

Risks of *Plasmodium falciparum* parasitemia among 10 years or below children in Indonesia: a 2010 national study

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Abstrak

Latar belakang: In 2007, 396 (80%) dari total 95 kabupaten/kota merupakan daerah endemis malaria. Maka SK Menteri Kesehatan Nomor 293 tahun 2009 adalah tentang eliminasi malaria. Malaria menyebabkan anemia, berat badan rendah, co-infeksi dengan penyakit lainnya. Untuk mencapai eliminasi malaria penting menurunkan parasitemia malaria. Tujuan studi ini untuk menentukan karakteristik, sosioekonomi dan perilaku pada anak usia 10 tahun ke bawah terhadap kejadian *Plasmodium falciparum* parasitemia di Indonesia.

Metode: Studi ini menggunakan data Riskesdas 2010. Sebanyak total 72,105 orang diperiksa *Plasmodium falciparum* parasitemia dengan menggunakan Rapid Diagnostic Test Nusa Tenggara Barat (RDT, Merek NTB) didapat 16.666 anak usia 10 tahun ke bawah. Data dianalisis dengan uji regresi logistik.

Hasil: Prevalensi anak-anak berumur 10 tahun ke bawah yang terkena *P. falciparum* parasitemia ialah 1,1%. Dibandingkan dengan anak di perkotaan, anak di daerah pedesaan mempunyai risiko 3,3 kali lipat terkena *P. falciparum* parasitemia [rasio odds suaian (ORa)=3,34; 95% interval kepercayaan (CI)= 2,23–5,02].

Kesimpulan: Anak-anak 10 tahun ke bawah yang bertempat tinggal di pedesaan dibandingkan yang di perkotaan mempunyai risiko lebih tinggi terkena *P. falciparum* parasitemia. (*Health Science Indones 2012;2:xx-xx*)

Kata kunci: *Plasmodium falciparum*, parasitemia, anak 10 tahun ke bawah

Abstract

Background: In 2007, in Indonesia 80% of a total 495 districts/municipalities was malaria endemic. Most malaria parasitemia is *P. falciparum*, and it is related to several risk factors. This analysis aimed to identify dominant risk factors related to *P. falciparum* malaria parasitemia among children 10 years or below.

Methods: This analysis used a part of Basic Health Research year 2010 data. A total of 72,105 people were examined parasitemia using Rapid Diagnostic Test Nusa Tenggara Barat (RDT Brand NTB). They were 16,666 children aged 10 years old and below. We used logistic regression analysis to identify determinant risk of positive *P. falciparum*.

Results: The prevalence of positive *P. falciparum* was 1.1%. Compared with urban children, rural children had 3.3-fold higher risk to be positive *P. falciparum* parasitemia [adjusted odds ratio (ORa)=3.34; 95% confidence interval (CI) = 2.23–5.02].

Conclusion: Rural than urban under 10 years children had higher risk to be positive *P. falciparum*. (*Health Science Indones 2012;2:xx-xx*)

Key words: *P. falciparum*, parasitemia, children 10 years or below

Malaria is still a major health problem in Indonesia. In 2007, 396 (80%) of a total 495 districts/municipalities were malaria endemic, and the dominant type of malaria is falciparum and vivax malaria.^{1,2}

Achievement of the millennium development goal of reducing child mortality by two-thirds from the 1990 rate will depend on renewed efforts to prevent and control several communicable diseases including malaria in all WHO regions.³

Decree of Minister of Health Number 293, year 2009 is on malaria elimination. It is in accordance to the Millennium Development Goals (MDG's), among others, to decrease malaria disease.

The Rapid Diagnostic Test (RDT) is easy to use, reliable and simple to interpret. The RDTs are more suited to health workers in situations where health services are deficient or absent. Therefore, the test can be used as an epidemiological tool for the rapid screening of malaria.⁴ The Ministry of Health of Indonesia, at present distributing malaria Rapid Diagnostic Test (RDT) for more access to early diagnose and treatment.

This study aimed to identify several dominant risk factors related to positive *P. falciparum* among children aged 10 years and below.

METHODS

This analysis used a part of data Basic Health Research in 2010 that conducted in 32 provinces in Indonesia on a total of 2,798 Census Block. Samples were in accordance to Household Census, ear 2010 conducted by Statistics Central Beureau.⁵ There were 69,300 households with 251,388 people.

A total of 72,105 people were examined for malaria parasite using Rapid Diagnostic Test Nusa Tenggara Barat (RDT Brand NTB), produced in West Nusa Tenggara, Indonesia.⁴ The RDT were conducted by enumerator teams who had academic education on health. They were trained on how to examine plasmodium types.

