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A report on investigation of Zika case & dengue outbreak in siwan Bihar in 2018

Dr. Nand Kishor[1], Dr. Ragini Mishra[2], Navnit Kumar Dutta[3*], Naveen Kumar Raman[4]
[1] Tutor, Department of Microbiology, Patna Medical College, Patna, Bihar, India
[2] State Epidemiologist, IDSP, State Health Society Bihar, Patna, Bihar, India
[3] Department of Microbiology, State Microbiologist, IDSP, Patna Medical College, Patna, Bihar, India
[4] Department of Microbiology, District Microbiologist, IDSP, Patna Medical College, Patna, Bihar, India
[*]Corresponding Author: Navnit Kumar Dutta

Abstract
Dengue outbreak in Siwan district in 2018 was investigated to determine the causes of current outbreak and prevent occurrence of outbreak in future. One patient from Hariharpur Lalgarh Village of Siwan was Zika Positive at SMS Hospital, Jaipur. Both Dengue & Zika virus is transmitted by same vector *Ades Aegypti*. The urban areas of Siwan like Puranikila, Siwan Nagar, Dakhintola, Sukultola, saikhtola, kagazi mohalla had reported increased number of fever cases & confirmed Dengue positive in Microbiology lab of PMCH, Patna. Entomological findings confirmed the presence of Aedine vector in the affected area. Finding confirms the factor leading to the present outbreak and highlights risk factor & control strategies to prevent future in the Siwan district. Community support and participation is also crucial for the prevention of future outbreaks and improving the health and well being of population in the Siwan district.

Keywords: substituted Li ferrite, magnetostatic and spin waves, microstrip array antenna, X-band frequency range

Introduction

Zika Virus Disease (ZVD) is a mosquito-borne viral infection which is transmitted through *Aedes Aegypti*, the mosquito species that also transmits Dengue and Chikungunya. Symptoms are generally mild and include fever, rash, conjunctivitis, muscle and joint pain, malaise or headache. Symptoms typically last for 2–7 days. The incubation period (the time from exposure to symptoms) of Zika virus disease is estimated to be 3–14 days. Most people with Zika virus infection do not develop symptoms. Zika virus infection during pregnancy can cause infants to be born with microcephaly and other congenital malformations, known as congenital Zika syndrome. Infection with Zika virus is also associated with other complications of pregnancy including preterm birth and miscarriage. An increased risk of neurologic complications is associated with Zika virus infection in adults and children, including Guillain-Barré syndrome, neuropathy and myelitis. It was first identified in Uganda in 1947 in monkeys. It was later identified in humans in 1952 in Uganda and the United Republic of Tanzania. Outbreaks of Zika virus disease have been recorded in Africa, the Americas, Asia and the Pacific. From the 1960s to 1980s, rare sporadic cases of human infections were found across Africa and Asia, typically accompanied by mild illness. In India, first outbreak of Zika Virus Disease was reported in Ahmedabad, Gujarat in Jan 2017 when 3 positive cases were reported and other in Tamil Nadu when 1 case was reported in February 2017. Both outbreaks were contained. Treatment for the Zika Virus disease is symptomatic and prevention from mosquito bites and source reduction remains the effective way to combat the disease.

The Central Surveillance Unit, IDSP, MOH&FW, Govt. of India notified the State Surveillance Unit, IDSP, Bihar about a Zika confirmed case by SMS Hospital, Jaipur on 7 Oct 2018. The case aged 22 years male, belonged to Hariharpur Lalgarh village, PHC Barharia, Siwan. On receiving the notification, Civil Surgeon, Siwan was apprised about the situation and informed to initiate active surveillance in the affected area. Case definition of Zika Virus Disease used was:

Suspected Case: Patient with skin rash or elevation of body temperature (>37.2 degreecelsius) with one or more of the following symptoms (not explained by other medical conditions):

a. Arthlagia or myalgia
b. Non-purulent conjunctivitis or conjunctional hyperemia
c. Headache or malaise
d. With history of travel to the State (Rajasthan, Haryana) with indigenous transmission of Zika in last 2 weeks.

Confirmed Case: A suspected case with laboratory positive result for the specific detection of Zikavirus by PCR.

