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Altered Trends In Malaria Infected Areas: Experience From A Tertiary Care Hospital, Delhi

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Abstract:
In the present study we report a sudden increase in the number of cases as well as those presenting with complications due to P. vivax over a period of four years. The current hospital based cross sectional study included suspected cases of malaria diagnosed by peripheral blood smear examination, and antigen detection in between years 2008-2011.There was marked increase in the number of malaria cases in 2011 as compared to previous years. The number of pediatric patients in 2011 was more than 6 times of that seen in 2010. The under 5-year population appears to be especially afflicted with the disease. Almost 1/3rd of these patients presented with hemorrhagic manifestations. P. vivax caused all these cases of complicated malaria. This sudden change calls for further investigations to know the reason behind this shift.

Key words: *Malaria, Plasmodium vivax, trend*

1.Introduction

Malaria is a disease of antiquity. Out of about 1.4 billion people living in 11 countries of the South East Asian Region (SEAR), World Health Organization (WHO) estimates 1.2 billion (85.7%) are exposed to the risk of malaria. Of the 2.5 million reported cases in the South East Asia, India alone contributes about 70% of the total cases[1, 2,3]. There are five species of human malaria parasites Plasmodium vivax, P. falciparum, P. malariae, P. ovale, P. Knowlesi[4]. In India 60 to 65 % of the infections are due to P. vivax and 35 to 40% due to P. falciparum.

Global attention till now has focused mostly on P falciparum which is considered to be more virulent species leading to various serious complications. But of late, it has been noted that even P vivax has started to cause serious infections with fatal complications [2,5,6]. In the present study we report the changing trends, disease presentation of malaria as seen in our tertiary care centre and the increasing importance of P vivax in causing serious disease especially in the paediatric population.

2.Subjects and Methods

This study was carried out in a tertiary care hospital of the North East district of Delhi, India, between January 2008 and December 2011 after obtaining Institutional ethical clearance. The study population included outdoor or indoor patients presenting with fever and

other symptoms suggestive of malaria. The study was conducted after obtaining approval from the Institutional Ethical Committee. A total of 3831 samples was collected after obtaining informed consent from suspected patients. The samples were examined for malaria by slide microscopy and rapid malarial antigen detection methods. On an average the monthly in-patient burden with fever suspected of malaria is 60 -70 cases versus OPD load which is estimated to be on an average 20 patients monthly who are referred to our Malaria microscopy Centre.

Slide Microscopy-Peripheral blood smear were prepared and stained by standard methodology. Giemsa staining technique was used and these slides were examined under oil immersion microscope[7].

Malaria Antigen detection was done by Sure Test Malaria PF/PV HRP2/pLDH Combo (Access Bio Inc, NJ, USA**)** commercially available immunochromatographic test. The sensitivity of this kit for P. vivax and P. falciparum were 96% and 98% respectively. Specificity is 97.5% and precision 100% (as per the manufacturers of the kit) . Samples were subjected to Dengue and Chikengunya (NIV Mac ELISA KIT, Pune India) serology as a routine procedure described by the health authorities for notifying vector borne infections during the outbreak season.

Statistical analysis: Seasonal variation of occurrence of malaria cases from 2008-2011 was done by using Chi-square test.

3.Results

During the study period of four years, a total of 3,831 samples was examined. Of these, 226 (5.9 %) samples tested positive for malaria. Year wise distribution of samples and percentage positives is shown in (Table I). In our setting malaria was mainly seen in the months of June to November with peak disease incidence in September which followed a linear trend over the four year study period ($P < 0.001$) (Figure 1). P. vivax was found to be the predominant species causing malaria. In 2011, 76% cases were caused by P. vivax, and rest by P. falciparum. There were two cases of co infection with these two species in the same year. In the previous years also P. vivax was the leading cause accounting for 86%, 100% and 56% cases respectively in the years 2010, 2009, and 2008.

