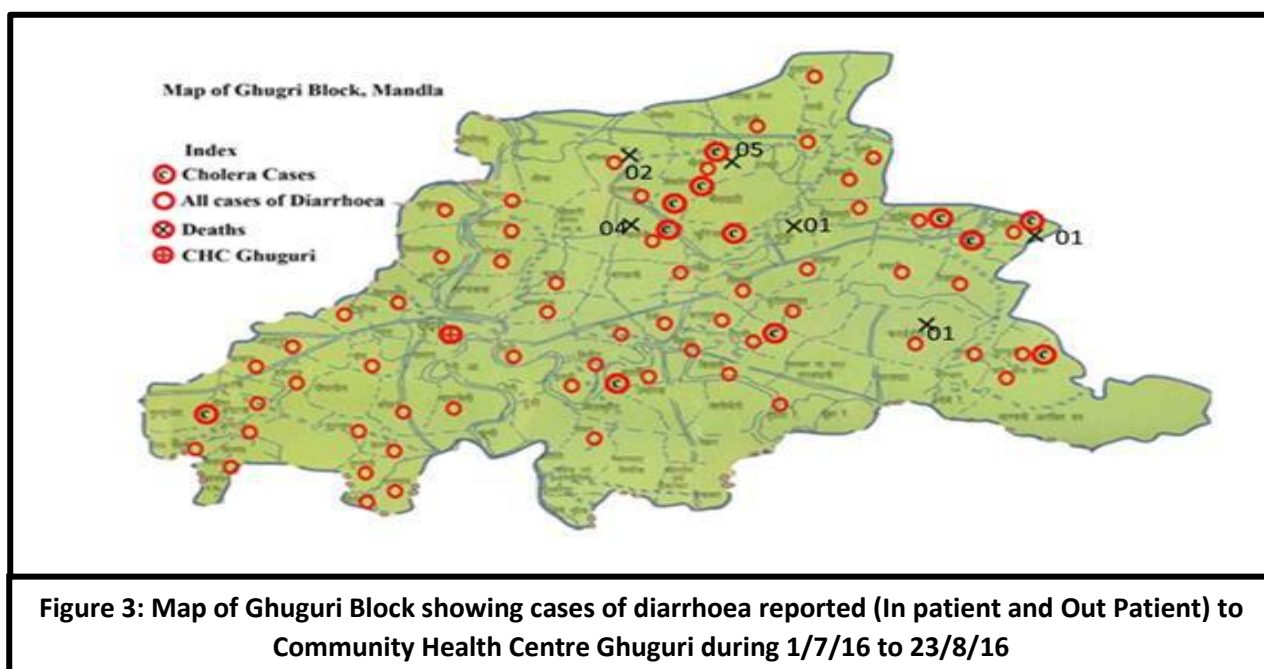

Figure 3: Map of Ghuguri Block showing cases of diarrhoea reported (In patient and Out Patient) to Community Health Centre Ghuguri during 1/7/16 to 23/8/16

Person Distribution:

628 cases with median age of 27 years (range: 1 month – 76 years) were identified. Females (61%) were more affected than males (39%) because in the weeding season which is locally called "Nindai", mainly female works in the field as a result of which females are more exposed as they drink any water available in the field. There were 14 deaths during the period with female predominance (86%) and median age of 39 years (range: 6 – 65 years).

Table 1: Age and Sex distribution of Cases & Deaths in Cholera outbreak in Ghuguri, Mandla, 20 July- 19 Aug, 2016 (N=628)

Age in years	Cases			Deaths		
	Male (%)	Female (%)	Total	Male (%)	Female (%)	Total
0-20	113 (46)	137 (36)	250	00 (0)	03 (25)	03
21-40	78 (32)	154 (40)	232	02 (100)	03 (25)	05
41-60	41 (17)	70 (18)	111	00 (0)	05 (42)	05
≥61	12 (5)	23 (6)	35	00 (0)	01 (8)	01
Total	244 (39)	384 (61)	628	02 (14)	12 (86)	14

Case fatality rate: 14/628*100=2.2

Among 614 patients treated at CHC (355 in outpatient department and 259 in inpatient department), 100% presented with acute watery diarrhoea, 273 (44%) with vomiting, 60 (10%) with fever and 5 (1%) with abdominal pain. All 259 inpatients were treated by IV fluids and antibiotics (doxycycline, ceftriaxone and metronidazole), and all 355 outpatients were treated with oral rehydration solution (ORS) and doxycycline as per treatment protocol developed by the district. All 614 (100%) cases treated at CHC recovered.

Field Observation

During the interaction with the community the team observed very poor personal hygiene practices. No concept of safe drinking water practices, very poor health seeking behavior was also noted. No residual chlorine was detected from the 25 water samples collected from drinking water sources. Majority of cases gave history of consuming water from open dug well and Jhiriya (Small Shallow water body made in the spring bed).

Case control study: Among 50 cases and 100 controls, illness was significantly associated with being female [exposure rate 74%, OR 6.6 (95 % CI 3.1 – 14.2)], drinking water flowing near paddy field [exposure rate 64%, OR 4.0 (95 % CI 1.4 – 8.0)] and not washing hand with soap after defecation [exposure rate 72%, OR 6.1 (95 % CI 1.7 – 21.)].

Laboratory investigation: Among 34 stool and rectal swab samples, 11 were positive for V. cholerae O1 Ogawa. All isolates were susceptible to tetracycline, ceftriaxone, meropenem, doxycycline, amikacin and norfloxacin and resistant to co-trimoxazole.

Environmental investigation: Among 25 water samples tested, all samples from well (8) and jhiriyas (8) near paddy fields revealed fecal contamination. Among 9 hand pump samples, 4 (44%) had fecal contamination. There was no residual chlorine found in any water sample tested. After chlorination of handpumps by the district on 4th to 6th August and use of those hand pumps by the villagers, cases started decreasing. Vibrio cholera could not be isolated in any water sample.

Open defecation was observed as a universal practice.None of the houses had a toilet in the 6 villages where the team visited. Lone community toilet present in one village was not in use. People used open unprotected dug wells and Jhiriyas for drinking water source. Paddy field work is predominantly done by women in this season, and they consume water flowing near paddy field (jhiriyas) due to absence of safe drinking water in the vicinity. There was overflowing of Jhiriyas due to heavy rain 15 days before the outbreak (122mm in 2016 and 46mm in 2015 between 15 - 30 July).

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Conclusion and Recommendations

This was an outbreak of Cholera in Ghughri Block of Mandla District, Madhya Pradesh associated with consumption of contaminated water around the paddy field. The contamination was probably due to the practice of open air defecation combined with mixing of surface water with drinking water sources around the paddy field after heavy rain fall before the outbreak. Poor access to safe drinking water around the working paddy field and to a competent health facility/health care provider resulted in high morbidity and mortality.

Recommendations:

Immediate
1. Refer cases immediately to hospital specifically from hard to reach areas as there is no health care provider nearby.
2. Store of ORS and chlorine tablets (2-3 per day per family) with local volunteer in hard to reach tolas with training on when and how to use.
3. Train local volunteers regarding chlorination of drinking water sources. Educate people regarding safe drinking water practices and risks of drinking contaminated water.
4. Do health education through health worker, ASHA and Anganwadi worker (during Immunization session, Village Health Nutrition Day etc.) regarding use of toilet, hand washing with emphasis on carrying safe drinking water to working fields.
5. Chlorinate the drinking water used by the community weekly and check for residual chlorine regularly.

Long term
1. Provide hand pumps in villages and fields where people work.
2. Provide toilets and piped water supply in each home.

The authors acknowledge the contribution of State & District officials who contributed in this outbreak investigation.

* Data extracted from IDSP Portal (www.idsp.nic.in) as on 17 January, 2017.
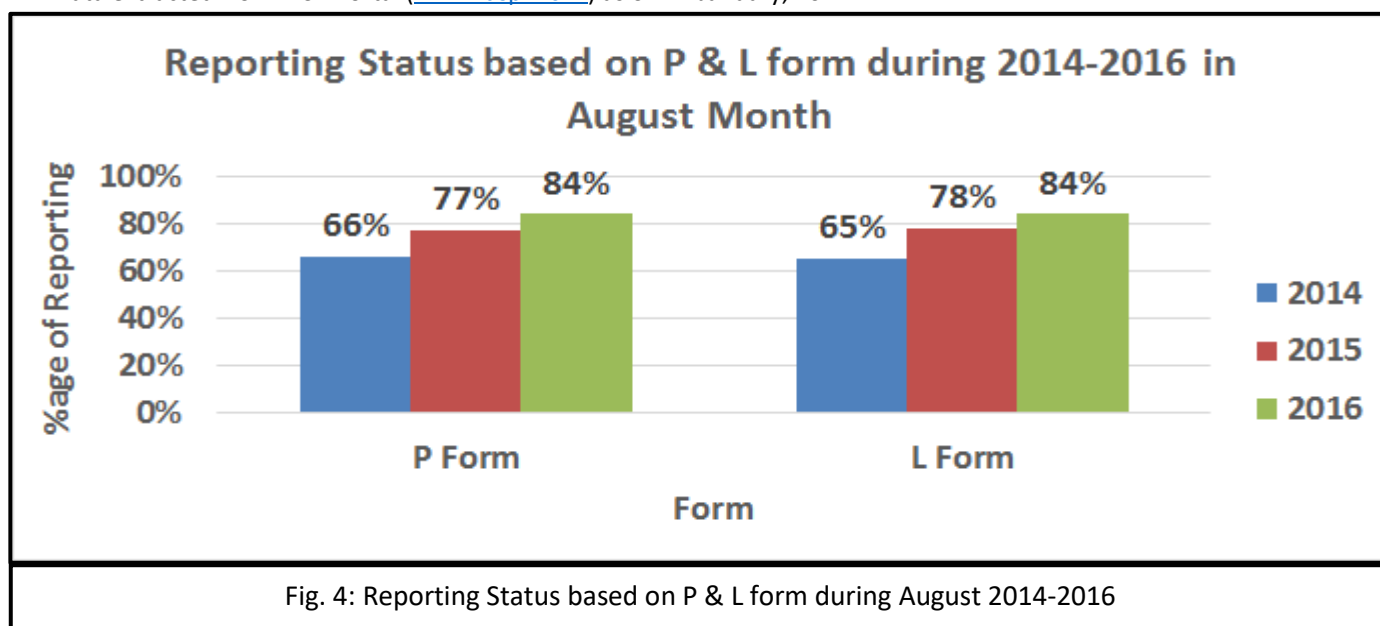