Specific Objectives

- To review and assess the situation of Zika Virus Disease and Dengue outbreak in Siwan.
- To determine the causes of current outbreak
- To conduct an epidemiological and also entomological survey in some of the affected areas of Siwan.
- To assess the environmental and sociological factors contributing to the abundance of Zika/Dengue vector.
- To recommend remedial measures to overcome the current outbreak and prevent occurrence of outbreaks in future.

Methodology

- Discussion with the District authorities and medical and paramedical staff to know the background information of the affected areas, genesis of outbreak, investigations carried out so far and control measures undertaken;
- Discussion with the physicians who treated the dengue cases about the clinical presentation of cases, results of laboratory investigations and outcome of cases;
- Interview and clinical examination of some of the dengue cases;
- Visit to the affected areas.
- Rapid fever survey by house to house visit and collection of sera samples from suspected cases for Dengue ELISA test at Department of Microbiology, Patna Medical College, Patna.
- Entomological investigations based on larval survey was done to understand the vector species prevalent in the area;
- Examination of water storage practices.
- Environmental investigation, knowledge, attitude & practices of the community were also analyzed as per pre-planned questionnaire.

Siwan district profile

Siwan, situated in the western part of the State, was originally a sub-division of Saran District, which in ancient days formed a part of Kosala Kingdom. The present district limits came into existence only in 1972, which is geographically situated at 25.58 to 26.23 North and 84.10 to 84.47 east. The total area of the Siwan district is about 2219.00 Sq. Km. with a population of 33, 30,464 as per the 2011 census. The district is bounded on the east by the Saran district, on the north by Gopalganj district and on the west and south by two districts of U.P. viz. Deoria and Balia respectively. Literacy rate is 71.59%. There are 1528 villages and 3 Municipalities in the district. The economy of Siwan district is mainly based on agriculture. The core agricultural crops of the district are wheat, rice, maize, sugarcane and potatoes. The district of Siwan possesses a good amount of potential for artisan based industry in comparison to other districts of Bihar. Moreover, the dairy sector of the district also contributes in its economy.

Baraharia PHC, Siwan profile

Barharia Block of Siwan district hastotal population of321, 292 as per the Census 2011. Out of which 164,179 are males while 157,113 are females. In2011 there were total 52,271 families residing in Barharia Block. The Average Sex Ratio ofBarharia Block is 957. As per Census 2011, all of the population of Barharia Block lives in urban areas. The average literacy rate in urban area is 68.9% and the sex ratio of Barharia Block is 957. The total literacy rate of Barharia Block is 68.93%. The male literacy rate is 65.63% andthe female literacy rate is 48.04% in Barharia Block.

Hariharpur Lagrah Village profile

HariharpurLalgarh is a Village in Barharia Block inSiwan District of Bihar State, India. It belongs to Saran Division. It is located 23 KM towards East from District headquarters Siwan. 9 KM from Barharia.108 KM from State capital Patna. This Place is in the border of the Siwan District and Gopalganj District. Gopalganj District Manjha is North towards this place. Total population is 4456 and number of houses are 696. Female Population is 49.8%. Village literacy rate is 60.0% and the Female Literacy rate is 25.0%.

General Observations

On verification of Zika case in Siwan, it was found that the case had come to his house in Siwan on 23 Aug 2018 to give his BCA exam. He returned back to Rajasthan on 12 Sep 2018. In the meantime, he visited Patna on 7 Sep 2018 & returned back to Siwan on 8 Sep 2018. During this time period, he had 2 episodes of fever that subsided after taking medications. On-going back to Rajasthan, he complained of fever on 19 Sep 2018 followed by re-occurrence of fever, headache, body ache and vomiting on 23 Sep 2018. He was found positive for Zika virus disease by SMS, Hospital, Rajasthan. As a precautionary measure, Health Alert on Zika was issued to each of the 38 district in Bihar vide letter No: SHSB/GA/IDSP/1495/2015/4780, dated 9/10/2018.

