

## Research Article

### Epidemiological Profile of Malaria and Adherence to Treatment in Children under Five

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#### Abstract

Malaria caused by in Angola is spread throughout the country and is endemic in the 18 provinces, with a higher incidence in the Northern provinces. Treatment is based on combinations of and adherence to drug therapy has an influence on the effectiveness of treatment. The objective of this investigation was to describe the epidemiological profile and treatment adherence of children under five years of age with a clinical diagnosis of malaria. The research was developed at the Pediatric Hospital of Malanje from February to March 2019. A quantitative, cross-sectional and approach was applied in a non-probabilistic convenience sample of 150 patients with malaria and ant malarial treatment. This study used indirect methods (self-report) to assess treatment adherence with questions based on the Morisky-Green-Levine test at the end of treatment. It was possible to observe that 100.0% of the patients were infected by the parasite, with a mean age of 26.56 months and a standard deviation of 10.82, with 95 (63.3%) of the patients being female and

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mostly from the ethnic group 42.7%. The Morisky-Green-Levine test indicated an adherence of 41.3%, compared to other studies it is a negative adherence. There was no statistically significant difference, which requires a more in-depth study, with a larger sample size, necessary to confirm the observations. The present study contributes to encourage those who have the challenge of dedicating their work towards the development of knowledge, which enhances the appropriate understanding for the numerous diseases currently neglected such as malaria.

#### Introduction

Malaria is a health problem of high importance, due to its high worldwide incidence and the consequences it brings to people affected by the disease, significantly influencing the development potential of countries, regions and states due to the multiple costs it entails. Studies carried out in endemic areas have established that malaria causes considerable losses for families in the form of income, treatment costs, loss of schooling and reduced agricultural production [1].

It occurs mainly in tropical areas with the highest occurrence in Africa, Southwest Asia and America, and its highest incidence is in the African continent, where 92.0% of all cases and 93.0% of deaths from malaria in the world occur, mainly in children under five years old [2].

A decrease in malaria cases worldwide occurred between 2010 and 2017 with a decrease of around 18.0%. Southeast Asia continues to see its incidence rate decrease from 17 cases of the disease per 1000 at-risk population in 2010 to 7 in 2017 (a decrease of 59.0%). All other regions did not register variations in incidence, except for the region of the Americas, which registered an increase largely due to the spread of transmission of the infection in Brazil, Nicaragua and Venezuela [2].

In Angola, malaria is distributed throughout the country, being endemic in the 18 provinces. The Northern provinces are the most affected due to their geographic and climatic characteristics, becoming the main cause of death in Angola, also of hospital admissions and absence from school or work, causing a negative impact on the health of the populations in education and economy from the country [3,4].

The strategies to combat the disease that have been implemented, with the objective of identifying populations at risk, reducing the levels of transmission of the disease and making the health system of several countries more effective, have contributed significantly to the reduction of malaria cases as well as the mortality rate [2].

Children less than five years of age are the most vulnerable, with the World Health Organization estimated that in 2017, they accounted for about 61.0% (266,000) deaths from malaria worldwide. When considering that malaria increases the risk of iron deficiency anemia (52.0%), febrile syndromes, convulsions, blood transfusions and deaths at this age, it is considered a very vulnerable population to get sick and die from this cause [2].

Treatment is one of the fundamental pillars for successful malaria control, however, worldwide, a significant number of patients abandon or do not comply with medical prescriptions. In some African countries, as well as in Ecuador and Peru, low adherence to treatment is one of the main barriers encountered in the fight against malaria. It is consensual that non-adherence to malaria drug therapy is one of the main causes of treatment failure and can contribute to the maintenance of the protozoan transmission chain, causing damage to the patient, family, health service, specific community and even population in general [5].

Rapid diagnosis and treatment are the most effective way to prevent a mild case of malaria from turning into a serious illness and death. In order to guarantee the improvement of the infected patient, it is necessary to administer one or more drugs, the drugs are chosen by the doctor according to some information on the following aspects: type of infecting , patient's age, history of previous exposure, and other health problems, verified on a case-by-case basis. Next, we present a summary of the main drugs according to the level of use, respectively the most currently used and those with little use [6,7].

- ✓ Artemeter + Lumefantrine
- ✓ Artemether + Chloroquine (AS+CQ)
- ✓ Artesunate + Amodiaquine (AS+AQ)
- ✓ Artesunate + Sulphadoxine + Pyrimethamine(S+SP)
- ✓ Artesunate + Mefloquine (AS+MQ)

#### Little use drugs

- ✓ Piperaquine + Dihydroartemisinin
- ✓ Piperaquine + Dihydroartemisinin + Trimethoprim
- ✓ Dihydroartemisinin + Nafloquine
- ✓ Artesunate + pyronaridine
- ✓ Artesunate + Chlorproguanil + Dapsone

In the absence of a vaccine, chemotherapy remains one of the weapons used to reduce malaria-associated morbidity and mortality. The treatment aims to reach the parasite at key points in its evolutionary cycle or else to interrupt the blood that is responsible for the clinical manifestations of the infection, to interrupt the transmission of the parasite by preventing the development of the sexual forms. When ineffective drugs are used or there are delays in treatment, especially in *P. malaria*, the parasite load continues to increase and can trigger complicated malaria. In a few hours, the patient can progress to a serious illness with one or more of the following manifestations: coma, metabolic acidosis, severe anemia, hypoglycemia, acute pulmonary edema [7-10].