Fig. 4: Reporting Status based on P & L form during August 2014-2016

As shown in fig 4, in August 2014, 2015 and 2016, the 'P' form reporting percentage (i.e. % RU reporting out of total in P form) was 66 %, 77% and 84% respectively across India, for all disease conditions reported under IDSP in P form. Similarly, L form reporting percentage was 65%, 78% 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.
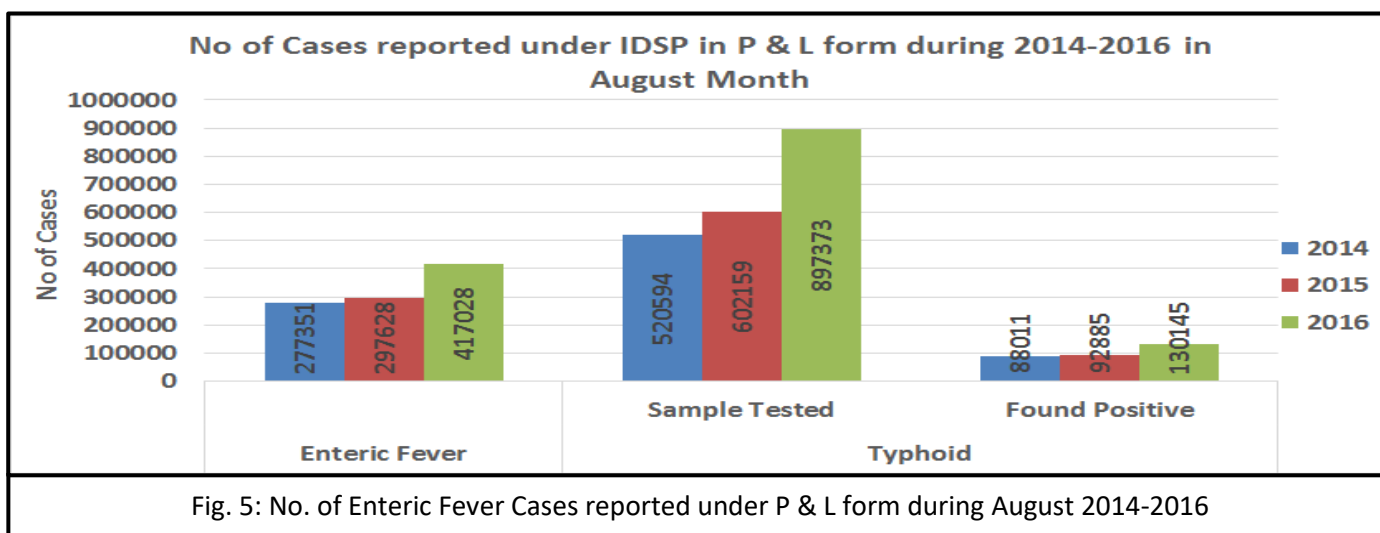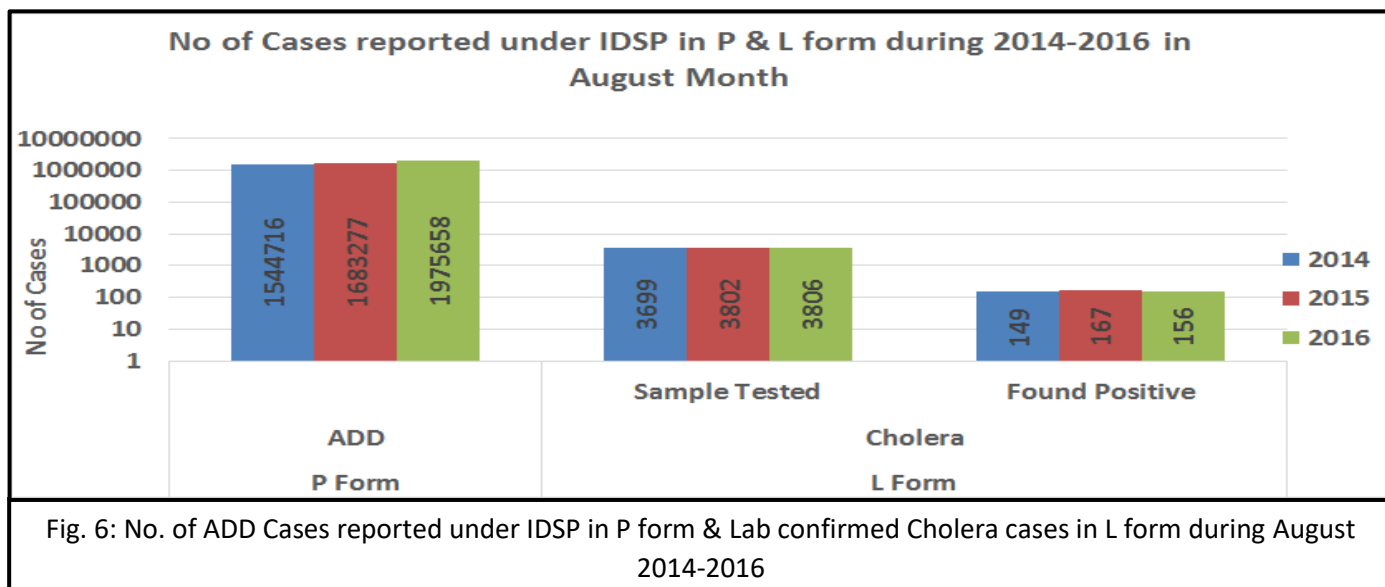

Fig. 5: No. of Enteric Fever Cases reported under P & L form during August 2014-2016

As shown in fig 5, number of presumptive enteric fever cases, as reported by States/UTs in 'P' form was 277351 in August 2014; 297628 in August 2015 and 417028 in August 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in August 2014; 520594 samples were tested for Enteric fever, out of which 88011 were found positive. In August 2015; out of 602159 samples, 92885 were found to be positive and in August 2016, out of 897373 samples, 130145 were found to be positive.

Sample positivity has been 16.9%, 15.4% and 14.5% in August month of 2014, 2015 & 2016 respectively.
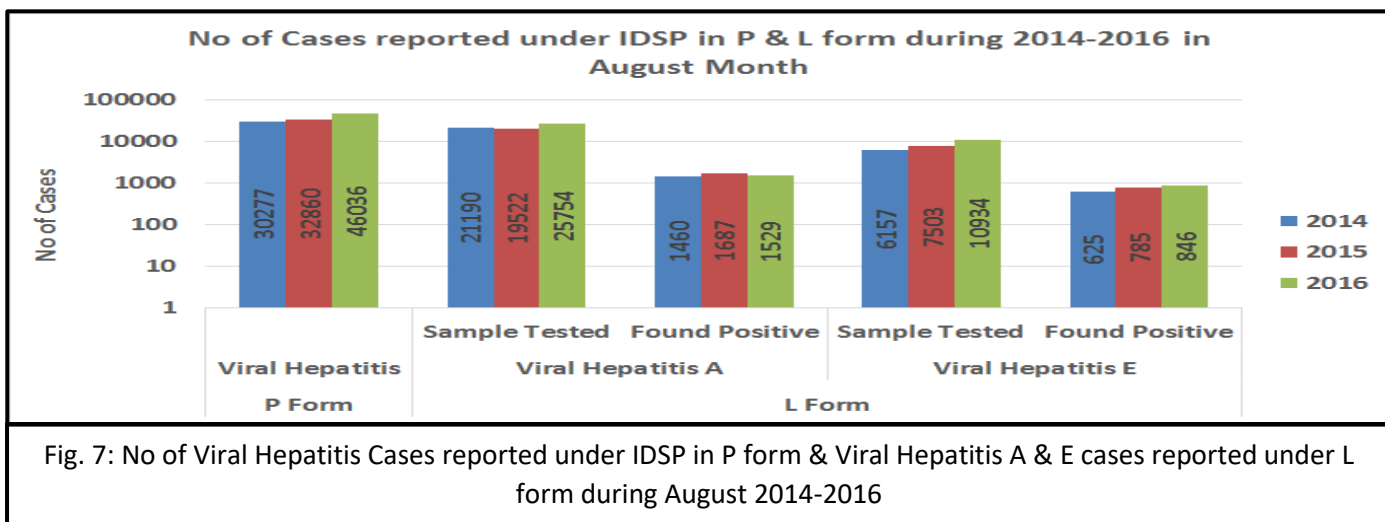
Limitation: The test by which above mentioned samples were tested could not be ascertained, as currently there is no such provision in L form.

