THE GUARDIAN OCCUPATION AND FACTORS INFLUENCING MALARIA IN GHANA'S CENTRAL REGION

Abstract

Background: Malaria morbidity and death in young children in Sub-Saharan Africa are disproportionally high when compared to worldwide malaria. Although enhanced malaria control strategies have reduced malaria cases and mortality, they have had minimal influence on child malaria morbidity and mortality in Africa. The study looked at how guardian traits affected parameters related with child malaria.

Methods: Guardian characteristics and clinical data were collected from caregivers and children aged 0 to 15 years in a cross-sectional study utilizing questionnaires and clinical data in two regions in Ghana's central region. The obtained data was analyzed using multivariate GLM.

Results: The majority of guardians were females 216/274 (78.8%) and over the age of 25 201/274 (73.4%). The most common vocations were trading/business (92/274, or 33.6%), farming (55/274, or 20.1%), and hairdressing/seamstress (42/274, or 15.3%). The guardian occupation status (OCSG) influences all of the factors influencing childhood malaria: the first point of contact for child health (FPOCCH) (F=29.838, p0.0001), malaria control intervention adopted (MCID) (F=11.827, p0.0001), clinical severity of the child (CSOC), for

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malaria treatment by guardians, clinical severity of the child (CSOC) (F=98.997, p0.0001), the days of onset of child symptoms before the hospital.

Conclusion: The study found that guardian occupation influences malaria morbidity among children in Ghana's Central Region. Thus, poor household guardians expose their children to a higher risk of malaria while also paying less attention to their occupation rather than the child's health.

Keywords: *Plasmodium falciparum*, Malaria, Childhood malaria, guardian characteristics, clinical severity, Malaria morbidity and mortality

I. INTRODUCTION

Childhood malaria is a public health concern because it causes a disproportionate amount of morbidity and mortality in young children [1, 2]. 95% and 96% of the anticipated 247 million malaria cases and 619,000 malaria-related fatalities in 2021 occurred in Africa [3]. Children under the age of five are vulnerable to P. falciparum malaria, which accounts for almost 80% of all malaria deaths in Africa [3]. Malaria endemicity, host immunity, the efficiency of malaria control and prevention strategies, the availability or proximity of healthcare facilities, and health-seeking behaviors are all factors [4-6].

Malaria control initiatives have significantly reduced malaria cases and mortality worldwide [7, 8]. Significant developments and gains in diagnosis, treatment, and vector control techniques have had minimal influence on child malaria morbidity and mortality [8]. Although the causes of child malaria are complicated, the characteristics of parents or caregivers that influence malaria morbidity and death are unknown.

Several investigations of socioeconomic and sociodemographic determinants on the risk of malaria infections [9-11] are equivocal. Several studies [12, 13] have identified ethnicity, education, parental occupation, malaria control strategies, and living standards as risk factors for malaria infections. A systematic review and meta-analysis also found that impoverished children had greater rates of malaria infection than poor children [14]. A multivariate analysis, however, found no association between crowding, education, parental occupation, and ownership of housing assets, despite the fact that there was an association in the univariate study [14].

Malaria in children is treated if discovered immediately and without delay. Multivariate GLM was used to access characteristics such as malaria control intervention (MCID), occupational status (OCSG), educational level (EDULG), sex (SOG), and Guardian age category (AGECOG) and their effects on factors associated with child malaria such as clinical severity of the child (CSOC), clinical symptoms (CS), first point of call for child health (FPOCCH), and the days of on-set of child symptoms before the hospital visit (DOOSCS).

II. METHODS

1. **Data Collection:** A cross-sectional study was carried out in Twifo Praso and Assin Foso in Ghana's Central region [15]. Children with probable malaria who were attending Twifo Praso District Hospital in Twifo Praso or St. Francis Xavier Hospital in Assin Foso and whose guardians or parents agreed to participate in the trial were enrolled in the study after providing written informed consent. Questionnaires (Supplemental table) were distributed to parents and guardians to collect information such as malaria control intervention

(MCID), occupational status (OCSG), educational level (EDULG), sex (SOG), and Guardian age category (AGECOG).

