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Research Paper

A Clinical and Laboratory Profile of 100 Cases of Childhood Malaria in A Private Teaching Hospital in Northern India

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Abstract: *The study was undertaken to know the clinical and laboratory profile of malaria cases occurring in children in Muzaffarnagar, a midsize town in Northern India. Children, aged up to 15 years, from June, 2015 to May, 2016, admitted to the Pediatric ward and showing a positive result for malaria on smear examination or rapid antigen test were studied. Besides history and clinical examination, relevant laboratory tests were conducted. Most cases affected were between age of 5 and 10 years; while July and August saw the highest number of cases, there was no case from January to March. Vivax malaria was the common type, with only a few cases of falciparum infection; some cases had a mixed infection. Chills/rigors, pallor and splenomegaly were commonest clinical features while anemia was the commonest laboratory finding with several cases showing thrombocytopenia.*

Keywords: *Malaria, P vivax, P falciparum, Rapid antigen test, Smear test*

I. INTRODUCTION

Malaria, has been known to mankind for thousands of years. Description of the illness can be found in the literature of ancient civilizations like India and China. While symptoms of malaria or a malaria like illness are described in the Indian scriptures like Atharva Veda and Charak Samhita, same can also be found in ancient Chinese literature written 2700 BC. [1,2] Although, in the late nineteenth century, the association between mosquito and malaria was already in knowledge, the real landmark was achieved on 20th August, 1897 in an old style laboratory in British India where a member of the Indian Medical Service, Ronald Ross could demonstrate the malarial parasite in a female anopheles.[3] India, since independence in 1947, has travelled a long way with regard to the control of malaria, like so many other health problems. At the time of independence, of a population of 330 million, about 75 million people were estimated to be infected with malaria every year, and the direct mortality due to the disease was estimated at 0.8 million per annum.[4,5] According to a recent WHO report, the incidence of malaria in India still accounted for 58% of cases in the South East Asia Region of WHO.[6] At present, official figures for malaria in India, available at NVBDCP (National Vector Born Diseases Control Programme) site indicate 0.7–1.6 million confirmed cases and 400-1,000 deaths annually.[5,7] Uttar Pradesh (U.P.) is the most populous state of the country and has its full share of the burden of health problems, malaria being no exception. Although, there is no paucity of literature on malaria, there is hardly any study conducted in or around Muzaffarnagar which is an important town situated in the western part of U. P. The present work is an endeavour to study the clinical and laboratory profile of malaria in children of this area.

II. MATERIAL AND METHODS

The study was conducted at the Department of Pediatrics of Muzaffarnagar Medical College, Muzaffarnagar, which is a private medical college with an independent Department of Pediatrics, that imparts teaching and training both at undergraduate and postgraduate levels. Muzaffarnagar is a mid-size town situated in the Western part of the state of U P. This was a prospective study done on the cases of malaria, in children aged up to 15 years, over a one year period, i.e., those admitted from the beginning of June, 2015 to the end of May, 2016. No out-patients case was included in the study as it was very difficult, rather impossible to have a proper follow up of such patients. In fact, as a matter of policy, all patients having or suspected to have malaria are admitted to the hospital and only a handful cases who do not get admitted owing to some reason, are treated as outpatients. Besides taking a detailed history, a thorough examination was done in each case. In history, the points noted were the presence of chills or/and rigors with fever (in view of young age when appreciation about the difference between chills and rigors is rather difficult, these symptoms were not taken separately), nausea

