Prevalence of Plasmodium Slide Positivity among the Children treated for Malaria, Jhangara, Sindh

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Abstract

Objective: The aim of the study was to estimate the prevalence of malaria amongst the children with fever or history of fever.
Setting: Rural Health Centre (RHC), Jhangara, a town near the Manchhar Lake in Taluka Sehwan, District Dadu, Sindh.
Subjects: Four hundred and thirty eight children of 6 months to 10 years of age, who attended above described RHC during August through October 1997.
Methods: A Sindhi-translated standard questionnaire was used to record symptoms and duration of child's illness. Each child was physically examined, had their auxiliary temperature measured; and blood samples were collected from which Giemsa stained thick and thin blood films were examined for presence of Plasmodium parasites.
Results: The median age of the studied children was 24 months and 57% (250/438) were boys. Fifty three percent (231) of the study subjects were from Jhangara Town, 40% (177) and 7% (30) came from other villages and villages near to the Manchhar Lake respectively. The prevalence of Plasmodium slide positivity was 5.9% (26/438). Among Plasmodium slide positive children, 65% (17/26) were positive for P. falciparum and 35% (9/26) for P. vivax. Among the P. falciparum positive children, 88% (15/26) had scanty (MP, 1-10/100 fields) and 12% (2/26) bad moderate density (MP, 10-100/100 fields) of infection. Seventeen percent (6/30) of the children from villages close to Manchhar Lake were Plasmodium slide positive compared to 7% (17/53) and 3 % (5/177) from Jhangara town and other villages respectively. Cough, diarrhea, abdominal distention and vomiting were the commonly reported symptoms among the children of all ages at the time of interview. Guardians reported fever as part of the illness in all children, although during physical examination only 128 (29%) had auxiliary temperature 37.5 °C. Pallor as an indicator for anemia, rash and prickly heat were the major recorded observations.
Conclusion: The Prevalence of Plasmodium positivity was higher in children who attended from villages close to Manchhar lake, therefore especial measure needs to be considered for this area. In addition, the health care workers in rural Sindh need to adopt appropriate guidelines to differentiate the clinical malarial patients from patients with other potential infectious diseases, which may need other treatment UPMA 50:401, 2000).

Introduction

Malaria is still a serious public health concern in many parts of the world[1] especially in developing countries. Immunity to malaria parasite infection increases with every exposure[2], therefore, children are more likely to develop malaria than adults. It is estimated that 1.5 to 2.7 million children die of malaria annually worldwide[3] and has been considered as the second cause of death among the children in developing countries[3,4].
A clinical-based survey conducted in Punjab showed 37%-43% prevalence of malaria during the months of September to December 1984[5], which had risen as compared to 25% to 35% during the same period in 1983. A population-based study conducted in Karachi among Afghan refugees reported a prevalence of 11.2% malaria among the children 1-9 years age[6]. A hospital based study in Karachi

reported a malaria parasite slide posilivity rate of 1% (526/49509) in children under 15 years[7]. During 1997, blood slides collected from 4 provinces by Pakistan National Malaria Control Program through active and passive case detection (2.7%) (77,480/2,914,056) were parasite positive[8]. Sindh province had prevalence of 2.4% (15,925/ 656,033) of parasite positive slides collected in the same year. The diversity of climate in various parts of the country may have a significant effect on the prevalence of malaria. Crop cultivation is a frequent activity in rural areas, thus by providing breeding sites for vectors it influences the prevalence/incidence of malaria. Therefore, a higher prevalence of malaria is expected in rural compared to urban areas.