Based on these considerations, the following research question was developed: What is the epidemiological profile of malaria and treatment adherence in children under five years of age in the province of Malanje-Angola in the period February-March 2019?

This study aimed to describe the epidemiological profile and treatment adherence of children under five years of age with a clinical diagnosis of malaria.

## Materials and Methods

This is a descriptive study with a quantitative approach, which identifies the occurrence of malaria cases in the Pediatric Hospital of Malanje, whose sample of subjects was obtained by the non-probabilistic method for convenience.

The present study was carried out at the Pediatric Hospital of the province of Malanje, which is located in the Republic of Angola on the northern plateau, has the city of Malanje as its capital, has a territorial area of 98,302 km<sup>2</sup>, with an estimated population of 745,666 inhabitants whose density is 76 in /km<sup>2</sup> and has 14 municipalities and 67 communes [9].

Data collection was carried out in February-March 2019, through the application of a face-to-face questionnaire, after the project was approved by the local Ethics Committee under protocol No. 1997GPS/GPM/2018 and ref. No. 43/19.

The choice of instrument used was intended to respond to the research objectives and the characteristics of the population and environment under study. The questionnaire was built based on the reality of Angola and it was validated in meetings by experienced professionals. The questionnaire used comprises the following steps: characterization, characterization of the clinical profile, and the test to measure adherence to treatment, which includes four questions. The questionnaire was completed in person at the hospital after consultation with the doctor. In the first collection, the interview was carried out on data, epidemiological data, knowledge about the disease and the verification of the laboratory result to verify the. And in the second collection, questions were asked about the Morisky-Green-Levine test to assess adherence to treatment children under five years of age with a confirmed clinical diagnosis of malaria in the outpatient clinic of the Pediatric Hospital of Malanje and who during the February-March period were in outpatients under observation regarding the prescription of and were included in the study were included in the study. All patients described in the previous paragraph whose clinical condition justified hospital admission were excluded.

Adherence to treatment was measured using the Morisky-Green-Levine scale. The choice of the Morisky-Green-Levine Test is based on the fact that it has an easy-to-measure instrument available in Portuguese, with a relatively small number of understandable questions that provide the verification of the patient's attitudes and behaviors towards taking medication. The questions are designed to reduce the bias of positive responses. To quantify the phenomenon, the scale assesses adherence behavior through four questions (MMAS-4), with dichotomous answers (yes/no). Using self-report as the default.

“Have you ever forgotten to take your medication?”, “Have you taken the medication at different times than indicated?”, “When you feel well, do you stop taking the medication?”, and “If the medication ever feels bad, stop taking it?” According to the Morisky-Green-Levine test protocol, each negative answer corresponds to a point and at the end, a scale from 0 to 4 is obtained. In the original article, a score of 0 to 3 was considered as low or medium adherence and a score of 4 as a high grip [10]. In the present study, to simplify the analysis, participants who scored between 0 and 3 were considered “non-adherent” and participants with 4 points “adherent”. The limitation of the Morisky-Green-Levine test is that it only assesses adherence to drug treatment, not taking into account adherence to non-drug treatment [10].

People with an appointment were informed about the study, its purpose, objectives and the guarantee of confidentiality of responses. After obtaining the willingness to participate in the study, people were contacted by the investigator to fill out the questionnaire. The questionnaire was completed by the researcher in the referred hospital unit in the first and second collection and the clarification of the questions was also carried out by the researcher when requested.

Descriptive analysis of the data, represented in simple frequency or contingency tables, was performed using the Statistical Package for Science (IBM®SPSS) program, version 24 for Windows. An exploratory and consequently descriptive analysis of the data was carried out, where measures of central tendency and dispersion were calculated, in addition to absolute and relative frequencies. To measure association between categorical variables corresponding to rows and columns, that is, to determine whether the distribution of individuals among categories of one variable is independent of the distribution of individuals in categories of other variables (Null hypothesis) in an analysis of a contingency table Fisher's Exact test was used (more suitable because it always provides the exact value of p in the binomial test), as an alternative to the chi-square test (whenever the applicability conditions of this test were not satisfied, due to the reduced dimension of our sample and present expected numbers in the table less than five). For all statistical tests, a significance level of 5.0 % was considered.

Characterization of the patients studied.

