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Concurrent dengue and malaria in an area in Kolkata

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ABSTRACT

Objective: To establish the nature and extent of dual dengue and malaria infections in an endemic area through a longitudinal study. **Methods:** A prospective study was conducted from August 2005 to December 2010 to document the nature and extent of concurrent dengue and malaria infections in an area in central Kolkata, endemic both for dengue and malaria. **Results:** Of 2 971 suspected cases of dengue fever, in 605 (20.36%) persons dengue infection was detected, of whom 46 (7.60%, 46/605) patients (40 and 6 suffered from secondary and primary dengue fever respectively) were simultaneously suffering from malaria (28 and 18 were infected with *Plasmodium vivax (P.vivax)* and *Plasmodium falciparum (P. falciparum)* respectively, such dual infections of dengue and malaria were detected in all the years of the study period, except 2007, indicating intense transmission of both dengue and malaria in the study area, and the phenomenon was not an isolated one, the rate of concomitant infections ranged from 25% in 2009 to 4.9% in 2005. Out of total population surveyed, 1.54% (46/2 971) had concurrent dengue and malaria infection. **Conclusions:** These findings added a new dimension in diagnosis, treatment, epidemiology and control of dengue and malaria. The possible risk of concurrent dengue and malaria infections should always be kept in mind in endemic areas for early diagnosis employing modern technology and prompt and effective treatment to avoid serious complications.

1. Introduction

The transmission season of dengue and malaria is practically the same in the city of Kolkata, where both the diseases are endemic. It has been reported[1] that though malaria transmission in Kolkata is perennial and occurs in every month of the year, maximum number of cases are found in the monsoon and post-monsoon seasons extending from July to the end of the year and the overall peak transmission of vivax and falciparum malaria is found in the months of September and November respectively. The seasonal incidence of dengue has also been documented after an epidemic outbreak of dengue and DHF in Kolkata in 2005 through two more years, when sporadic cases of dengue are found in almost every month of the year, but maximum number of cases are detected in the monsoon and post-monsoon seasons, tallying with malaria, with the overall peak in the month of September[2].

In Kolkata *Aedes aegypti (Ae. aegypti)* and *Anopheles stephensi (An. stephensi)* mosquitoes are the vectors of dengue[3] and malaria [both *Plasmodium vivax (P. vivax)* and *Plasmodium falciparum (P. falciprum)*][4] respectively. These species of mosquitoes are container breeders, they can share the same habitat and the density of these two species of mosquito increases in the monsoon and post-monsoon seasons[3,4].

Under these circumstances, it is quite possible, that a person can be infected simultaneously by both dengue and malaria. Concurrent dengue and malaria infections have been documented from India and other parts of the world (loc. Cit) in recent years, especially due to advanced technological facilities in diagnosing dengue. The present piece of work deals with the nature and extent of dual dengue and malaria infections in an endemic area through a longitudinal study.

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2. Materials and methods

The study area consisted of about 3 sq. km around the central laboratory, the Gautam Laboratories, 9A, Kalikrishna Tagore Street, Kolkata 700007 situated in the central part of the city, a cosmopolitan area, thickly populated, endemic for both dengue and malaria. The study period extended from August 2005 to December 2010. The patients residing in the study area and suspected to be suffering from dengue were sent to the laboratory by the local doctors. The individual patient was investigated for detection of both malaria and dengue. The thick and thin blood films of each patient stained with Giemsa's and Leishman's stains respectively were examined under oil-immersion lens for detection of malaria parasites. Dengue specific IgM and IgG antibodies, if present in these patients, were detected using IVD micro-well ELISA dengue fever kits (IVD Research Inc., Cardsbad, C.A., 2005).

3. Results

Results of dengue antibody test and malaria infection are presented in Table 1. Year wise (2005-2010) concurrent dengue and malaria cases are depicted in Table 2. Concurrent dengue and malaria cases were found to be 7.60% (46/605) among total dengue cases. On the other hand, out of 240 malaria cases, 46 (19.17%, 46/240) had concurrent dengue infection. Out of total population examined or surveyed 1.54% (46/2 971) had concurrent dengue and malaria infection.

Monthwise distribution of 46 concurrent dengue and malaria infections was as follows: June 1, July 1, August 5, September 10, October 15, November 13 and December 1 during 2005-2010.

4. Discussion

Due to advanced diagnostic facilities and methods, concurrent infections of dengue and malaria were reported in recent years from India[5-7] and other countries[8-10] but these were only isolated and casual observations. However, Carme *et al*.[11] undertook a retrospective study in French Guiana, involving 1 723 cases, where concurrent infections

Table 1
Analysis of dengue antibodies and malaria infection (2005 – 2010).

