VIRUS RESEARCH AND DIAGNOSTIC LABORATORY NETWORK (VRDLN)

ANNUAL REPORT

Reporting on 2014 Surveillance Data

Compiled by: VRDLN Team

National Institute of Epidemiology,

Chennai-77

CONTENTS

LIST OF FIGURES

LIST OF TABLES

List of abbreviations

Ag: Antigen
CMV: Cytomegalovirus
CSF: Cerebro-spinal fluid
EBV: Epstein Barr Virus
HAV: Hepatitis-A
HBV: Hepatitis-B
HCV: Hepatitis-C
HEV: Hepatitis-E
HSV: Herpes Simplex Virus
ICMR: Indian Council of Medical Research
IgM: Immunoglobulin M
IgG: Immunoglobulin G
JE: Japanese Encephalitis
PCR: Polymerase Chain Reaction
RTPCR: Real Time Polymerase Chain Reaction
NIE: National Institute of Epidemiology
NIV: National Institute of Virology
RSV: Respiratory Syncytial Virus
VRDLN: Virus Research and Diagnostic Laboratory Network
VZV: Varicella Zoster Virus

Introduction

Viral suspected outbreaks are frequent in India and at the same time, there is inadequacy of virology laboratories in the country for their diagnosis, especially at the district level. To address this shortage, the Department of Health Research (DHR), Ministry of Health and Family Welfare, Govt of India is establishing a network of laboratories across the country to create infrastructure for timely identification of viruses causing outbreaks/morbidity significant at public health level. DHR envisages establishing 160 Viral Research & Diagnostic Laboratories (VRDLs) during the 12th plan period: 10 Regional Labs; 30 State Level Labs and 120 Medical College Level labs. This network is also intended to provide virological diagnosis to patients attending tertiary health facilities (medical colleges) and thereby generate surveillance data on common viral diseases from different parts of the country.

The objectives of the network are:

(1) Create infrastructure for timely identification of viruses and other agents causing morbidity significant at public health level and specifically agents causing epidemics and/or potential agents for bioterrorism.
(2) Develop capacity for identification of novel and unknown viruses and other organisms, emerging and re-emerging viral strains and develop diagnostic kits
(3) Provide training to health professionals

(4) Undertake research for identification of emerging and newer genetically active/ modified agents.

Networking laboratories

During Sep 2013- March 2015, the DHR has released funds for the establishment of 42 virology laboratories, 20 of which are functional while the remaining 22 are likely to be functional in the next few months (Fig 1).

This includes 5 regional, 6 state and 31 medical college level laboratories. The Medical College laboratories are equipped with appropriate infrastructure to carry out serological and molecular diagnostics, whereas the State level laboratories are equipped with BSL-2 facility and carry out serology, molecular diagnostics, fluorescence microscopy, tissue culture and sequencing for all the enlisted viruses. Regional laboratories, in addition to the above diagnostics, are expected to identify novel and unknown viruses, undertake research activities, participate in disease surveillance, and train health professionals. This virology laboratory network has the capacity to diagnose over 25 viral etiologies including Dengue, Chikungunya, JE, West Nile, Rotavirus, Adenovirus, varicella zoster, measles, Norovirus, Enterovirus, Rubella and hepatitis A-E virus.
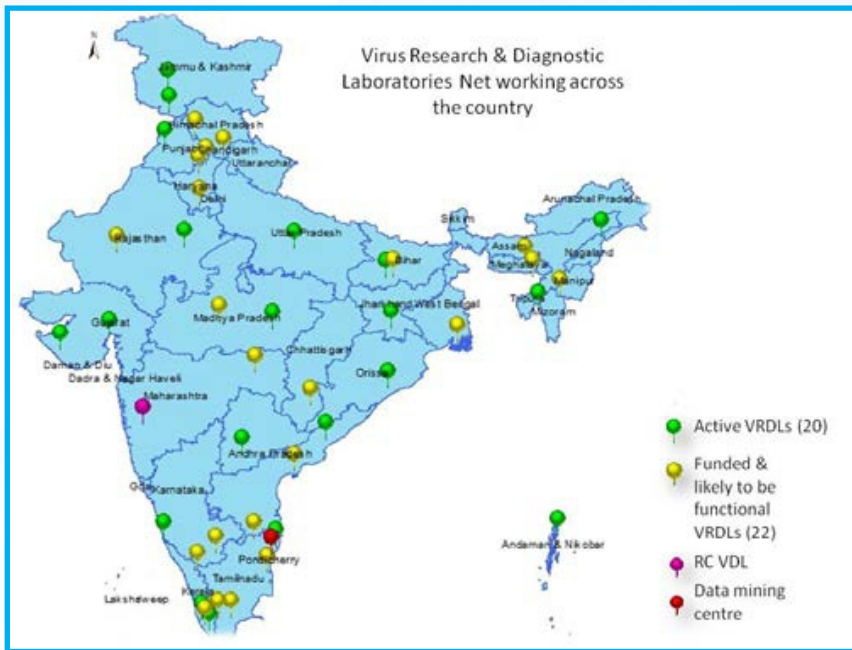
Figure 1: Virus research laboratory network

VRDL Resource Center

In order to ensure quality in laboratory procedures, VRDL resource center was established at NIV, Pune. The Resource Centre is mandated to develop algorithms and SOPs for laboratory procedures, regularly train various categories of VRDL staff in different laboratory techniques as well as periodically conduct Quality Assurance programme.

Data Management Center

The virology laboratory network is expected to generate a large volume of data on viral diseases and suspected outbreaks. To manage the data generated by the network and analyze it periodically, a data management center was established at the National Institute of Epidemiology (NIE), Chennai in January 2014.

As the data management center, NIE has initiated a series of activities to facilitate easier data entry from the networking labs, as detailed below:
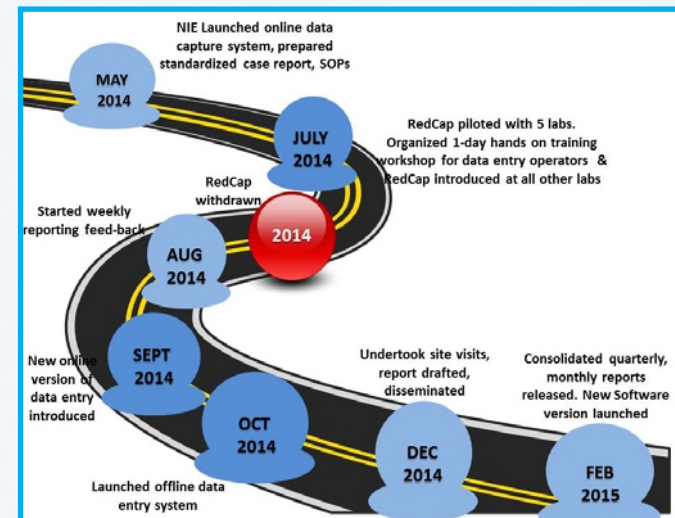
Figure 2: Data Management Centre - Milestones

Standardized case-report form (CRF):

For data collection, a standardized CRF was designed after consulting the Principal Investigators of the VRDLs. This form captures patient information, clinical and epidemiological details, and details of sample collection, laboratory tests conducted and their results from in/out patients seeking treatment from medical colleges as well as samples from disease outbreaks referred to the VRDLs by state health authorities for laboratory diagnosis. The guidance and instructions for filling the form were brought out as SOP and shared with the VRDLs.

Launch of data entry system:

In July 2014, NIE launched online data entry system using the REDCap (Research, Electronic Data Capture platform) software, developed by Vanderbilt University. REDCap, is a secure web application for building and managing online surveys and databases and being used by over 1200 institutions in 86 countries. The VRDLs after one-day hands-on training on online data entry were requested to enter the data from 1 April 2014. However this data entry system was discontinued based on the feedback from VRDLs to have an offline system. The new data management system (version-1) having both online and offline modes of data entry was introduced in October 2014. The new data entry system had several unique features including capacity for huge storage of data similar to REDCap, mid-way saving option, use of Optimized Web Application thereby making online data entry possible even for slow Internet connections. Although all the VRDLs started using the data entry system by October end,

there was a large backlog of data entry. In Dec 2014, NIE visited 10 VRDLs to review the modalities of data entry at VRDLs, clarify their doubts about online/offline system and understand the reasons for the backlog. Absence of a dedicated data entry person was the main reason for the lack of real-time data entry. Based on the feedback received from these VRDLs, NIE launched the second version of the software in Feb 2015 to make it more user-friendly. As on April 1, 2015, all the 20 VRDLs have been successfully using the newer version for data entry.

Report Generation wizard:

The data management system has the facility to generate the following reports which can be downloaded by the VRDLs - (a) Laboratory register (Line list of samples collected), (b) Lab result report (Results of lab investigation) (c) Individual Patient Report (d) Suspected Outbreak Report (e) ICMR Monthly Report. This wizard can be promptly used as a complete register for documentation purposes of all the entries made by the VRDLs.

Weekly and monthly feedback:

NIE sends weekly email to all the VRDLs on every Monday (or the first working day of the week) about the (i) number of VRDLs which entered the data and (ii) number of records entered by each VRDLs during the previous week. Since 2014, NIE also initiated the process of sending monthly feedback to VRDLs about incomplete data entries. As a part of this, VRDLNs are sent the list of incomplete records i.e. records with missing information about 9 key variables (age,

sex, presenting syndromes, district, duration of illness, date of onset of illness, sample collected, laboratory result, investigation required) with a request to complete these records. After Feb 2015, this procedure was incorporated on the website as data validation tool and VRDLs are advised to run this tool to find out incomplete records. NIE also has planned to randomly check 5% of the records entered by the VRDLs for correctness of the data entry.