Steps taken by the District Health Authorities for Zika

1. Active fever case search through the Health Workers was initiated from 7 Oct 2018 itself in the affected area.
2. Survey of each house in the village Hariharpur has been completed. Till date, all 677 houses have been surveyed and 41 cases of fever have been recorded. 39pregnant women have been identified in the village and none had fever. Majority of the fever cases have been reported in the Age group of 20 to 40 (21 cases). Duration of fever in majority of the fever cases is 2-10 days except 2 cases that complained of fever since past 1 month.
3. The sample of the case of family members and few pregnant women (16 samples) were taken by the RHO, Patna team that was sent to RMRI, Patna for Zika testing. All samples have been found to be negative for Zika virus disease.
4. The IEC materials on Zika were provided to the district by State Health Society Bihar and the pamphlets on Zika has been distributed in each house by the ASHAs to spread awareness in the community.

Dengue situation in Siwan:

Dengue cases were being reported in Siwan district. The urban areas of Siwan like Puranikila, Siwan Nagar, Dakhintola, Sukultola, saikhtola, kagazimohalla had reported increased number of fever cases since 1 Oct 2018. Many cases were tested in Private Hospitals and found to be positive for dengue. 5 ELISA positive cases from Siwan were confirmed in Microbiology lab of PMCH, Patna in September 2018, initially. Camp was organized by the district and block Health teams in the affected areas from 3 Oct 2018 onwards. Approximately, 404 fever cases were tested in Puranikila and Sukul toil on 3 and 4 Oct 2018 out of which 39 were found to be Dengue NS1 positive through RDTs. The Civil Surgeon informed that the outbreak information was provided to the SPO, NVBDCP, Bihar, Dr M.P Sharma. As per his direction, the screening of the fever cases were stopped as it was informed that the Govt. of India has banned the screening of Dengue through RDT. As a result, from 6 Oct 2018 onwards,

only platelet count of the new fever cases was being done by the Health team in the camp to identify dengue cases giving incorrect information on dengue status and under-reporting of the cases. The State IDSP team informed the Civil Surgeon that there is already a circular issued from MOH&FW, Govt. of India vide letter No: No. 7-165/2016/NVBDCP/DEN, MOH& FW, Govt. of India, dated 9 Jun 2016 regarding notification of each dengue case whether it is probable (kit+ve) or confirmed (ELISA positive) and similar instructions have been provided to all the districts vide Dengue Alert issued vide letter No: SHSB/ GAIDSP/ 518/ 2011/ PartII/3810, dated 4/9/2018. It was informed that in laboratory poor settings, screening of dengue cases should be done through RDTs for early detection and case management. Platelet count is a prognostic indicator and should not be used as diagnostic indicator. The team went to various urban areas. Large number of fever cases was found. In few houses, all family members had fever. As Sadar Hospital Siwan had stopped screening for dengue as per instruction of SPO, NVBDCP, Bihar, many cases were going to Private Practioners and Hospitals for treatment leading to out of pocket expenditure and anger among the general public. As per information provided by the community members, a death due to dengue was also reported in the area. Many serious cases were being taken to Gorakhpur for treatment. As per reports of the cases seen in the affected tolas (area), many were found to be NS1 positive for Dengue. The team collected 19 samples from potential cases from the affected areas. Out of 19, 16 samples were confirmed as ELISA positive in PMCH, Patna on 12 Oct 2018 and 2 were equivocal. This established Dengue outbreak in the urban areas of Siwan. Approximately 20 houses were searched for aedine larva. The salient findings of the outbreak investigation are briefed as under:-