with or without vomiting, headache, cough and altered consciousness, with or without seizures. On clinical examination, we particularly looked for the presence of pallor, icterus, palpable liver (more than 2 cm) and spleen and any abnormal neurological findings. All relevant investigations were done. The blood of every child was tested for malarial parasite by two methods; besides the conventional method, wherein thick and thin smears are prepared and examined under microscope for the presence of parasite, the rapid antigen test was also done. The rapid test used in the study was "Aspen Malarigen", which is a chromatographic immunoassay for qualitative determination of malarial parasite infection in the patient's blood. This test, besides giving a diagnosis of malaria, is also supposed to discriminate between Plasmodium falciparum (P falciparum) and Plasmodium *vivax* (P vivax). Besides this, haemoglobin (Hb) level, total and differential leucocyte count (TLC, DLC) and platelet count were done in each patient. Some other tests, e.g., tests for liver function and kidney function were done whenever required. Complications whenever occurring in a any patient were also noted. Though treatment was done according to the well established guidelines, it did not form part of the present study. All this clinical and laboratory data was analysed after completion of the one year period; an interesting coincidence was that the total number came out to be 100 patients. All the patients who were either tested positive for malaria parasite either on the smear test or on the rapid antigen test were included in the study.

2.1. Exclusion criteria*:*

All those patients who had some coexisting disease, like typhoid fever, were excluded from the study. There were a few children who were empirically treated for malaria, though not showing any positive laboratory test for malaria; they were also not included in the study.

III. RESULTS

3.1. Age and sex*:*

Distribution of cases according to age and sex is shown in table 1. As usually expected, male children, over all, outnumbered female children; regarding age, maximum number of patients belonged to the age group of above 5 years up to <10 years.

3.2. Month-wise Distribution:

This is shown in Fig 1. As can be easily seen, there is preponderance of cases in the months of June, July, August and September (the maximum number being in August), after which, cases began to sharply decline in number, so much so that there was no case in January, February and March after which cases again began to rise again.

3.3. Type of infection:

Regarding the type of malaria, as shown in table 2, a great majority of cases (90) showed the evidence of infection (solely) by P vivax; pure P falciparum infection was found only in 3 cases, while 7 cases had a mixed infection, i.e., having both P vivax and P falciparum infection (table 2). As already mentioned earlier, 2 different types of tests were employed for the detection of the specific type of malarial infection, which can be seen in table 3. As is evident in the table, most of the cases showed positive result on both tests but in the remaining cases, the rapid test showed more positive cases than the smear test.

3.4. Clinical Features:

The main presenting symptoms and clinical signs are shown in table 4. As every child that came had fever, this symptom is not shown in the table. A great majority of children had chills and/or rigors, while a few patients also had altered consciousness. Regarding the clinical signs, as can be easily seen in the table, most of the cases had splenomegaly, while hepatomegaly and pallor were also seen in a large number of children.

3.5. Laboratory Findings: As already mentioned before, the diagnosis of malaria was determined on the basis of either the smear test or the rapid antigen test. Besides the tests specifically meant for the diagnosis of malaria, some other laboratory tests were also done to find the status of other systems, especially the hematopoietic system. As shown in table 5, while anemia was seen in a vast majority of cases, a significant number exhibited leucopenia and thrombocytopenia too. A few cases also had a slight derangement of liver function as shown by slight rise in the serum levels of bilirubin, alanine transferase (ALT) and aspartate transferase (AST). None of our cases showed any evidence of renal dysfunction as evidenced by proteinuria or rise in serum urea or creatinine levels.

3.6. Comparison of clinical features and laboratory parameters in P vivax and P falciparum Cases:

An attempt was also made to look for the differences in either clinical features or the laboratory findings in both types of malarial infection. The same is depicted in the above tables viz. 4 & 5.

IV. DISCUSSION

In the present study, boys outnumbered girls; they were almost twice the number of girls (table 1); this is probably because of higher number of boys visiting the hospital (like most public hospitals). This is a general pattern, a fact closely related to our social behaviour where, by and large, boys receive more parental care than girls. Other studies on the subject of malaria also show similar findings [8,9]. As regards age, maximum cases were seen between 5 and 10 years. Although, malaria affects all ages, including the fetal stage and no definite age predilection is described in literature, we found more cases in this age group, the next age group being above 10 years. The seasonal distribution of cases through a one year period shows a definite surge of cases in the months of July, August and September and a decline in winter months with no case coming in January, February and March. This is directly related to the breeding season of the vector, the Anopheles mosquito. This is not only experienced by all in general but also vindicated by other studies; almost the same findings were observed in some other studies done in other parts of the country, though most of the studies on malaria were not confined to children [8,9].