Progress of data entry

During 1 April 2014 – 31 March 2015, 20 VRDLs have uploaded details of 40, 227 patients. This included 38,403 patients attending medical college referred to VRDL for etiological diagnosis and 1,824 patients from suspected outbreaks (Fig 3 and 4)

Figure 4: VRDLs activity status of data entry from April 1st 2014 to March 31st 2015

Figure 3: Number of records uploaded by VRDLs, 1 April 2014 – 31 March 2015 (n=40,227)

Data analysis

The data entered by the VRDLs is analyzed to calculate the following five primary indicators:

1. Number of suspected outbreaks diagnosed by the network
2. Number of suspected outbreaks by syndrome
3. Number of suspected outbreaks by virological diagnosis
4. Number of patients by syndromes
5. Number of patients tested for specific viruses

RESULTS
Section I: Suspected Outbreaks diagnosed by VRDLs

As per the details entered in the data capture system, the VRDLs, during 1 April 2014 to 31 March 2015, processed samples from 112 suspected outbreaks. The details of 29 suspected outbreaks where less than 5 cases were investigated are not included in this report. Map below shows the distribution of 83 suspected outbreaks by VDRLs across the country (Figure 5).

Of these 83 suspected outbreaks, virological diagnosis was established in 74 (89%) whereas in 9 (11%) suspected outbreaks no etiological agent could be identified. Among the 74 suspected outbreaks that were lab confirmed, the median duration between receipt of samples and laboratory diagnosis was 3 days (0-26 range) (Figure 6)
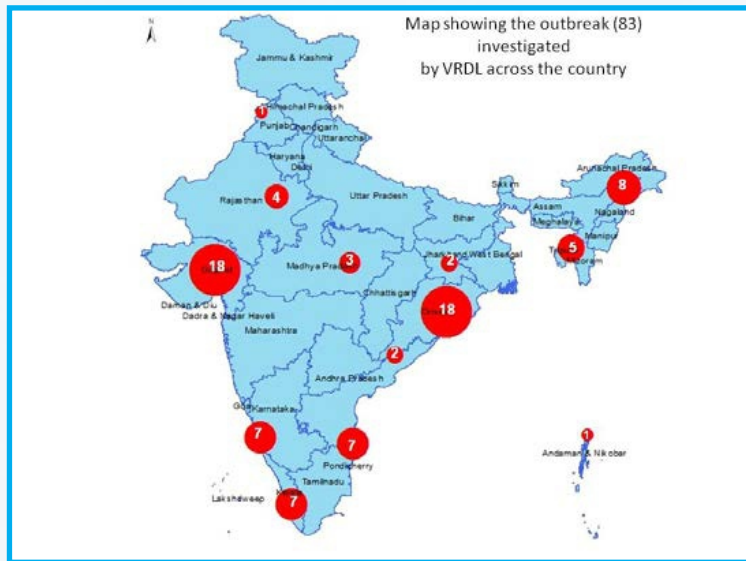
Figure 5: Outbreaks investigated by VRDLs (n=83)

Figure 6: Median time for diagnosis of suspected outbreaks (n=74)

Sample collection

VRDLs conducted 3001 tests on 1823 samples collected from 1662 cases affected during these 83 suspected outbreaks. Out of 1662 cases tested, 731 (44%) were positive for at least one viral etiology. Blood/serum was the most frequently collected sample (97%).

Figure 8 describes the presenting syndrome of 83 suspected outbreaks. The common presenting syndromes included fever with rash (suspected measles/rubella) and fever with jaundice.

Information about the presenting illness was not entered in the data entry system for 10 suspected outbreaks.

SuspectedOutbreaks (83)

1662patients

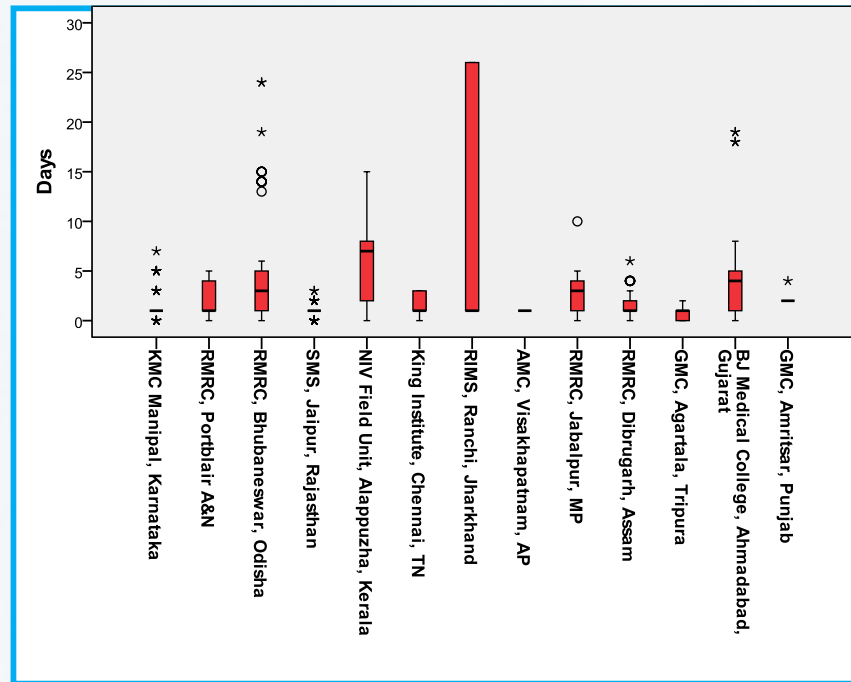1823 samples collected
1010 positives

3001 tests run, 731
positvie cases

Figure 7: Details of samples collected and tested among patients affected in outbreaks
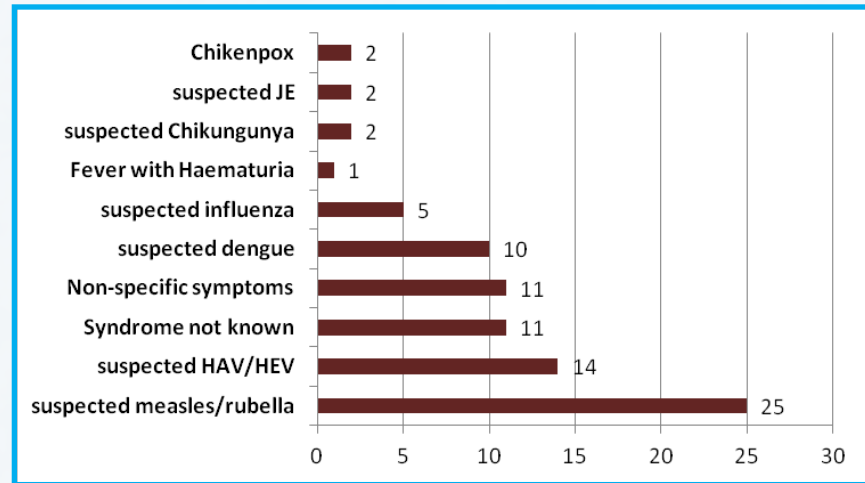
Figure 8: Presenting syndromes

11 suspected outbreaks with missing information. Non-specific symptoms include anorexia, weight loss, weakness, leg pain, leg oedema, fatigue, urinary complaints etc.

About 71% of these suspected outbreaks were due to measles, hepatitis E, dengue or herpes zoster. Etiological agent could not identified in 9 suspected outbreaks (Table 1).

Table 1: Etiological agents identified in 83 suspected outbreaks

| Etiological agent	Number of Suspected Outbreaks (n=83)
Measles	22
Dengue	17*
Hepatitis E virus	13
Varicella Zoster	7
Japanese Encephalitis	4
Hepatitis A virus	3
Chikungunya	2
Influenza A	2
Influenza A H3N2	2
Influenza A H1N1	1
Enetro-virus	1
Etiological agent not identified	9

1 case each in 4 suspected outbreaks was positive for IgM antibodies against Chikungunya

The geographic distribution of common suspected outbreaks diagnosed by the VRDLs and the age and sex distribution of cases investigated are presented in Tables 2-6 and Figure 9-18.

