Severe Anemia in Children Infected With Malaria in Taiz - Yemen and Its Relation to Age, Parasitaemia and Eosinophilia

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Abstract: In Yemen, about 12 million individuals live in endemic areas of malarias, out of them more than 90% were due to Plasmodium falciparum (WHO, 2001 a)
Malaria continues to be a major health problem in Yemen .Severe anemia in malaric children occurs more frequently than cerebral malaria (Laurence et al, 1994).
The aim of this work is to detect the relation of severe anemia in malaric patients < 5ys with the parasitaemia level of Plasmodium falciparum .
This research was done in Alsewedi pediatric hospital in Taiz governorate from January to September 2008,for 100 admitted cases, results, of this study indicated the strong relation of severe anemia in falciparum malaric children to age < 5ys and there was no relation between the severe anemia in falciparum malaric children to the parasitaemia level .There was strong relation between younger ages and low level of Hb (P<0.05). These finding suggest that increase level of parasitaemia not related to severe anemia in P falciparum malaria. Also younger ages <5ys has strong relation to severe anemia Hb<5g per ul in falciparum malaria.
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1. Introduction

Plasmodium falciparum malaria causes 1-2 million deaths per year (WHO, 2001b), another half billion get infected but survive, most cases are found in sub-sahran Africa (Kahl, 2003).

Age and transmission intensity are known to influence the manifestations of severe falciparum malaria in African children (Idro, et al., 2006) .Malaria is one of the main causes why 3.5 millions low-birth weight infants are born each year in the region (Roger, 2000).

Reduction in severe disease and death from falciparum malaria in Africa requires new, more effective and inexpensive public health measures (Miller and Greenwood, 2002).

The burden of malaria in tropical world is estimated to involve 300-500 million episodes of acute illness and more than million deaths per year, mainly in African children. The emergence of Plasmodium falciparum resistance to widely used antimalarial drugs such as chloroquin has made malaria control and treatment much more difficult (D'AleTssandro and Butteins, 2001).

Resistance of Plasmodium falciparum to chloroquin was confirmed in most countries of Sub-Sahran Africa (Trape, 2001 & Carter and Mendis, 2002)

Highly complex and dynamic system (Craig et al., 2004). Malaria is mesoendemic and transmission is perennial, falciparum is the main species identified and A.arabiensis the main vector in Taiz (Daoud, 1988).

Malaria is one of the most common diseases in Yemen Arab Republic, Plasmodium falciparum represented > 90%, 20% of cases resistant to chloraquin (Al-Mawri, 2000).

2. Materials and Methods:

Study area:

Taiz Governorate in Yemen .It lies in the foothill and middle heights, which rang from 200-2000m elevation. The mean annual temperature between 20-3°c with little seasonal variation and relative humidity 40-60.The annual rainfall is 800-1200mm, and most of this fall in March-May and Augest-September.

In the present study used questionnaire for personal data, laboratory tests for each admitted malaric child and we get agree from each patient "consent"

The study was in Alsewedi - pediatric hospital in Taiz governorate / Yemen on 100 admitted positive Plasmodium falciparum malaria, age from 1 to 10 years regardless the sex .This study was from January to September 2008.

Peripheral blood smear (thick and thin) stained with Giemsa stain is used to identified the species, a sexual stage of parasite and the level of

parasitemia (WHO, 1985, Shute, 1988 & Garcia, 2001). Parasitaemia may be expressed as a percentage of RBCs infected, or as number of parasites present in l ul of blood. Since l ul of blood contains 5×10^6 RBCs,a 1% parasitaemia represents 50000 parasites per ul. (Moody, 2002).

Drabkins solution is used to determined hemoglobin level in g/dL(a colorimeter). Alonso et al (2002) defined severe anemia as Hb <5g per dl in patient with asexual form of P.falciparum in peripheral blood.

Counting eosinophil level:Eosinophil relative frequencies were determined by differential counting and for hospital study the absolute eosinophil count was obtained by multiplying the frequency with total leucocytes.

The eosinophil level were counted in non infected and infected children and the infected children divided as acute infection and asymptomatic infection.,the level of eosinophil also counted in infected children after cure.

The statistical analysis of data was carried out using statistical package for social science (Spss/ps).

3. Results:

The research aimed to detect the relation between severe anemia in malaric children to the age and level of parasitemia.

- According to study all the 100 positive cases were Plasmodium falciparum species.
- In present study, hemoglobin was classified into < 5g/dL and > 5-10g/dL according to (Alonso et al., 2000).

Table (1): shows the number of admitted patients according to age.

There were 45 positive cases their age < 5ys old, and 55 cases, their age from 5-10 ys , Total cases positive were 100.

Table (1): Number of malaric children according to age.

Age	< 5ys	5-10y
No	45	55
Total	100 cases	

<: less than. >: More than. g/dL : gram per deciliter. p/uL: parasite per micro liter. ys: years .
Hb: hemoglobin.
%: percentage PD: parasite density. P:*P Plasmodium*.

Normal children (non infected)

Table (2): Represented the percentage of Hb in malaric children in relation to their age:

In positive cases < 5ys old a bout 15/45 cases their Hb < 5g/dL, means those cases suffered from severe anaemia, then was positive significant correlation between the level of Hb and the age of positive case (P< 0.05) .

Table (2): Hb precent in malaric children according to age.

Age	<	5ys	5-10y	
Hb%	<5g/dL	>5g/dL	<5g/dL	>5g/dL
Cases	15	30	10	45
P.value	0.045			

<: less than. >: More than. g/dL : gram per deciliter. p/uL : parasite per micro liter. ys: years .
Hb: hemoglobin.
%: percentage PD: parasite density. P:*P Plasmodium*.

