



Disease Alert

प्रकोप चेतावनी

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

March 2016

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Kyasanur Forest Disease: Outbreaks, Surveillance & Control

Kyasanur Forest Disease (KFD) is a re-emerging zoonotic tick borne arboviral disease affecting monkeys and man. This disease was first discovered in 1957 from Kyasanur forest area, Shimoga district of Karnataka state following monkey deaths and human cases. The common sign and symptoms of KFD are fever, myalgia, diarrhoea, cough, hepatomegaly, splenomegaly, epistaxis later leading to oral and intestinal haemorrhages and meningo-encephalitis. The disease in man is often fatal unless diagnosed early and treated symptomatically. The case fatality rate (CFR) is about 2 to 10%. KFD is a viral hemorrhagic fever caused by flavi virus, which is immunologically related to Russian Spring Summer Encephalitis (RSSE) virus.

The Ixodid ticks of the genera Haemaphysalis are the vectors of the disease and a number of forest dwelling small mammals like rodents, shrews, an insectivorous bat and many birds maintain the natural enzootic cycle of the virus in the forest ecosystem. The wild primates black faced langurs (*Semnopithecus entellus*) and red faced bonnet monkeys (*Macaca radiata*) get the virus infection by tick bite and they act as amplifying hosts and also susceptible to the infection. The monkey death area are treated as "hot spots" due to dropping of infected ticks from their body with high titers of virus. Human beings get the infection by tick bites while visiting these areas owing to forest related occupation. High mortality of monkeys (Epizootics) are observed during the months of December to June which is coinciding with the seasonal activity of nymphal stages of Haemaphysalis ticks.

KFD is a seasonal disease mainly reported during early and peak summer months and other forest fringed areas during the transmission period. In the areas of reporting monkey deaths, health education to the community is essential and people should be advised to avoid venturing in the forest. Persons who need to visit the forest for occupational purpose should cover their body with thick clothes and topical application of tick repellants like DMP oil, in order to avoid tick bites. All monkey deaths in the forest and adjoining villages should be reported to the local health authorities for further investigations and to undertake insecticidal treatment of the floor area covering a radius of 50 metre radius of the hot spot.

KFD is endemic in Shimoga district, a primitive sylvan territory in Western Ghats due to deforestation, encroachment and human colonization of the above area. The disease was restricted to above area till 1971, subsequently moved to Chikkamagalore, Uttara Kannada, Dakshina Kannada and Udupi districts and later in 2012 to Chamarajanagar district. In 2013, KFD was detected in autopsy of dead monkeys in Nilgiris district of Tamil Nadu state. More recently monkey deaths and human cases were reported from three neighbouring States bordering Karnataka viz., Wayanad and Malappuram districts of Kerala (2014 – 15), North Goa district of Goa State (2015-16) Sindhudurg district of Maharashtra and recently in 2016 in Belagavi district of Karnataka State (2016). It is evident that, the KFD is centripetally spreading to newer territories. The probable reasons are due to interplay of a complexity of factors related to deforestation and human settlement in forest biotopes. Improved surveillance,



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enhanced diagnosed facilities and timely undertaking of appropriate disease specific control measures are very much needed for the successful containment of the disease in endemic and newer areas.

Outbreak reporting under IDSP: KFD outbreaks have also been reported under IDSP. The details of the KFD outbreaks reported by States/districts are as under. However number of cases and deaths are not final, but as reported by states at the initiation of outbreak.

Table 1: State/District wise no of KFD outbreaks, cases and deaths reported under IDSP during 2014-2016

S. No.	State	District	2014			2015			2016			Total		
			No of Outbreaks	Cases	Deaths									
1	Goa	North Goa	0	0	0	2	74	2	0	0	0	2	74	2
	Goa Total		0	0	0	2	74	2	0	0	0	2	74	2
2	Karnataka	Belagavi	0	0	0	0	0	0	1	23	0	1	23	0
		Shimoga	2	91	0	1	112	0	0	0	0	3	203	0
	Karnataka Total		2	91	0	1	112	0	1	23	0	4	226	0
3	Kerala	Malappuram	1	4	0	0	0	0	0	0	0	1	4	0
		Wayanad	1	6	0	1	140	7	0	0	0	2	146	7
	Kerala Total		2	10	0	1	140	7	0	0	0	3	150	7
4	Maharashtra	Sindhudurg	0	0	0	0	0	0	1	194	0	1	194	0
	Maharashtra Total		0	0	0	0	0	0	0	194	0	1	194	0
Grand Total			4	101	0	4	326	9	2	217	0	10	644	9

Data extracted from IDSP Portal (www.idsp.nic.in) as on June 19; 2016

Enteric Fever, ADD, Cholera and Viral Hepatitis A & E, and Dengue 2014-2016*

* Data extracted from IDSP Portal (www.idsp.nic.in) as on July 19; 2016.

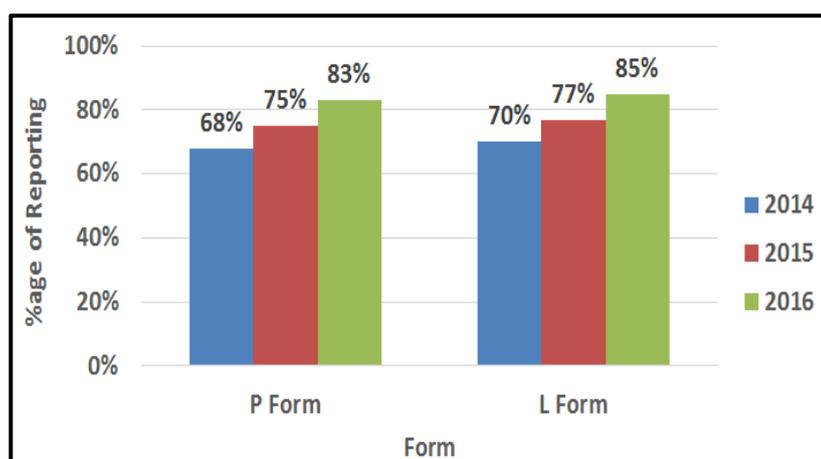


Fig. 1: Reporting Status based on P & L form during March 2014-2016

As shown in fig 1, in March 2014, 2015 and 2016, the 'P' form reporting percentage (i.e. % RU reporting out of total in P form) was 68 %, 75% and 83% respectively across India, for all disease conditions. Similarly, L form reporting percentage was 70%, 77% and 85% respectively across India for all disease conditions, during the same month. The completeness of reporting has significantly increased over the years in both P and L form, thereby improving the quality of surveillance data.

As shown in fig 2, number of presumptive enteric fever cases, as reported by States/UTs in 'P' form was 166493 in March 2014; 182338 in March 2015 and 234598 in March 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in March 2014; 279724 samples were tested for Enteric fever, out of which 46858 were found positive (16.75% positivity). In March 2015; out of 365171 samples, 56215 were found to be positive (15.39% positivity) and in March 2016, out of 463840 samples, 64380 were found to be positive (13.88% positivity).