Chioroquine is the cheapest and most easily available anti-malaria dmg. As resistance to chioroquine rises[9], other drugs will be used more frequently such as Sulphadoxine/ Pyrirnethamine. These are recommended drugs for chloroquine¬resistant malaria, costs nearly five times as much as chioroquine. Furthermore, these drugs have serious side-effects[10] and non-malaria cases being more susceptible to these. The consequence of expensive treatment in a country with limited resources such as Pakistan may result in a delay in the initiation of therapy and/or poor compliance. It is thus imperative to assess the magnitude of the malaria parasite infection to provide policy makers necessary data for appropriate planning of malaria control activities. Therefore, the objective of this study was to determine the prevalence of Plasmodium slide positivity among febrile children attending the only rural health center in Jhangara. This clinic-based study to assess the prevalence of malaria is one of the first such studies conducted in rural Sindh, Pakistan; the only other one to our knowledge was Covel and colleague community-based studies conducted in 1932 and 1934[11] The results of this study on malaria status in this region might become useful to the RHC health workers to evaluate the ill children properly and not to miss out other treatable illnesses.

Patient and Method

This study was undertaken at the Rural Health Center (RHC) Jhangara, among outpatient children who came from the town of Jhangara and surrounding villages during August through October 1997. The children were included in the study if they met the eligibility criteria. Jhangara union council of Taluka Sehwan in district Dadu consists of 64 villages with a population of about 16,000, located near the bank of Manchhar Lake and has a total area of 60 km^2. Manchhar Lake has many different canals, which go around the villages for the purpose of irrigation, which in turn increase the breeding sites for mosquitoes. The rest of the union council is desert with high temperatures during summer days and dry and windy conditions in the evenings.

RHC is the only health facility in the union council that normally receives 50-100 patients daily. However, the number of patients decreases towards end of each month. This is mainly due to a diminishing drug supply as these drugs are supplied only once in the beginning of each month.

The inclusion criteria in this study were: (i) children who attended RHC in Jhangara and had fever or history of fever during a month prior to the time of interview, (ii) age 6 months to 10 years, (iii) did not have history of treatment with anti-malaria drugs in the last one month[12] and (iv) willing to participate in the study. Patients were referred to the investigation team alter the medical officer had formally examined the children. Guardians of eligible children gave informed verbal consent to allow their children to be a part of the study. Using a pre-tested Sindhi translated questionnaire we collected all the required information to determine the patient's demographic characteristic information and as to the reasons why he or she had been brought to the RHC. Similarly, questions with respect to the present illness other than fever and history of fever, such as diarrhea, cough where asked. In addition, there were questions regarding symptoms such as rigors, abdominal pain, and headache, which were only feasible for age group 24 months or greater. The duration of these symptoms was sought. Patients guardians reported symptoms observed by them with respect to the infants and small children they had brought in. The patient's guardian first described in their own words the nature and duration of tile

patient's symptoms, then they were questioned using a checklist of symptoms. However, older children were able to describe their own symptoms directly to the interviewer. All eligible children underwent a general examination for dehydration, anemia, anthropometric measurements and body temperature using a standard oral mercury thermometer. The examiner did a physical examination of the patient and looked for pallor (sign of anemia), spleen enlargement, jaundice and other abnormalities. For ascertainment of anemia we examined both nail bed and conjunctiva. To evaluate nail-bed pallor, the posterior surface of the child's hand was rotated towards the examiner and the nail beds observed directly without applying any pressure on the nails[13]. To evaluate conjunctiva pallor, the examiner gently everted the lower eyelid and directly inspected the palpebral conjunctiva. Finally capillary blood was sampled for thick and thin film examination. Blood films were stained with 4% Giemsa's stain and examined for 100 microscopic thick film fields under an oil immersion objective before being declared negative. A trained technician performed blood film examinations and diagnosis was confirmed by the field supervisor, a medical graduate who undenvent three weeks training at the Aga Khan University Laboratory before initiation of this study. Outcome variables of interest were the presence or absence of malaria parasite in the blood slide . Also, among those who were malaria parasite positive (MP+), we identified different species such as P. falcipanun and P. vivax. List of all those children who were MP+ was given to the rural health center's medical officer to ensure their compliance in taking the anti-malaria drug according to standard treatment.

As the prevalence of malaria is less than 5%, based on National Malaria Control report[8], a sample size of 456 was needed to estimate the prevalence of malaria in our study population with a 2% margin of error.

