Original article

Socioeconomic and cultural factors associated with mortality in Malaria induced anaemia among under-five children in Benin city, Nigeria

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Abstract:

Background: Children under the age of five years bear the brunt of malaria infection. Malaria induced anaemia (MIA) is the most prevalent presentation of malaria and a major cause of morbidity and mortality in Nigeria. ***Objective***: To determine the socioeconomic and cultural factors associated with mortality in under-five children presenting with malaria induced anaemia. ***Methods***: This is a cross-sectional descriptive study conducted at the Children Emergency Room of the University of Benin Teaching Hospital, Benin City, Nigeria. Questionnaires which were researcher-administered were used to collect information on the child's age, gender, parents' or caregiver's education, occupation, recognition of symptoms of malaria and anaemia, cultural practices during child's illness and patients' outcome. ***Results***: The case fatality rate was 3.1%. Poor parental education, low social class and lack of skilled job amongst the parents were associated with high mortality. Other factors associated with mortality include high patronage of chemists and prayer houses as well as poor recognition of pallor by mothers. ***Conclusion/Recommendations***: Improvement in socioeconomic status especially female education and empowerment is again emphasized. This and other socioeconomic boost should be targeted alongside malaria-control programmes in order to reduce mortality associated with malaria induced anaemia. Parental enlightenment on recognition of symptoms of malaria and anaemia will improve their health-seeking behaviour, promote early diagnosis and prompt institution of effective antimalarial therapy.

Key words: malaria; anaemia; under-fives; mortality; socioeconomic and cultural factors

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Introduction

Malaria remains a major public health problem worldwide. About two billion people are at risk of having malaria and 90% of such people live in the sub-Saharan Africa where malaria transmission is most intense. Globally, an estimated 300-500 million clinical malaria episodes occur annually with more than two million deaths yearly; most of these occurring in children under the age of five years.[1] These children exhibit inadequate immunity against malaria and are thus prone to the severe forms of the disease including life threatening complications.[2,3] Severe malaria is a major cause of childhood morbidity and mortality in developing countries.[2,4,5] and can present with one or more life threatening complications such as severe anaemia, cerebral malaria, hypoglycaemia and hyperparasitaemia among others. In holoendemic regions like Nigeria, malaria induced anaemia (MIA) is the most prevalent presentation of severe malaria in children accounting for as high as 30- 55% of cases.[5-7] The high prevalence of MIA worsens the problem of anaemia in children thus increasing the morbidity and mortality in under-fives.[8] Malaria induced anaemia contributes 37% to malaria mortality.[9] The burden of malaria-associated anaemia has been estimated at 190 000–974 000 deaths per year in children under five years of age.[9] Even with blood

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transfusion, case fatality rate for MIA is between 6-18%.[10]

The pathogenesis of malarial anaemia is often multi-factorial, complex and incompletely understood. Postulated mechanisms fall broadly under haemolysis and dyserythropoiesis. Malaria-associated anaemia may present either as an acute episode or as a chronic process following repeated, often, asymptomatic infection.[11] A number of studies have described the risk factors for malaria induced anaemia in Africa.[10, 12-14] These factors, however, have been mainly clinical, laboratory, environmental, host-genetic factors and principally include the infecting malaria parasite species, intensity of transmission, patient age and presence of other concomitant, non-malarial causes of anaemia. Socio-economic and cultural factors associated with MIA have, however not been evaluated.

Socioeconomic and cultural factors are important in disease transmission and outcome. This is more so in the case of malaria where the disease occur largely in certain geographical regions and pronounced in certain age groups compared to others.[15-17] An understanding of these factors is necessary for the design of preventive interventions. We therefore, evaluated the socio-economic and cultural factors associated with mortality in under-five children with MIA requiring blood transfusion, who were admitted into the Children's Emergency Room of the University of Benin Teaching Hospital, Benin City, in southern Nigeria.