Regarding the type of infection, the vivax malaria was the dominant type in the present study, such cases constituting 97% of total cases, 90 pure vivax and 7% mixed with the falciparum malaria. Fortunately (for our patients), we did not encounter a large number of falciparum malaria cases – 10 cases out of 100 were seen and only 3 of them were pure falciparum infection, rest 7 being mixed with vivax - though most of other studies on malaria mentions higher figures of falciparum cases. In some other studies from different parts of India this was 36% and 40 % respectively. [8,9]. A recent study done in tribal areas of the country, the percentage of falciparum malaria was 21% [10]. However, none of these studies were done exclusively on children. It is not possible to explain the low incidence of falciparum infection in our study.

It is interesting to note that though both the tests for malaria, viz., the conventional smear test and the rapid antigen test were done on each case, the number of positive cases came out differently on these two tests. While 65 cases came out positive on both the tests, the smear test showed 15 positive cases and the rapid test gave 20 positive cases. This means that the smear test was positive in 80 cases while the rapid test showed positive result in 85 cases, showing thereby a higher sensitivity for the rapid test. This is contrary to the traditional teaching wherein, for malaria, the smear test is termed the 'gold standard' for the diagnosis of malaria. Regarding the relative sensitivity of both methods, while some authors say the rapid test has lower sensitivity, some others claim it is as sensitive as the smear test to detect the infection.[11,12].

As regards clinical manifestations, the most common symptom in our study was chills/rigors. This is understandable and is not contradicted by any literature or studies. Joint pains have been described in one study but we did not encounter that in any of our cases.

Splenomegaly was the most consistent clinical sign, present in 83% of cases in the present study while pallor was nearly as common (72%). We, however, encountered icterus and altered sensorium in only a few cases. The Aligarh study found splenic enlargement in fewer cases but icterus more frequently. Moreover, several cases were found to have respiratory distress and seizures in that study while we did not find any such sign in any case. On the other hand, another study from South India had found cough and icterus almost as infrequent as in our study. However, an important point is that both of those studies had included both children and adults in their studies, while our study was limited to children only. [8,9]

As regards the laboratory investigations, the most common finding observed was anemia (76%) which roughly corroborated with the clinical sigh of pallor. Another significant finding was the presence of low platelet counts in over half of cases though this was never too low to cause alarm. Some cases also showed leucopenia. We could not come across a study which included this aspect. Indices of liver function were also found abnormally raised but only in a small number of cases; while serum bilirubin was raised in 5% of cases, serum alanine aminotransferase (ALT) and seum aspertate aminotransferase (AST) were found raised in 7% cases. The Aligarh study had found higher number of cases with abnormal liver function.[8]

We also tried to compare cases with P vivax malaria with those having P falciparum infection with regard to clinical features and laboratory findings. However, in view of much lower incidence of falciparum cases in the present study, this comparison carries a limited significance and any statistical analysis would not be fruitful. Nevertheless, what can be easily seen is that nearly all symptoms, clinical signs and laboratory tests point towards a more sinister illness in P falciparum cases than P vivax cases.

V. CONCLUSIONS

We could conclude from the present study that in this area, the malaria commonly affecting children is P vivax with only a few cases occurring with falciparum infection. The strength of the present study is a reasonably large number of studied children over a full one year period. The limitation was that this study was hospital based; an ideal study has to be a field study which better reflects the community.