Data analysis

Descriptive statistics were computed to study the demographic characteristics, distribution of signs and symptoms in the study subjects and to analyze the prevalence of Plasmodium slide positivity. We used Epi Info version 6.04 and SPSS (statistical package for social sciences) version 7.5 for data management and statistical analysis.

Results

During the study period, 451 children met the inclusion criteria and were recruited in this study. Of these 451 eligible children 13 were excluded because ten had a history of malarial treatment and three children did not tolerate finger pricking or proper physical examination. Thus analysis was restricted to 438 children. The median age of enrolled children was 24 months and 57%.(250/438) were boys. Fifty three percent (231) of the study subjects were from Jhangara Town, 40% (177) and 7% (30) came from other villages and villages near to the Manchhar Lake respectively.

The prevalence of Plasmodium slide positivity among the study subjects was 5.9% (26/438). Among Plasmodium slide positive children, 65% (17/26) were positive for P. falciparum and 35% (9/26) for P. vivax. Among tile P. falcipanun positive children, 88% (15/26) had scanty (MP 1-10-100 fields) and 12% (2/26) had moderate density (MP, 10-100/100 fields) of infection.

The prevalence of Plasmodiurn slide positivity was slightly higher in children less than five years of age and also, it, was higher in male (6.8%) compared to female children (4.8%). Seventeen percent (6/30) of the children from villages close to Manchhar Lake were Plasmodium slide positive compared to 7% (17/53) and 3% (5/177) from Jhangara town and other villages respectively (Table 1).

Table1. Distribution of blood slide positive by age group, gender, and area of residence of study subjects who attended the Rural Health Center, Jhangara, August-October, 1997 (n=438).

Variables	Number examined (n=438)		Prevalence of malaria (MP+)* (n=26)	
	No.	%	No.	%
Age (months)				
6 - 36	293	67	16	6
37 - 60	75	17	5	8
61 - 96	39	9	2	5
97 - 120	31	7	1	3
Gender				
Male	250	57	17	6.8
Female	188	43	9	4.8
Residence				
Jhangara town	231	5	17	7
**M. Lake villages	30	7	6	17
Other villages	177	40	5	3

* Malaria parasite positive blood slide

** Manchhar

Of 438 children only 11% (47/438) were using bed-net, among whom only 1 child had Plasmodiurn positive blood slide.

Cough, diarrhea, abdominal distention and vomiting were the commonly reported symptoms among the children of all ages at the time of interview (Table 2).

Table 2. Distribution of symptoms among the study subjects who attended the Rural Health Center, Jhangara, August-October, 1997 (n=438).

Variables	MP (+ve)* = 26	%	MP (-ve)*=412	%
Cough	8	31	155	38
Diarrhoea	7	27	99	24
Abdominal distention	4	15	60	15
Vomiting	4	15	58	14
Unwell off and on	0	-	16	4
Nausea	0	-	11	3
Cold	0	-	13	3
Major signs along with fever during physical examination				
Fever**	9	35	119	29
Pallor	10	39	112	27
Rash	7	27	58	14
Prickly heat	2	8	31	8
Dehydration***				
Mild	2	8	26	6
Severe	0	-	1	0.2
Splenomegaly	1	4	4	1
Hepathomegaly	0	-	3	0.7

* Malaria parasite positive blood slide & malaria parasite negative blood slide

** Fever $\geq 37.5^{o}C$.

*** Assessed through particular signs and general appearance of children such as lack of tears, tenting of skin and dry mucous membranes.

However, among the children aged 24 months or more, weakness, headache and abdominal pain were frequently reported symptoms (Table3).

Table 3. Distribution of symptoms among the study subjects for the children aged 24 months or more who attended the Rural Health Center, Jhangara, August-October, 1997 (n= 280).

Variables	MP (+ve) = 19	%	MP (-ve) = 261	%
Weakness	2	11	75	29
Headache	11	58	81	31
Abdominal pain	5	26	59	23
Rigors	8	42	19	7
Earache	0	-	17	7
Myalgia	0	-	11	4

Guardians reported fever as part of the illness in all children, although during physical examination only 128 (29%) had auxiliary temperature>37.5 °C at the time of visit. Pallor as an indicator for anemia, rash and prickly heat were the major observations among the study subjects (Table 2).