The disease was almost equally distributed between males and females with male patients slightly outnumbering the females.

It was seen that in the years 2008, 2009, and 2010 adult patients were more (88%, 71%, and 64% respectively) than the paediatric patients. But in the year 2011 there was a marked increase in the pediatric cases (5-12 years with a median age of 7 years) and these accounted for 62% of total cases. (Table II). Also in the previous years there were a very few cases in the under 5 years population (nil in 2008 and 2009, 2 in 2010), whereas in 2011, there were 32 cases in this age group.

In the pediatric patients, almost $1/3^{rd}$ of patients with benign tertian malaria presented with one or other hemorrhagic manifestations like petechiae and epistaxis along with fever (in the absence of co-infection with dengue) Fig2. One patient of benign tertian malaria presented with fever, headache, vomiting, multiple convulsions and altered sensorium indicating cerebral malaria. Two patients were positive for both P. vivax and P. falciparum presented with fever, intermittent vomiting and respiratory distress. No death was reported in these patients and they responded to conventional antimalarial and supportive therapy.

4.Discussion

India is a malaria endemic region and disease transmission continues to occur year after year despite all the vector control methods in practice. Malaria is a leading cause of morbidity as well as mortality and spares no age group. Malaria kills one child every 30 seconds, about 3000 children every day worldwide[8].

Young children in stable transmission areas who have not yet developed protective immunity against malaria are particularly susceptible to it and its complications including severe anemia, respiratory distress in relation to metabolic acidosis, coagulopathy or cerebral malaria with its sequelae (e.g., hemiparesis, cerebellar ataxia, aphasia, spasticity) in survivors.

Our hospital caters to a large population of Delhi, particularly the eastern and northeast region and the adjoining areas of neighbouring state Uttar Pradesh (population ≈ 3 millions). Over a period of last four years, a marked increase in disease incidence was seen in 2010, and 2011. As compared to nine cases in 2008 (1.8%) and seven cases in 2009 (1.1%), 45 cases were seen in 2010 (4.5%) and 165 cases in 2011 (9.8%).

In our setting we noted that malaria mainly corresponds to the rainy season. The temperature and humidity during the monsoons are favourable for the breeding of mosquito vector, and hence increase in the disease transmission. The season of transmission remained similar during these four years.

There is very limited information on age and sex-specific seasonal prevalence of malaria in different paradigms in the country. The burden is generally higher in men than women in all age groups, which was also seen in our study. Children in some states (Assam, Arunachal Pradesh, and Rajasthan) had a higher incidence of malaria than adults, whereas in the Gangatic plains, the situation was reversed[8].

In the years 2008-2010, the number of adult patients was more than the paediatric patients. However in 2011 there was a surge in the number of paediatric patients, and this group outnumbered the adults. From a total of 19 paediatric patients in 2008-2010, the number soared to 102 in 2011. Most of these children had P. vivax malaria and many of them presented with complications, which included petechiae, epistaxis and possibly a case of cerebral malaria. Kaushik et al in 2008 documented complications like pallor (83.3%), icterus (8.3%), multiple convulsions (33.3%) and respiratory distress (8.3%) from our hospital[9].

Clinical profile of severe P. vivax malaria in Latin America describes a series of 17case of patients hospitalized with major complications of jaundice and severe anemia in Plasmodium vivax infection[10].

Though such complications in vivax malaria have been reported previously in pediatric as well as adult age group[11-13], the sudden appearance and the surge in number of cases in our setup is definitely a cause of concern. It has to be found if a change in the genetic

profile of the parasite is responsible for these manifestations or is it due to a faltering in the immune status of the susceptible population?