Year	Total no. of suspected dengue patients	Patients negative for dengue antibodies *n*(%)	Patient positive for IgG (Old dengue cases) *n*(%)	Dengue cases *n*(%)			Malaria cases *n*(%)		
				Patient positive for IgM (Primary dengue)	Patient positive both for IgG & IgM (Secondary dengue)	Total of Primary and Secondary dengue cases	Patient positive for *P. vivax* infection	Patient positive for *P. falciparum* infection	Total malaria cases
2005	868	187 (21.54)	457 (52.64)	77 (98.87)	147 (16.93)	224 (25.80)	36 (4.14)	23 (2.64)	59 (6.79)
2006	627	118 (18.18)	447 (71.29)	23 (3.66)	39 (6.22)	62 (9.88)	25 (3.98)	17 (2.71)	42 (6.69)
2007	173	36 (20.80)	121 (69.94)	1 (0.57)	15 (8.67)	16 (9.24)	15 (8.67)	9 (5.20)	24 (13.87)
2008	402	86 (21.39)	216 (53.73)	41 (10.19)	59 (14.67)	100 (24.87)	28 (6.96)	15 (3.73)	43 (10.69)
2009	89	24 (26.96)	53 (59.55)	8 (8.98)	4 (4.94)	12 (13.48)	14 (15.73)	8 (8.98)	22 (24.71)
2010	812	99 (12.19)	522 64.28	52 (6.40)	139 (17.11)	191 (23.52)	28 (3.44)	22 (2.70)	50 (6.15)
Total	2971	550 (18.51)	1816 61.12	202 (6.79)	403 (13.56)	605 (20.36)	146 (4.91)	94 (3.16)	240 (8.07)

Table 2
Concurrent dengue and malaria cases.

Year	Total no. of suspected dengue patients examined	Cases of dengue *n*(%)		
		P. vivax	*P. falciparum*	Total
2005	868	7 (0.80)	4 (0.46)	11 (1.26)
2006	627	6 (0.95)	3 (0.47)	9 (1.43)
2007	173	–	–	–
2008	402	7 (1.74)	3 (0.74)	10 (2.48)
2009	89	2 (2.24)	1 (1.12)	3 (3.37)
2010	812	6 (0.73)	7 (0.86)	13 (1.60)
Total	2971	28 (0.94)	18 (0.60)	46 (1.54)

of dengue and malaria were obtained in 1% of cases.

We started conducting a prospective study facing a dengue outbreak in epidemic form extending from August 2005 to December 2010 in Kolkata, tallied with intense malaria transmission, creating a suitable environment for the dual transmission which was facilitated by increased density of both the vector mosquitoes during the season of transmission.

But through this extended study, it was revealed that the dual infections of dengue and malaria were not isolated phenomena, evidenced by the fact that almost in every year (except 2007) during the study period this feature was present, even in those years (2006, 2009) when dengue transmission was not so intense. It was also reveled that in every year of the study period dengue cases outnumbered malaria cases demanding adequate attention of the public health personnel.

So many cases of individual and dual infections of dengue and malaria clearly indicated that the intensity of transmission of both the diseases was very high over years. Though simultaneous infections of dengue and malaria seemed to be a regular feature, no much attention was paid and no due importance was given to this phenomenon previously as clinical detection of dengue was not so easy or prompt in those days. Due to the modern facilities it would now be feasible to detect such simultaneous infections.

In such an endemic area, with practically the same transmission season of dengue and malaria the possible risk of dual infections should be taken into consideration during investigations of acute febrile illness.

Though most of the cases came with acute illness, it was quite possible that a fraction of patients might be asymptomatic carriers of malaria[12] and the findings of malaria parasites was due to routine examination. Nevertheless proper treatment of hitherto undetected asymptomatic cases would be an added advantage. Such asymptomatic *P. vivax* and *P. falciparum* carriers were detected in this endemic area[13].

Manifestations of concurrent infections would produce severe consequences such as prolonged fever, severe muscle and joint pains, various rashes, haemorrhagic episodes, low B.P., shock etc, when vivax malaria would be complicated and uncomplicated falciparum cases might take the form of sever malaria. Platelet count might be low in both vivax and falciparum malaria as well as in dengue and DHF. As the number of secondary dengue cases (40) was more than primary dengue cases (6), suffering from concurrent infections of dengue and malaria, possibility of DHF and DSS in those cases would have remained. In clinical practice these patients would require special attention and constant monitoring. The distinction between severe dengue and severe malaria in such situations would require clinical expertise for proper treatment supported by adequate investigations and circumstantial evidences.

Most of the concurrent cases of dengue and malaria were found between September and November, with a peak in October; at which period the risk of contracting double infections would be more than in any other period.

In the present series all the patients with concurrent infections of dengue and malaria responded to the treatment and survived, but death due to concurrent infections of dengue and falciparum malaria are not uncommon[10].

Conflict of interest statement

We declare that we have no conflict of interest.

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