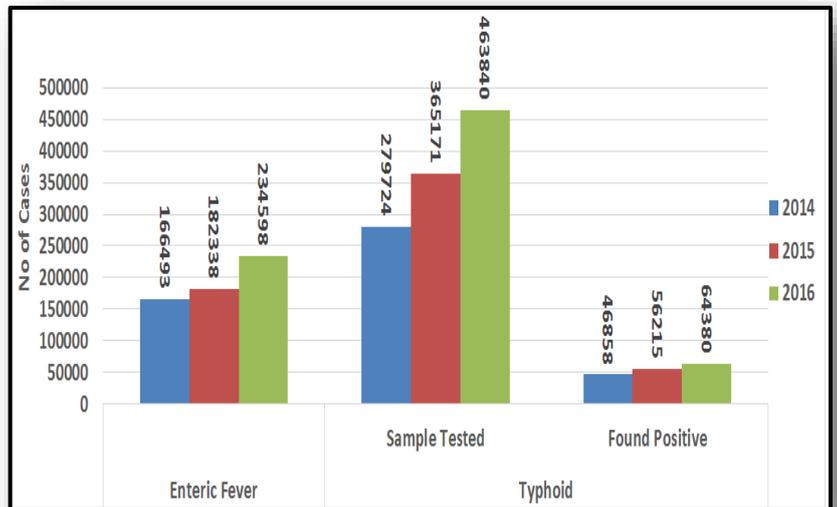


Fig. 2: No. of Enteric Fever Cases reported under P & L form during March 2014-2016

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

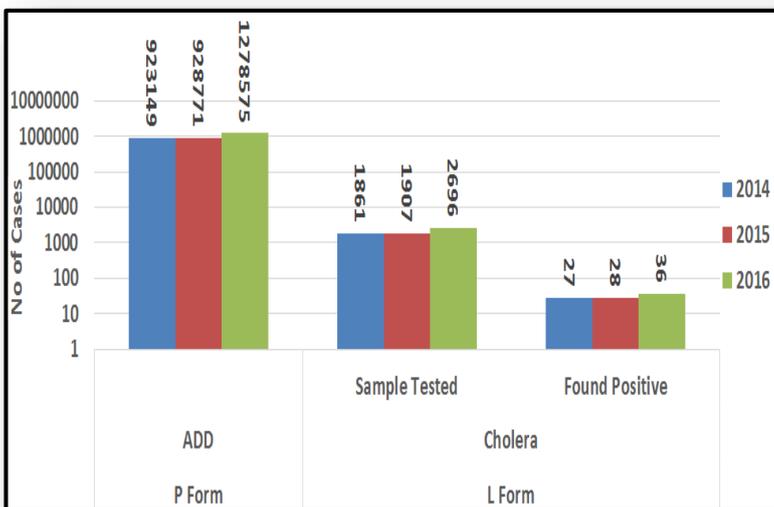


Fig. 3: No. of ADD Cases reported under IDSP in P form & Lab confirmed Cholera cases in L form during March 2014-2016

As shown in fig 3, number of Acute Diarrhoeal Disease cases, as reported by States/UTs in 'P' form was 923149 in March 2014; 928771 in March 2015 and 1278575 in March 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in March 2014, 1861 samples were tested for Cholera out of which 27 tested positive (1.45% positivity); in March 2015, out of 1907 samples, 28 tested positive for Cholera (1.47% positivity) and in March 2016, out of 2696 samples, 36 tested positive (1.34% positivity).

As shown in fig 4, the number of presumptive viral hepatitis cases was 21716 in March 2014, 20573 in March 2015 and 36186 in March 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 March 2014; 16789 samples were tested out of which 1061 were found positive (6.32% positivity). In March 2015; out of 15631 samples, 849 were found to be positive (5.43% positivity) and in March 2016, out of 17411 samples, 977 were found to be positive (5.61% positivity).

As reported in L form (fig 4) for viral hepatitis E, in March 2014; 4019 samples were tested out of which 372 were found

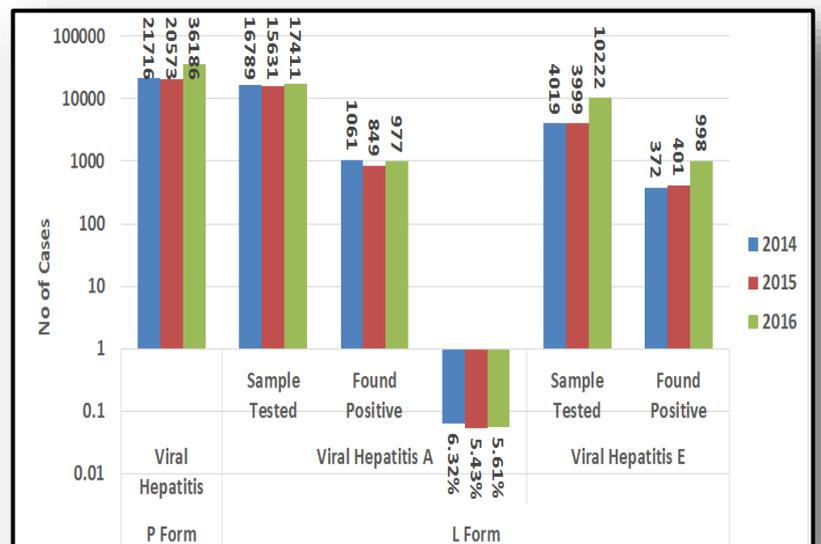


Fig. 4: No of Viral Hepatitis Cases reported under IDSP in P form & Viral Hepatitis A & E cases reported under L form during March 2014-2016

positive (9.26% positivity). In March 2015; out of 3999 samples, 401 were found to be positive (10.03% positivity) and in March 2016, out of 10222 samples, 998 were found to be positive (9.76% positivity).

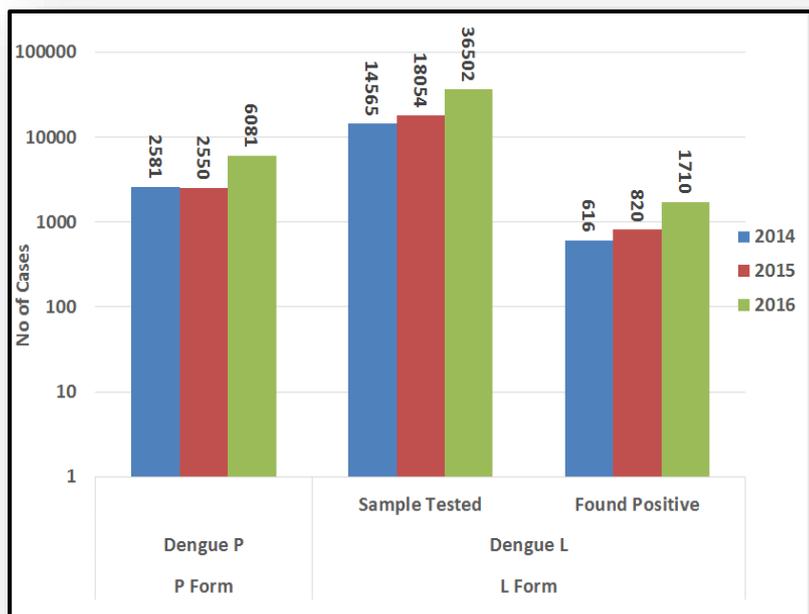


Fig. 5: No. of Dengue Cases reported under IDSP in P & L form during March 2014-2016 in

As shown in fig 5, number of presumptive Dengue cases, as reported by States/UTs in 'P' form was 2581 in March 2014; 2550 in March 2015 and 6081 in March 2016. These presumptive cases are diagnosed on the basis of standard case definitions provided under IDSP.