Fig. 6: No. of ADD Cases reported under IDSP in P form & Lab confirmed Cholera cases in L form during August 2014-2016

As shown in fig 6, number of Acute Diarrhoeal Disease cases, as reported by States/UTs in 'P' form was 1544716 in August 2014; 1683277 in August 2015 and 1975658 in August 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in August 2014, 3699 samples were tested for Cholera out of which 149 tested positive; in August 2015, out of 3802 samples, 167 tested positive for Cholera and in August 2016, out of 3806 samples, 156 tested positive.

Sample positivity of samples tested for Cholera has been 4.0%, 4.4% and 4.1% in August month of 2014, 2015 & 2016 respectively.

Fig. 7: No of Viral Hepatitis Cases reported under IDSP in P form & Viral Hepatitis A & E cases reported under L form during August 2014-2016

As shown in fig 7, the number of presumptive Viral Hepatitis cases was 30277 in August 2014, 32860 in August 2015 and 46036 in August 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 August 2014; 21190 samples were tested out of which 1460 were found positive. In August 2015; out of 19522 samples, 1687 were found to be positive and in August 2016, out of 25754 samples, 1529 were found to be positive. Sample positivity of samples tested for Hepatitis A has been 6.9%, 8.6% and 5.9% in August month of 2014, 2015 & 2016 respectively.

As reported in L form for Viral Hepatitis E, in August 2014; 6157 samples were tested out of which 625 were found positive. In August 2015; out of 7503 samples, 785 were found to be positive and in August 2016, out of 10934 samples, 846 were found to be positive. Sample positivity of samples tested for Hepatitis E has been 10.2%, 10.5% and 7.7% in August month of 2014, 2015 & 2016 respectively
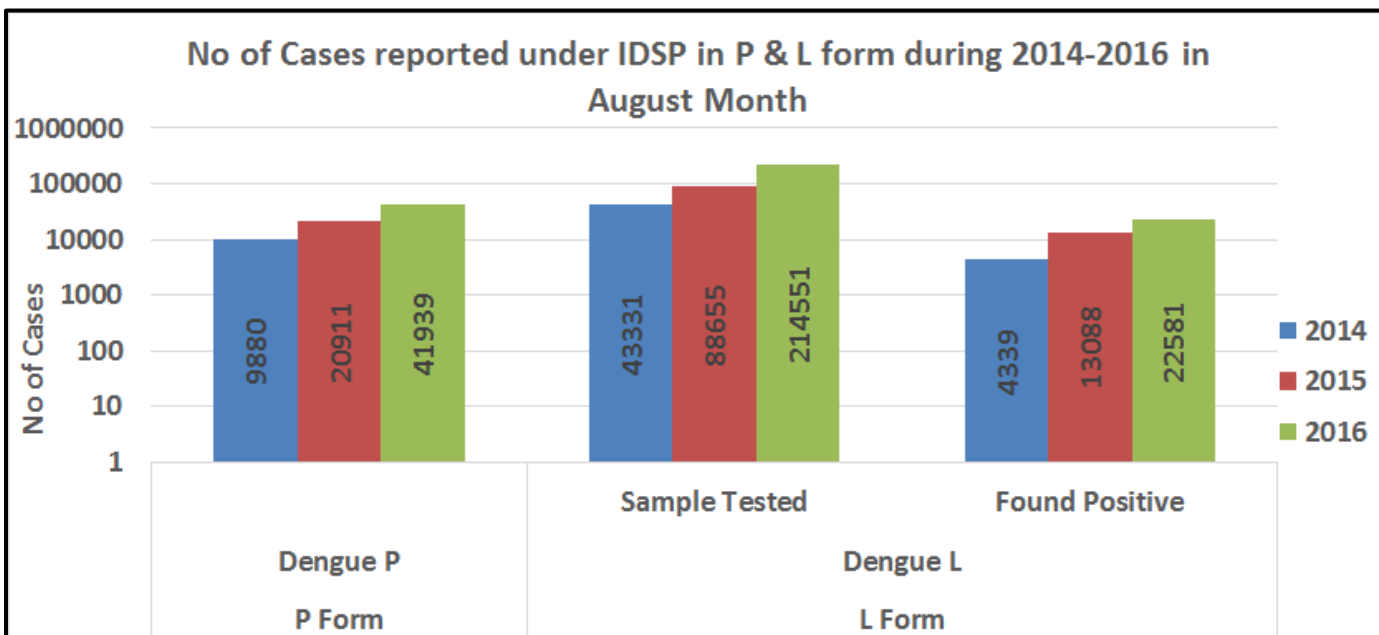

Fig. 8: No. of Dengue Cases reported under IDSP in P & L form during August 2014-2016

As shown in fig 8, number of presumptive Dengue cases, as reported by States/UTs in 'P' form was 9880 in August 2014; 20911 in August 2015 and 41939 in August 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in August 2014; 43331 samples were tested for Dengue, out of which 4339 were found positive. In August 2015; out of 88655 samples, 13088 were found to be positive and in August 2016, out of 214551 samples, 22531 were found to be positive.

Sample positivity of samples tested for Dengue has been 10.0%, 14.8% and 10.5% in August month of 2014, 2015 & 2016 respectively.
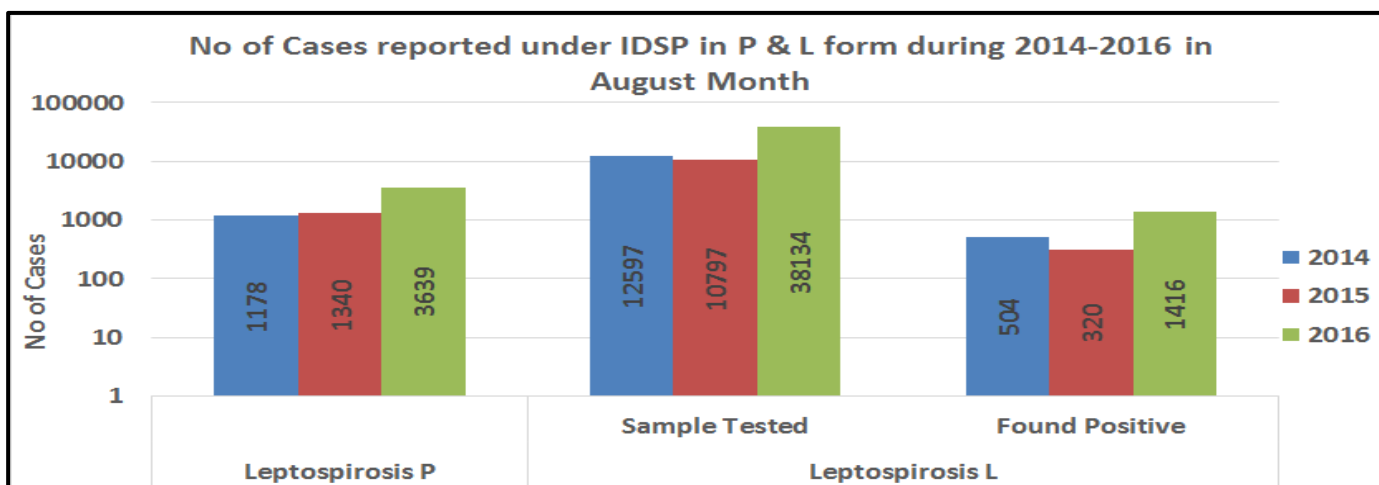

Fig. 9: No. of Leptospirosis Cases reported under IDSP in P & L form during August 2014-2016

As shown in fig 9, number of presumptive Leptospirosis cases, as reported by States/UTs in 'P' form was 1178 in August 2014; 1340 in August 2015 and 3639 in August 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in August 2014; 12597 samples were tested for Leptospirosis, out of which 504 were found positive. In August 2015; out of 10797 samples, 320 were found to be positive and in August 2016, out of 38134 samples, 1416 were found to be positive.

