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Low birth weight and incidence of first malaria episode and adherence to malaria treatment protocols in infants in Chikwawa district, Malawi.

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Abstract

Background:
In Malawi, malaria is a leading cause of infant morbidity and mortality. Low birthweight and fetal anaemia are also a common occurrence. The relationship between birthweight and fetal anaemia and malaria morbidity in infancy is not known.
Objectives:
To investigate the relationship between incidence of first malaria episode and birthweight and fetal anaemia and to investigate adherence of health workers to Integrated Management of Childhood Illnesses (IMCI) malaria treatment protocol.
Design:
A stratified sample of 561 infants was selected based on low birth weight (LBW, <2.5Kgs), fetal anaemia (FA, Hbcord <12g/dl) and matched controls with normal birth weight (NBW) and no fetal anaemia (NFA). Cases were defined as LBW FA, LBW NFA, and NBW FA.
Results:
Cumulative incidence to first malaria episode did not significantly differ between the study groups and the controls. Sulphadoxine-pyrimethamine (SP) was prescribed to the majority of malaria cases (89.3%).
Conclusion:
There is no relationship between birthweight and fetal anaemia and first malaria episode. There is good adherence to IMCI guidelines for malaria treatment.

Introduction

In Malawi like other malarious areas, malaria is a leading cause of infant morbidity and mortality. In Malawi about 30% of paediatric hospital admissions and about 20% of paediatric deaths are attributed to malaria (Wirima, 1999). The Malawi Ministry of Health has malaria treatment guidelines (NMCP, 1992) which are supported by the IMCI guidelines (WHO, 2000). In 1993, Malawi became the first African country to switch to sulphadoxine pyrimethamine (SP) as the first line drug (Brabin et al., 1997). Fetal anaemia (FA) increased the risk of anaemia in infancy and we investigated if this was related to increased risk of malaria. We further investigated adherence of medical personnel to IMCI diagnostic guidelines and compared diagnosis of malaria by use of these guidelines and microscopy.

Subjects and Methods

A stratified sample of infants was selected based on low birth weight (LBW), fetal anaemia (FA) and matched controls with normal birth weight (NBW) and no fetal anaemia (NFA). Cases were defined as LBW FA, LBW NFA, and NBW FA. 561 infants from this sample were selected for a follow-up study. Four hundred and ninety four (67 did not return for various reasons) mothers in the follow-up study were asked to return to the hospital with their child at 4-weekly intervals and visits were integrated with the immunisation schedule. Data was also collected when the child was brought to a health facility with an intercurrent illness at unscheduled visits. If this visit was at a facility outside the study area, data was extracted from the child's under-5 health record. At recruitment a questionnaire was completed by a project nurse, which included information on age, literacy and obstetric history. At every visit, scheduled or unscheduled, to one of the two study hospitals, research nurses completed a questionnaire which included questions on cough, eye discharge and diarrhoea. Infants presenting with any illness were treated by Clinical Officers (CO) or Medical Assistants (MA) according to Malawi standard management guidelines (NMCP, 1992). Infant blood for malaria assessment was collected by finger prick at scheduled visits at 10, 18, 26, 38 and 52 weeks and with every illness when attending a study hospital. Malaria slides were stained with Giemsa and read counting asexual *Plasmodium falciparum* parasites against 200 white blood cells. The clinical diagnoses were established and documented by the Clinical Officers or Medical Assistants attached to the attended health facility. Data were analysed using SPSS for windows, version 11.0 (2001). The follow-up period was the number of days from birth to 1 year of age or last visit, whichever came first. Incidence estimates and their confidence intervals were calculated by dividing the number of new episodes of malaria by the duration of follow up and converted to annual rates. The study received ethical approval from the College of Medicine Research and Ethics committee.

Results

A total of 338 malaria diagnoses were made by Clinical Officers and Medical Officers. Of these, 75.2% of the infants were febrile and 89.3% were prescribed treatment with sulfadoxine pyrimethamine. There were 161 (47.6%) with an unknown malaria slide result, 71 (21%) with a negative and 107 (31.7%) with a positive malaria slide result. Infants with negative malaria slides were not more likely to have fever, respiratory infections, poor feeding or other illnesses but were more likely to have diarrhoea than those with positive malaria slide (Table I).

