JMSCR Vol||06||Issue||01||Page 32456-32460||January 2018

www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v6i1.10

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Detection of large number of NS1$^+$ Dengue Virus (DENV) cases at Lucknow, India during the years 2016 and 2017

Authors
AK Kapoor[1], Divya Singh[2], Reena Singh[3], Priyamvada Saxena[4]
[1]Pathologist, RML Mehrotra Pathology Pvt. Ltd., Nirala Nagar, Lucknow, Uttar Pradesh, India
[2]Microbiologist, RML Mehrotra Pathology Pvt. Ltd., Nirala Nagar, Lucknow, Uttar Pradesh, India
[3]Senior Technologist, RML Mehrotra Pathology Pvt. Ltd., Nirala Nagar, Lucknow, Uttar Pradesh, India
[4]Technologist, RML Mehrotra Pathology Pvt. Ltd., Nirala Nagar, Lucknow, Uttar Pradesh, India
Corresponding Author
Ashok Kumar Kapoor
D87 Mahanagar Extension**,** Vigyan Puri**,** Lucknow-226006**,** Uttar Pradesh, India
Email: *drashokkapoor2016@gmail.com*

Abstract
Large number of cases with dengue fever (n = 833) were reported in our lab from 30th June 2016 to 26th November 2016. Later, in subsequent year 173 patients with dengue fever were recorded. Diagnosis of dengue virus infection was confirmed by dengue NS1 antigen detection test using human serum samples. All the patients (n = 1006) were dengue NS1 positive (NS1$^+$). Dengue-IgM antibody was also detected in sera of 86 patients. In addition, anti-IgG antibody test was positive in 12 patients. NS1$^+$ patients were reported mainly from Gomtinagar, Indira nagar and Ajanta hospital, Alambagh areas. Results of CBC revealed leucopenia in 229 of 513 (45%) patients in year 2016 and in 37 of 90 (41%) patients in year 2017. Only 7 of 513 patients had leucocytosis in the year 2016. Severe thrombocytopenia was detected in 116 of 693 (13%) patients in the year 2016 while it was detected only in 14 of 127 (11%) patients in the year 2017. Development of herd immunity during 2016 outbreak of dengue fever might have resulted in serotype-specific neutralizing antibody formation and lower incidence of dengue fever in following year. Both thrombocytopenia and leucopenia appeared to contribute to severity of disease.
Keywords: *Dengue virus leucopenia thrombocytopenia.*

Introduction

Dengue virus is known to be endemic in Lucknow. Detection of high incidence of haemagglutination-inhibiting (HI) antibodies and occasional isolation of Dengue type-2 (DENV-2) from cases of pyrexia at Lucknow in 1966-1967 (UC Chaturvedi, unpublished data) indicated a long-standing activity of group B Arbovirus in this area[1]. Subsequently, an epidemic of dengue fever was reported from Lucknow in the year 1996[2]. Later, we again had large number of cases of pyrexia in 2016 and dengue NS1 antigen was detected. These patients were being treated either by private practitioners or at a private hospital. The patients were referred to us for dengue antigen test and for complete blood cell counts (CBC). First dengue NS1$^+$ case was recorded in our lab on 30th June 2016 and last patient was recorded on 26th November 2016. Sudden upsurge of dengue NS1$^+$ patients in 2016 was followed by

a sleep fall in dengue $NS1^+$ cases in the same period in following year 2017. Present study relates to hematological features of these patients.

Case Report

Patients: Present study relates to the results of 1006 patients with dengue fever. Age of the patients ranged from 5 months to 81 (median 50) years. Male female ratio was 1.5:1. During the year 2016, 833 serum samples of patients were tested positive for dengue NS1antigen from 30th June 2016 to 26th November 2016. Again during above period, 173 serum samples were tested positive for dengue NS1 antigen in the year 2017. Peak incidence was recorded in the months of September and October (figure 1).