Sample positivity of samples tested for Leptospirosis has been 4.0%, 3.0% and 3.7% in August month of 2014, 2015 & 2016 respectively.
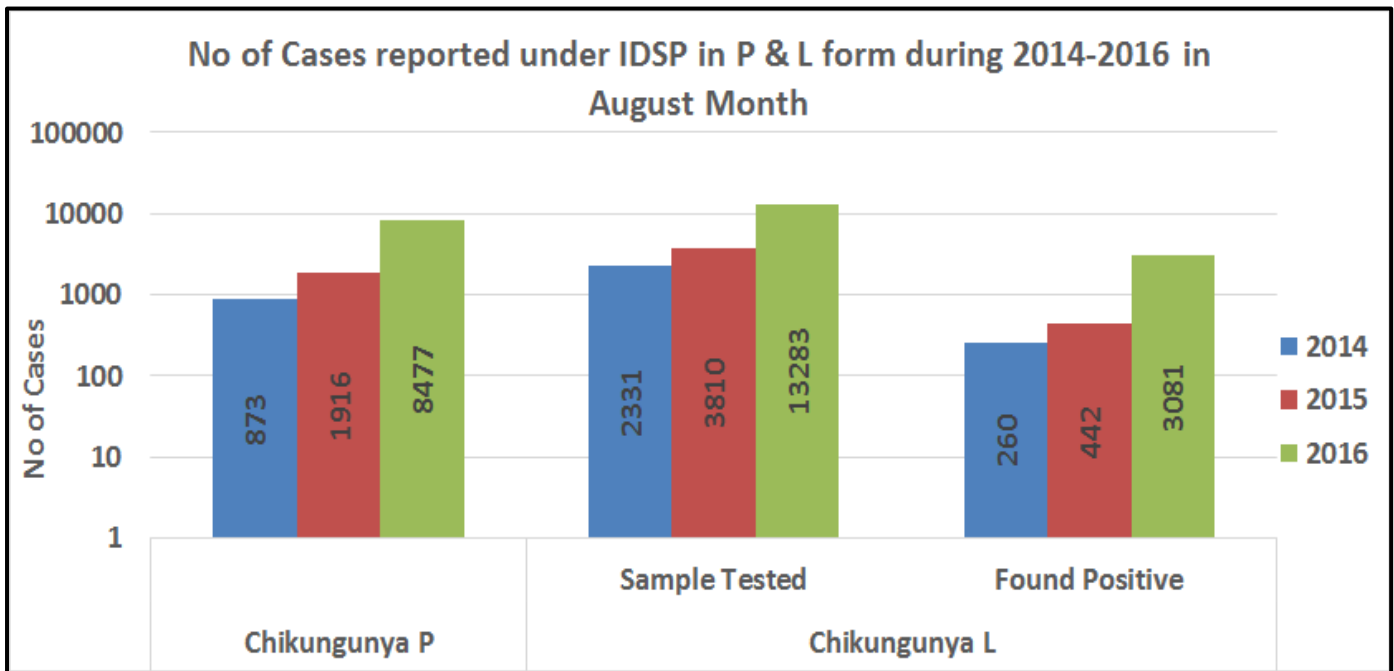

Fig. 10: No. of Chikungunya Cases reported under IDSP in P & L form during August 2014-2016

As shown in fig 10, number of presumptive Chikungunya cases, as reported by States/UTs in 'P' form was 873 in August 2014; 1916 in August 2015 and 8477 in August 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in August 2014; 2331 samples were tested for Chikungunya, out of which 260 were found positive. In August 2015; out of 3810 samples, 442 were found to be positive and in August 2016, out of 13283 samples, 3081 were found to be positive.

Sample positivity of samples tested for Chikungunya has been 11.2%, 11.6% and 23.2% in August month of 2014, 2015 & 2016 respectively.

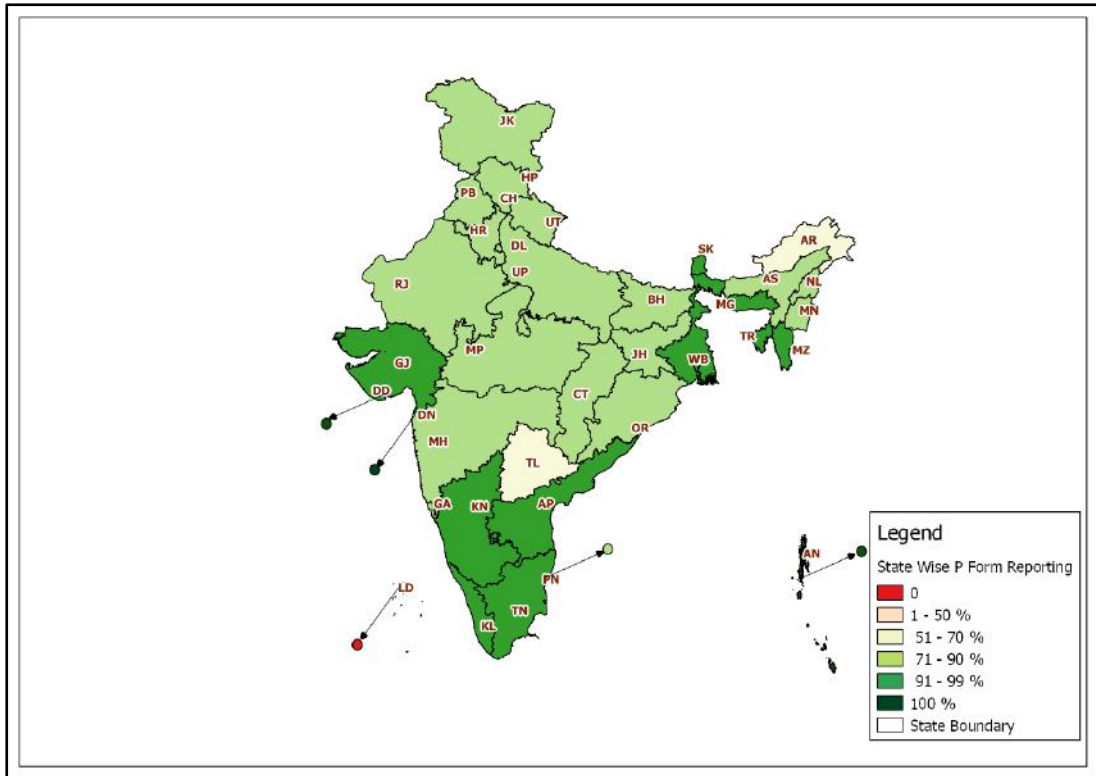Fig 11: State/UT wise P form completeness % for August 2016

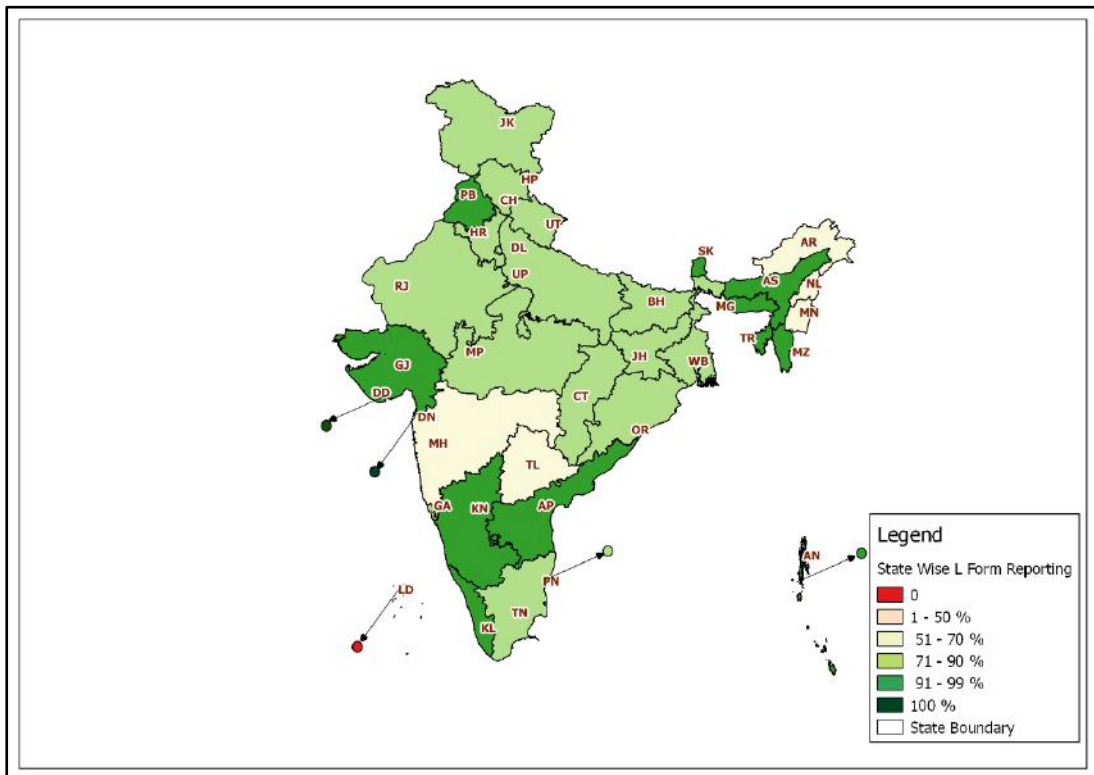Fig 12: State/UT wise L form completeness % for August 2016