Table I: Number of infants by malaria slide result and illness

Symptoms	Malaria slide		
	Malaria +ve (n=107)	Malaria –ve (n=71)	p-value
Fever	87	56	NS
Respiratory Infection	26	20	NS
Poor feeding	19	13	NS
Diarrhoea	19	25	0.01
Other	17	13	NS

NS: Not significant.

There were 112 infants in the LBW NFA group, 124 with NBW FA, 35 with LBW FA and 199 controls. Duration of follow up times in years were 29.1 for LBW FA, 90.5 for LBW NFA, 96.6 for NBW FA and 171.7 for NBW NFA. Incidence of malaria in the LBW FA group was 0.83 (95% C.I. 0.5, 1.16); LBW NFA,

1.26 (95% C.I. 1.03, 1.49); NBW FA, 1.13 (95% C.I. 0.92, 1.34) and NBW NFA 1.15 (95% C.I. 0.99, 1.31). Cumulative incidence to first malaria episode did not significantly differ between the study groups and the controls (Table II).

Table II: Cumulative incidence (95% C.I.) of first malaria episode

	Month of follow-up				
Study Group (n)	**1**	**3**	**6**	**9**	**12**
LBW NFA (112)		0.10	0.38	0.60	0.75
		(0.04, 0.16)	(0.28, 0.48)	(0.50, 0.70)	(0.65, 0.85)
NBW FA (124)	0.01	0.09	0.34	0.53	0.66
	(0.0, 0.03)	(0.03, 0.15)	(0.24, 0.44)	(0.43, 0.63)	(0.56, 0.76)
LBW FA (35)		0.06	0.22	0.33	0.51
		(0.0, 0.14)	(0.05, 0.38)	(0.15, 0.51)	(0.33, 0.69)
NBW NFA (199)	0.01	0.07	0.34	0.55	0.66
	(0.0, 0.02)	(0.03, 0.11)	(0.26, 0.42)	(0.47, 0.63)	(0.56, 0.76)

Discussion

There were no differences in incidence of malaria between cases and controls. This confirms results by another study in Mangochi, Malawi (Slutsker et al., 1996) where malaria incidence did not differ between infants with LBW and NBW.

Sulphadoxine-pyrimethamine (SP) was prescribed to the majority of malaria cases (89.3%). This indicates good adherence to the Malawi National Malaria Control Programme guidelines for recommended treatment of febrile children (NMCP, 1992) as well as to the Integrated Management of Childhood Illnesses (IMCI) guidelines (WHO, 2000) both of which require that a febrile infant be treated for malaria. Among infants with a slide, 21% diagnosed as having malaria by the hospital personnel were actually slide negative. As such a considerable over-use of SP would have occurred. In addition, at least 10% of malaria cases would be missed if diagnosis on the basis of fever alone was used. In our study, of 245 respiratory infection episodes, 75.9% were febrile, of whom only 21.2% had a positive malaria slide, and all of these would have received anti-malarial treatment unnecessarily if IMCI guidelines were followed. This leads to over use of SP and may enhance development of resistance. The usefulness of diagnostic algorithms for managing malaria in children on the basis of such guidelines has been reviewed and they show good sensitivity and specificity, although most studies have only included children older than one year (Chandramohan et al., 2002). The accuracy of these algorithms is not sufficient to determine whether antimalarial drugs should be given to children presenting with febrile illness (Chandramohan et al., 2002). In a study in Nigeria, Afolabi et. al (2001), reported that the sensitivity of malaria clinical diagnosis in infants below 6 months was 32.7% (compared to microscopy) and specificity was 74.6%. Smith et al (1994) and Schellenberg et al (1994) have proposed methods which model fever risk as a continuous function of parasite density and can be used to estimate the probability that any individual episodes of fever is malaria attributable. In resource poor settings, without appropriate laboratory facilities, the IMCI guidelines for treating all febrile illnesses as malaria still offers a reasonable strategy for diagnosing infant malaria in febrile children.

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