As reported in L form, in March 2014; 14565 samples were tested for Dengue, out of which 616 were found positive (4.23% positivity). In March 2015; out of 18054 samples, 820 were found to be positive (4.54% positivity) and in March 2016, out of 36502 samples, 1710 were found to be positive (4.68% positivity).

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: State/UT wise P form completeness % for March 2016

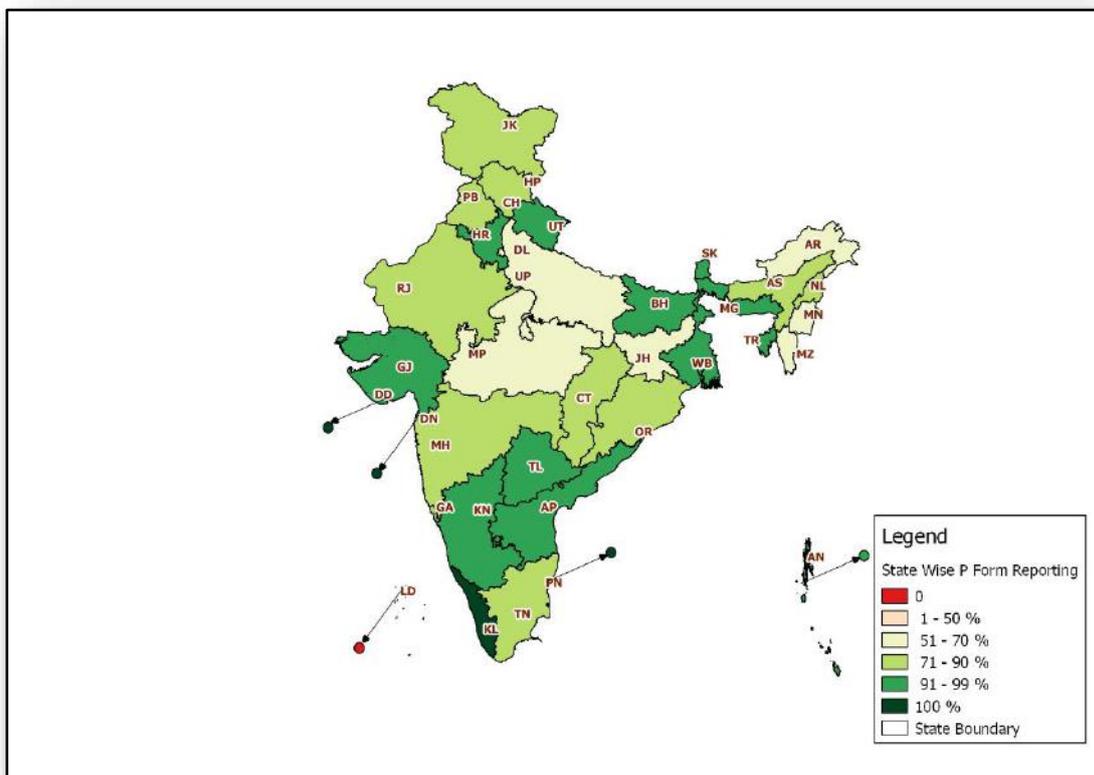


Fig 7: State/UT wise L form completeness % for March 2016

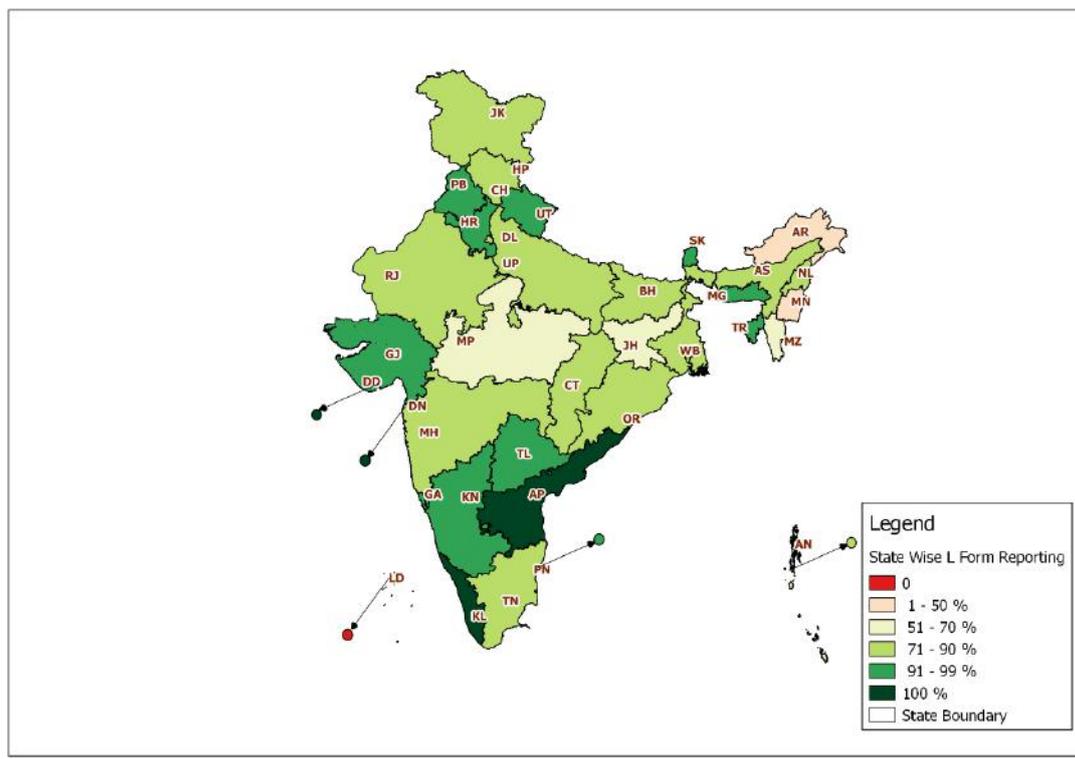


Fig 8: State/UT wise Presumptive Enteric fever cases and outbreaks for March 2016