For this analysis we selected subjects aged 10 years or younger, had *P. falciparum* only, and who did not have any malaria parasite. Therefore, we dropped subjects aged 11 year or older (55,439 subjects), who had *P. vivax* (16 subjects), mixed *P. falciparum* and *P. vivax* (10 subjects), and one subjects who had not valid result, leaving 16,666 subjects for the analysis.

Several risk factors were collected: sex, age, socio-economics (family expenditure, residence (urban/rural areas); preventive measure (use of mosquito net, take traditional medicines).

To identify several dominant risk factors related to positive *P. falciparum*, we used Stata released 9 using logistic regression methods.⁶

RESULTS

The prevalence of positive *P. falciparum* among children 10 years or below was 1.1% (182/16,692). Furthermore, Table 1 shows, in general, positive and negative *P. falciparum* were similarly distributed with respect of region, gender, age, and use mosquito net. However, compared to those who had quintile 5 subjects, quintile 4 subjects were 38% less likely to be positive *P. falciparum*.

Our final model (Table 2) notes that residence was a dominant risk factor related to positive *P. falciparum*. Compared to urban children, rural children had 3.3-fold to be positive *P. falciparum*.

DISCUSSION

Limitation of the study, among others, we did not elucidate fever symptom among the children.

According to regions, the malaria elimination target is in accordance to *P. falciparum* parasitemia detected among children 10 years and lower that detected more *P. falciparum* parasitemia in Java, Central Indonesia, and Eastern Indonesia. Malaria was prevalent in low socioeconomic conditions⁷⁻¹⁰ and low mosquito net use.¹¹

Children aged 10 years or below who lived in rural areas had 3.6-fold risk for *P. falciparum* parasitemia. It was more likely due to the environment. The rural area is more suitable for malaria vector breeding places. This was in accordance to the study conducted in rural and sub-urban settings in Gambia where malaria was prevalent.⁶ But it is in contrast for the association between risk of malaria infection and socioeconomic factors.⁷ A study in Bacan island, North Maluku Indonesia showed an associations between malaria among children 0-15 years old and low socioeconomic conditions.³

Although more of the children having *Plasmodium falciparum* parasitemia did not use mosquito nets, the preventive effect was not significant. Bacan

Table 1. Several demographic, socio-economic characteristics and risk positive *Plasmodium Falciparum*

	<i>P. falciparum</i>				Crude odds ratio	95% Confidence interval	P
	Negative (n=16,457)		Positive (n=182)				
	n	%	n	%			
Region							
Bali	82	0.5	1	0.5	1.00	Reference	
Java	2,228	13.5	13	7.1	0.48	0.06–3.70	0.480
Middle Indonesia	10,171	61.8	58	31.9	0.46	0.06–3.41	0.454
Eastern Indonesia	3,976	24.2	110	60.4	2.27	0.31–16.44	0.418
Gender							
Female	7,999	48.6	81	44.5	1.00	Reference	
Male	8,458	51.4	101	55.5	1.17	0.88–1.58	0.272
Age							
0-4 years	6,698	40.7	70	38.5	1.00	Reference	
5 years	1,568	9.5	19	10.4	1.16	0.70-1.94	0.570
6 years	1,693	10.3	23	12.6	1.30	0.81-2.09	0.278
7 years	1,693	10.3	13	7.1	0.73	0.41-1.33	0.309
8 years	1,524	9.3	16	8.8	1.01	0.59-1.73	0.987
9 years	1,639	10.0	21	11.5	1.23	0.75-2.00	0.416
10 years	1,642	10.0	20	11.0	1.17	0.71-1.92	0.548
Quintile 5	1,987	12.1	20	11.0	1.00	Reference	
Quintile 4	2,879	17.5	18	9.9	0.62	0.33-1.18	0.144
Quintile 3	3,284	20.0	37	20.3	1.12	0.65-1.93	0.686
Quintile 2	3,649	22.2	43	23.6	1.17	0.69-1.20	0.562
Quintile 1	4,658	28.3	64	35.2	1.37	0.82-2.26	0.227
Use mosquito net							
Yes	7,212	43.8	76	41.8	1.00	Reference	
No	9,245	56.2	106	58.2	1.08	0.78–1.09	0.577

Table 2. Residence and risk of positive *Plasmodium Falciparum*

	<i>P. falciparum</i>				Adjusted odds Ratio*	95% Confidence interval	P
	Negative (n=16,457)		Positive (n=182)				
	n	%	n	%			
Residence							
Urban	6,645	40.4	30	16.5	1.00	Reference	
Rural	9,812	59.6	152	83.5	3.34	2.23–5.02	0.000

*Adjusted for family expenditure

Island, possibly the children sleeping under the nets sometimes went out of the nets so they did not have enough protection.^{3,12}

In conclusion, 10 years or lower children who lived in rural compared to who lived in urban area had higher risk to be positive *P. falciparum*.

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