Fig 13: State/UT wise Presumptive Enteric fever cases and outbreaks for August 2016
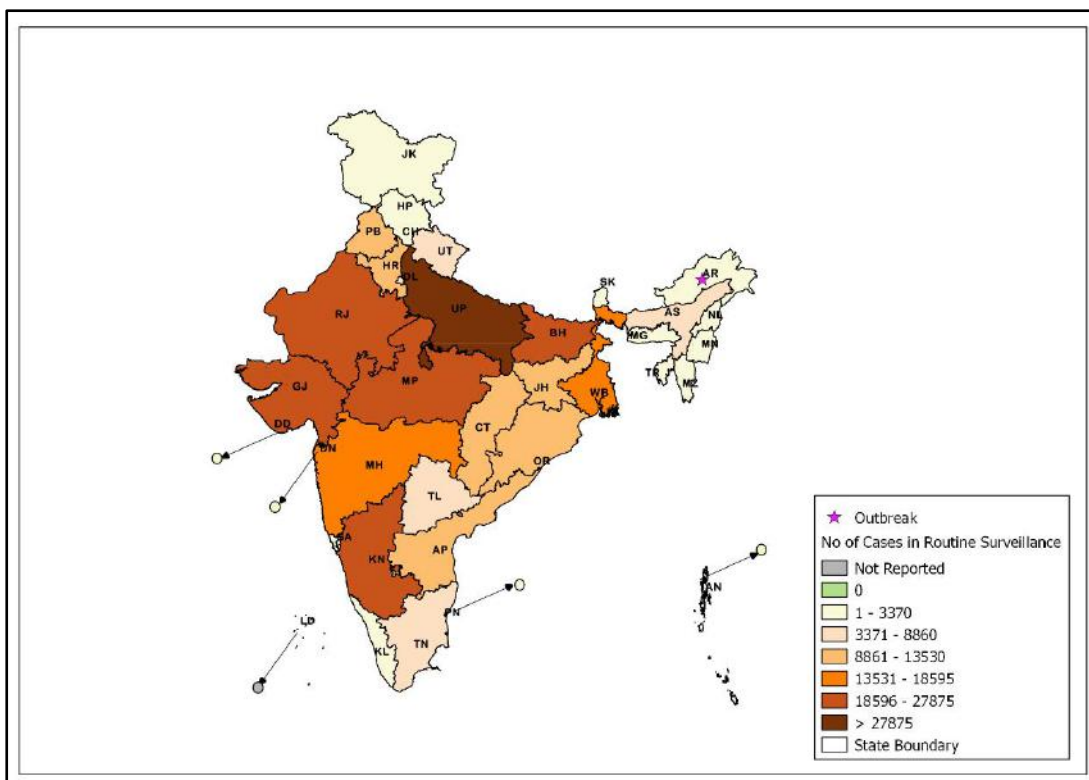

Fig 14: State/UT wise Lab Confirmed Enteric Fever cases and outbreaks for August 2016
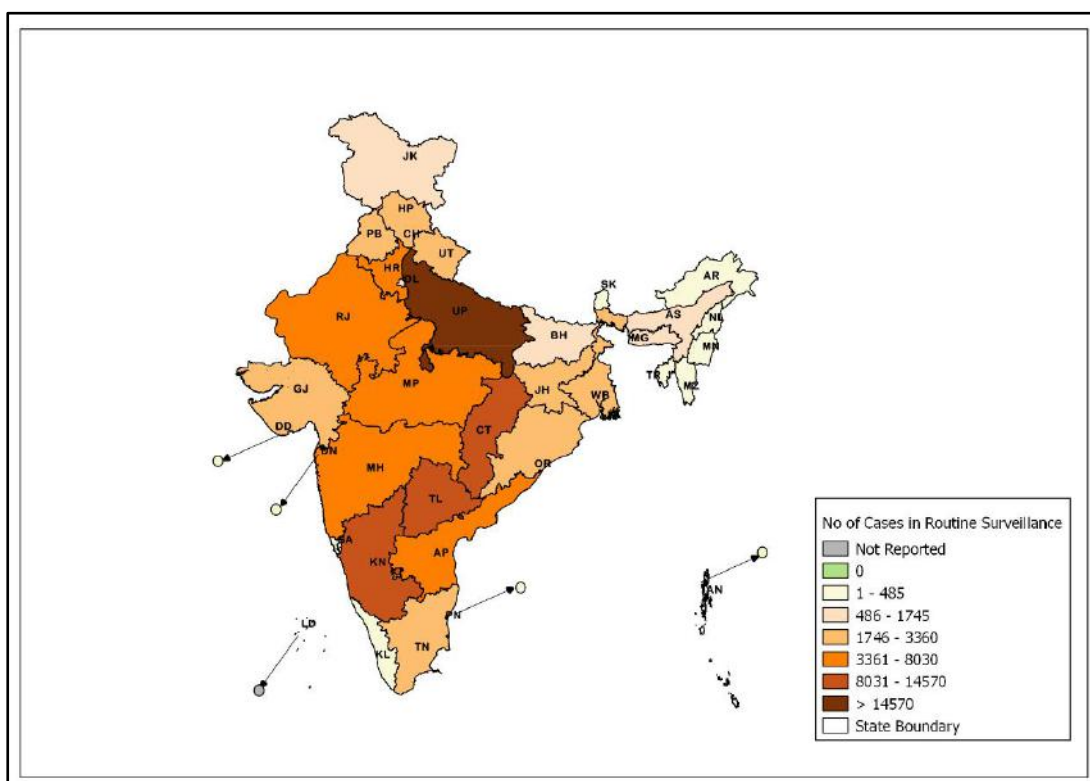
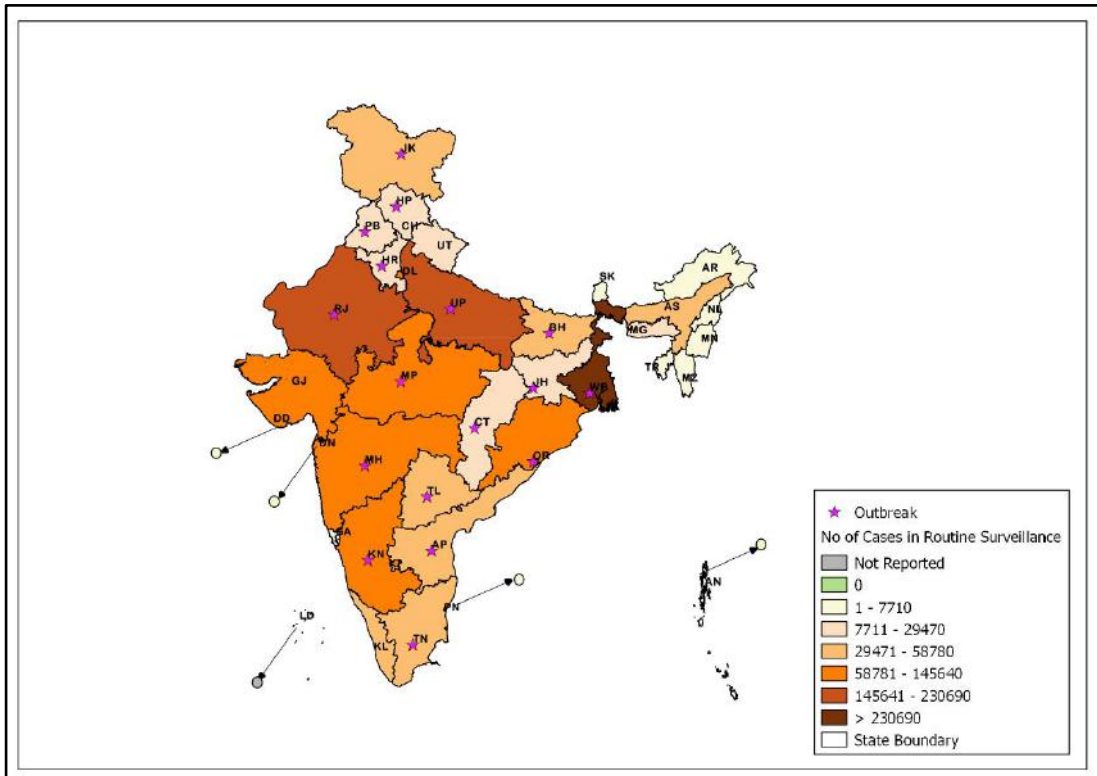**Fig 15: State/UT wise Presumptive ADD cases and outbreaks for August 2016**