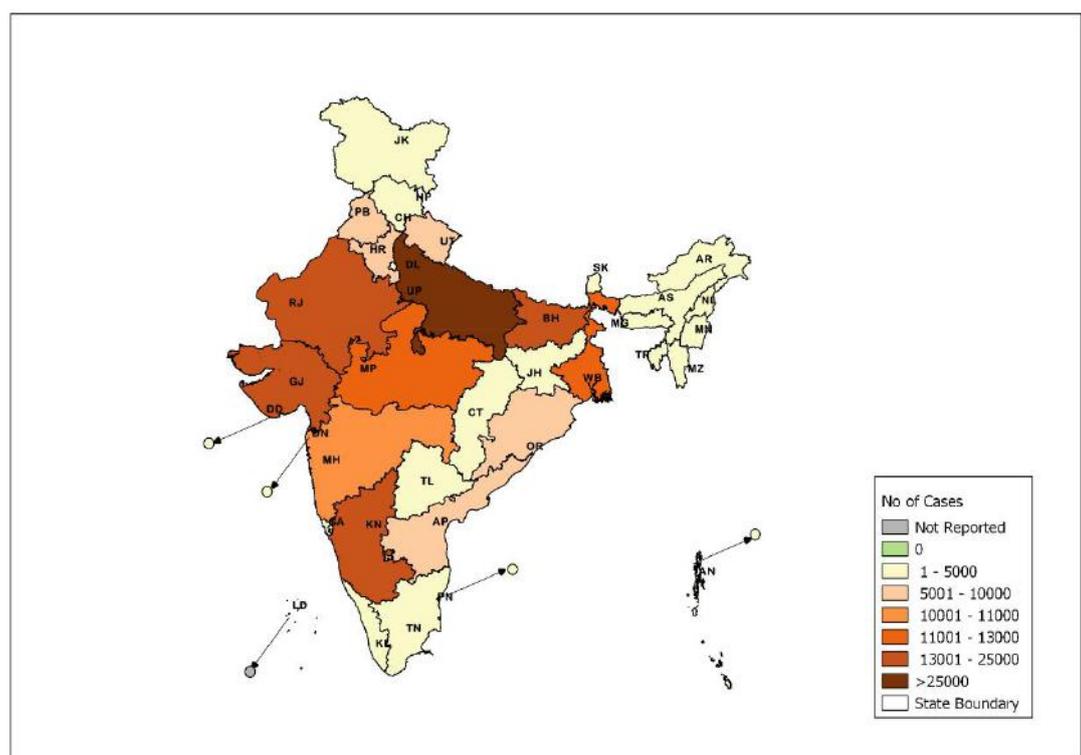


Fig 9: State/UT wise Lab Confirmed Enteric Fever cases and outbreaks for March 2016