Table 2: Distribution of Measles outbreaks

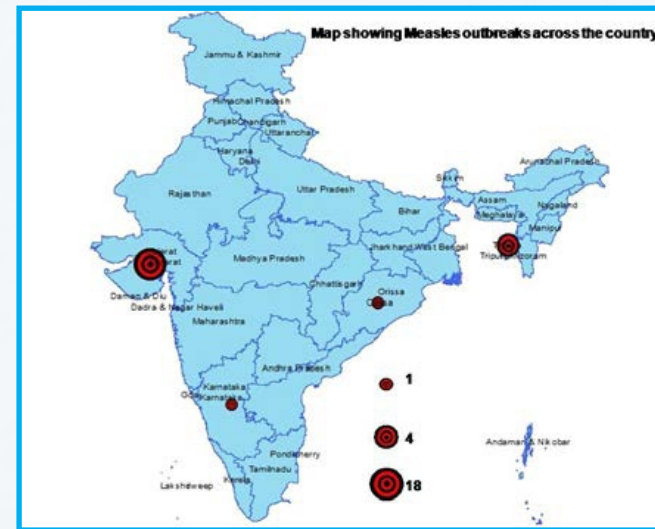| Reporting VRDL	State (Districts)	No. of outbreaks	No. positive/No. tested
MCVR, Manipal	Karnataka (Udupi)	1	8/10
RMRC, Bhubaneswar	Odisha (Rayagada)	1	11/29
GMC, Agartala	Tripura (Unakoti, Dhalai North Tripura)	4	22/22
BJMC, Ahmedabad	Gujarat (Ahmedabad, Bhavnagar, Diu, Jamnagar, Junagadh, Vadodara, Diu & NH, Surat, Kutch,Rajkot Surandranagar)	16	60/86

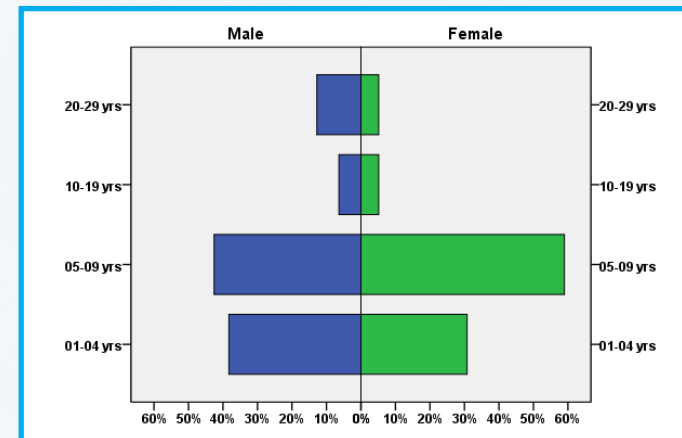**Figure 9: Map showing distribution of measles outbreaks detected by VRDLN**

Figure 10: Age and sex distribution of measles cases

Table 3: Distribution of dengue and Chikungunya outbreak

Reporting VRDL	State (districts)	No. of Outbreaks (n=19)	No. positive/ No. tested
Dengue (17)			
RMRC, Port Blair	Andaman & Nicobar (North, middle, south Andaman)	1	29/62
NIV, Allepey	Kerala (Malappuram, Kottayam, Kohzikode)	4	58/225
KIPM, Chennai	Tamil Nadu (Villipuram, Mudiyanur, Tirunelveli, Madurai, Thiruvallur, Viruthunagar Kanchipuram)	7	43/63
RIMS, Ranchi	Jharkhand (Giridh)	1	2/11
RMRC, Bhubaneswar	Odisha (Malkangiri)	1	1/34
NIRTH, Jabalpur	Madhya Pradesh (Bahmani Banjar, Mandla, Shivpuri, Raisen, Sagar)	3	109/215
Chikungunya (2)			
NIV, Allepey	Kerala (Ernakulum)	1	181/197
AMC, Vizag	Andhra Pradesh (Chodavaram)	1	1/5
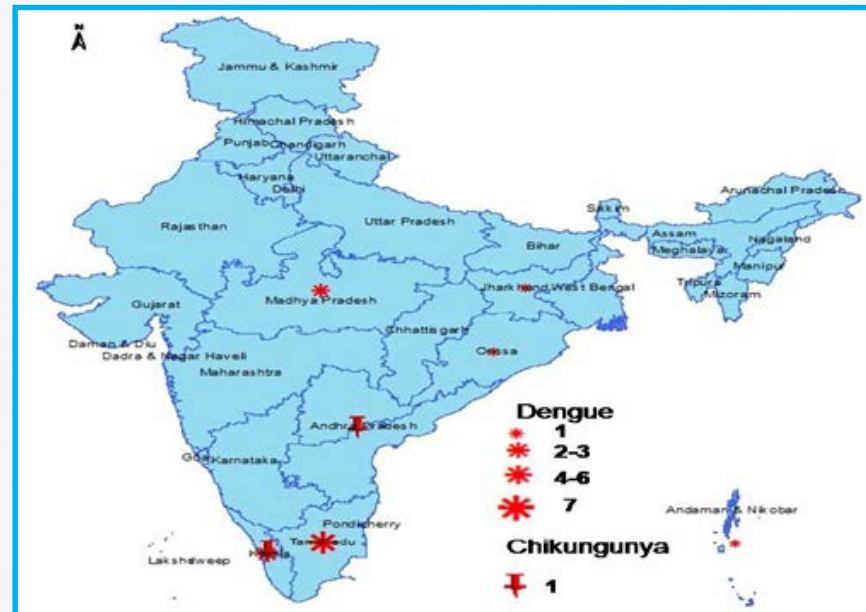
Distribution of dengue and Chikungunya outbreaks (Fig 11, above) and Age and sex distribution of cases affected in dengue outbreaks (Fig 12, below)
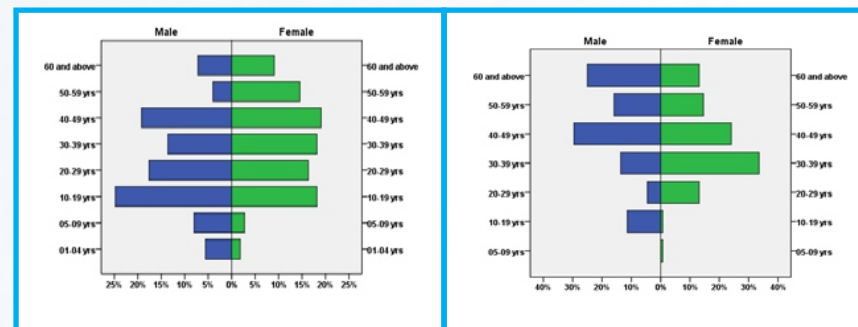
Table 4: Distribution of Hepatitis A and E outbreaks

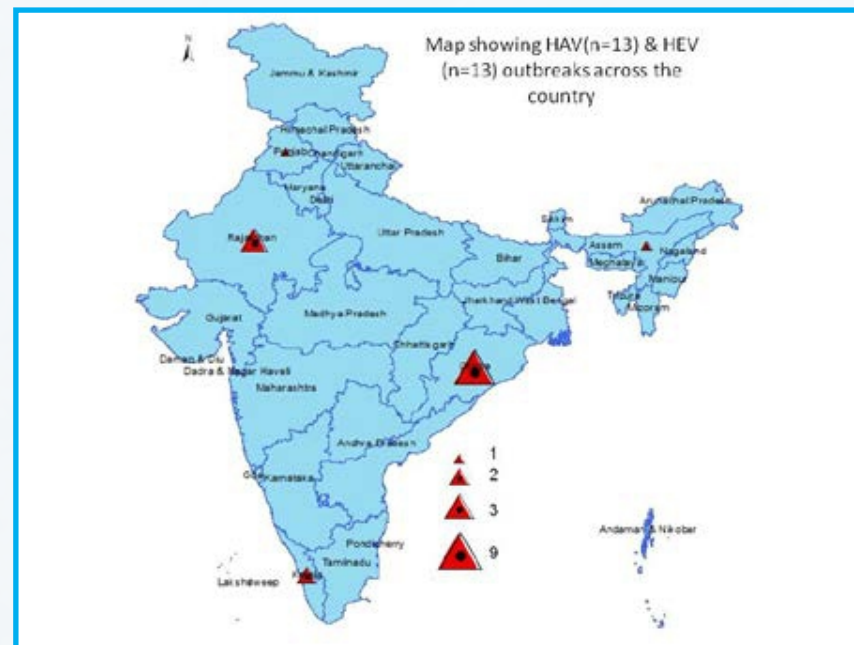| Reporting VRDL	State (District)	No. of outbreaks	No. of cases positive/ No. tested
Hepatitis A (n=3)			
MCVR, Manipal	Kerala (Waynad)	1	4/10
NIV Alappuzha	Kerala (Mallapuram)	1	20/30
RMRC, Dibrugarh	Assam (Sivasagar)	1	9/10
Hepatitis E (n=13)			
RMRC, Bhubaneswar	Odisha (Khurda, Sambalpur , Cuttack)	9	123/186
SMS, Jaipur	Rajasthan (Jaipur)	3	73/98
GMC, Amritsar	Punjab (Gurdaspur)	1	15/17

Figure 13: Map showing distribution of hepatitis A and E outbreaks detected by VRDLN

Figure 14: Age & Sex distribution of cases affected during HAV (left) & HEV (right) outbreaks
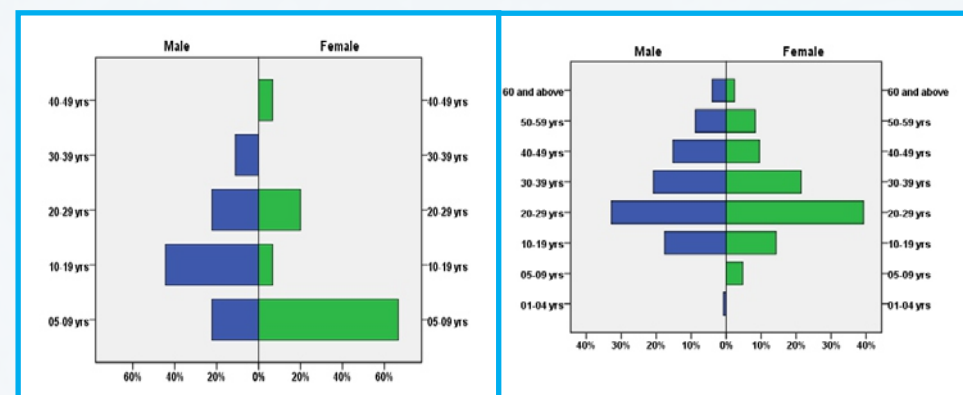
Table 5: Distribution of Chickenpox outbreaks