Level of Hb decreased with age, but level of Hb was > 5g/dL in about 30 positive cases their age > 5 ys .In positive cases their age from 5-10 ys about 10 cases their Hb was < 5 g/dL but 45 cases their Hb > 5 g/dL .This indicated that increase the age of patients , increasing the level of haemoglobin .At end of this table, the severe anaemia was in malaric patients their age < 5 ys.

Table (3): Represented the % of Hb in relation to level of parasitaemia (PD) . The numbers of positive cases < 5 ys and their Hb < 5 g/dL, their (PD) was 100 - 250 (P/ul) . The numbers of positive cases < 5 ys and their Hb > 5 g/dL, their parasite density was 500 - 1000 p/ul.

This indicated that there was positive relation between the Hb in malaric cases and age (P < 0.05). , but no correlation between severe anaemia in malaric cases and PD (P > 0.05) . This mean high level of parasitaemia not related to severe anaemia in malaric patients . The numbers of positive cases > 5 ys ,thejr Hb level > 5g / dL and their PD was 500-1000 p/uL but the numbers of positive cases > 5 ys and their Hb > 5 g/dL and their PD was > 10,000 p/uL . Means again that no relation between severe anemia and PD .Decrease Hb not means high level of parasite in peripheral blood.

Table (3): Hb concentration level in relation to level of parasitaemia (PD) in malaric children.

Age	<	5ys	5-10y	
Hb%	<5g/dL	>5g/dL	<5g/dL	>5g/dL
No. of cases	15	30	10	45
PD (p/uL)	100-250	500-1000	500	1000
P. value	> 0.05			

<: less than. >: More than. g/dL : gram per deciliter. p/uL : parasite per micro liter. ys: years .
Hb: hemoglobin.
%: percentage PD: parasite density. P:*P Plasmodium*.

Table (4): It represented the positive malaric cases with severe anemia who received blood transfusion < 5 ys. About 15 out of 45 positive cases

received blood. In positive cases > 5 ys 10 out of 55 cases received blood.

Table (4): Number of positive malaric children with severe anemia and received blood transfusion

Hb%	Blood transfusion	
	Yes	No
<5g/dL	15	30
>5g/dL	10	45
Total	25	75

<: less than. >: More than. g/dL : gram per deciliter.
p/uL : parasite per micro liter. ys: years .
Hb: hemoglobin.
%: percentage PD: parasite density. P:*P Plasmodium*.

Eosinophilia in Plasmodium falciparum infected children and non infected children:

About the infected child they are investigated for eosinophilia as acute infection and asymptomatic parasitemia. A significant drop in eosinophils was observed during acute illness, returning to normal value after cure, the percentage of eosinophil in non infected child was 5-5.5%.and the percentage of eosinophil in infected children in acute stage was 2.5-5%. In contrast a significant increase in eosinophil frequency was observed in children with asymptomatic parasitemia at the times of infection eosinophil frequency was scientifically higher in asymptomatic children than in clinical malaria., the percentage of eosinophilia in this group was 5-8%.

4. Discussion

Malaria caused by *P.falciparum* remain the major life threatening parasitic infection in the world, (Durand et al., 2005).

From table 1: indicate that the age <5 yrs is more exposed to severe malaria and anaemia.

Idro et al, 2006 reported a relation between manifestation of severe malaria in children < 5yrs and transmission intensity and anaemia, which agree with our funding.

It is clear that there is a strong relation between age <5 ys and decreased Hb. (Tbale 2). Kwadwo et al., 2003, recorded that severe anemia was diagnosed in 30 individuals ranging form 3 months to 5 ys, but was primary noticed in children <24 months. These results coinced with Price et al., 2001 they stated that there was relation between decreased age and decrease Hb. They also added that children age <5ys were more likely than bolder to become anemic in Thailand.

It is clear that no relation between decreased Hb and parasitaemia level (Table 3). On the other view Kwadwo et al., 2003, showed that parasitaemia was strongly associated with lower Hb in children <2ys of age. But Al Serouri et al., 2002, not agreed with our result, they showed that parasitaemic group had a significantly lower Hb than non parasitaemic group.

And about the level of eosinophil in our study, our data indicate that *p. falciparum* infection induce eosinophilia. Our study led us hypothesis that *plasmodium falciparum* infection induces eosinophil production but that the excess production in clinical malaria is out balanced may be due to increase sequestration or destruction due to inflammatory process in the tissue, kurtzhals et al., (1998) agree with our study, they mentioned the increase in eosinophil activity in acute Plasmodium falciparum infection in association with cerebral malaria. Shanks and Wilairatanaporn (1992) said that eosinophilia in persons from malaria endemic area my represent a normal late response to malaria infection.

Jungwon et al., (2005) mentioned that hematologist should consider the possibly of pseudoeosinophilia as result hemozoin-containing WBCs and confirm the WBCs differential count by microscopy in cases of malaria.

The absolute eosinophil count was increase above the normal range in 7% of American servicemen with acute malaria eosinophilia was found in 6% before treatment and 30% after treatment of malaria (Reilly and Barrett, 1971).

In Gambian children with acute uncomplicated malaria there was reduction or absence of eosinophils in the peripheral blood at presentation and these returned to at normal numbers in all cases 3-7 days after treatment of malaria (Abdullah, 1988). No such changes were seen in patients with chronic malarial anemia. A study in Thailand found that eosinophil counts were elevated in 11% of patients with acute malaria at presentation and 93%had elevated eosinophil count by the day 7 after treatment there was then a marked reduction of eosinophil count by day -14 followed by another increase by 28 day (Camach et al., 1999).

Recommendation:

Malaria as a cause of severe anemia in our children should be given a wide attention and followed from the researchers, a cadmic staff, ancftnedical students.

Malaria is a dangerous disease we should become more a wariness to this problem.

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