Fig 16: State/UT wise Lab Confirmed Cholera cases and outbreaks for August 2016
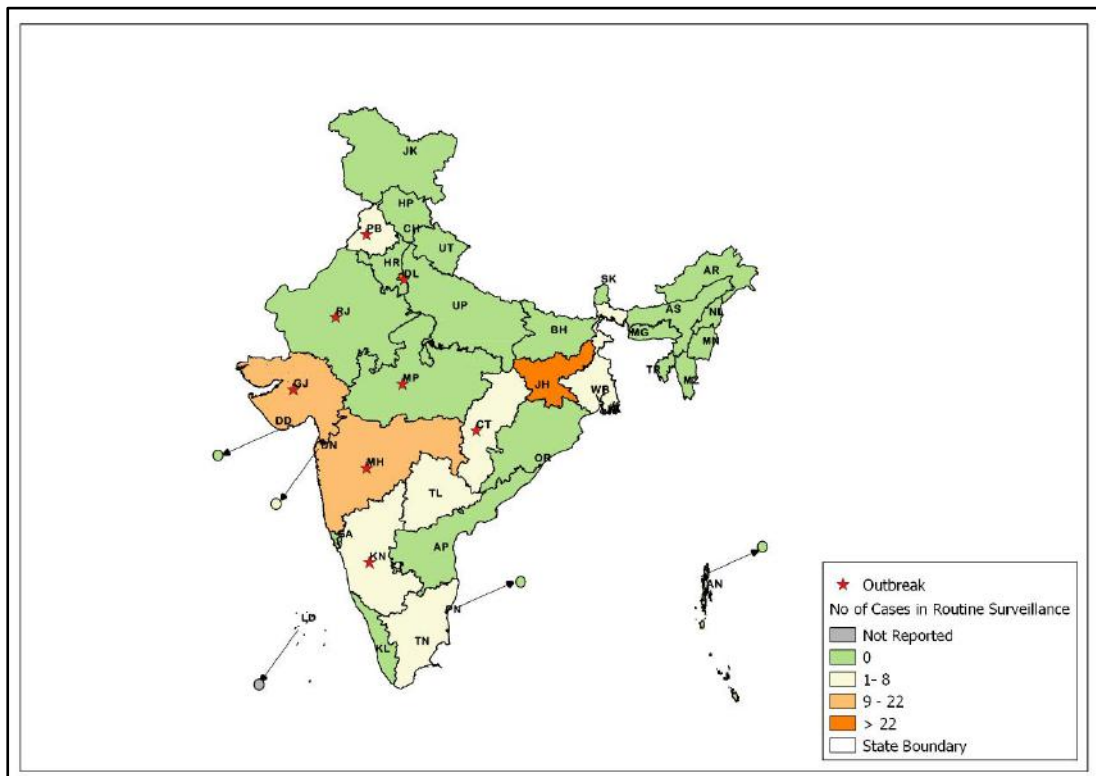
Fig 17: State/UT wise Presumptive Viral Hepatitis cases and outbreaks for August 2016
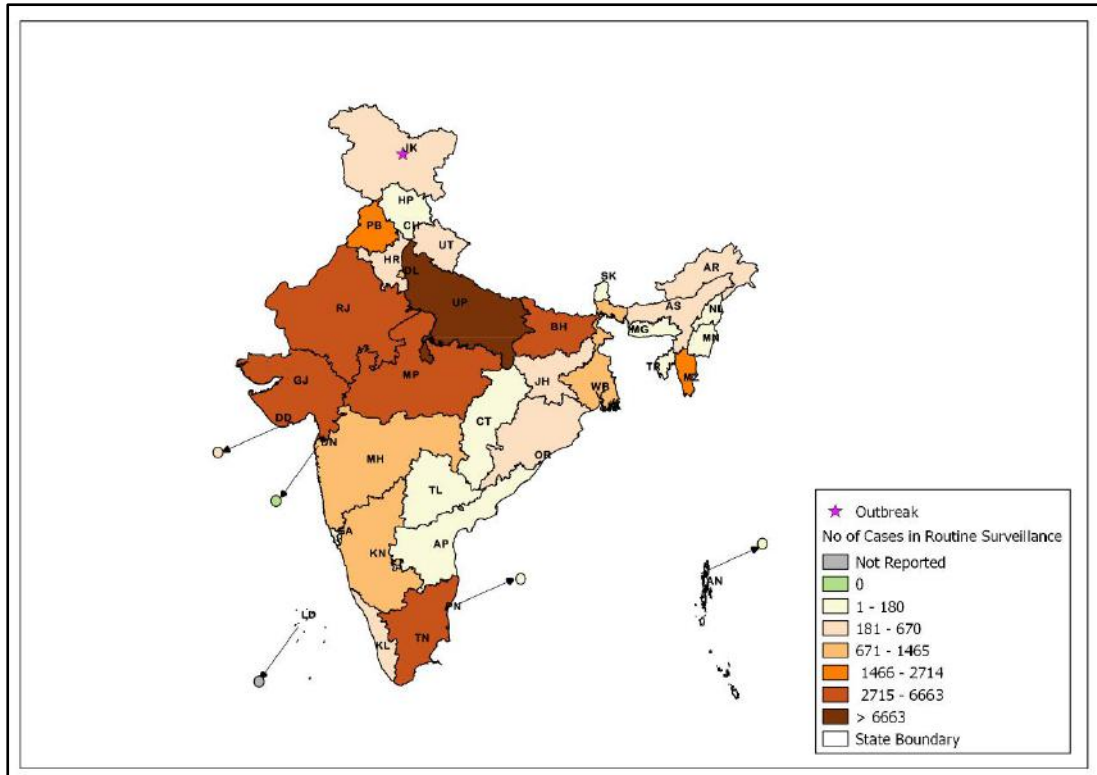

Fig 18: State/UT wise Lab confirmed Viral Hepatitis A cases for August 2016
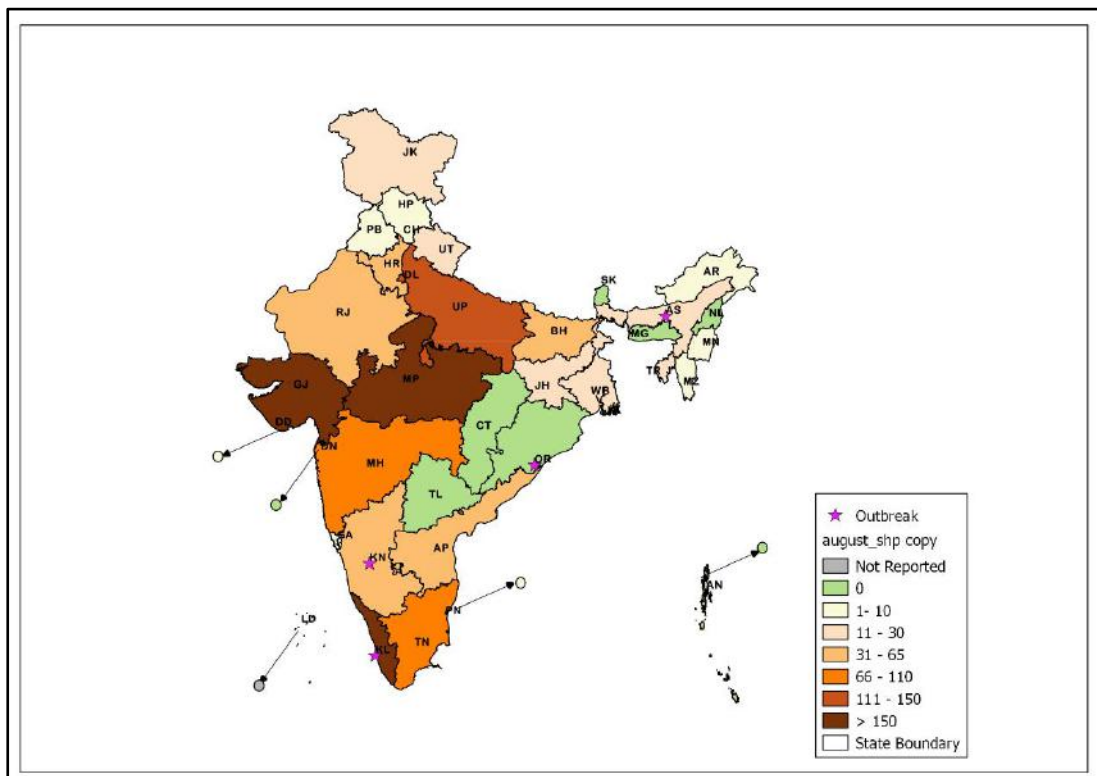
Fig 19: State/UT wise Lab confirmed Viral Hepatitis E cases for August 2016
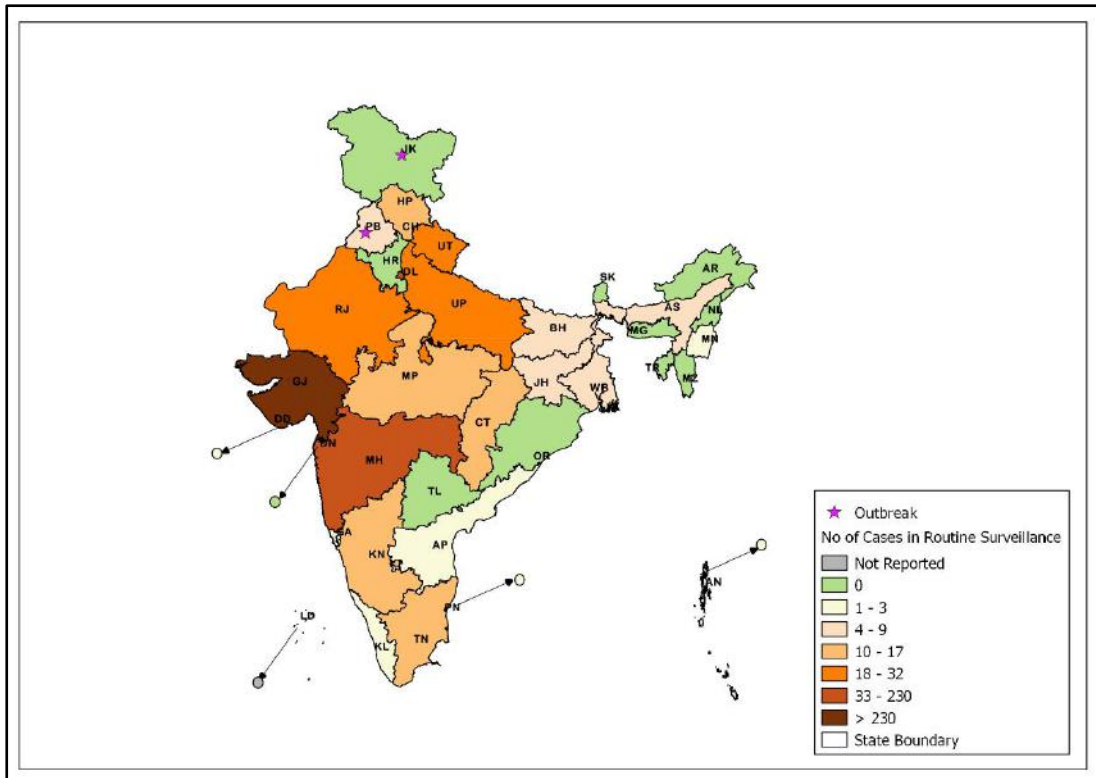
Fig 20: State/UT wise Presumptive Dengue cases & outbreaks for August 2016
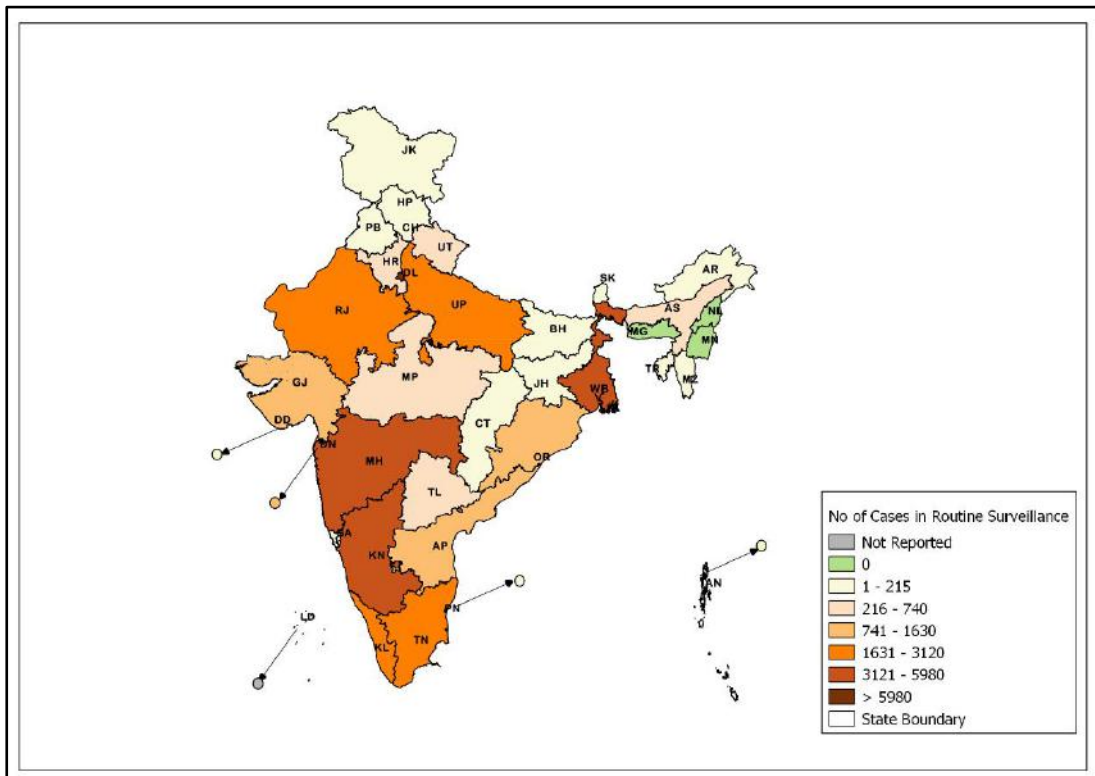
Fig 21: State/UT wise Lab confirmed Dengue cases for August 2016