Clinical severity of the child (CSOC), clinical symptoms (CS), the first point of call for child health (FPOCCH), and the days of onset of child symptoms before the hospital visit (DOOSCS) were obtained through a questionnaire, and clinical data including malaria parasitaemia, haemoglobin concentration (HB), Mean Cell Haemoglobin (MCH), and platelet count were obtained from the hospital's laboratory log book.

2. **Examination in a Laboratory:** The Sysmex KX-21 haematology analyzer was used to obtain the haemoglobin concentration (HB), Mean Cell Haemoglobin (MCH), and platelet count (PLT). The parasite density of the individuals was determined using Giemsa-stained smears. Participants with malaria parasite density > 70,000 N/mm3 and one or more of the clinical indicators HB 6 g/dl, PLT 90*109/L, and MCH 24 pg were deemed clinically severe malaria cases.

3. **Data Examination:** SPSS statistical software version 16 (SPSS Inc.) was used to analyze the data gathered. The characteristics and factors determining malaria severity in children of parents and guardians are presented in proportions and percentages. The effects of parental and guardian characteristics on factors influencing malaria severity in children were examined using a Multivariate Generalized module test (Multivariate GLM test), with statistical significance set at p0.05.

III. RESULTS

1. **Characteristics of Parents and Variables Influencing Malaria in Children:** The guardians (274 patients) and their children ages 0 to 15 (274 children) are re-enlisted in the trial. Questionnaires were distributed to guardians and parents in the Central Region of Ghana to collect guardian characteristics and factors influencing child malaria. The majority of guardians were females 216/274 (78.8%), while the majority were over the age of 25 201/274 (73.4%). Parents with a middle/junior secondary school education were 106/274 (38.7%), while those with a senior or vocational-technical education were 97/274 (35.4%). The guardians' major vocations were trading/business (92/274/33.6%), farming 55/274 (20.1%), and hairdressing/seamstress 42/274 (15.3%).

The age 0-5 years was 190/274 (69.3%), and the age 6-15 years was 84/274 (30.7%), 154/274 (69%), and 34/274 (12.4%) had mild and severe clinical malaria, respectively. Participants commonly displayed high body 233/274 (85%), lack of appetite 189/274 (69%), excessive crying 154/274 (56.2%), and less active 153/274 (55.8%). Guardians went to hospitals 89/274 (32.5%), drug or chemical stores 60/274 (21.9%), and clinics or health centres 58/274 (21.2%) for malaria treatment. Most guardians delay

malaria treatment for their children for more than a day after the onset of clinical symptoms. Guardians also used malaria protection measures such as mosquito nets, mosquito spraying, and mosquito coils (Table 1).

2. **Children's Clinical Malaria Data:** Clinical malaria data revealed a high median (range) parasite density of 89923 (64056-149541) parasites/mm3, a low median haemoglobin concentration of 8.40 (4.70-11.60) g/dl, a low median Mean Cell Haemoglobin of 24.8 (22.45-27.20), and a platelet count of 126 (87-146) x109/L of blood (Table 2). Participants with a parasite density greater than 70000 parasites/mm3 and a haemoglobin content less than 10 g/dl, as well as any other two clinical criteria, were classed as severe. High parasitaemia with all other normal parameters was classified moderate, while low parasitaemia with all other normal parameters was considered mild (Tables 1 & 2).

3. **The Features of the Guardian Influence the Elements that Contribute to Malaria in Children:** The multivariate GLM statistics revealed that the occupational status of the guardian (OCSG) (F=11.827, p0.0001), educational level of guardians (EDULG) (F=19.384, p0.0001), and age category of guardian (AGECOG) (F=192.593, p0.0001) significantly influenced the malaria control intervention adopted (MCID); the OCSG (F=29.838, p0.0001) and AGECOG (F=9. Furthermore, the OCSG (F=98.997, p0.0001) and EDULG (F=62.148, p0.0001) significantly influenced the clinical severity of the child (CSOC); the days of onset of child symptoms prior to the hospital visit (DOOSCS) and clinical malaria symptoms (CS) were both significantly influenced by OCSG (p0.0001) (Table 3).

IV. DISCUSSION

Despite recent developments and improvements in malaria control programs, malaria morbidity and death among children in Sub-Saharan Africa remain high [3, 7, 16, 17]. Delays in malaria diagnosis and treatment are exacerbated by socioeconomic variables [18-21]. The study looks at guardian traits and their relationship to clinical malaria severity in children in Ghana's Central region.