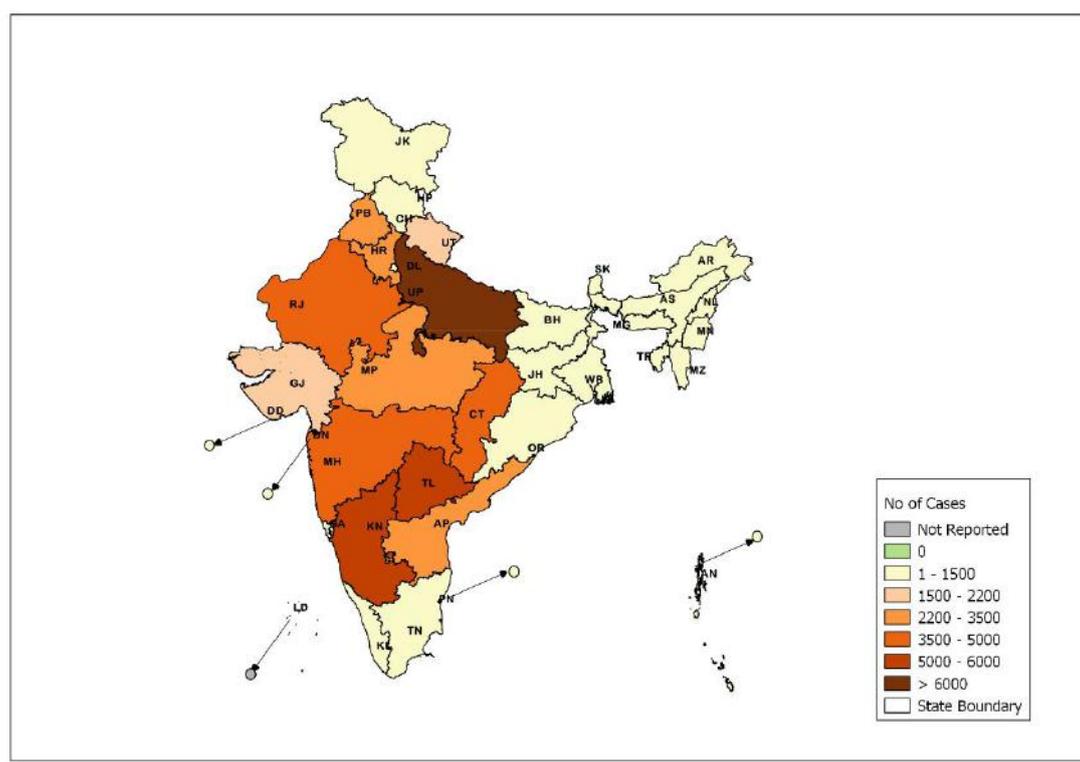


Fig 10: State/UT wise Presumptive ADD cases and outbreaks for March 2016

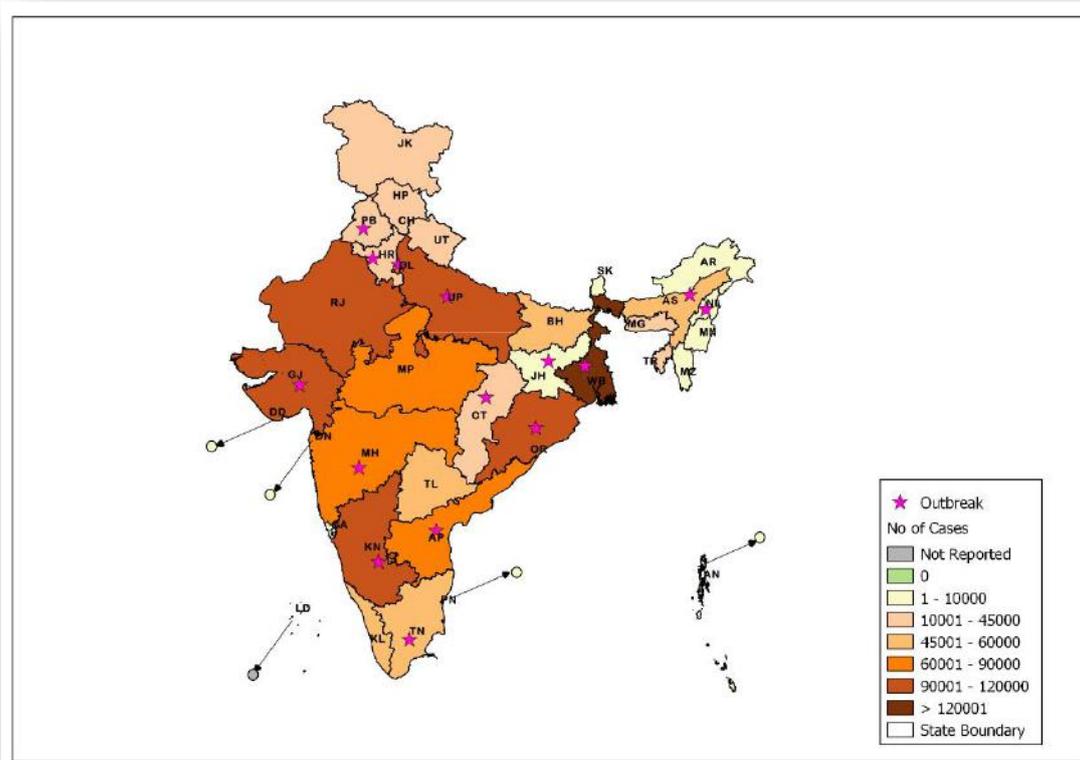


Fig 11: State/UT wise Lab Confirmed Cholera cases and outbreaks for March 2016

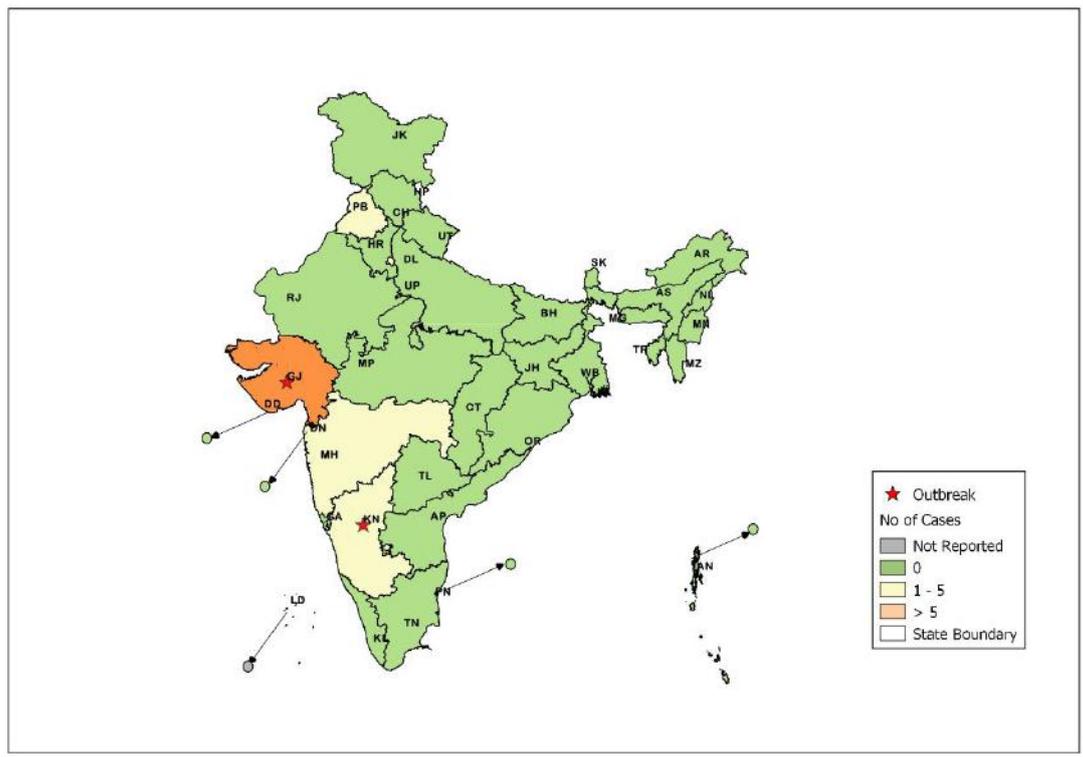


Fig 12: State/UT wise Presumptive Viral Hepatitis cases and outbreaks for March 2016