Reporting VRDL	State (Districts)	No. of outbreaks (n=7)	No. of cases positive/ No. tested
RMRC, Bhubaneswar	Odisha (Puri, Dhenkanal)	2	8/11
RMRC, Dibrugarh	Assam (Dibrugarh,Sonitpur)	2	14/17
RIMS, Ranchi	Jharkhand (West Singhbum)	1	1/5
MCVR, Manipal	Karnataka (Shimoga, Udupi, Chitradurga)	2	16/17

Figure 15: Map showing distribution of chickenpox outbreaks detected by VRDLN

**Figure 16: Age & Sex distribution of cases affected during chickenpox outbreaks**

Table 6 : Distribution of JE outbreaks

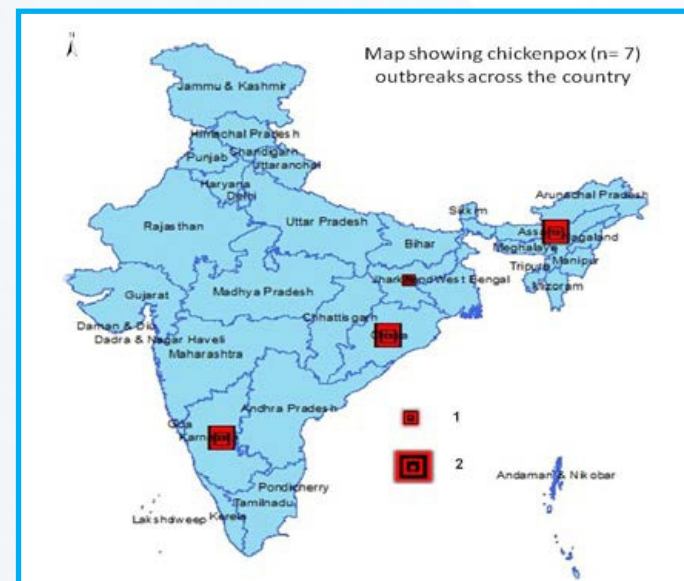| Reporting VRDL	State (district)	No. of outbreaks (n=4)	No. of cases positive/No. tested
RMRC, Bhubaneswar	Odisha (Jajpur)	3	11/29
RMRC, Dibrugarh	Assam (Dibrugarh)	1	10/10

Figure 17: Map showing distribution of JE outbreaks detected by VRDLN

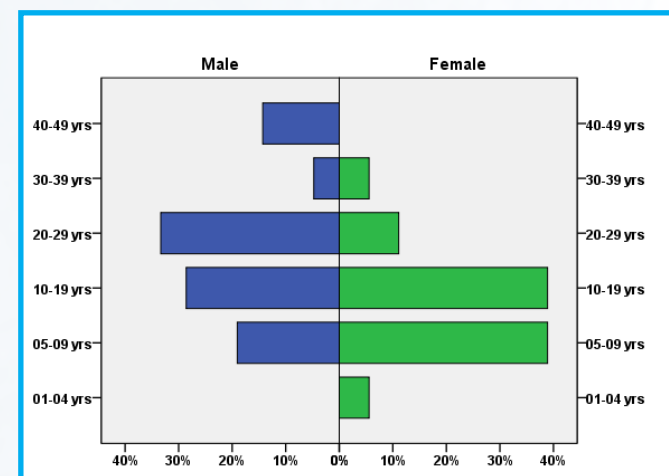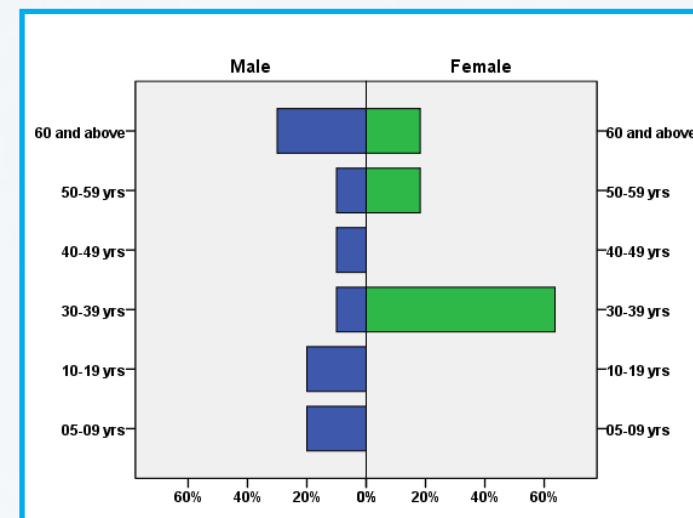**Figure 18: Age & Sex distribution of cases affected during JE outbreaks**

Table 7: Distribution of influenza (n=5) and enterovirus (n=1) outbreaks

Reporting VRDL	State(Districts) [virus]	No. of outbreaks (n=6)	No. of cases positive/ No. tested
RMRC, Dibrugarh	Assam (Dibrugarh) – [Influenza A]	2	24/43
MCVR, Manipal	Kerala (Waynad, Shimoga) – [Influenza H3N2]	2	9/19
MCVR, Manipal	Karnataka (Bijapur) – [Influenza H1N1]	1	6/6
RMRC, Dibrugarh	Assam (Dibrugarh, West-Siang) [Entrovirus]	1	1/6

Table 8: Details of undiagnosed Outbreaks (n=9)

Presenting syndrome	No.	State (Districts)	Viruses tested for
Fever with rash (suspected measles)	2	Gujarat (Kach, Valsad)	Measles
Fever with rash, arthralgia (suspected dengue)	1	Andhra Pradesh (Pendurthi)	Dengue
Fever with Haematuria	1	Rajasthan (Alwar)	Dengue
Non-specific Syndrome (Fever, headache, body pain etc.)	1	Agartala (Dhalai)	JE
	1	Odisha (Kalahandi)	EBV
	1	Odisha (Malkangiri)	Dengue, JE, Chikungunya
	1	Assam (Sivsagar)	Entrovirus
Syndrome not specified	1	Kerala (malapuram)	Chikungunya, Dengue

Section II: Virological Diagnosis provided to patients attending medical college hospitals

Sample collection and laboratory tests

During the reporting period, VRDLs provided diagnosis to 38, 403 patients attending medical college hospitals. A total of 41, 974 samples were collected from 38, 403 patients (mean samples per patient: 1.1, range: 1-6) on which 70,867 tests (mean number of tests per patient: 1.9, range: 1-10) were carried out. Blood/serum was the most frequently collected sample (52.7%), followed by throat/nasopharyngeal swabs (24.6%) and CSF (n=11%) (Figure 19).
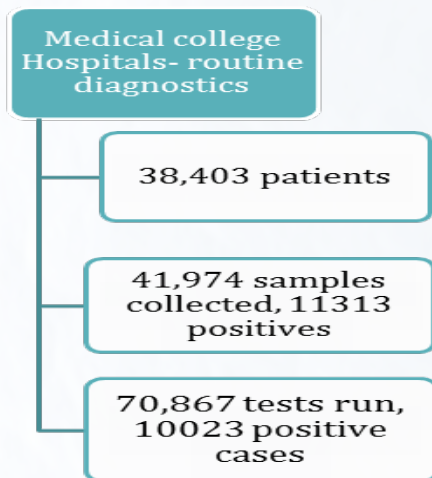

Figure 20: Distribution of samples collected

Figure 19: Details of samples collected and tested among patients attending medical college hospital

Presenting Syndromes

During April 2015 – March 2015, details of 38,403 patients attending medical colleges and investigated for virological diagnosis were entered in the data entry system. The commonest syndrome of patients included respiratory syndrome (35.5%), acute jaundice syndrome (14.2%), acute encephalitis syndrome (15.5%), and hemorrhagic fever (12.2%). Information about the presenting syndrome was not entered for 3228 (8.4%) patients; 3000 patients had more than one syndrome (Figure 20).
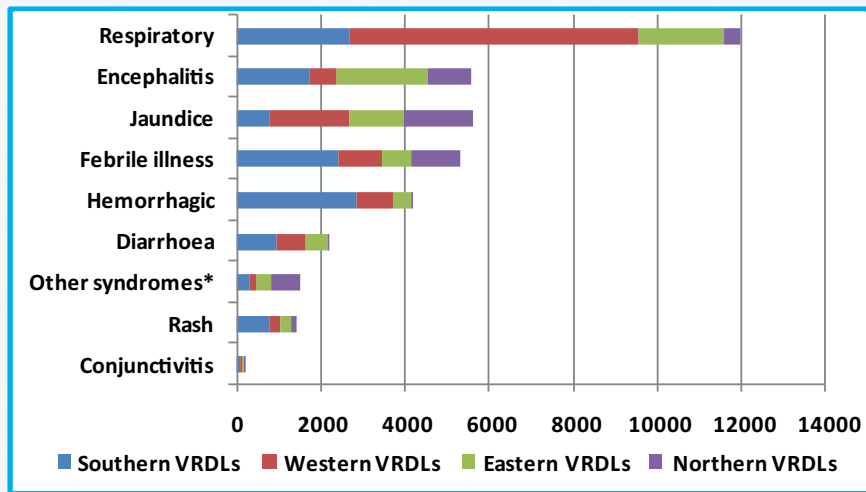
Included pregnant women investigated for routine antenatal check-up (n= 540, 76%)

Figure 21: Presenting syndromes of patients investigated by VRDLs (n=34,147)

Figure 22: Tests run for commonly tested viruses (n=46306)