Legend (Fig 21):
★ Outbreak
No of Cases in Routine Surveillance
- Not Reported
- 0
- 1 - 80
- 81 - 270
- 271 - 615
- 616 - 1585
- 1586 - 2435
- > 2435
- State Boundary
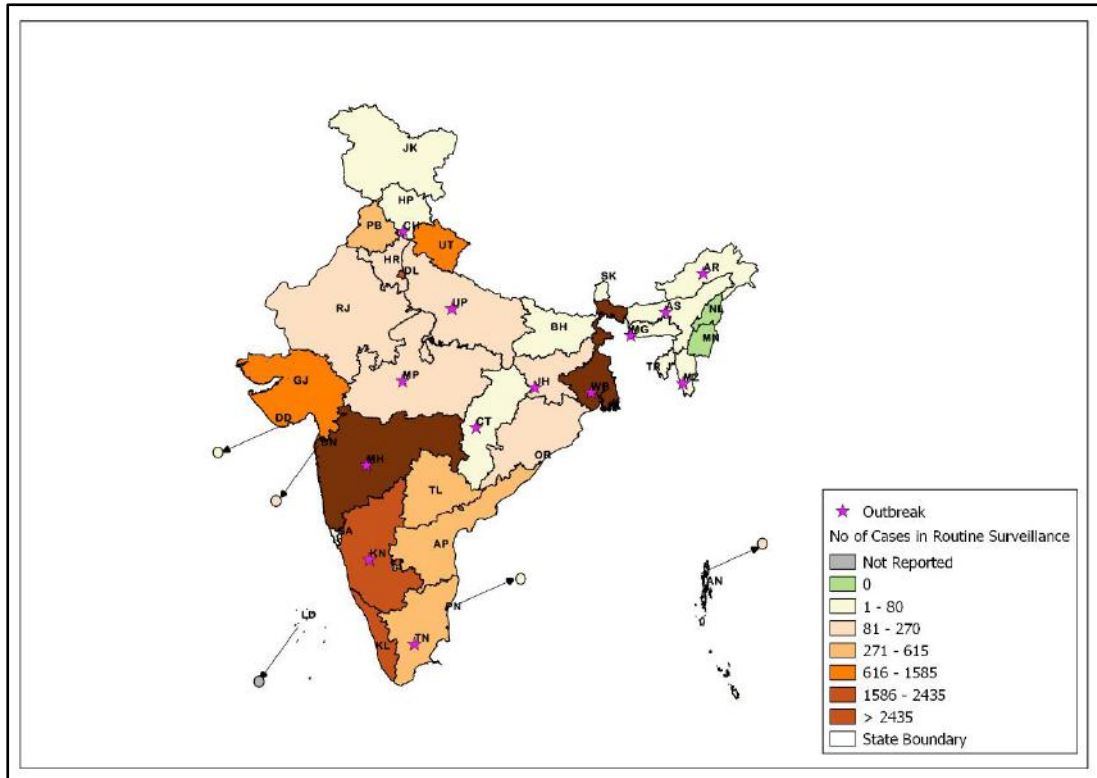
Fig 22: State/UT wise Presumptive Leptospirosis cases for August 2016

Legend (Fig 22):
No of Cases in Routine Surveillance
- Not Reported
- 0
- 1 - 15
- 16 - 55
- 56 - 155
- 156 - 230
- 231 - 570
- > 570
- State Boundary

Fig 23: State/UT wise Lab Confirmed Leptospirosis cases & outbreaks for August 2016