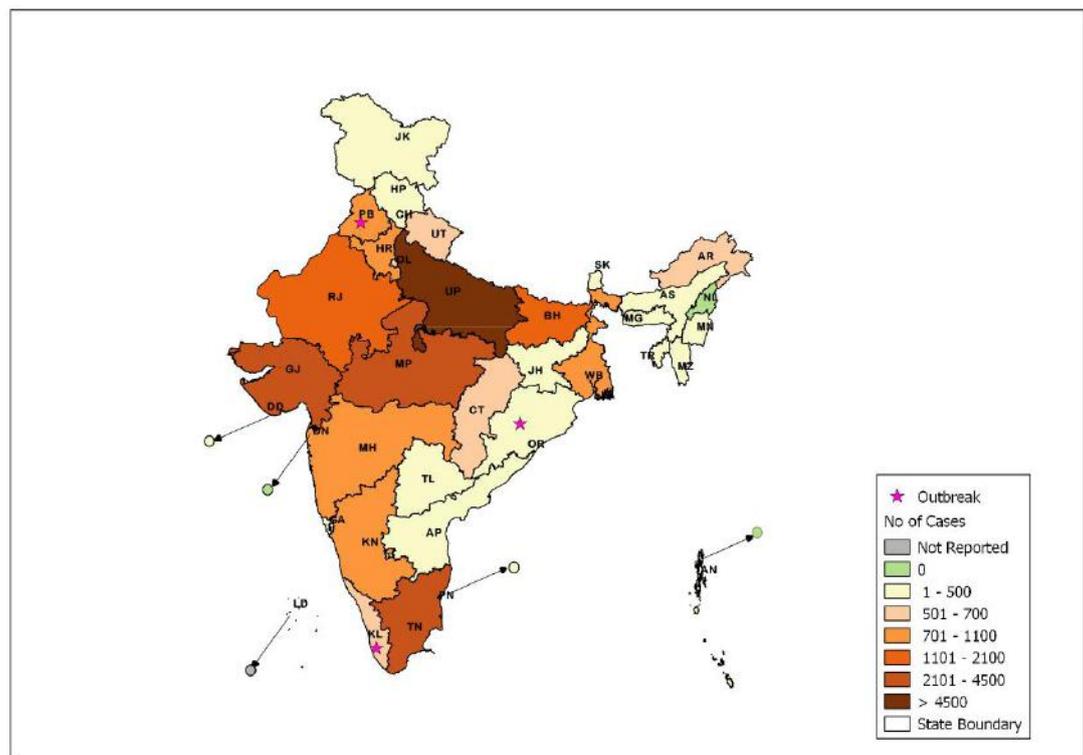


Fig 13: State/UT wise Lab confirmed Viral Hepatitis A cases for March 2016

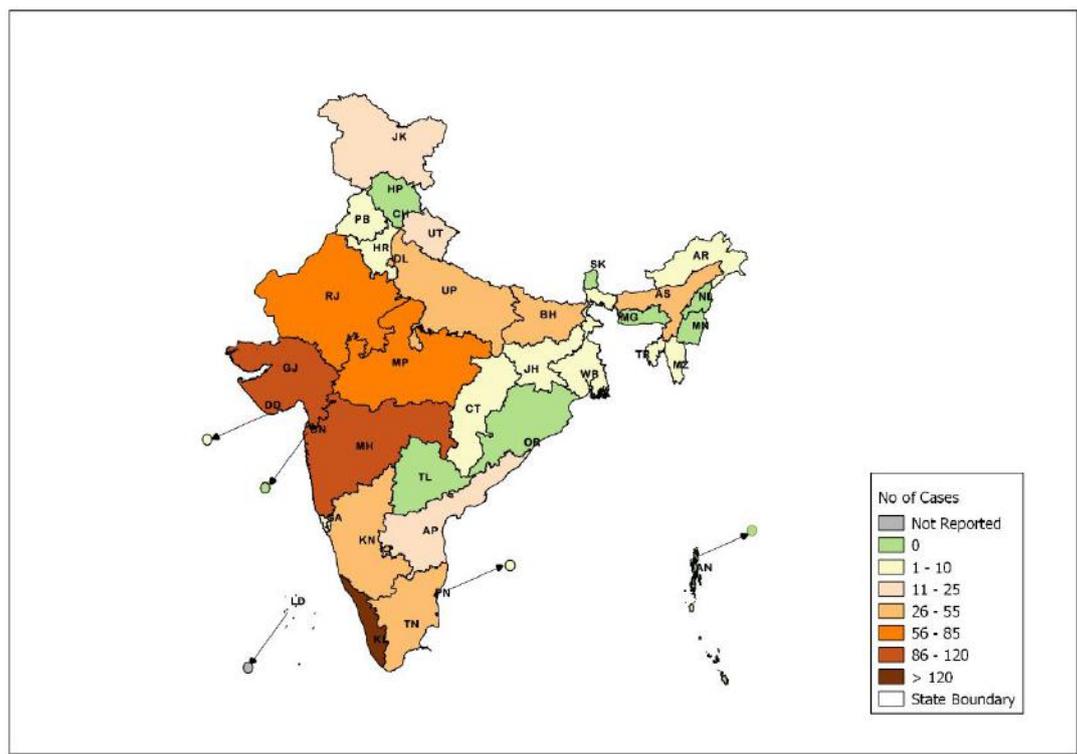


Fig 14: State/UT wise Lab confirmed Viral Hepatitis E cases for March 2016

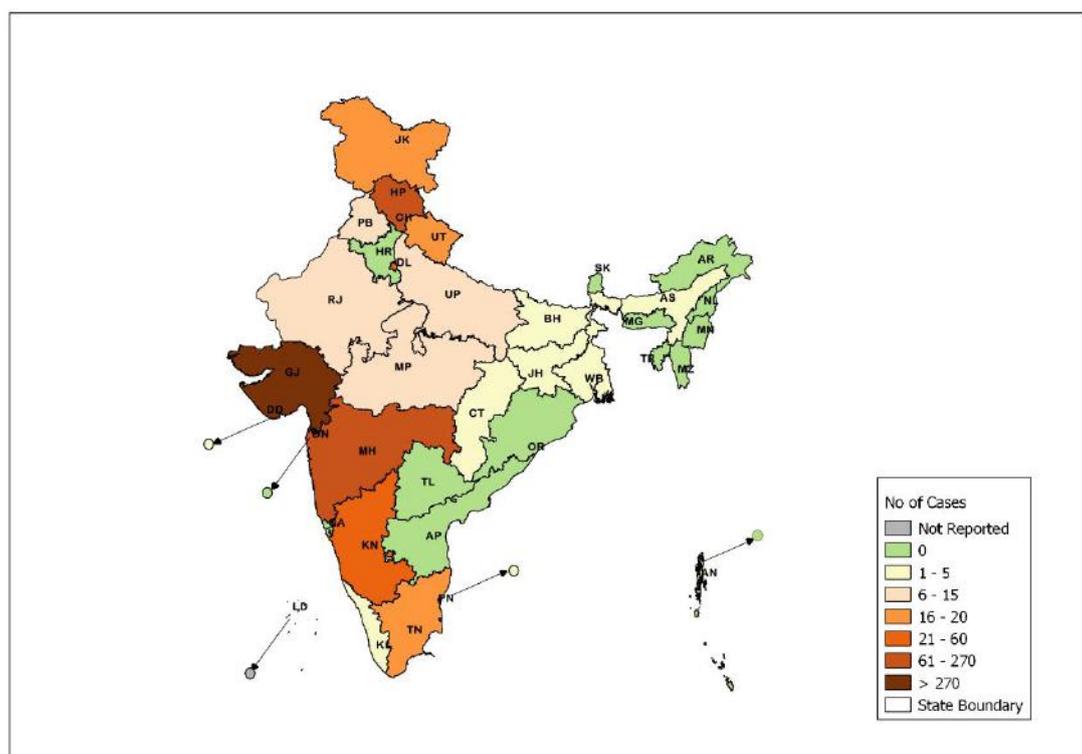
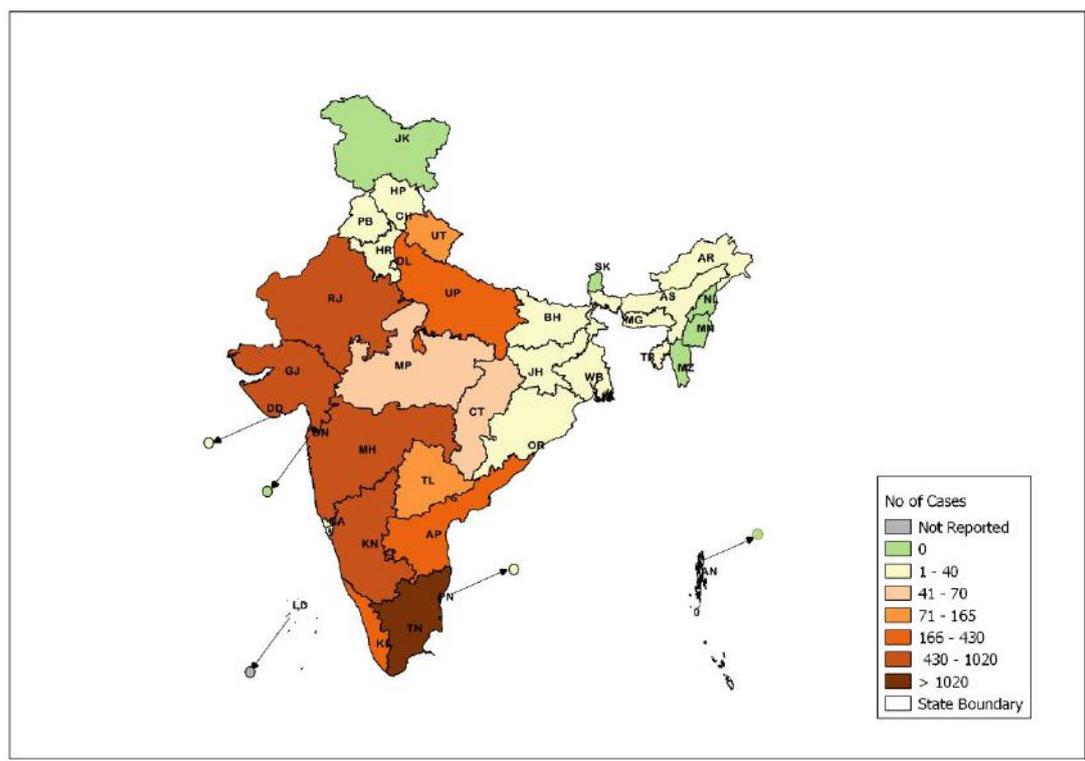


Fig 15: State/UT wise Dengue cases for March 2016



**KFD Outbreak Investigation Report from District Sindhudurg, Maharashtra By
Dr N.Balakrishnan Joint Director NCDC Bangalore, Dr. Sanket Kulkarni Asstt. Director, IDSP
& Dr. Harish Shukla EIS officer NCDC.**

Background:-

- Two people were admitted with complaints of fever with headache, body ache and Myalgia and reported to a Hospital in Goa. As the KFD outbreak was ongoing in Goa, both were tested for KFD. Thus the first case of KFD was detected and was cross notified to District Sindhudurg. Further investigations of the 28 cases with similar complaints in Ker Village under PHC Sateli Bhedashi was done by NIV Pune.
- Out of 28 samples sent to NIV Pune 18 samples tested positive for KFD by IgM Elisa. On further investigation cases with similar complaints were also reported in nearby villages like Zolambe, Asaniye, and Kolzar. Samples from these villages were also tested and found that 5 from Asaniye, 4 from Zolambe and 3 from Kolzar were also positive by IgM ELISA. Hence this was confirmed to be an outbreak of KFD and this was communicated to IDSP, New Delhi on 23.2.2016 and asked for assistance to investigate.