1. Date wise distribution of Dengue cases in Siwan

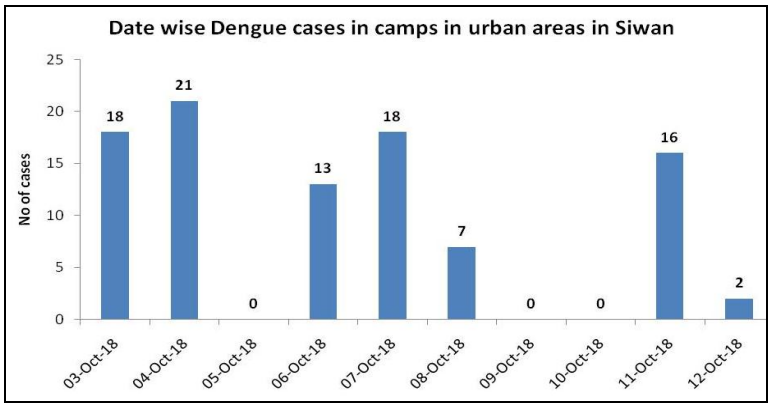

Fig 1

2. Person wise distribution of Dengue cases in Siwan Age wise distribution

Table 1

Age Group	Frequency	Percentage (%)
0-10	10	13
11-20	20	26
21-30	18	24
31-40	9	12
41-50	9	12
51+	10	13
Total	77	100
Sex wise distribution		
Sex	Frequency	Percentage (%)
Male	38	49
Female	39	51
Total	77	100

3. Place wise distribution of dengue cases in Siwan

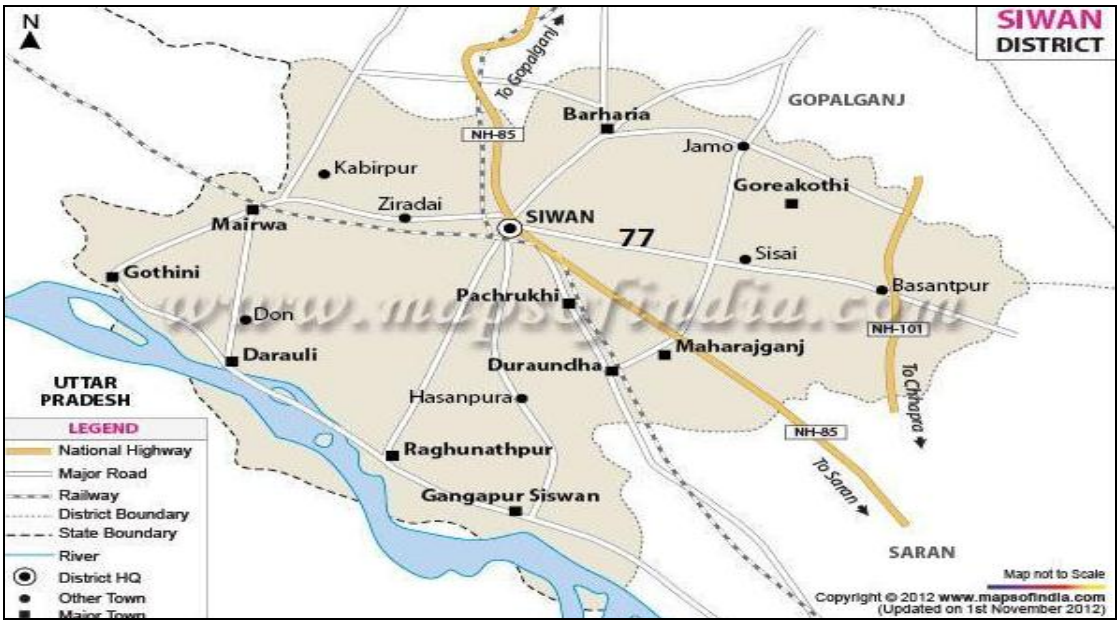

Fig 2

4. Clinical presentation of dengue fever

Table 3: Clinical presentation of fever cases, Bihar Based on interview with patients & as per reports of clinicians (n=25)

Clinical symptom	Affected (%)
Fever	25(100)
Headache	25(100)
Myalgia	12 (48)
Retro-orbital pain	17(68)
Nausea/vomiting	19 (76)
Diarrhoea	4(16)
Pain abdomen	4(16)
Petechiae/rash	0 (0)
Dark coloured stool (malaena)	0 (0)
Bleeding gums	0 (0)

5. Serological status of dengue in Bihar

Table 4

Test	Number	Percentage (%)
Rapid NS1, IgM, IgG& PC +ve	39	41
NS1/IgM ELISA +ve	18	19
Platelet Count<1 Lakh	38	40
Total	95	100

