Original Article.

Simple clinical parameters to diagnose Malaria in Outpatient Department.

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Abstract

Introduction: Malaria is the world's most important parasitic infection which poses major health challenges. Best estimates currently describe the annual global burden of malaria as 300-500 million cases and 1-2 million deaths. Traditionally malaria is diagnosed clinically based upon sign symptoms and clinical examination particularly in remote areas where laboratory facilities are not available. However, no universal criteria exist for clinical diagnosis of malaria and presenting features are highly variable region to region. Therefore, we planned to define the simple parameters based on clinical signs and symptoms that predict malaria without laboratory confirmation of parasitemia.

Objective: To determine the sensitivity, specificity and positive predictive values of simple clinical parameters for the diagnosis of malaria without laboratory confirmation of parasitemia.

Methodology: This observational study was carried out at pediatric department of Karachi Medical and Dental college and Abassi Shaheed Hospital Karachi during 15 April 2015 to 15 February 2015. Children between 6 months to 5 years, who presented with short duration of fever (less than 7 days) were included in study. The diagnosis of malaria was confirmed on identification of parasite (Plasmodium vivax or Plasmodium falciparum) in blood obtained from finger prick sample for thick and thin film. The patients were divided into two groups (+ve MP cases and -ve MP cases). Focal signs and symptoms, pallor (anemia) and splenomegaly were checked in both groups to assess the sensitivity, specificity and predictive values of these simple clinical parameters and co-related with the presence of malaria parasitemia.

Result: Six hundred fifty-seven children were examined. One hundred (15.22%) children out of 657 had malaria confirmed while 84.78% (557 of 657) had illness other than malaria. There were 43 children (43%) with Plasmodium falciparum malaria, 47 children (47%) with Plasmodium vivax malaria and 10 (10%) with mixed infections. Three clinical parameters (No focal features, anemia & splenomegaly) were studied in all febrile patients which were divided into two groups (Malarial parasite +ve and malarial parasite -ve).

Conclusion: Few simple clinical findings can lead to reliable clinical diagnosis of malaria with more logical use of antimalarial drugs in children.

Key words: Malaria, Anemia, Splenomegaly.

Introduction: Malaria is the world's most important parasitic infection which poses major health challenges. Despite years of continual efforts, malaria is still a threat to over two billion people, representing approximately 40% of the world's population in about 100 countries. Geographical distribution of the disease is worldwide, being found in tropical areas, throughout Sub-Saharan Africa and to a lesser extent in Southeast Asia, South Africa, the Pacific Islands, India and Central and South America. Best estimates currently describe the annual global burden of malaria as 300-500 million cases and 1-2 million deaths [1-5]. A clinical diagnosis of malaria is tradition among medical doctors. This method is least expensive and most widely practiced. Clinical diagnosis is based on the patients' signs and symptoms, and on physical findings at examination [6]. Children with fever are generally treated with antimalarial drugs without laboratory confirmation of disease, because it is a serious life-threatening illness, it is customary in hyperendemic area like Pakistan to treat all children with febrile illness with an antimalarial drug when laboratory diagnosis are not available. Early diagnosis and prompt treatment of malaria are essential, but areas with high levels of malaria often have scarce healthcare resources. Health workers may not have access to sophisticated methods for diagnosis. In the past, they overcame this by routinely giving chloroquine, the most common antimalarial treatment, to any patient with fever. WHO & UNICEF recommended in IMCI (Integrated Management of Childhood Illnesses) that all febrile illness in malarial endemic areas should be treated with an antimalarial drug if there is no running nose or measles [1, 2]. This algorithm for treating malaria is insufficient especially in our setup where other diseases; like enteric fever, urinary tract infection, pneumonia and gastroenteritis; with almost similar clinical picture are prevalent.

Is reliable malaria diagnosis of malaria possible after simple assessment of patients' symptoms? There are no universal criteria for symptomatic diagnosis of malaria[7-9]. For example, in Thailand, fever and headache without a cough are reliable predictors of malaria in children. In the Philippines, the symptoms that most consistently predict malaria fever are chills and sweating. Symptoms are influenced by the level of malaria in the area. In addition, perception of symptoms may be culturally determined[10, 11].

Therefore, we planned to assess the simple parameters based on clinical signs and symptoms that may predict malaria without laboratory confirmation of parasitemia.