Virological investigations

The virological investigations conducted among patients presenting with different syndromes are summarized in Figure 22 (A-D). Most of the samples from patients with respiratory syndrome were investigated for H1N1 (n= 9039, 74.6%) whereas majority of the AES patients were investigated for HSV-2 (n= 2981, 62.3%) and JE (n= 2222, 46.4%). Tests run for different viruses are summarized in Figure 21.
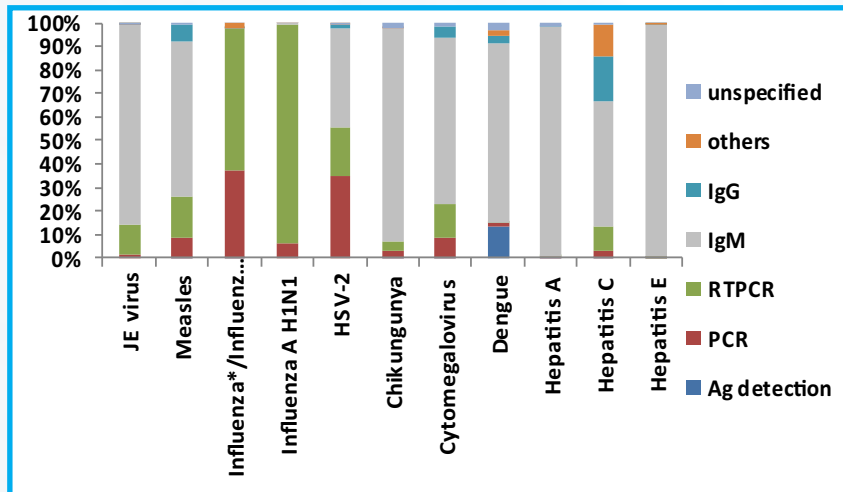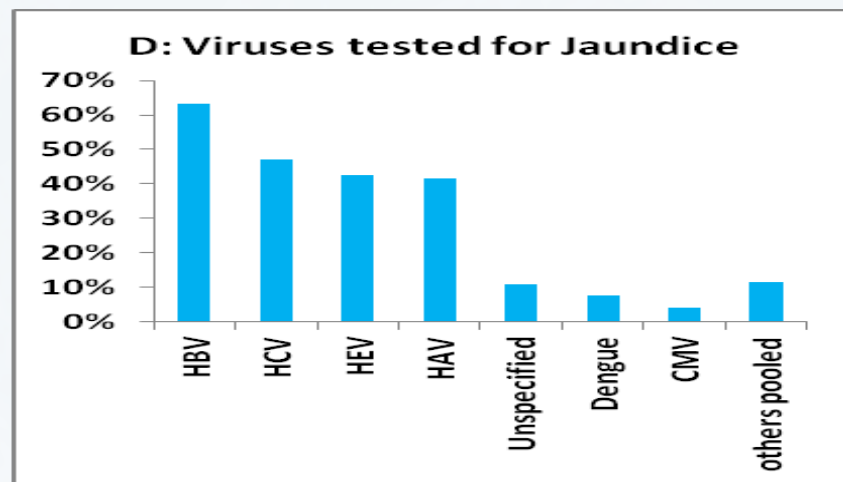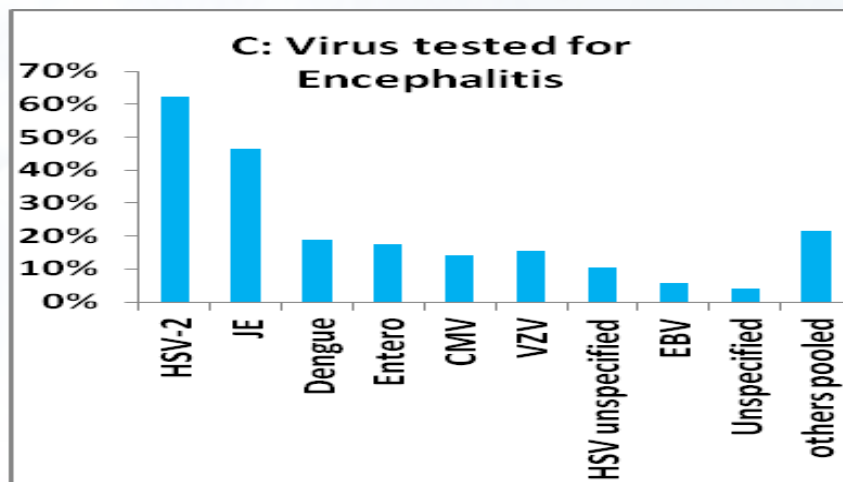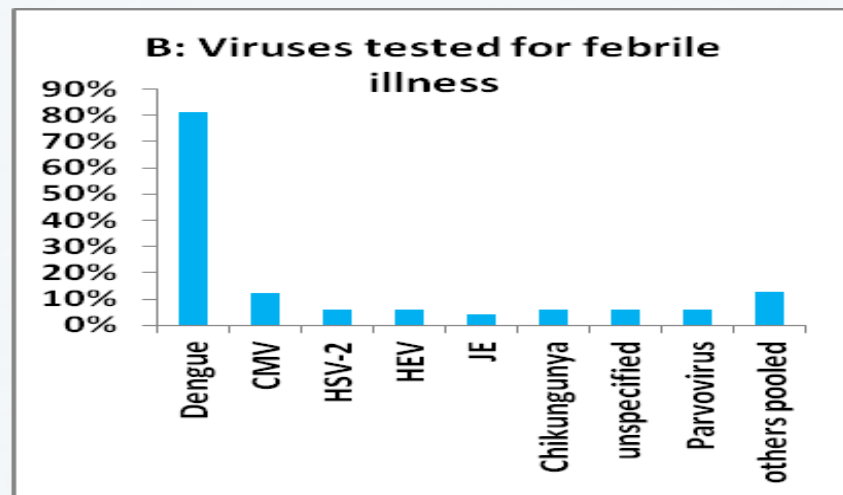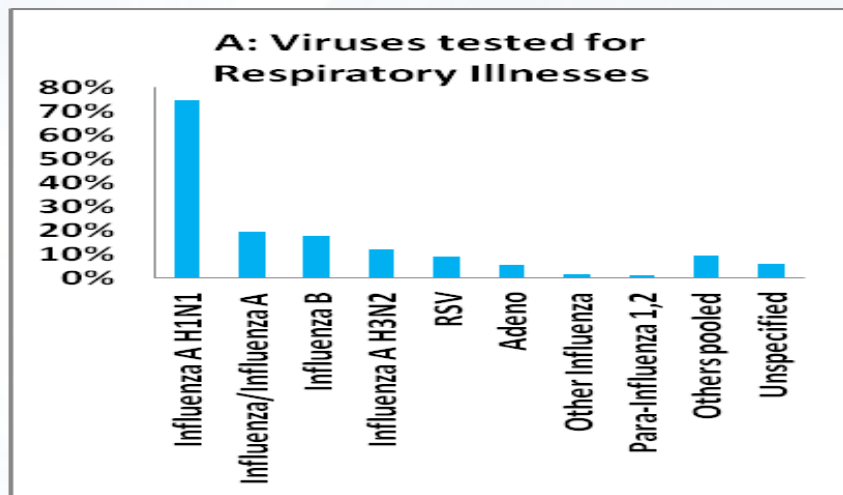
Figure 23: Virological investigations done for various syndromes

Virological Diagnosis.

Dengue (n=12228, 14%), Influenza A (H1N1) (n=9736, 37.4%), Hepatitis B (n=5859, 24.5%), Herpes Simplex Virus (HSV-2) (n=4941, 3.9%), Hepatitis C virus (n=3312, 5.6%), and Japanese Encephalitis (n=3423, 5%) were the commonest viruses tested for by the VRDLs (Table-9).

Table 9: Commonly tested viruses from reporting VRDLs

Viruses	# Samples tested (n=70,867)	% positives
Dengue	12228	14.0
Influenza A H1N1	9736	37.4
Hepatitis B virus (HBV)	5859	24.5
Herpes Simplex Virus (HSV-2)	4941	3.9
Hepatitis C virus (HCV)	3312	5.6
Japanese Encephalitis(JE)	3423	5.0
Cytomegalovirus (CMV)	2891	14.4
Hepatitis A virus (HAV)	2654	27.8
Hepatitis E virus (HEV)	2627	12.2

Influenza/ Influenza A	2413	23.0
Influenza B	2335	3.2
Enterovirus	2080	5.9
Influenza A H3N2	1913	5.7
Rubella Virus	1716	7.1
Respiratory Syncytial Virus (RSV)	1347	14.3
Varicella Zoster Virus (VZV)	1147	6.7
Adenovirus	1080	8.8
Measles	893	26.7
Epstein-Barr-Virus (EBV)	823	5.4
Herpes simplex virus (HSV)	794	8.3
Chikungunya	754	13.5
Parvovirus	702	16.9
Norovirus	618	2.1
Rota Virus	575	40.3
Mumps	341	15.5
Other Influenza	237	21.9
Parainfluenza 1,2	172	9.3
Rhinovirus	170	8.2
Others viruses **	1665	5.4

*Note: **The number of positive samples for individual viruses are < 10. Other viruses tested includes MERS corona, Hanta, KFD, Chandipura, West Nile etc.*