1. Total 95 cases of Dengue have been reported in Siwan from 3 Oct 2018.The index case information is not clear as many people in the affected area informed that there was rapid increase in fever cases from last week of Sep 2018 onwards.
2. Most affected places were urban tolas like Purnaikila, Sukultola, Saikhtola, Kagazimohalla.
3. The disease has afflicted almost all the age group but the incidence is more in the age group 11-20 (26%)>21-30 (24%). Females (51%) are more affected than Males (49%).
4. The most common clinical features shown by Dengue patients were fever (100%), headache (100%) and nausea/vomiting (76%). No patients surveyed suffered from rash.
5. Out of the total 95 cases, 19% of the patients were ELISA positive and 41 % were rapid NS1 kit positive (suspected dengue).
6. Lots of construction activities were seen in the affected areas. Multistoried buildings were seen in affected areas of Patna district that were surveyed for checking the larval breeding areas.
7. During rapid fever survey in affected areas, 19 blood samples each were collected from symptomatic cases, out of 16 was confirmed for dengue by Microbiology Department, PMCH, Patna. This emphasizes the need for rapid fever survey by the health workers for early case detection and its referral as per need.
8. History of travel outside the locality was insignificant during the field visit.
9. The general weather condition during the last one month has been hot and humid. A large population in affected areas of the four districts did not receive continuous supply of piped water. As a result of the intermittent supply, water storage practices mainly in big cement and plastic tanks were common.

Entomological Observations & results: Larval sampling was done using various indices like House, Container and Briteau index. All the domestic and peri-domestic premises were searched. Containers such as tyres, plastic materials, earthen pots, tin items, cement tanks, coolers & other miscellaneous items were thoroughly searched for mosquito breeding sites.

6. Aedine Larval survey results

Table 5

SN.	Indexes	Siwan Results
1	Houses surveyed	20
2	Positive for Aedes breeding	3
3	House Index(percentage of house/premises positive)	15
4	Containers searched	40
5	Containers positive	4
6	Container index (percentage of containers in fested)* In examining the containers, onlythose having water have counted)	10
7	Briteau Index (No. of containers positive/No. ofhouses inspected x 100)	20

7. Key breeding sites for Aedes

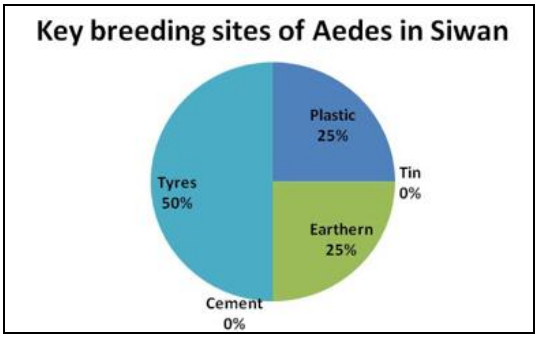

Fig 3

1. 20 houses each in affected villages and tolas/mohallas of Siwan district was surveyed for the presence of aedine larva in several water storage containers.
2. Out of 20 houses, 3 houses were positive for aedinelarvae House Index (HI) was 15, Container Index (CI) was 10 and Briteau Index (BI) in was 20. Although many of the houses had discarded water from majority of the containers on account of Zika case, but based on these indices, Siwan district is on risk of dengue transmission. Note: HI >10 (critical level) and BI >20 (critical level) for transmission.
3. Maximum number of larval collection was done from Tyres> Plastic containers.

Environmental & Sociological Observations and Results: These are based on standard pre-planned questionnaire & interview with the patients & their relatives as well as community members residing in visited villages.

8. Knowledge, Attitude and Practices of affected community

Table 6

Number of people interviewed (n=50)			
S.N	**Knowledge**	**Yes (%)**	**No (%)**
1	Knowledge about Dengue	35 (70)	15 (30)
2	Knowledge about signs & symptoms ofDengue	20 (40)	30 (60)
3	Knowledge about spread of Dengue	15 (30)	35 (70)
4	Knowledge about Dengue vector	15 (30)	35 (70)
5	Knowledge about prevention of Dengue	17 (34)	33 (66)
6	Knowledge about Dengue vector breeding indiscarded water toragecontainers/ornamental plant containers	5 (10)	45 (90)
	Attitudes & Practices		
1	Person feels mosquito bite during day time	45 (90)	5 (10)
2	Cover overhead water containers/othercontainers	20 (40)	30 (60)
3	Involved themselves in Govt efforts	25 (50)	25 (50)
4	Use of repellent in day time	0	50(100)
5	Wear full cloth in day time	20 (40)	30 (60)
6	Cleaning of water coolers/other containers onweekly basis	10 (20)	40(80)
7	Store water at home	40 (80)	10 20)