Date of Investigation: 29.02.2016 to 03.03.2016

Central team was sent to investigate the outbreak which started on 29.02.2016.

Details of Investigation:

The team members visited the area on 29.02.2016 along with the state officials and support staff. Initially the medical officer from PHC Bhedashi was met and the area involved with the outbreak was discussed. The details of the outbreak including line lists, no of monkey deaths and area of monkey deaths was collected.

Objectives

1. To determine the magnitude of the outbreak.
2. To determine epidemiological characteristics of the outbreak.
3. To determine risk factors associated with this outbreak

Methodology:

On discussion with state health authorities about the outbreak and after formulating and reviewing the line list of cases as well as interacting with patients in the line list a case definition was prepared.

Case Definition:

- Clinical Case: A person residing in an area under PHC SateliBhedashi or PHC Talkat with a presentation of fever with headache, body ache and myalgia with or without haemorrhagic or neurological manifestations from 09/01/2016.
- Confirmed Case: A clinical case positive by RT-PCR or IgM ELISA.
- Line list of cases was prepared and analysed for Time, Place & person.

Result

Investigation findings:

Confirmation of the outbreak: From 09th Jan 2016 to 03rd Mar 2016, a total of 54 samples were sent for testing at NIV Pune of which 29 samples were tested positive (**53.7%**) for KFD. As the disease is being diagnosed for the first time in the state, no cases have occurred in last five years which confirms the existence of an outbreak. But 8 samples were tested positive for IgG antibodies which confirms the past infection in the area but was not diagnosed.

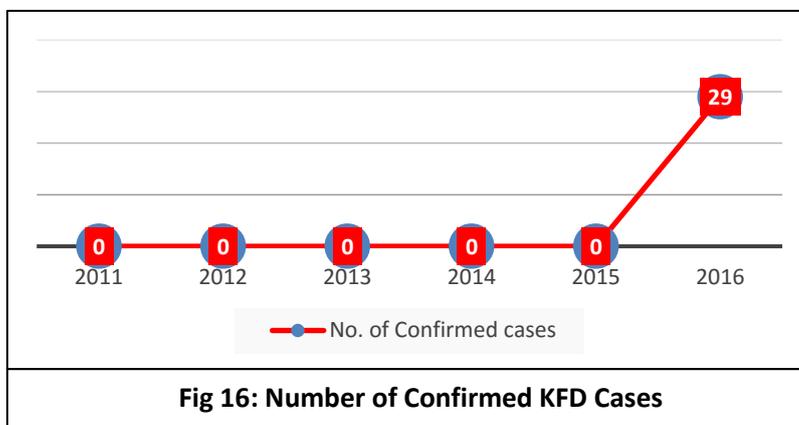


Table 2: Symptom wise KFD cases

Sl. No	Name of the Symptom	No of cases	Percentage (%)
1	Fever	22	100
2	Headache	22	100
3	Chills	18	81.8
4	Vomiting	10	45.5
5	Relapse	14	63.6
6	Neurological signs or symptoms	0	0
7	Haematological signs or symptoms	0	0

Clinical Profile of the positive KFD cases:

All the cases had intermittent fever of mild to moderate grade (only 3 had high grade of fever) with Headache. Around 82% of the cases reported to have chills along with fever and 45% cases reported to have vomiting. Around 63% of the patients reported to have similar symptoms after 7-9 days of the previous illness. Haemorrhagic and Neurological manifestations were not documented in anyone of the confirmed cases. The detailed profile is shown in the table 2 (n = 22):

Descriptive Epidemiology:

- Place Distribution:** Below mentioned table 3, shows the distribution of confirmed cases in District Sindhudurg

Table 3: Distribution of confirmed KFD cases in District

S. No	Affected Village	No. of cases reported	Population	Attack rate (in %)
1	Ker	17	611	2.79
2	Asaniye	5	2001	0.25
3	Zolambe	4	2000	0.20
4	Kolzar	3	2075	0.14

- Time Distribution:**

All the cases started from 09.01.2016 and daily surveillance of the cases is continuing till date with the latest positive case cross reported on 14.06.16 from village Padve (Dhangarwadi) under PHC - Morgaon, District Sindhudurg.

- Person Distribution:**

A total 29 confirmed cases of KFD have been reported out of which only 22 could be contacted as others were not available at home even after repeated visit. Out of 29 cases, 62% were females and 38% were males. All the age groups were affected from 4years to 71 years.

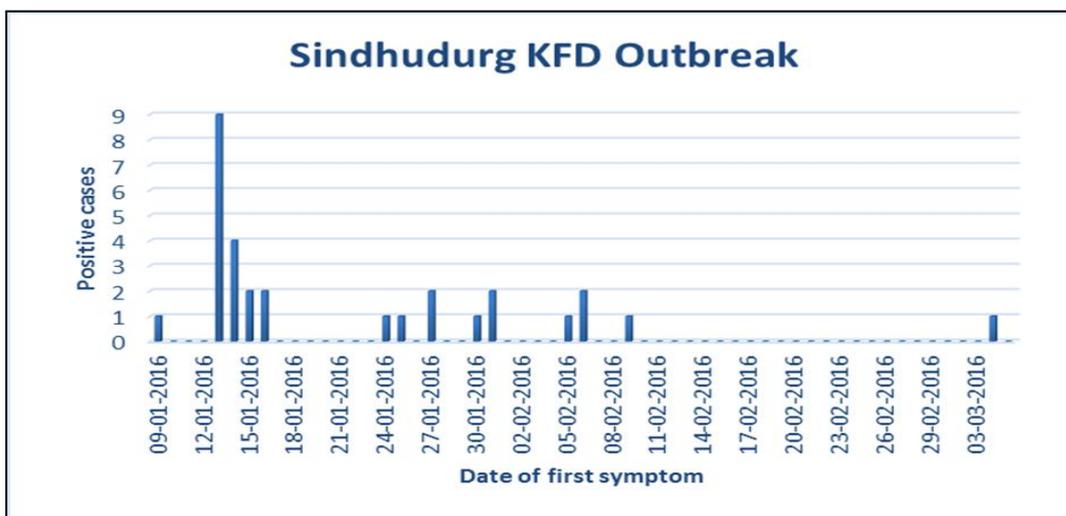
Table 4: Distribution of Sex Ratio in KFD cases in District Sindhudurg, Maharashtra

Sl. No	Age Group (In Years)	Male	Percentage	Female	Percentage
1	0-5	0	0	1	6.25
2	6-18	2	15.4	1	6.25
3	19-35	1	7.7	7	43.75
4	36-60	8	61.5	6	37.5
5	Greater than 60	2	15.4	1	6.25
Total		13	100	16	100

While interviewing regarding their signs and symptoms we also gathered information pertaining to their daily habits which expose them to the infection. All had visited the cashew plantations for cleaning the cashews farms or banana gardens as it was a cashew harvesting season. However three cases had not visited the fields out of which one had recent history of tick bite, other had past history of tick as the patient was 70 years old and was not going to field since 3 years.