Areas showing virus activity: The patients were reported from different localities of Lucknow. Most of the cases were reported from Niralanagar (n = 418), Ajanta hospital, Alambagh (n = 223), Gomtinagar (n = 165), Indira nagar (n = 91) and Jankipuram (n = 60) areas. Small number of cases were reported from other areas, e.g. Gokhlemarg (n = 18), Aashiana (n = 16), Hussainganj (n = 14), Eldeco (n = 2), Rajajipuram (n = 2) and Jyotiplaza, Alambagh (n = 4). Fourfold higher number of cases were reported in the year 2016 (n = 833) when compared to 2017 (n = 173).

Virological investigations: Table 1 shows the results of dengue antigen (NS1) and dengue antibody detection tests. Dengue NS1 antigen was detected by one step ELISA using monoclonal murine anti-dengue NS1 antibody (Patella™ dengue NS1 antigen kit was purchased from Bio-Rad, France). All the patients (n = 1006) were dengue NS1 antigen positive ($NS1^+$). Dengue IgM and IgG antibody detection was done by Micro ELISA (kits were purchased from J. Mitracompany Pvt Ltd, New Delhi). Dengue IgM was detected in 86 patients and dengue IgG was detected in 12 patients (table 1).

Results

Leucopenia (TLC <4000 leucocytes/mm^3) was detected in 229 ot 513 (45%) patients in the year 2016. In addition, 37 of 90 (41%) patients had leucopenia in the year 2017. Only 7 other patients showed leucocytosis (leucocytes >11000/mm^3). However, leucocytosis was not seen in the year 2017 (table 2). The results of platelet count revealed severe thrombocytopenia in 116 of 693 (13%) patients in the year 2016. Moreover, only 14 of 127 (11%) patients showed severe thrombocytopenia in the year 2017 (table 3).

Table 1: Serological findings in Dengue fever cases

Year	No. of cases	Dengue $NS1^+$cases	Anti-Dengue IgM positive cases	Anti-Dengue IgG positive cases
2016	833	833	76	8
2017	173	173	10	4
Total	1006	1006	86	12

Table 2: Total leucocyte counts in patients during year 2016 and 2017.

Year	Total leucocyte counts (cells/mm^3)*		
	< 4000	4000-11000	>11000
2016			
no.	229	277	7
%	45	54	1
2017			
no.	37	53	None
%	41	59	
Total			
no.	266	330	8
%	44	54	1

* TLC was done only in 513 patients in year 2016 and in 90 patients in year 2017. Percentage (%) has been calculated accordingly.

Table 3: Shows severity of thrombocytopenia in patients

Year	Platelet counts in patients** (platelets/mm^3)			
	<50000	50000 to 100,000	100,000 to 150,000	>150,000
2016				
no.	116	187	191	199
%	13	27	28	29
2017				
no.	14	35	32	46
%	11	28	25	36
Total				
no.	130	222	223	245
%	16	27	27	29

** Platelet counts were done only in 693 patients in 2016 and in 127 patients in year 2017. Percentage (%) has been calculated accordingly.