Subjects and Methods

The study was a cross-sectional one carried out at the Children Emergency Room (CHER) of the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria from March to December 2009. Benin City is in the Southern part of Nigeria, lies in the rainforest belt as well as the malaria belt and has stable malaria transmission all through the year.

Subjects included under-five children with severe malaria anaemia requiring blood transfusion. Recruitment did not depend on absolute packed cell volume (PCV) or haemoglobin concentration of the patients but on the fact that they were anaemic and clinically decompensating. They were transfused with human immunodeficiency (HIV) and hepatitis surface antigen (HBsAg)-negative blood. Excluded from the study were children with suspected malaria without *Plasmodium falciparum* parasitaemia. Diagnosis of malaria was confirmed on the basis of the presence of asexual forms (trophozoites/ring forms) of malaria parasites.[18] The patients were recruited consecutively into the study. Questionnaires which were researcher-administered were used to collect information on the child's age, gender, parents' or caregiver's education, occupation, recognition of symptoms of malaria and anaemia, cultural practices during child's illness and patients' outcome. The socioeconomic status of the families were classified in accordance with the method described by Olusanya *et al*.[19]

Data collected were entered into the Statistical Package for Social Sciences (SPSS) version 16 for analysis. The results were cross-tabulated as frequency tables and contingency tables. Means, standard deviations, and ranges were used as appropriate to describe continuous variables. Fischer's exact test was used to test the strength of association where appropriate. Level of significance was set at $p<0.05$. The study was approved by ethical committee of University of Benin Teaching Hospital (UBTH), Benin city, Nigeria.

Results

Characteristics of study subjects

One hundred and sixty under-five children were studied made up of 93 (58.1%) males and 67 (41.9%) females giving a M: F ratio of 1.39: 1. Half of the under-fives 80 (50.0%) was in the age range 12 – 35 months with a median age of 26.5 (3 – 59) months [Table I].

Table I: Demographic characteristics of Under-Fives

Socio-demographic characteristics	Frequency (n = 160)	Percent
Age group (months)		
0 – 11	20	12.5
12 – 23	34	21.3
24 – 35	46	28.8
36 – 47	24	15.0
48 – 59	36	22.5
Sex		
Male	93	58.1
Female	67	41.9
Outcome		
Discharged	155	96.9
Died	5	3.1

Median age (Range): 26.5 (3 – 59) months. Sex Ratio (Male:Female): 1.39:1

Parents' socioeconomic and demographic characteristics and MIA occurrence

The majority of the mothers were married 124

(77.5%), Benin 87 (54.4%), had secondary level of education 92 (57.5%) with unskilled occupation 136 (85.0%). A higher proportion of the fathers had secondary level of education 83 (51.9%) with unskilled occupation 131 (81.9%). A higher proportion of the parents were classified as having middle socioeconomic status 66 (41.3%) [Table II].

Table II: Socioeconomic/demographic characteristics of parents

Socio-demographic characteristics	Frequency (n = 160)	Percent
Mothers marital status		
Married	124	77.5
Co-habiting	22	13.8
Single	11	6.8
Divorced	3	1.9
Mothers' ethnicity		
Benin	88	55.0
Esan	11	6.9
Others	61	38.1
Mothers educational status		
No formal	1	0.6
Primary	51	31.9
Secondary	92	57.5
Tertiary	16	10.0
Fathers educational status		
No formal	15	9.4
Primary	32	20.0
Secondary	83	51.9
Tertiary	30	18.7
Mothers occupation		
Unskilled	136	85.0
Semi-skilled	9	5.6
Skilled	15	9.4
Fathers occupation		
Unskilled	131	81.9
Semi-skilled	22	13.7
Skilled	7	4.4
Parents' socioeconomic status		
Low	61	38.1
Middle	66	41.3
High	33	20.6

Mothers' health-seeking behaviour, beliefs, practices and recognition of symptoms of Malaria Induced Anaemia.