The last case was a four year old child which had no history going to field but the family was visiting the forests and also bringing the wood and dried leaves from the field. Rest all gave the history tick bite and none had used any type of personal protective measures (PPM) like use of tick repellents, wearing full sleeved clothes, wearing pants and shoes to cover legs and feet in order to prevent themselves from tick bite. It was also observed that there was poor reporting of monkey deaths in the area. Since the confirmation of the human cases the monkey deaths were started to be reported and since then 16 monkey deaths have been reported.

Fig 17: Epi Curve of the Outbreak in District Sindhudurg, Maharashtra



Environmental Investigation:

The forest area adjoining to the affected villages, is of tropical deciduous type and has many clusters of black faced langur which are more responsible for amplifying the KFD in comparison to the Red faced Bonnet monkeys. The temperature as well as the relative humidity of the area support the development of the tick as well its survival.

A total of 16 monkey deaths have been reported in January and February.

Tick Collection:

Ticks were collected by flagging method from various locations in 4 villages (Ker, Zolambe, Asaniye and Kolzar) from in and around the monkey death area, cashew plantations, foot path frequented by villagers, cattle grazing areas etc. However ticks were recorded from the first three villages only the nymphs of KFD vectors viz., *Haemophysalis spinigera* and *H.turturis*. Majority of the ticks were collected from Ker village. **One tick pool sample collected from cashew plantation and cattle grazing areas of Ker village sent for virus isolation to RMRC, Belgaum found positive to KFD virus by RT-PCR method.**

Table 5: Tick Collection from the Field by Flagging Method District Sindhudurg, Maharashtra

Area	Source	Tick Species	Male	Female	Nymph	Total
Asaniye village, Doda Marg, Sindhudurg, MH.	Field tick collection by flagging	<i>H.spinigera</i>	-	-	1	1
Ker village Doda Marg, Sindhudurg, MH.		<i>H.spinigera</i>	-	-	26	26
		<i>H.turturis</i>	-	-	14	14
Zolambi village, Doda Marg, Sindhudurg, MH.		<i>Amblyomma Spp</i>	-	1	-	1
	<i>H.spinigera</i>	-	-	3	3	
Total						45

Tick Collection from domestic animals:

Tick collections have also been carried out from the domestic cattle housed in cattle sheds of the villages namely Ker and Asaniye where from cases were recorded. The Tick infestation rate which is the proportion of animals positive for ticks was 0.4 and 0.5 respectively. The tick infestation rate/index, which is the average number

of ticks collected from the total animals' positive for ticks. In both villages the KFD vector ticks *H. spinigera* and *H.turturis* have been recorded from cattle in addition to other cattle tick genera.

Table 6: Tick Collection from Domestic Animals in District Sindhudurg, Maharashtra

Village (Animal examined)	Tick infestation rate/ Tick Index	Tick Species	Male	Female	Nymph	Total
Ker Village (10)	0.4/2.2	<i>H.spinigera</i>	-	6	-	6
		<i>H. turturis</i>	-	7	-	7
		<i>H.bispinosa</i>	-	1	-	1
		<i>Rhipicephalus Spp</i>	-	3	1	4
		<i>Boophilus Spp</i>	-	2	-	2
		<i>Amblyomma Spp</i>	-	2	-	2
		Total	-	21	1	22
Asniye village (6)	0.5/1.75	<i>H.spinigera</i>	-	-	2	2
		<i>H.turturis</i>	2	-	-	2
		<i>Amblyomma Spp</i>	-	3	-	3
		Total	7	3	2	7

Rodent Collection:

The team also collected a total of 5 rodents from two villages (Asaniye and Zolambe), the samples which are sent to NIV Pune and RMRC Belgaum. **Out of the 5 *Rattus rattus* trapped from the above study villages one *R. rattus* collected from Zolambe village found positive for KFD virus in organ samples (Liver, Spleen) by RT-PCR by RMRC Belgaum.**

Rodent collection by wodertraps

Table 7: Tick Collection from Domestic Animals in District Sindhudurg, Maharashtra

Village name	Number of traps laid / Number of positive for rodents	Number of rodents trapped / Virus isolation from rodent
Ker village Doda Marg, Sindhudurg, MH.	2/0	-
Zolambi village, Doda Marg, Sindhudurg, MH.	4/2	4/1 (<i>Rattus rattus</i> found positivity for virus)
Asaniye,village Doda Marg, Sindhudurg, MH	2/1	1/- (<i>Rattus rattus</i>)

Recommendations:

- States should do regular KFD surveillance during transmission season as per case definition available with them.
- Role of different depts. needs to be specified.
 - Responsibility of Forest dept. - Reporting of monkey deaths & hot spot spraying (Need to be coordinated at Ministry of Environment and Forest for proper coordination).

- Livestock Development/Animal Husbandry dept. - Surveillance of KFD in cattle, control of ticks in cattle, monkey autopsy (Need to be coordinated at Ministry of Animal Husbandry, Dairying and Fisheries)
3. State should continue with dusting of 5% Malathion covering 50 metre radius of the hot spot (In areas where monkey death have been reported) or controlled burning may be carried out.
 4. To consider an active surveillance of cases in areas within 5km radius of reported monkey deaths.
 5. To consider intensifying IEC activities in all the affected villages regarding natural history of disease, personal protection from tick bite, avoiding monkey death areas and seeking health care services in case of appearance of symptoms.
 6. To consider a vaccination strategy for high risk group for prevention of such an outbreak in near future.
 7. To consider co-ordination with Karnataka Health and Animal Husbandry departments for sharing there expertize regarding KFD.
 8. Tick control strategies or policies need to be finalized with each responsible departments.

Research activities which may be undertaken for further understanding of KFD:

1. To know the viral load required for causing infection in Humans from various stages of tick.
2. Vaccination/Immunization studies for requirement of booster doses in already immunized lot and also for those who had been naturally infected.
3. Since the vector tick species are prevalent in many of the affected villages systematic studies need to be undertaken to elucidate their exact role in disease transmission.



Action from the field

1. State review meeting of Karnataka state by Dr. Pradeep Khasnobis Sr. CMO & Officiating NPO IDSP & Dr. Sanket Kulkarni, Asstt. Director IDSP at Bangalore from 14.03.2016 to 15.03.2016.



2. State review meeting of Arunachal Pradesh by Dr. Nishant Kumar, Asstt. Director IDSP at Itanagar from 31.03.2016 to 04.04.2016.



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.
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)

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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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