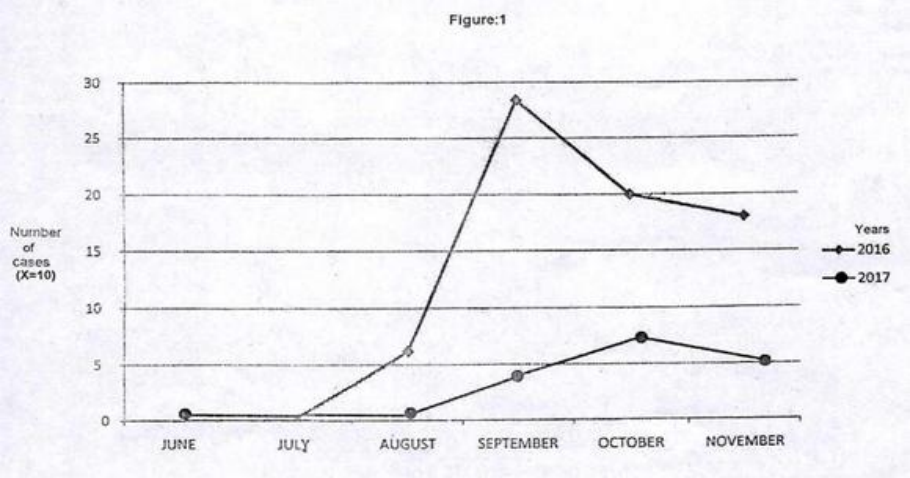

Fig 1 Month wise distribution of dengue NS1* Patients

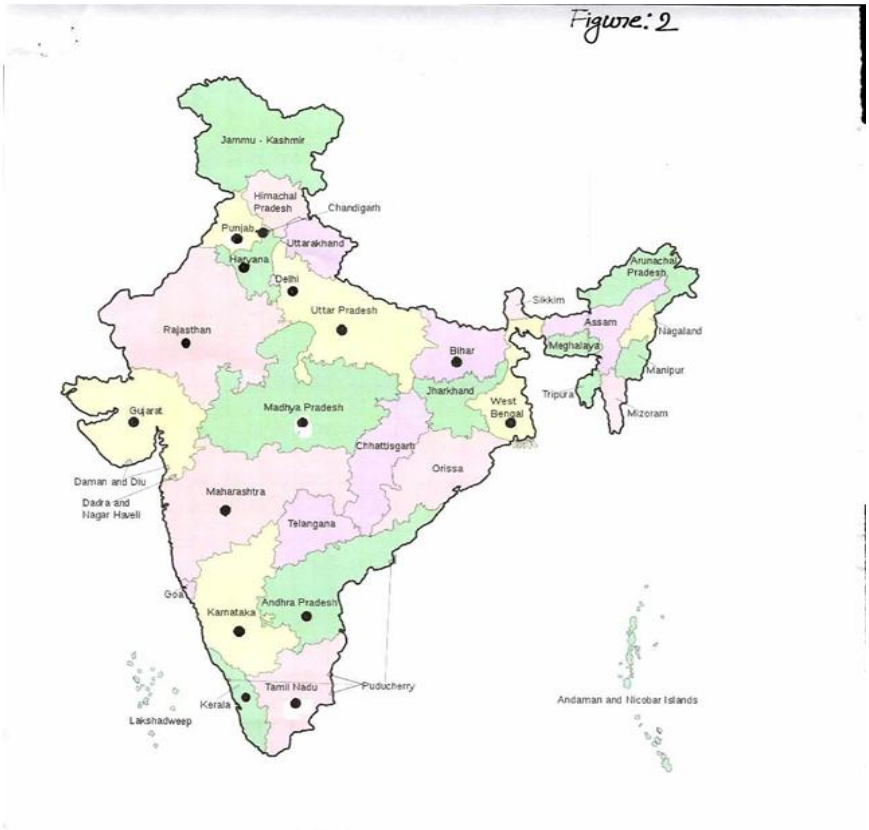

Fig 2 Virologically Confirmed Cases (.) of dengue virus (DENV) infection reported from Indian population