The findings found that females typically seek medical attention for children who have malaria. In most families, mothers are the focal point for their children's diseases [22]. Mothers are indirectly held accountable for childcare within the family [23, 24]. In a normal Sub-Saharan African household, women raise children and are responsible for the health and well-being of the children and the family [25, 26]. Mothers, understandably, govern the home, whereas men are responsible for the moral and economic power of the household [27, 28]. The father determines treatment decisions for the child, although both parents participate in separate decision-making in the child's healthcare process [28]. Previous research has found that the malaria status of children is determined by both parents [26-29].

The study found that guardian employment had a substantial impact on the adaptation of malaria control strategies in malaria-infected children's families. Although occupational exposure, education, and age are well-documented risk factors for malaria [13, 30], it is uncertain how an individual's occupation effects the selection and adaptation of malaria management and therapy for sick children. Surprisingly, the majority of guardians were farmers, traders, and hairdressers. Farming, trading, and hairdressing are all outside jobs that expose you to mosquito bites and a significant risk of malaria [31, 32]. The guardians (mothers) bring their young children to work, exposing them to malaria risk. Although most parents use treated mosquito nets or sprays, these treatments may not prevent malaria infection in their children since they were exposed to the vector prior to their usage.

Furthermore, guardian occupation has a substantial impact on the first point of contact for child health (malaria treatment), the days of development of child symptoms prior to the hospital visit, and the clinical severity of malaria in children. Self-employed or small-business entrepreneurs are more likely than others to put off obtaining medical care for a sick child [33-36]. Other variables, such as malaria preventive misconceptions and self-medication, or the use of non-medically advised malaria prevention measures, induce treatment delays [37-40]. The findings of this study coincide with previous reports on the impact of a guardian's work on proper malaria treatment in children [41].

Guardian education was found to be substantially related to household malaria control interventions, the first point of contact for child health (malaria treatment), and the clinical severity of malaria in children. The caretaker's educational level influences malaria control and prevention [42-44]. Misconceptions regarding malaria therapy and the successful management of malaria infections in children are exacerbated by low levels of knowledge. Guardians with at least a Senior Secondary school education raise malaria awareness and understanding about getting suitable malaria therapy for unwell children [41, 45].

The age of the guardian was substantially connected with household malaria control actions and the initial point of contact for child health (malaria treatment). In malaria-endemic locations, older caregivers get more experience in malaria management methods and seek proper healthcare for a sick child.

V. CONCLUSION

The study found that guardian occupation has a significant impact on malaria morbidity among children in Ghana's Central region. Malaria in children is connected with severe sociodemographic characteristics of guardians. Furthermore, guardians from poor households prioritize their employment over the health of their children, exposing them to a higher risk of malaria. Thus, disregarding early malaria symptoms and signs leads to severe malaria and malaria-related mortality.

1. **Terms are Defined as Follows:**
   - CSOC stands for Clinical Severity of the Child.
   - FPOCCH stands for First point of Contact for child health
   - DOOSCS stands for Days of onset of child symptoms before hospitalization
   - CS stands for Clinical Symptoms
   - MCID stands for Guardian's Malaria Control Intervention
   - OCSG stands for Guardian's Occupational Status
   - EDULG stands for Guardian Educational Level
   - SOG stands for Sex of the Guardian
   - AGECOG stands for Age Group of Guardians

2. **Declarations of Ethics Approval and Participation:** The Ghana Health Service Ethics Committee Institutional Review Board (GHS-ERC-17/01/12) and the University of Cape Coast Institutional Review Board (UCCIRB/28/09/3.1.1) authorized the study. All methods were carried out exactly as approved by the IRB and in accordance with the applicable principles and regulations of the Helsinki Declaration 2013 (64th World Medical Association General Assembly, Fortaleza, Brazil, October 2013).

3. **Participation Permission:** All recruited study participants provided written informed consent, including assent for adolescents aged 0 to 15, and parental consent for children aged 15 and under.