1. Influenza A (H1N1)

A total of 9,736 samples were tested for Influenza A(H1N1) of which 3642 samples (37.4%) [3599 cases] were positive. Although the up-surge of H1N1 cases during January-March 2015 was reported from most of the Indian states, 3 laboratories - BJMC, Ahmedabad (n=2837, 78%), MCVR, Manipal (n=276, 2.8%) and RMRIMS, Patna (n=317 3.2%) together accounted for more than 94%(N=3642) of the laboratory confirmed samples. Other laboratories have not yet uploaded/entered their data. The number of samples tested and the % positivity peaked from January 2015, with most (74%) of the H1N1 cases aged between 20-60 years.
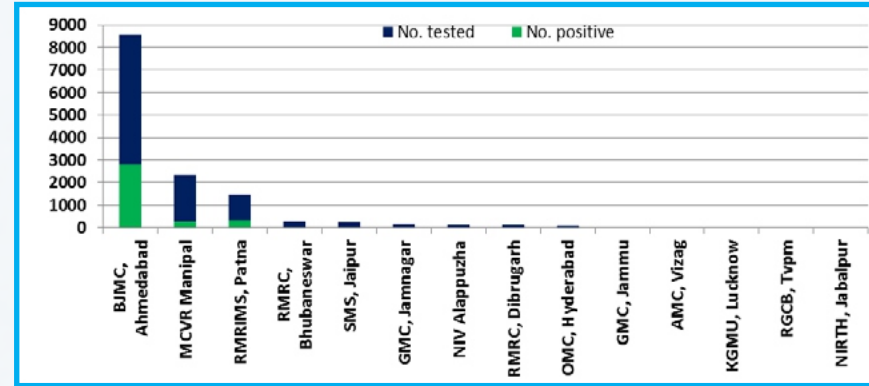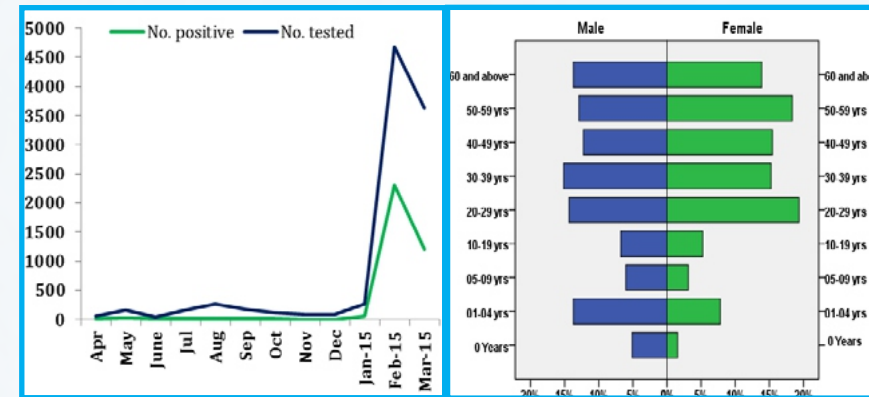

Figure 24: Influenza A H1N1 samples processed by VRDLs (above), distribution of positive samples by months, age & sex (below)

2. Dengue

A total of 12,228 samples were investigated for dengue and 1718 samples (14%) [1576 cases] were laboratory confirmed. Five laboratories (MCVR, Manipal, n= 485, RMRC, Port Blair, n=217, KIPM, Chennai n=226, KGMU, Lucknow n=166 and NIRTH, Jabalpur n=230) accounted for more than three fourth (77%) of the samples investigated for dengue. The dengue virus positivity among the samples tested showed a steady rise with a peak in November and then decline thereafter. Most of the cases were among individuals aged 20-29 years (n=492, 31%) and 10-19 years (n=309, 20%).
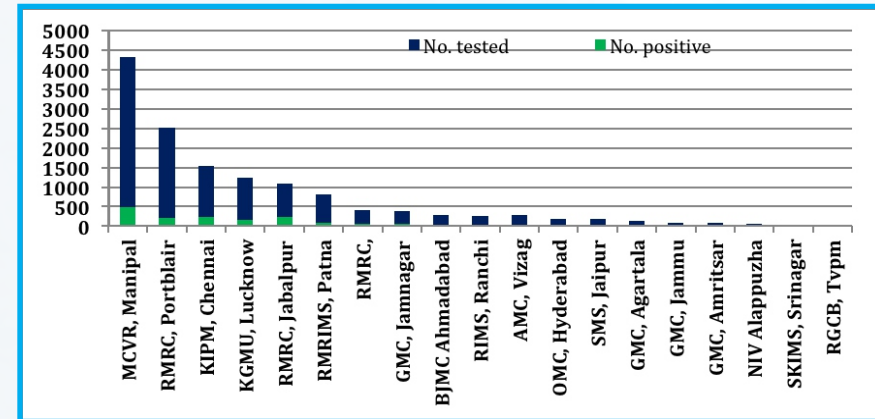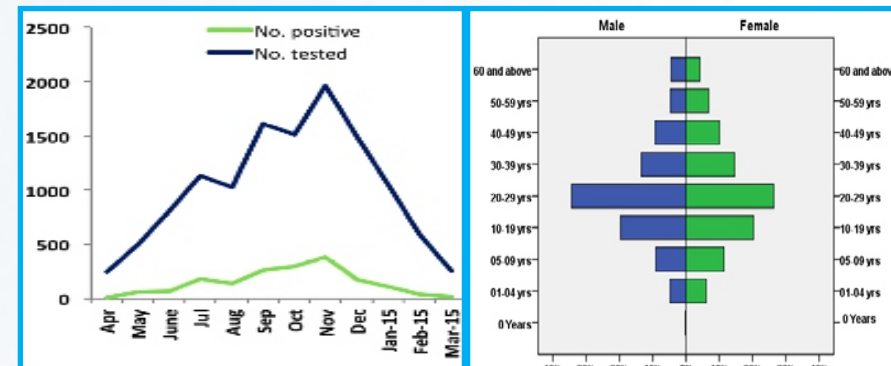

Figure 25: Dengue samples processed by VRDLs (above), distribution of positive samples by months, age & sex (below)

3. Japanese Encephalitis

A total of 3423 samples were tested for JE and 172 samples (5.0%) [153 cases] were positive. Two laboratories (KGMU, Lucknow=41 and RIMS, Ranchi n=40) accounted for 47% of the JE samples tested. JE cases occurred during July to December months. Majority (n=80, 52%) of the cases were in children, below 19 years of age.
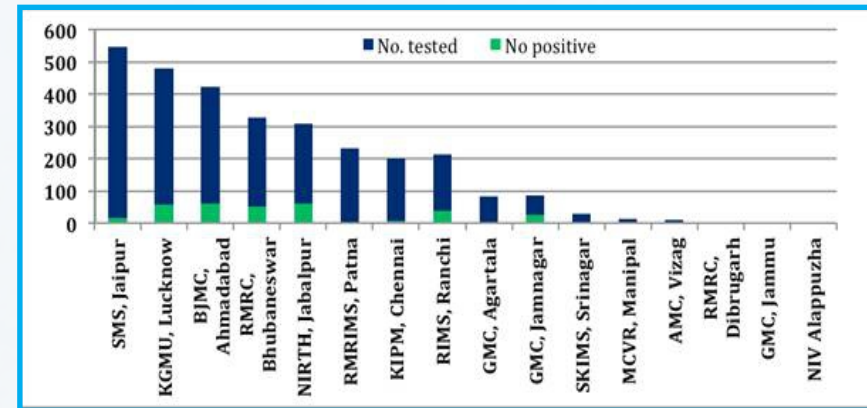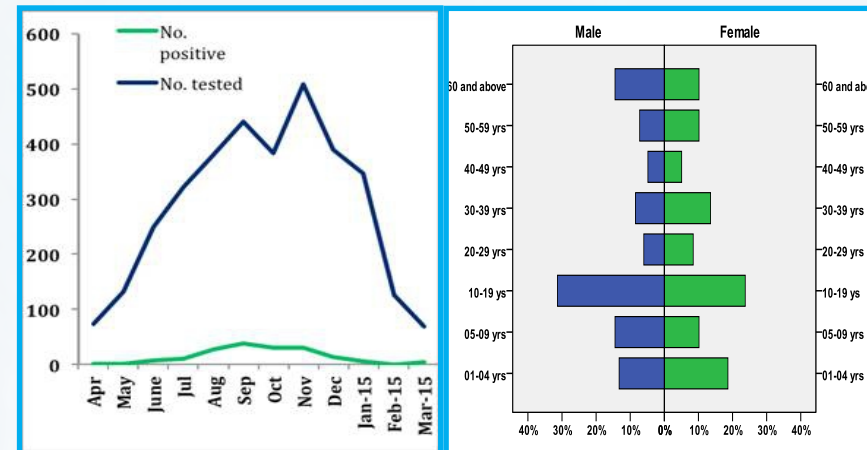

Figure 26: JE samples processed by VRDLs (above), distribution of positive samples by months, age & sex (below)