Discussion

Outbreaks of dengue fever (DF) are known to occur in India. First epidemic of Dengue-like illness was recorded in Chinnai in the year 1780. However, the virologically- confirmed cases were reported from Kolkata in the year 1944[1] and later in the year 1964. Subsequently, dengue fever cases were reported from Visakhapatnum, Kanpur and other cities of India[2-4] (figure 2). At present DENV-1 and DENV-2 appear to be prevalent in India[5]. DENV-2 was the predominant serotype prevalent in northern India including Lucknow[2], Hardoi[6] and Gwalior[7]. Most important feature of this study was the detection of large number of dengue $NS1^+$ cases from Lucknow. Number of cases reported in 2016 were approximately fourfold higher when compared with 2017. Emergence of present outbreak of DF in 2016 suggested genetic exchanges or mutations which might have occurred in virus subsequent to its replication in *Aedes* mosquito or in humans[8]. Dengue virus (DENV) mainly induces antibody-mediated immune responses while T-cell mediated delayed type hypersensitivity is relatively poor[4]. Subclinical infection of Lucknow population with a DENV serotype during 2016 might have produced herd immunity against homologous virus. Subsequent secondary infection with a similar DENV serotype failed to produce disease in large number of humans due to preexisting neutralizing antibodies in the year 2017 (Protective immunity). However, secondary infection by a different heterologous serotype may induce non-neutralizing antibody formation resulting in antibody dependent macrophage-mediated enhancement of infection[9]. Another important feature of this study was the detection of severe thrombocytopenia both in years 2016 and 2017. DENV inhibits megakaryopoiesis, resulting in apoptosis and cell death[10]. Another interesting feature of this study was the detection of leucopenia both in 2016 and 2017. Severity of disease appeared to be related both with thrombocytopenia and leucopenia.

Conclusion

Outbreaks of dengue fever occurred in years 2016 and 2017. Higher number of cases were recorded in the year 2016 as compared to 2017. First outbreak resulted in formation of neutralizing antibodies, reactive against homotypic DENV serotype. Extent of disease and number of subjects infected with DF were much less in 2017 compared to 2016 due to preexisting neutralizing antibody. Further both thrombocytopenia and leucopenia might have contributed to severity of disease in our population.

Financial support and sponsorship: None

Conflicts of interest: There are no conflicts of interest.

References

1. Sabin AB, Schlesinger MC. Production of immunity to dengue with virus modified by propagation into mice. Science 1945; 101 : 640-642.
2. Chaturvedi UC, Kapoor AK, Mathur Asha, Chandra D, Khan AM, Mehrotra RML. A clinical and epidemiological study of an epidemic of febrile illness with hemorrhagic manifestations which occurred at Kanpur, India, in 1968. Bull WldHlth Org 1970, 43, 281-287.
3. Chaturvedi UC, Mathur Asha, Kapoor AK, Mehrotra NK, Mehrotra RML. Virological study of an epidemic of febrile illness with hemorrhagic manifestations at Kanpur, India, during 1968. Bull WldHlth Org 1970, 43; 289-291.
4. Gupta N, Srivastava S, Jain A, Chaturvedi UC. Dengue in India. Ind J Med Res 2012; 136 : 373-390.
5. Dengue net in India. Weekly epidemic record 2004; 79 : 57-6.
6. Chaturvedi UC, Mathur Asha, Kapoor AK, Agarwal SK, Tandon HO, Mehrotra RML. Clinico-virological study of an outbreak of Dengue-like illness at Hardoi (U.P.). Ind J Med Res 1974; 62 : 827-830.

7. Parida MM, Dash PK, Upadhyay C, Saxena P, Jana AM. Serological and virologicalinvestigation of an outbreak of dengue fever in Gwalior, India. Ind J Med Res 2002; 116 : 248-254.
8. Banerjee K. Emerging Viral infections with special reference to India. Ind J Med Res 1996; 103 : 177-200.
9. Halstead SB, O'Rourke EF. Dengue viruses and mononuclear phagocytes : 1 Infection enhancement by non-neutralizing antibody. J Exp Med 1977; 146 : 201.
10. Basu S, Jain P, Gangodkar S, Shetty S, Ghose K. Dengue 2 virus inhibits *in vitro* megakaryocytic colony formation and induce apoptosis in thrombopoietin-inducible megakaryocyte differentiation from cord blood $CD34^{+}$ cells. FEMS Immunol Med Microbiol 2008; 53 : 46-51.