Methodology: The study was con ducted in pediatric department of Abbasi Shaheed Hospital Karachi from 15 Apryl 2015through 15 February 2016.Children between 6 months to 5 years, who presented at outpatients' department with short duration of fever (less than 7 days) were included. During period of study six hundred fifty-seven cases were enrolled for the study. Detailed history and clinical examination performed for each child selected for the study. The

Performa includes history and clinical findings relevant to exclude other illnesses like upper respiratory tract infection, pneumonia, gastroenteritis, enteric fever or urinary tract infection (appendix 1). Serious and indoor patients (acute gastroenteritis with severe dehydration, severe pneumonia, meningitis or encephalitis) were not included in study.

Appendix 1:

Appendix I: Focal Signs and Symptoms (variables) included in Study.

History

1. Abdominal Pain
2. Diarrhea
3. Vomiting
4. Earache or Discharge
5. Noisy breathing or Running nose
6. Sore throat
7. Cough
8. Difficulty in breathing
9. Yellow discoloration of skin or mucous membrane
10. Urinary Symptoms
11. Skin rashes

Examination.

1. Skin rashes (measles, scarlet fever, drug reaction, viral exanthems, scabies)
2. Jaundice (skin, mucous membrane, palate)
3. Pallor (skin, palm, conjunctiva)
4. Signs of dehydration
5. Peripheral edema
6. Red or bulging tympanic membrane
7. Ear discharge
8. Exudate on tonsil
9. Nasal discharge or blockage
10. Increase respiratory rate
11. Lower chest indrawing
12. Nasal flaring
13. Grunting
14. Wheezing
15. Hemic murmur (Ejection systolic)
16. Splenomegaly
17. Hepatomegaly
18. Tenderness of liver

Note: Sign and Symptoms related to Central Nervous System (CNS) were not included in this study.

The diagnosis of malaria was confirmed on identification of parasite (Plasmodium vivax or Plasmodium falciparum or mix) in blood obtained from finger prick sample for thick and thin film. Complete blood counts, blood culture, urine culture and X-ray chest were done when there was clinical suspicion of other illnesses like enteric fever, urinary tract infection, pneumonia or sepsis. Once report for thick and thin film available, the patients were divided into two groups (+ve MP cases and -ve MP cases). Focal signs and symptoms, pallor (anemia) and splenomegaly were checked in both groups to assess the sensitivity, specificity and positive predictive values of these simple clinical parameters and co-related with the presence of malaria parasitemia.

Results: Six hundred fifty-seven cases were registered in 10 months and were included in study. One hundred (15.22%) children out of 657 had malaria confirmed while 84.78% (557 of 657) had illness other than Malaria (table I).

Table I: Prevalence of other illnesses

Disease	Frequency (n=657)	Percentage (%)
Upper RTI*	155	23.59
Acute gastroenteritis	123	18.20
Pneumonia	115	17.50
Enteric fever	49	7.45
Urinary tract infection	38	5.78
Strep pharyngitis	32	4.87
Acute otitis media	22	3.34
Acute viral hepatitis	18	2.73
PUO*	5	0.76

*RTI: Respiratory Tract Infection
PUO: Pyrexia of Unknown Origin

There were 43 children (43%) with Plasmodium falciparum malaria, 47 children (47%) with Plasmodium f vivax malaria and 10 (10%) with mixed infections. Forty (40%) out of 100 cases of malaria were less than 2 years and 10 (10%) of them were less than one year. Forty-eight (48%) cases of confirmed malaria were female and 52% (52 of 100) were male. There was almost equal sex predilection. There were 115 children with pneumonia contributing to 17.50% of the enrolled children and 123 patients with acute gastroenteritis, accounting for 18.72% of all children included in study. Of the children with acute febrile illnesses other than malaria, there were 155 cases of upper respiratory infection (23.59%), 49 cases of enteric fever (7.45%), 38 cases of urinary tract infection (5.78%), 32 cases of streptococcal pharyngitis (4.87%), 22 cases of acute otitis media (3.34%) and18 cases of acute viral hepatitis (2.73%).5 cases (0.76%) had no diagnosis at the end of routine investigations and were therefore labelled as pyrexia of unknown origin (PUO).

All patients (malaria +ve and malaria -ve) were looked for three clinical parameters i.e. no focal features, anemia & splenomegaly. The chances of malaria in febrile patients are 73%,66% & 4 0% with anemia, fever without focal features & splenomegaly respectively (table II, III&IV). Fifteen percent of cases had no focal features in non-malarial cases similarly 39 cases had anemia and 4% cases had splenomegaly in non-malarial febrile illness.