4. **Consent for Publication:** Not applicable

5. **Availability of Data and Materials:** All the data are available in the manuscript

6. **Competing Interests:** The authors declare no competing interests

VI. ACKNOWLEDGEMENT

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Table 1: Guardian Characteristics and Factors Influencing Malaria Morbidity in Children

Variables	N (%)
Sex of Guardian	
Male	58 (21.2%)
Female	216 (78.8%)
Age category of Guardian	

<25 years	73 (26.6%)
>25 years	201 (73.4%)
Educational level of Guardian	
Primary school	7 (2.6%)
Middle school/ JSS	106 (38.7%)
Senior Secondary school/ Voc-tech.	97 (35.4%)
College/ tertiary education	12 (4.4%)
informal education	52 (19.0%)
Occupational status of Guardian	
Farming	55 (20.1%)
Hairdresser/ Seamstress	42 (15.3%)
Driver	25 (9.1%)
Teacher/ government worker	16 (5.8%)
Trading/ business	92 (33.6%)
Artisan/ Mason	13 (4.7%)
Galamsey/ mines worker	2 (0.7%)
Unemployed	20 (7.3%)
Pension	9 (3.3%)
Child Age category	
0-5 years N (%)	190 (69.34%)
6-15 years N (%)	84 (30.66%)
Clinical severity*	
Severe	34(12.41%)
Moderate	86(31.39%)
Mild	154(56.20%)
Clinical symptoms	
High body temperature	233 (85.04%)
Less active	153 (55.84%)
Vomiting	45 (16.42%)
Headache	65 (23.72%)
Loss of appetite	189 (68.98%)
Stomach ache	54 (19.71%)
Diarrhea	32 (11.68%)
Convulsion	19 (6.93%)
Cough	23 (8.39%)
Excessive crying	154 (56.20%)
First point of call for child health	

Hospital	89 (32.5%)
Clinic /health centre	58 (21.2%)
Pharmacy shop	51(18.6%)
Drug/chemical shop	60 (21.9%)
Self-medication / herbal drug use	16 (5.8%)
Days of on-set of child symptoms	
1 day	44 (16.1%)
>1 day	230 (83.9%).
Malaria prevention intervention	
Usage of mosquito net	142 (51.8%)
Mosquito spraying	93 (33.9%)
Mosquito coils	39 (14.2%)

Table 2: Clinical Characteristics of Diagnosed Malaria Infected Children in the Central Region of Ghana

Characteristics	Median (Range)
Malaria parasites density (N/mm3)	89928 (64,056-149,541)
Haemoglobin (g/dl)	8.4 (4.70-11.60)
Mean Cell Haemoglobin (pg)	24.8 (22.45-27.20)
Platelet count (10^9 /L)	126 (87.00-146.00)

Table 3: Association Between Guardian Characteristics and the Factors Influencing Malaria in Children

Factor affecting child malaria [b]	**Guardian characteristics** [a]	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**p-value**
MCID	OCSG	5.954	3	1.985	11.827	<0.0001
	EDULG	4.2	3	1.4	19.384	<0.0001
	SOG	9.644	3	3.215		
	AGECOG	7.111	3	2.37	192.593	<0.0001
FPOCCH	OCSG	20.028	4	5.007	29.838	<0.0001
	EDULG	0.62	4	0.155	2.146	0.076
	SOG	0	4	0		
	AGECOG	0.486	4	0.122	9.877	<0.0001

CSOC	OCSG	33.224	2	16.612	98.997	<0.0001
	EDULG	8.977	2	4.489	62.148	<0.0001
	SOG	0	2	0		
	AGECOG	0	2	0	0	1
DOOSCS	OCSG	2.569	2	1.284	7.655	<0.0001
	EDULG	0	2	0	0	1
	SOG	0	2	0		
	AGECOG	0	2	0	0	1
CS	OCSG	18.455	1	18.455	109.977	<0.0001
	EDULG	0	1	0	0	1
	SOG	0	1	0		
	AGECOG	0	1	0	0	1

- [a] **Guardian characteristic;**
  - OCSG [Occupational status of Guardian]
  - EDULG [Educational level of Guardian]
  - SOG [Sex of Guardian]
  - AGECOG [Age category of Guardian]

- [b] **Factors affecting child malaria;**
  - CSOC [Clinical severity of the child]
  - FPOCCH [First point of call for child health]
  - DOOSCS [Days of on-set of child symptoms before the hospital visit]
  - CS [Clinical symptoms]
  - MCID [Malaria control intervention adopted by Guardian]