4. Hepatitis-A and E

Of the 5291 patients with acute jaundice syndrome, 4457 samples were investigated for hepatitis A and E together and 739 samples (27.8%) [727 cases] were positive for IgM antibodies against HAV while 322 samples (12.2%) [321 cases] were positive for IgM antibodies against HEV. Majority of HAV cases were children, aged below 19 years (n=615, 85%) whereas most (n=109, 34%) HEV cases were among young adults. Cases of HAV and HEV were reported throughout the year.
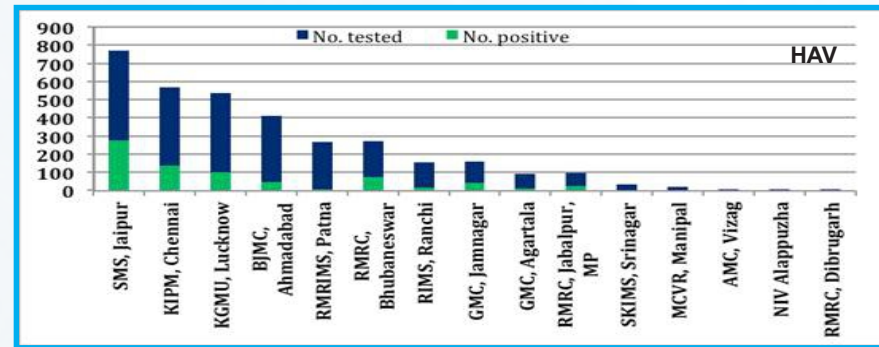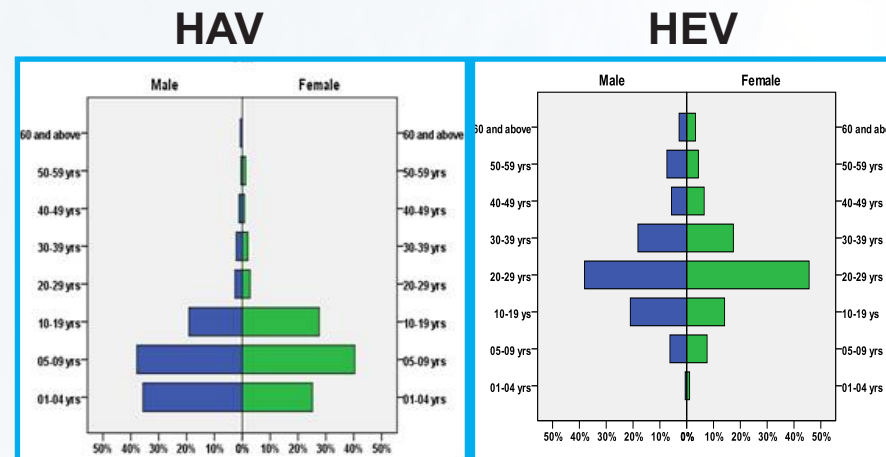

Figure 27: HAV (above) & HEV (below) samples processed by VRDLs. Figures below show age and sex distribution of HAV (left), HEV (right) sample
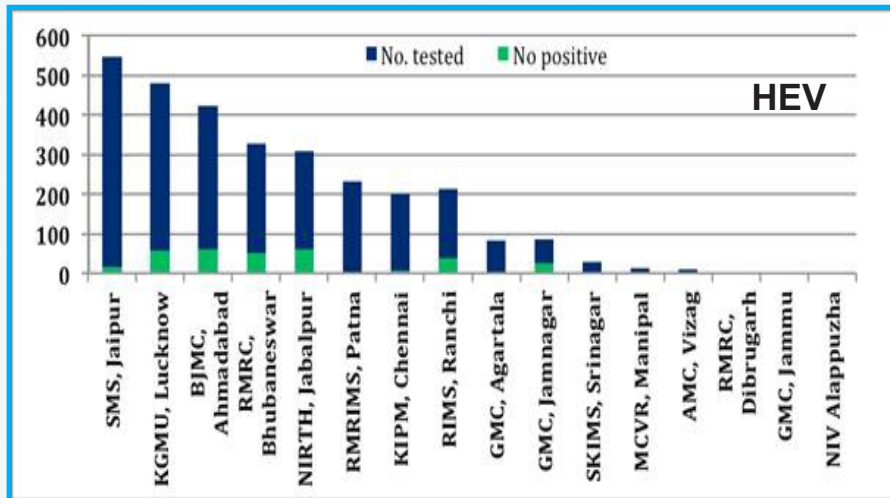
5.Rota virus

A total of 575 samples were investigated for rotavirus and 232 samples (40.3%) [232 cases] were found positive. Two laboratories (RMRC, Bhubaneswar (n=151) and SMS, Jaipur (n=41) accounted for >80% of rotavirus samples tested. Rotavirus cases showed 2 peaks – a major peak during December and smaller peak during June. More than 95% of the cases were below 5 years of age.
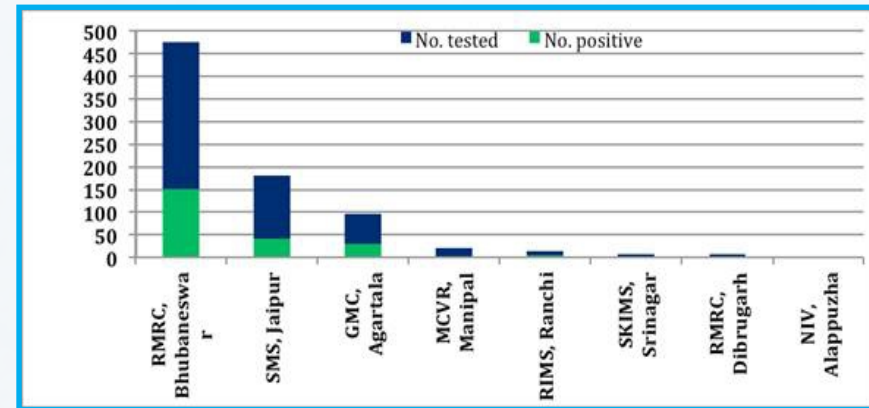
Figure 28: Rotavirus samples processed by VRDLs (above), distribution of positive samples by months, age & sex (below)
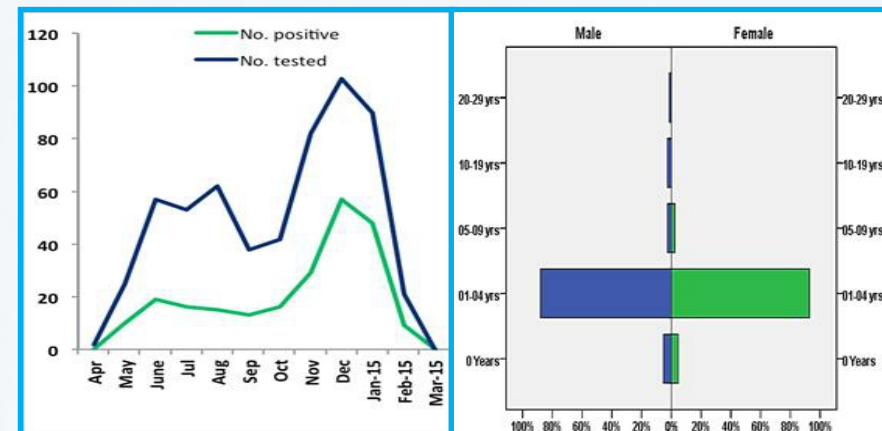
6.Measles

A total of 893 were investigated for measles virus and 239 samples (26.7%) [220 cases] were positive. Majority of the positive cases were aged below 30 years (n=189, 82%) and were diagnosed by MCVR Manipal, KGMU Lucknow and KIPM Chennai.
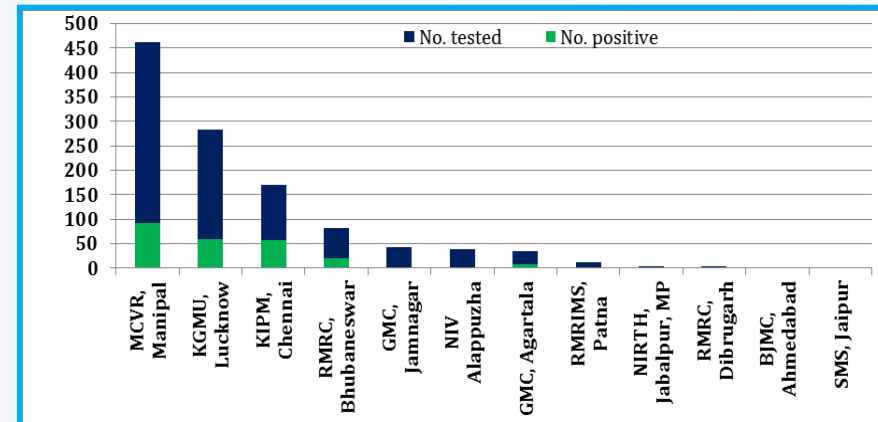
Figure 29: Measles virus samples processed by VRDLs (above), distribution of positive samples by months, age & sex distribution (below)
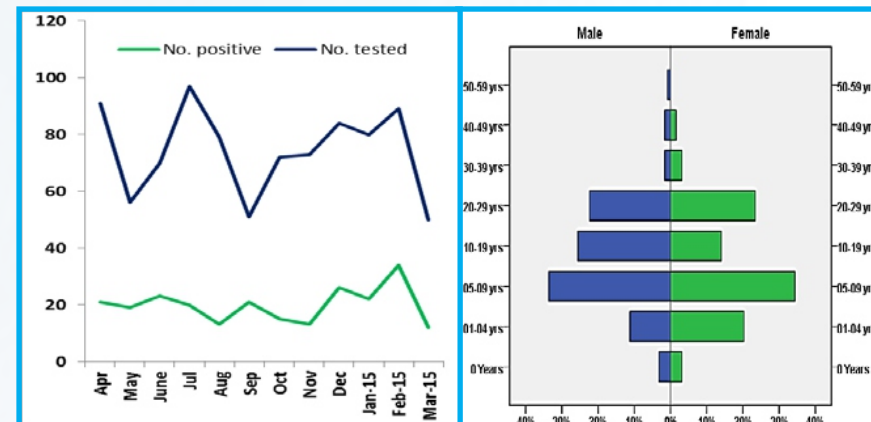
7. Chikungunya

Of the 754 samples tested for Chikungunya 102 samples (13.5%) [102 cases] were positive. RMRC, Port Blair and KIPM Chennai tested higher number of samples for Chikungunya. Most of the positive cases were aged were more than 20 years of age (n=80, 78.4%).