A higher proportion of the parents 113 (70.6%) do not believe in alternative medicine, cannot recognize pallor 99 (61.9%) and took their under-fives to the chemist 124 (77.5%) for pre-hospital treatment. While 130 (81.3%) gave self medications before coming to the hospital, 29 (18.1%) of the children were given native concoctions. Only 46 (28.7%) of the mothers brought their children directly to the hospital for treatment. (Table III).

Table III: Parents health seeking behaviour, beliefs, practices and recognition of symptoms of MIA.

Characteristics	Frequency (n = 160)	Percent
Belief in Alternative Medicine		
Yes	47	29.4
No	113	70.6
Recognition of pallor		
Yes	61	38.1
No	99	61.9
Place of pre-hospital treatment		
Chemists	124	77.5
Hospital	46	28.7
Clinics	11	6.8
Herbalist	6	3.8
Prayer houses	6	3.8
Spiritualist	3	1.9
Pre-hospital intervention/practices		
Medications	130	81.3
Native concoctions	29	18.1
Scarification marks	16	10.0
Feet in fire	1	0.8
No intervention	22	13.8

Most of the mothers 121 (75.6%) recognised at least one symptom of malaria. Ninety eight (61.3%) mothers were aware that malaria could cause anaemia while 62 (38.7%) were not.

Patient Outcome and Socioeconomic/ Cultural Factors.

A hundred and fifty five (96.9%) of the children with MIA were discharged home while five died giving a case fatality rate of 3.1% (Table I). The under-fives

Table IV: Socio-demographic characteristics of Under-fives and outcome following MIA

Characteristics	Outcome of MIA Frequency (%)		p-value*
	Discharged	Died	
Age group (months)			
0 – 11	20 (100.0)	0 (0.0)	0.354
12 – 23	32 (94.1)	2 (5.9)	
24 – 35	46 (100.0)	0 (0.0)	
36 – 47	23 (95.8)	1 (4.2)	
48 – 59	34 (94.4)	2 (5.6)	
Sex			
Male	65 (97.0)	2 (3.0)	0.931
Female	90 (96.8)	3 (3.2)	

Fisher's exact test

that died were in the age groups 12 – 23 months 2 (5.9%) and 48 – 59 months 2 (5.9%) [Table IV]. This association was not statistically significant (p = 0.354). More females died 3 (3.2%) compared to males 2 (3.0%). This was not statistically significant (p = 0.931) [Table IV].

All the children that died had parents who were married and were unskilled workers. These findings were not statistically significant (p = 0.999). The majority had parents with low socioeconomic status 4 (80.0%), and fathers with secondary level of education 3 (60.0%). However, none of the findings was statistically significant (Table V).Worthy of note is the fact that majority 4 (80.0%) of the children that died were those of mothers with primary level of education (p = 0.035) (Table V), who were not aware that malaria could cause anaemia and did not recognise pallor in their children.

Among the parents who believed in alternative medicine (47), only 2 (4.3%) died. This was not statistically significant (p = 0.631) [Table VI]. Among the parents who sought pre-hospital treatment at the chemist (124) and spiritual homes (3), all [5 (4.0%)] and 1 (33.3%) of the children died respectively. While those who went to herbalist (6) and prayer houses (6), none of their children died. These findings were not statistical significant. Among the parents who administered native concoction (29), scarification marks (16), fire to feet (1), and did nothing (22), 2 (6.9%), 1 (6.2%), none and 4 (18.2%) of their children died. Only the statistical association between no intervention and treatment outcome was significant (p = 0.001) [Table VI].