Table III: Study variables.

Clinical features	N=657	
	MP +ve n=100 (15.22%)	MP-ve n=557 (84.78%)
No focal features	66 (66%)	84 (15.08%)
Anemia	73 (73%)	216 (38.77%)
Splenomegaly	40 (40%)	24 (4.30%)

Table III: Statistical Analysis of Clinical Predictors of Malaria

	Sensitivity (%)	Specificity (%)	Positive Predict Value (PPV) (%)	Negative Predict Value (NPV) (%)
No focal features	66	84.91	44	13.01
Anemia	73	61.22	25.25	19.98
Splenomegaly	40	95.69	62.50	6.74

Table IV: Signs and Symptoms associated with diagnosed cases of malaria.

Focal features	No. of cases	MP +ve cases (n=100)	MP -ve cases with Focal features (n=44)
Abdominal Pain	11	11%	25%
Yellow discoloration of skin or mucous membrane	08	08%	18.18%
Diarrhea	07	07%	15.90%
Vomiting	06	06%	13.63%
Signs of Dehydration	05	05%	11.36%
Urinary symptoms	05	05%	11.36%
Cough	04	04%	9.09%
Running nose	03	03%	6.81%
Combination of Signs and Symptoms	10	10%	22.72%

Discussion:

The diagnosis of malaria depends upon the identification of parasites in blood [12]. It is a major cause of life threatening parasitic infection [13]. Because parasites may not be seen at the height of the fever, examination should be repeated preferably at intervals of 12 hours[2]. This study demonstrates clinical findings in various plasmodium species unlike available international and national data which either focused on one of the P. species[14-20] or few of the factors in different species[21,22].

Because microscopy for the diagnosis of malaria is often unavailable in peripheral health facilities in developing countries, therefore, objective current study is early diagnosis of malaria by using simple clinical parameters that are both sensitive and specific for the diagnosis of malaria specially by the health workers of peripheral health unit. We identified few clinical signs that can be used to improve the diagnosis of malaria with confidence in children with fever and to guide initiation of treatment.

IMCI (Integrated Management of Childhood Illnesses) developed by WHO and UNICEF, states that a febrile child from a low risk malaria setting should be treated for malaria if there is no running nose or measles[1,2.]This is insufficient statement. Therefore, we planned our study to identify clinical signs and symptoms that predict malaria with more confidence. Three clinical parameters (no focal features, anemia & splenomegaly) were studied in all febrile patients who were divided into two groups (malarial parasite +ve & malarial parasite -ve). The chances of malaria in febrile patients are 73%, 66% & 40% with anemia, fever without focal features & splenomegaly respectively.

Fifty-six cases out of 100 (56%) diagnosed malarial cases have no focal features while remaining 44 cases (out of 100) have focal features like abdominal pain, vomiting, cough, running nose, dehydration and jaundice. As we mention earlier that malaria may have wide diversity of presentation and there are no universal criteria for symptomatic diagnosis of malaria[3,7,11]. One should rule out other illnesses (enteric fever, pneumonia, UTI, hepatitis, and gastroenteritis) while considering malaria on clinical features [10, 23].

In our study 73 children have mild to moderate anemia in MP positive malarial cases while on other hand 216(38.77%) out of 557 non-malarial cases also have some degree of anemia. This is probably because of high prevalence of iron deficiency in our community due to poor intake of iron and worm infestation. Anemia may also be a feature of other febrile illnesses as seen in our study. The absence ff other obvious causes of infection gave a reasonable sensitivity and specificity of malaria.

The spleen is more commonly enlarged in vivax than falciparum infections[24-26]. Spleen may become very large and hard and even rupture after repeated attacks.[8,9,24,27,28]Enlarged spleen were seen in 40 children with malaria (out of 100) and 24 children without malaria (24 of 557). The causes of enlarged spleen in our study are may be enteric fever (7.45%) and hepatitis (2.73%). Spleen may be palpable in some cases of non-specific viral infection.

Conclusion: We concluded that by using a combination of a few simple clinical findings, better clinical definition can result without compromising sensitivity and specificity of diagnosis. This will result in more rationale use of antimalarial drugs in children and appearance of resistant to these drugs may be delayed. Health workers should be trained to detect anemia and splenomegaly because these two features improve the prediction of malaria.

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