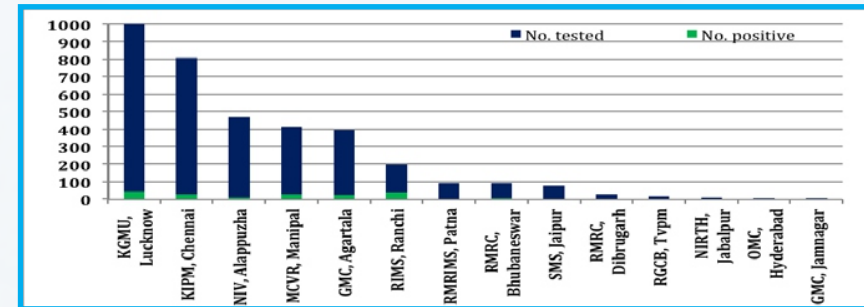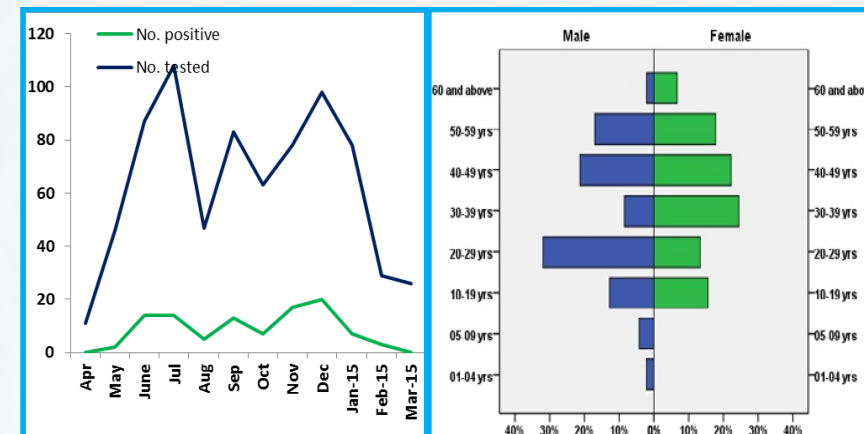**Figure 30: Chikungunya samples processed by VRDLs (above), distribution of positive samples by months, age & sex (below)**

Data entry issues – completeness, timeliness and quality

Although, all the functional VRDLS are entering their data in the online/offline data entry system, several challenges persist. These include:

Completeness and timeliness of data entry:

The progress of data entry by the VRDLs is very slow and there is a backlog of un-entered data with majority of the VRDLs. The monthly reposts submitted by 13 VRDLs include the number of samples processed in each month. During 1 April 2014 – 31 March 2015, the VRDLs processed 77,257 samples as per the monthly reports. As per the data entered, these labs processed 29, 402 samples during this period. Thus the total backlog for these 13 labs pooled together is about 47,855 samples, ranging from 613 (RMRC Bhubaneswar) to 8047 [KGMU, Lucknow) (Figure 31). This delay limits the analysis of the data in a timely manner. For example, during the recent 2015 H1N1 outbreak in India, only three VRDL had entered their data, while most of the VRDLs have tested substantial number of samples.
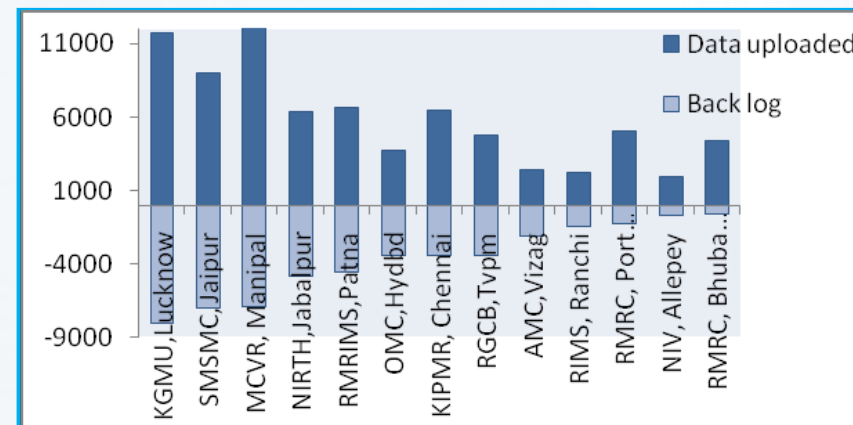
Figure 31: Estimated backlog records from 13 VRDLs. Calculated based on number of samples tested. Source: ICMR monthly reports

Quality of data entered:

Quality of the data entered reflects on the results when analysed. As a part of quality control mechanism and to assure quality of the data across the network, NIE checks the data entered by VRDLs for its completeness and logical errors in the first week of every month. The online data validation program automatically captures the missing information of the key variables (age, sex, PHC/CHC/district, date of onset of illness, duration of illness, syndrome details, lab results and investigation required) during the data entry. NIE also initiated providing feedback to individual lab about the quality of their

data from Nov 2014. Figure 32 shows the percentage of records with missing information.

Figure 32: Percentage of records with missing information on key indicators

Conclusion

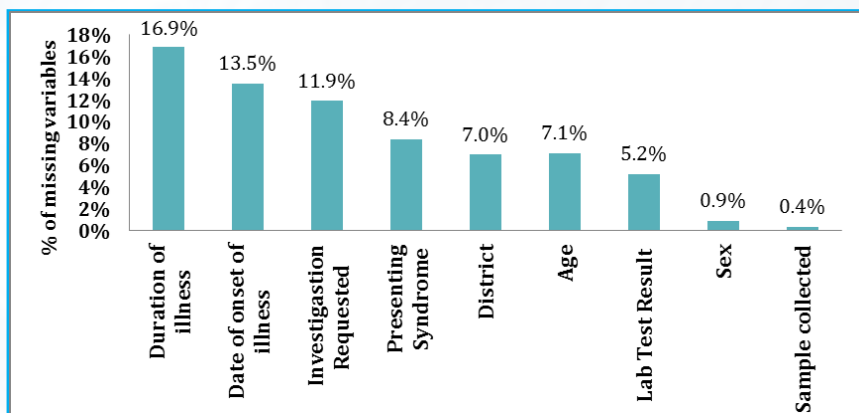In 2011, the Department of Health Research, Govt of India initiated this project to strengthen the virology laboratory infrastructure in the country. These laboratories, to be established in 150 government medical colleges in the country in a phased manner, are expected to provide timely diagnosis to disease outbreaks and thereby assist the state health authorities in outbreak response. During 2013- 2015, the DHR has established 30 virology laboratories, which has the capacity to provide diagnosis to over 25 viral etiologies. During 2014-15, these laboratories have diagnosed more than 112

disease outbreaks. The common viral outbreaks diagnosed by these laboratories include measles, dengue, chickenpox, Japanese encephalitis and influenza A (H1N1). This network has also provided virological diagnosis to nearly 40,000 patients attending the medical colleges. In India, disease outbreaks are detected, investigated and responded by the Integrated Disease Surveillance Programme (IDSP). The DHR/ICMR virology research and diagnostic laboratory network can complement IDSP by providing early diagnosis for these outbreaks, and thereby help the state health authorities in mounting timely response.

Timeliness and completeness of reporting and the quality of data are key attributes of any disease surveillance system. While the virology laboratory network is generating valuable surveillance data about common viral illnesses from the country, incomplete and delayed reporting remains a challenge. NIE has been working on these challenges through weekly and monthly feedbacks and periodic visits to the VRDLs and re-training of the VRDL staff in data entry. Appointment of a dedicated data entry person at each VRDLs would help address these issues to a great extent.

Lab code	Currently functional VRDL centers with abbreviations used
001	Manipal Centre for Virus Research(MCVR), Manipal, Karnataka
002	Regional Medical Research Centre (RMRC), Port Blair, Andaman and Nicobar
003	King George's Medical University(KGMU), Lucknow, Uttar Pradesh
004	Regional Medical Research Centre(RMRC), Bhubaneswar, Odisha
006	SMS Medical College, Jaipur, Rajasthan
007	Rajiv Gandhi Centre for Biotechnology(RGCB), Thiruvananthapuram, Kerala
008	National Institute of Virology(NIV) Field Unit, Alappuzha, Kerala
009	King Institute of Preventive Medicine and Research(KIPM) , Chennai, Tamil Nadu
010	Rajendra Institute of Medical Sciences(RIMS), Ranchi, Jharkhand
011	Andhra Medical College(AMC), Visakhapatnam, Andhra Pradesh
012	National Institute of Regional Tribal Health(NIRTH), Jabalpur, Madhya Pradesh
013	Rajendra Memorial Research Institute of Medical Sciences(RMRIMS), Patna, Bihar
014	Regional Medical Research Centre(RMRC) for NE Region, Dibrugarh, Assam
015	Government Medical College(GMC), Agartala, Tripura
016	Osmania Medical College(OMC), Hyderabad, Andhra Pradesh
018	Govt. Medical College(GMC), Jammu, Jammu and Kashmir
019	Sher-i-Kashmir Institute of Medical Sciences(SKIMS), Srinagar, Jammu and Kashmir
020	BJ Medical College(BJMC), Ahmadabad, Gujarat
022	Govt. Medical College(GMC), Amritsar, Punjab
026	Government Medical College(GMC), Jamnagar, Gujarat

LOCATIONS OF CURRENTLY FUNDED DHR/ICMR VRDLs IN INDIA

ICMR VRDLs
DHR MC VRDLs
DHR STATE LEVEL VRDLs
DHR REGIONAL LEVEL VRDLs
RC-VDL & DATA MINING CENTRE