Table V: Socio-demographic characteristics of parents and outcome following MIA

Characteristics	Outcome of MIA Frequency (%)		p-value*
	Discharged	Died	
Mothers marital status			
Married	119 (96.0)	5 (4.0)	0.588
Not married	36 (100.0)	0 (0.0)	
Mothers educational status			
No formal	1 (100.0)	0 (0.0)	0.035
Primary	47 (92.2)	4 (7.8)	
Secondary	92 (100.0)	0 (0.0)	
Tertiary	15 (93.8)	1 (6.2)	
Fathers educational status			
No formal	15 (100.0)	0 (0.0)	0.574
Primary	30 (93.8)	2 (6.2)	
Secondary	80 (96.4)	3 (3.6)	
Tertiary	30 (100.0)	0 (0.0)	
Mothers occupation			
Unskilled	131 (96.3)	5 (3.7)	0.999
Semi-skilled	9 (100.0)	0 (0.0)	
Skilled	15 (100.0)	0 (0.0)	
Fathers occupation			
Unskilled	126 (96.2)	5 (3.8)	0.999
Semi-skilled	22 (100.0)	0 (0.0)	
Skilled	7 (100.0)	0 (0.0)	
Parents' socioeconomic status			
Low	57 (93.4)	4 (6.6)	0.072
Middle	66 (100.0)	0 (0.0)	
High	32 (97.0)	1 (3.0)	

Fisher's exact test

Discussion

Malaria brings to bear a huge burden and a devastating impact on morbidity and mortality in childhood. Anaemia is an almost mandatory symptom of malaria, and severe anaemia constitutes the most frequent defining symptom of severe malaria[17] Socioeconomic and cultural factors affect the presentation and outcome of diseases.[16] Although the interaction between malaria, anaemia, and socioeconomic status is multifaceted, its knowledge is however fundamental for our understanding of childhood morbidity and mortality and for the development of effective intervention strategies. The current study revealed that very few parents with tertiary level of education had children who developed MIA. This is not surprising as high maternal educational status positively influences the health-seeking behaviour, socioeconomic status and economic power of the family.[20,21] Furthermore, most of the parents were unskilled workers. This is possibly related to the educational status of the parents. A poorly educated parent will likely be employed as an unskilled worker.

The social class of a family is dependent on many factors like the maternal level of education, father's occupation, income and housing. Majority of the children with MIA were from the low and middle socioeconomic class (SEC). It is not difficult to decipher why this is

Table VI: Socio-demographic characteristics of parents and outcome following MIA

Characteristics		Outcome of MIA Frequency (%)		p-value*
		Discharged	Died	
Belief in alternative medicine	**Yes**	45 (95.7)	2 (4.3)	0.631
	No	110 (97.3)	3 (2.7)	
Place of pre-hospital treatment				
Chemist	Yes	119 (96.0)	5 (4.0)	0.588
	No	36 (100.0)	0 (0.0)	
Herbalist	Yes	6 (100.0)	0 (0.0)	0.999
	No	149 (96.8)	5 (3.2)	
Prayer houses	Yes	6 (100.0)	0 (0.0)	0.999
	No	149 (96.8)	5 (3.2)	
Spiritualist	Yes	2 (66.7)	1 (33.3)	0.999
	No	153 (97.5)	4 (2.5)	
Pre-hospital intervention				
Native concoction	Yes	27 (93.1)	2 (6.9)	0.223
	No	128 (97.7)	3 (2.3)	
Scarification marks	Yes	15 (93.8)	1 (6.2)	0.414
	No	140 (97.2)	4 (2.8)	
Feet in fire	Yes	1 (100.0)	0 (0.0)	0.999
	No	154 (96.9)	5 (3.1)	
No intervention	Yes	18 (81.8)	4 (18.2)	0.001
	No	137 (99.3)	1 (0.7)	

Fisher's exact test

so. Most of the parents had maximum of secondary level of education and were unskilled workers, thus reducing their SEC. Also, people from low SEC are likely to live in poor accommodation and environment which tend to encourage breeding of mosquitoes. They are also more likely to live in houses without mosquito nets.