- Most of the affected population belonged to middle socio-economic strata, with most of the houses being semi – pucca/ or pucca- category. Majority of them belonged to agricultural labour community. Lots of construction activities were going on in these villages. Multi-storied buildings were also seen in these villages where water storage practices were most common. Due to no rain since last 2 months, many containers had become dried and that may pose further risk when rainfall would occur. In affected areas, palm and coconut shells could be found in large numbers, although they were dried up during the visit, they might serve as potential breeding sites for aedine larva once rainfall occurs.
- Majority of the population were illiterate and unaware of the cause of the disease. Awareness regarding disease control & prevention was also very less.
- Due to lack of continuous water supply in the affected areas, water storage practices in several containers for long duration were very peculiar.
- Most of the affected areas were very dirty & no proper

waste management was being done.

9. Conclusion

Approximately 95 cases of Dengue have been reported in Siwan from 3 Oct 2018 till 12 Oct 2018. Disease has afflicted almost all age groups but the incidence is more in 11-20 age group. Larval surveillance in the affected areas were positive. High House and Briteau Index in all the four districts remain pose significant risk of outbreaks in the future if appropriate control measures are not put in place. Around 70% of the population was aware about the term Dengue, however knowledge about various aspects were lacking. Around 80% of the population stored water at home. Only 10% of the population cleaned/changed the water stored in domestic or peri-domestic containers. Community support and participation is also crucial for the prevention of future outbreaks and improving the health and wellbeing of population in the districts.

10. Recommendations

1. Strengthening of the surveillance, particularly fever along with appropriate response is important.
2. Health Workers viz: ASHAs and ANMs should be informed to keep a close vigil on fever cases in their respective areas. If the numbers of fever cases are 5 or more in number during a period of 7 days, they should collect 5-10% blood samples from affected population in village for serological information.
3. Health Workers should also be informed to check the water containing containers in respective areas and for advising the villagers to empty them at regular intervals.
4. Sensitization of medical and para-medical personnel in the government as well as private sectors needs to be undertaken for appropriate and timely management of cases.They should be notified to report the dengue cases to the Civil Surgeon Office.
5. District level coordination meeting comprising of local community leaders of affected areas and other departments like municipality and other stakeholders should be called to spread awareness regarding the disease & to prevent future outbreaks.
6. Medical camps in affected areas would be beneficial as this would also ensure community awareness.
7. Malathion fogging in areas having greater concentration of cases or areas with higher vector density must be undertaken on a priority basis at 2-3 days interval.
8. Anti-larval measures with Temephos (Abate) (1ppm) may be put in big drums and containers from which water cannot be discarded or thrown away.
9. Vector & larval surveillance should be carried out throughout the year to map the vector density & larval breeding sites. For this VBD consultant should be made well equipped.
10. Awareness of Community through IEC, IPC & BCC must be done for success of intervention methods. This should cover following aspects:
    a. Cause and transmission of Dengue fever, about the vector breeding places, specifically household container breeding and biting habits, etc, symptoms of the disease, management including treatment of the cases, and community measures for prevention of breeding and to prevent man-mosquito contact.
    b. Vector control measures like intensification of entomological surveillance in the area on regular basis, emptying the containers on weekly basis and scrubbing & drying them when not in use.
11. All places adjoining the affected areas where a case of Dengue has been recorded should be made alert & close vigil on all the fever cases should be kept for timely referral & cases management and to prevent future outbreak.
12. Availability of drugs and rapid test kits should be made available at all key hospitals for preliminary screening of cases.
13. Possibility of providing regular water supply to residential areas.
14. More number of laboratories should be strengthened to support for early diagnosis of Dengue fever and for blood collection from suspected cases. In poor Laboratory settings, use of rapid test kits for dengue should be promoted for early detection of cases and for timely management of outbreaks.
15. Waste management should be properly planned by District Health Authorities & Municipality.

11. Acknowledgments

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