Fig 24: State/UT wise Presumptive Chikungunya cases & outbreaks for August 2016

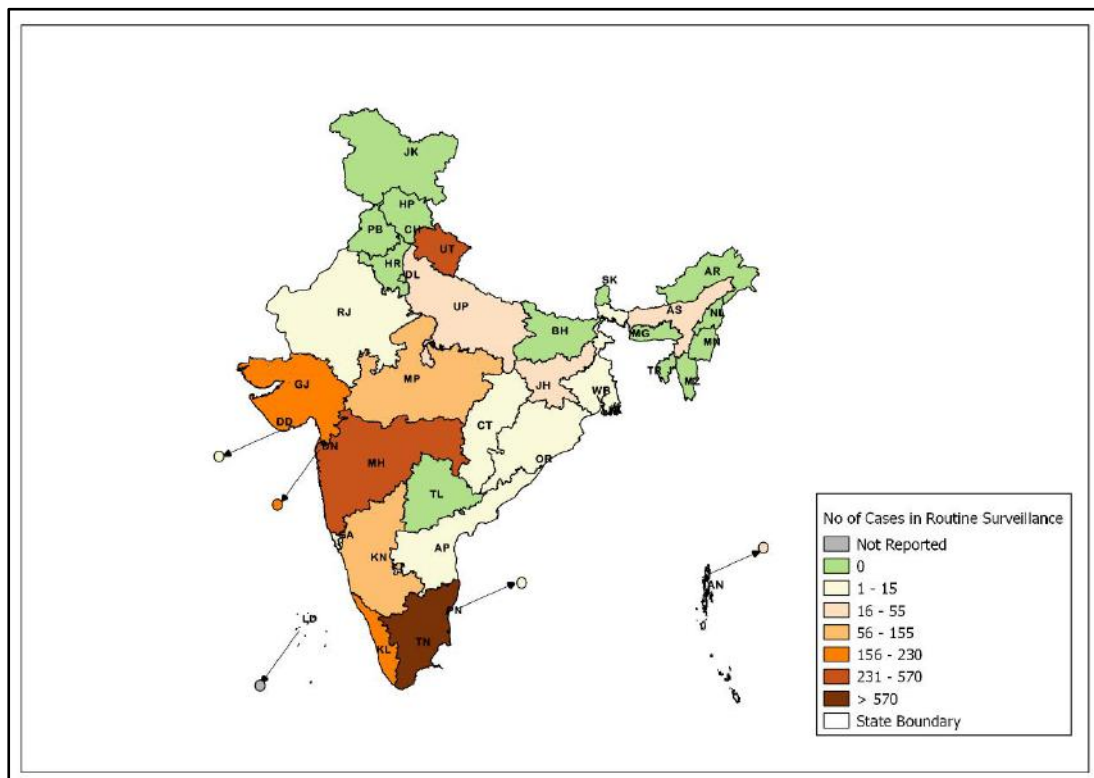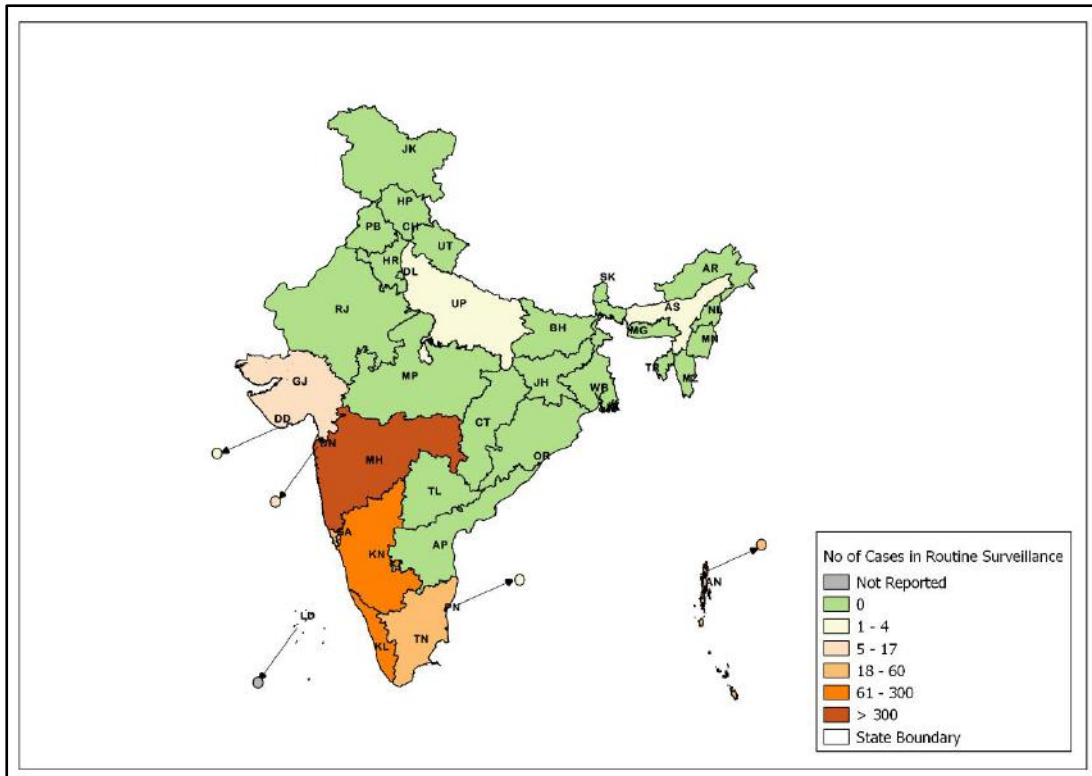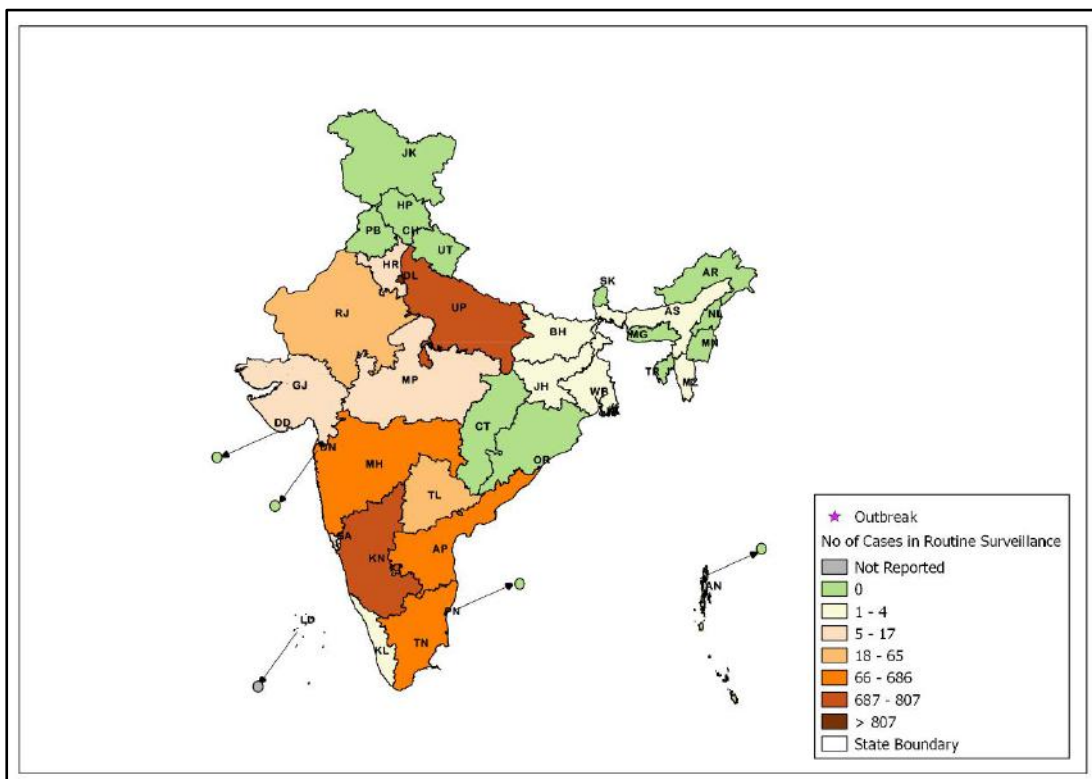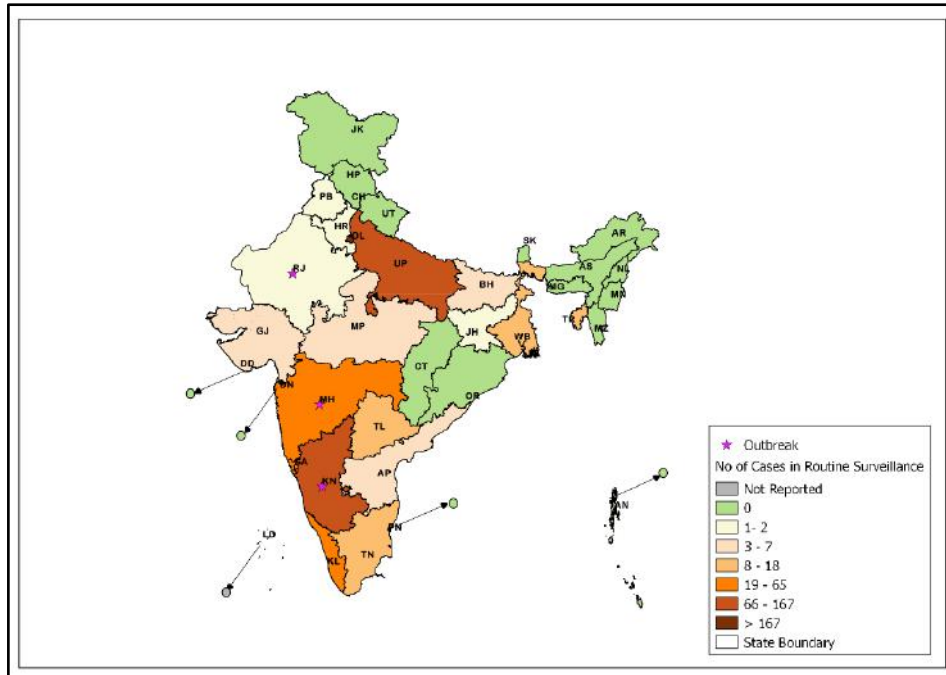**Fig 25: State/UT wise Lab Confirmed Chikungunya cases & outbreak for August 2016**

Action from the field

- 3rd National Summit on Good and Replicable Practices and Innovations in Public Health Care Systems was held at Tirupati, Andhra Pradesh from 29 - 31 August 2016 and followings practices were selected from IDSP:

    - Infographics for Disease control - Jammu & Kashmir - Infographics for Disease control - Jammu & Kashmir: Use of infographics to create awareness among health officials & community is a useful feature practiced during outbreak situations. It will not only help in containment of outbreak at early level but also in prevention of future outbreaks of similar nature. Thus it will have a key role in programme management point of view.

    - District Public Health Labs – Tamil Nadu: As part of the restructuring plan under IDSP, it was decided to set up the District Public Health Laboratories (DPHL) in the District Hospitals so that the laboratory would be beneficial to the patients and also to the community covering the entire district. The DPHLs are functioning under the administrative control of the Director of Public Health and Preventive Medicine. The performance of all DPHLs is monitored by the Deputy Director (SPHL) and State Lab –coordinator. Specified % of positive and negative serum samples tested for epidemic prone communicable diseases like Dengue, Leptospirosis, Chikungunya, Scrub Typhus etc., by ELISA at DPHL is being sent periodically to the State headquarters viz. State Public Health Laboratory (SPHL) for crosschecking. The laboratory is located and designed to provide suitable, direct access for patients and health staff, strategically located and well connected by road and allow for disposal of laboratory materials and specimens.

- Dr Jyoti, Asstt. Director IDSP was at AIIH & PH Kolkata to oversee ongoing FETP training on 5 August 2016.

- Dr Sanket Kulkarni, Asstt. Director IDSP was in Kozhikode, Malappuram and Tiruvanthapuram, Kerala for Diphtheria Outbreak investigation from 16 to 20 August 2016.

- Dr Suhas Dhandore, Asstt. Director IDSP was at Shimla, Himachal Pradesh for IDSP review meeting cum training for the District Surveillance Officers (DSOs) & Data Managers on 18 & 19 August 2016.
- Dr Nishant Kumar, Asstt. Director IDSP was at Mandla to investigate Cholera Outbreak as a part of Central RRT from 19 to 23 August 2016.

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 leptospires 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 leptospires 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, 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)

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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