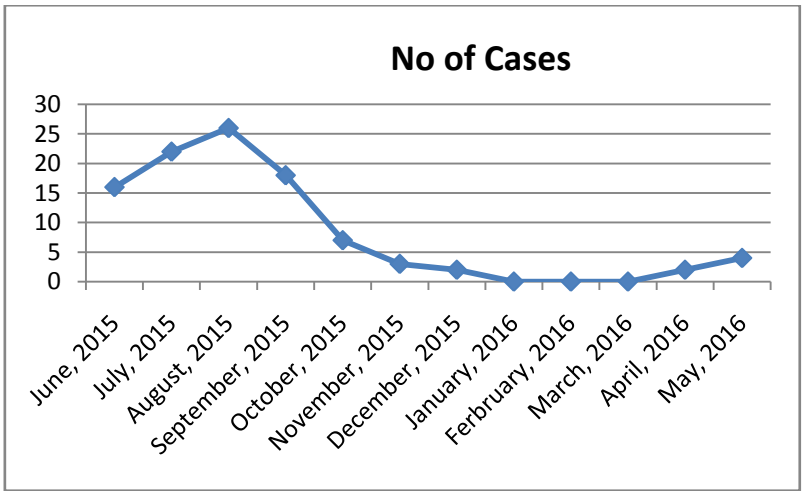

Figure 1: Monthwise distribution of cases

Table 1: Distribution of cases according to age and sex – n=100

Age group	No of children	Male children	Female children
Below 1 year	3	2	1
1 year to <5 years	19	10	9
5 years to <10 years	49	38	11
10 years and above	29	14	15
Total number	100	64	36

Table 2: Type of malarial infection found (n=100)

Plasmodium species	No of cases
P. vivax	90
P. falciparum	3
Mixed infection by P vivax and P falciparum	7

Table 3: Positive cases seen on different types of tests (n=100)

Type of test	No of positive cases
Only smear test	15
Only rapid card test (antigen test)	20
Both tests showing positive result	65

Table 4: Clinical Features in Malaria Cases - P vivax and P falciparum

Symptoms/Signs/ Lab features	All malaria cases (n = 100)	P vivax cases (n = 90)	P falciparum cases (n = 3)	Cases with mixed infection (n = 7)
Chills/rigors	80 (80%)	71 (78.88%)	3 (100%)	6 (85.71%)
Nausea/vomiting	34 (34%)	28 (31.11%)	2 (66.66%)	4 (57.14%)
Headache	28 (28%)	23 (25.55%)	2 (66.66%)	3 (42.85%)
Cough	26 (26%)	23 (25.55%)	1 (33.33%)	2 (28.57%)
Altered consciousness	07 (7%)	04 (4.44%)	1 (33.33%)	2 (28.57%)
Pallor	72 (72%)	64 (71.115)	2 (66.66%)	6 (85.71%)
Icterus	07 (7%)	04 (4.44%)	2 (66.66%)	1 (14.28%)
Hepatomegaly	60 (60%)	52 (57.77%)	2 (66.66%)	6 (85.71%)
Splenomegaly	83 83%)	75 (83.33%)	2 (66.66%)	6 (85.71%)

Table 5: Laboratory Features in Malaria Cases - P vivax and P falciparum

Lab finding	All malaria cases (n=100)	P vivax cases (n=90)	P falciparum Cases (n =3)	Cases with Mixed infection (n = 7)
Anemia	76 (76%)	68 (75.55%)	2 (66.66%)	6 (85.71%)
Leucopenia	26 (26%)	20 (22.22%)	2 (66.66%)	4 (57.14%)
Thrombocytopenia	58 (58%)	50 (55.55%)	2 (66.66%)	6 (85.71%)
Raised serum bilirubin	05 (5%)	2 (2.22%)	1 (33.33%)	2 (28.57%)
Raised ALT	07 (7%)	2 (2.22%)	2 (66.66%)	3 (42.85%)
Raised AST	07 (7%)	2 (2.22%)	2 (66.66%)	3 (42.85%)

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