Discussion

Our passive case detection in a clinical setting has shown a point prevalence of 5.9% which is relatively low as compared to 40% to 70% in other districts of Sindh, such as Larkana[11]. This difference in prevalence in our study and the community based study done in upper rural Sindh (Larkana district, 1932) is perhaps dime to the time lapsed between both studies and the occurrence of an epidemic of malaria in that area at that time. A second reason could be that in the previous study", the indicator for malaria diagnosis was based on the spleen rate (enlarged spleen in proportion of study population), while our study looked at blood samples for malaria parasites. An enlarged spleen is also caused by many diseases such as Kalazar, Leukemia, and cytornegalo virus[14], etc. Moreover, low prevalence of malaria in Jhangara observed in our study could be due to weather, that is during the day the temperature is relatively high and dry, while at night it is windy and cool. We think in such condition mosquitoes are less likely to exist. In our study area, 91% of the subjects slept in open courtyards where such conditions exist. Additionally 11% of our study population was using bed-nets, which could result in the low prevalence of malaria. The difference in the prevalence of malaria in rural Sindh observed in this study and that from Punjab reported by Strickland's[15] could be in part due to difference in geographic and climatic conditions between Punjab and Sindh particularly in Jhangara. For example, in Punjab there is a continuous irrigation system, whereby crops are cultivated year round. Such a cultivation system provides an ideal breeding site for mosquitoes. Whereas, in case of Jhangara, the cultivation system is seasonal. This is consistent with the argument made by the World Health Organization[3] that the extent of the malaria problem can vary enormously from country to country, area to area and even within different groups of a population.

Of 30 children residing around Manchhar Lake, 5 (17%) had positive blood slides, compared to 21(5.1%) of 408 came from other Vllages which are situated away from Manchhar Lake. However, we

cannot be confident that the difference is not due to random variation within the study population. A similar study in Senegal[6], showed that the proximity of a childs residence to a neighboring marsh, similar to our Anopheles breeding sites, increased the incidence of malarial infections. However, if children were to reside away from such marshy areas, the incidence of malarial infections decreases sharply. This indicates that high exposure to vectors appear to be epidemiologically significant.

The effect of using bed nets for decreasing the prevalence of malaria is well documented[17]. A study conducted in Mandinkas, Gambia showed the lowest prevalence among three ethnic groups that were using bed-nets. Our study results too have shown a, significant effect of bed-nets. However, .a single child (2%) among the children who were using bed net was Plasmodium blood slide positive. This three-year-old child was wearing short sleeve clothes at home and had not screen net on their doors amid windows. The utilization of bed-nets is easy, durable, relatively cheap and does not require special expertise or a great deal of time putting up or maintaining them[4]. In addition, they are useful in protecting children against other pests, such as scorpions, centipedes, beetles, ticks and flies. This suggests a significant effect towards the protection of children from mosquito bites. We carried out this study in one site during a single transmission season: results might be different during other seasons or in other populations. Therefore, we suggest a prospective study be done in the future, in order to validate the prevalence estimation of malaria in this area.

Considering a prevalence of 5.9% Plasmodium blood slide positivity in this study population and frequency of prescription of anti malarial to all the study subjects by GP's in this area, the adherence to the current WHO protocol by the health workers for the treatment of malarial patient is suggested. This study shows the acquisition of parasitemia was higher among children who were residing in villages around Manchhar Lake. This is largely, because stagnant water provided suitable sites for mosquitoes breeding. Therefore, even though, malaria is difficult to eradicate, measures can be taken to minimize its incidence in villages near Manchhar Lake. New mosquito breeding sites should not be allowed to develop or be kept to a minimum. Swaps and canals, which are existing breeding sites for mosquitoes, should be sprayed with the appropriate insecticides by local malaria control program experts in order to control the vector. Educational campaigns to encourage the use of repellents, protective clothing, screening, bed-nets and other forms of personal protection against the bite of mosquitoes are important and widely recommended[18].

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