Knowledge about the symptoms of a disease by a caregiver can encourage early detection at home and presentation to the health facility for appropriate treatment. Over 75% of the mothers could recognise at least one symptom of malaria and 61% were aware that malaria could cause anaemia; however, only 38% could recognise pallor. Even though majority of the mothers knew the symptoms of malaria, if they could not recognise pallor, early presentation to the hospital may be hindered.

Parental cultural beliefs and practices can influence their health-seeking behaviour, place of pre-hospital management and consequently influence the progression of disease. In the current study, majority of the mothers had visited chemists to get medicines for their children before presenting to the hospital and most of the children had taken some forms of medication before presentation, while fewer numbers visited places like the herbalists and prayer houses. A lower rate of use of orthodox medications (22%) and herbs (20%) in children with malaria was documented by Olasehinde *et al*[22] in Ota, Ogun State, in Southwestern Nigeria. The high use of medications prior to presentation is perhaps predicated on the assumption that it is seemingly easier, cheaper and less time consuming for parents to buy drugs over the counter than to see a doctor in the hospital. Patronage of chemists prior to presentation may also be related to the parents' educational status (particularly maternal education) and SEC. An educated woman is more likely to seek health care from a competent source *ab-initio* than an uneducated one.[22] Delay in accessing appropriate treatment for malaria can enhance progression of uncomplicated malaria to severe forms of malaria.

Child health in addition to being a development indicator itself, is closely associated with other development indicators, such as adult health, educational attainment, productivity, and income.[23] Among the potential determinants of child health, the mother's education has been the focus of economists. More educated mothers may have healthier children because they have better knowledge about health care and nutrition, have healthier behaviour, and provide more sanitary and safer environments for their children.[24] An understanding of how the mother's education affects child health will help us to evaluate a very important development policy in the world today: the improvement of women's education.[25] In fact, two additional goals of the MDGs are to directly target the education of women.[26] Raising the education of girls is also the priority of the World Bank. [27] According to the World Bank, one primary

reason for this priority is that raising the education of women can greatly improve the health of the next generation. Our study justifies the policy priority.

Transfusion is an intervention which requires great care and should be limited to situations where it can improve survival as was the reason for transfusing our patients. Late presentation of patients in our setting many times leaves the physician with no other option. The fatality rate of the current study is lower than 7.5% recorded by Obonyo *et al*[28] among underfives with severe malaria anaemia in western Kenya. In their study, unlike in present study where all the patients recruited were transfused, transfusions were given to 20% of all admissions but to 70% of severely anaemic children. The mortality rate among severely anaemic children who were transfused vs. non-transfused children was comparable. This they explained to be due to the case mix of the children they sampled which did not distinguish children at high risk of mortality. Contrary to findings in the present study, Mockenhaupt *et al*[5] in their study conducted among hospitalized children with severe malaria in northern Ghana did not record any mortality due to severe malaria anaemia though it was the leading manifestation of severe malaria in the region; instead, malnutrition and circulatory collapse were the important predictors of fatal malaria. All the mothers of the children with mortality were unskilled workers and had given drugs before presentation to the hospital. Although cases of mortality were few, parental low socioeconomic class, parents with unskilled labour, maternal lack of recognition of pallor, prior intake of drugs were common factors found in the mortality cases. Thus, modification of these factors will go a long way in reducing mortality associated with MIA.

In conclusion, we dare say that malaria-control programmes alone may not suffice in the reduction of childhood mortality associated with MIA. We identified poor maternal education as a factor associated with MIA mortality. Therefore, in addition to malaria-control programmes, we have to recognize and consequently target the underlying socioeconomic factors which modify the disease outcome. There is need to emphasize improvement in socioeconomic status especially female education and empowerment as this will equip mothers with the ability to take appropriate decisions relating to the child's needs. The aforementioned and other socioeconomic boost may reduce morbidity and mortality associated with MIA. Parental enlightenment on recognition of symptoms of malaria and anaemia will encourage early detection of the disease at home as well as early presentation in competent health facilities and thus promote early diagnosis and prompt institution of effective antimalarial therapy.

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