It is also interesting to note that in the years 2008-2010, when the number of malaria cases was less, the number of dengue cases, which is another mosquito borne disease, was more. This situation was reversed in the year 2011. These two diseases are transmitted by two different species of mosquito's viz. Anopheles species and Aedes species respectively for malaria and dengue. So a difference in the number of cases may be attributed to the change in the mosquito population. A thorough study of these mosquito vectors and their breeding areas is called for to understand the sudden change in the malaria disease transmission. The interplay of human, mosquito, and Plasmodium spp. biology contributes to the clinical spectrum and geographic distribution of malaria. Each of these influences and affects the others, and all in the context of ecology and against the backdrop of climate. Hence a thorough understanding of each of these factors is necessary to understand the change seen in the dynamics of malaria transmission and disease presentation.

P. vivax is already responsible for more than 60% cases of malaria in India and with the kind of ugly turn this supposedly "benign malaria" is taking, it can cause major havocs in the population.

Although, P. vivax malaria was considered to be a benign form of malaria, but with the increasing reports of severe disease and even deaths esp. in paediatric population, it should no longer be considered benign. Studies have shown that 21-27% of patients with severe malaria have P. vivax monoinfection with an overall mortality of 0.8-1.6%. Drug-resistant P. vivax strains and partially effective primaquine regimens significantly undermine the radical cure and control of this relapsing infection[14].

There is an urgent need to study the factors leading to this change and the methods to combat this emerging problem at the earliest.

Year	Total samples	Positives	% positive
2008	502	9	1.8
2009	653	7	1.1
2010	992	45	4.5
2011	1684	165	9.8

Table 1: Distribution Of Malaria Positive Cases (2008-2011)

Age group	2008 (N=9)	2009 (N=7)	2010 (N=45)	2011(N=165)
<5 years	0	0	2	32
5-15 years	1	2	14	70
16-25years	2	2	7	18
>26years	6	3	22	45

Table 2: Age Distribution Of The Malaria Positive Patients (2008-2011)

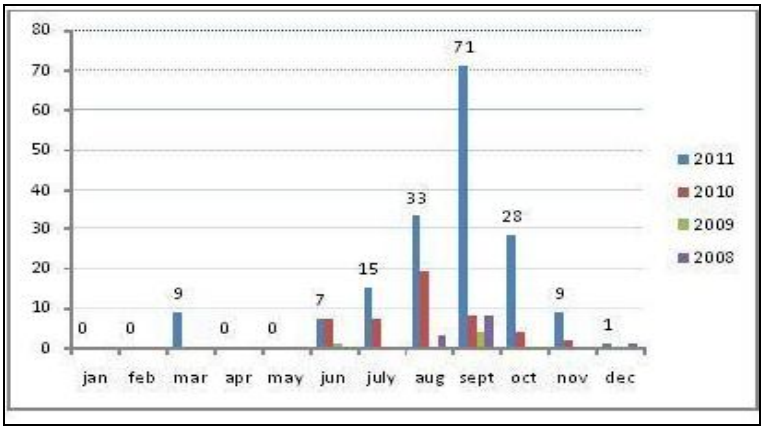

Figure 1: Seasonal Distribution Of Malaria, 2008-2011

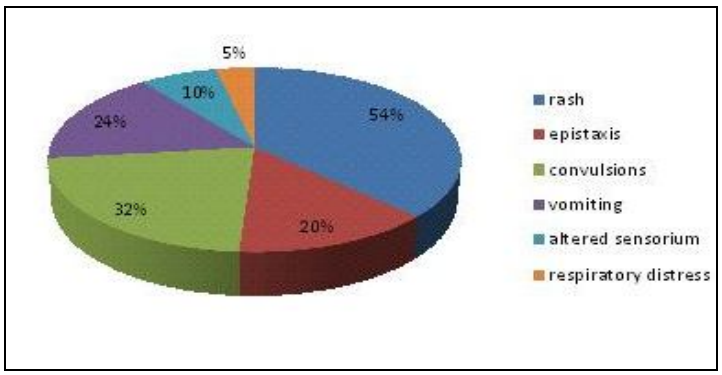

Figure 2: Clinical Complications Of Severe Malaria Due To P. Vivax In The Year 2011

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