The characteristics and the association with treatment adherence measured on the Dichotomous Scale are presented below, noting that of the 150 individuals included in the study, 95 (63.3 %) were female. With the stratification of the sample by ethnicity, 42.7 % belonged to the ethnic group. As for the child's caregivers, 48.7 % were civil servants. Regarding the level of education, it was found that (44.0 %) of the caregivers had reasonable education, having only completed the second cycle. Regarding the distance from home to the hospital, it was found that 51.3% traveled a distance of 2 km. The assessment of adherence using the dichotomous scale showed a prevalence of 58.7 % (n=88) of non-adherents.

It can be concluded that the null hypothesis is not rejected (since;  $p > 0.05$ ).

It can be concluded that the applied analysis model showed no significant association between treatment adherence and variables according to the Morisky-Green-Levine Test and Fisher's Exact Test.

### Responses obtained in the Morisky-Green-Levine Test

Table 1 shows the absolute frequency and percentage observed in each question of the Morisky-Green-Levine test. It was observed that 53.4 % of the patients reported having forgotten to take their antimalarial medication, 30.6 % stopped taking the medication when they felt well and 29.3 % did not care about the time to take the medication. Only 9.3 % of the patients reported that they stopped taking the medicine if they ever did not like it.

Epidemiological characteristics of the patients studied. The data in table 2.

There was no statistically significant association between epidemiological variables and treatment adherence. However, it was evidenced that 98.7 % of the patients who reported that they bought the drugs at the pharmacy were non-adherent, 68.7 % of non-adherents had no diagnosis of anemia and 44.7 % had malaria once.

Answers	YES (n=62)		NO (n=88)	
	N	%	N	%
Have you ever forgotten to take the medicines?	80	53,4	70	46,6
Have you taken the medications in different times than indicated?	44	29,3	106	70,7
When you feel good, stop taking the medicines?	46	30,6	104	69,4
If the medicine ever falls to you bad stop taking?	14	9,3	136	90,7

**Table 1:** Shows the absolute frequency and percentage observed in each question of the Morisky-Green-Levine test.

Adherents	62 (41,3%)
Not adherents	88 (58,7%)

Adherence to treatment							
Answers	YES (n=62)		NO (n=88)		Total		p Value
	N	%	N	%	n=150	%	
<b>N° of previously acquired malaria?</b>							
None	2	3,2	11	12,5	13	8,7	<b>0,076*</b>
One	34	54,8	33	37,5	67	44,7	
Two	18	29,1	23	26,1	41	27,3	
Three	6	9,7	14	15,9	20	13,3	
Four or more	2	3,2	7	8	9	6	
<b>Place of purchase of medicine?</b>							
Pharmacy	62	100	86	97,7	148	98,7	<b>0,512*</b>
Marketplace	0	-	2	2,3	2	1,3	
<b>Was diagnosed with anemia?</b>							
Yes	22	35,5	25	28,4	47	31,3	<b>0,420*</b>
No	40	64,5	63	71,6	103	68,7	

**Table 2:** Show the answers given by the children's guardians about the epidemiological characteristics, according to the results of the Morisky-Green-Levine Test and Fisher's Exact Test.

Factors related to knowledge about the disease.

The analysis of the data in table 3 reveals that 98.7 % of caregivers stated that Malaria is not a lifelong disease, 98 % that the disease can be controlled with diet and/or medication.

According to the knowledge about the disease in the analysis, we can conclude that H0 is not rejected between the variable "malaria is a disease for life" and "adherence to treatment" ( $p > 0.05$ ) and we conclude that we also do not reject the null hypothesis between the variable "malaria can be controlled with diet/drug" and "adherence to treatment" ( $p > 0.05$ ).

The tendency in answering questions about treatment adherence is for patients to give doctors positive answers, as they ask the questions in a way that the answers they want to hear are "YES". More than an attempt to override the positive response bias, this approach attempts to use this to gain insights into non-adherence.

Adherence to treatment							p Value
Answers	YES (n=62)		NO (n=88)		Total		
	N	%	N	%	n=150	%	
<b>Malaria is a lifelong disease?</b>							
Yes	0		2	2,3	2	1,3	<b>0,512*</b>
No	62	100	86	97,7	148	98,7	
<b>Malaria can be controlled with diet and/or medicine?</b>							
Yes	61	98,4	86	97,7	147	98	<b>0,99*</b>
No	1	1,6	2	2,3	3	2	

**Table 3:** Distribution of caregivers according to responses on factors related to knowledge about malaria, according to the results of the Morisky - Green - Livene test and the Fisher test.

The results obtained in this study do not differ much from the results found in previous studies carried out in the endemic regions of Asia and Africa, which, measuring adherence to treatment through self-report, found adherence frequencies ranging from 48.3 to 96.3 % [12-15].

Of the answers obtained by the caregivers of the children on the questions of the Morisky-Green-Levine Test, the highest percentages of positive attitudes of the total number of caregivers studied towards taking medication were “not to stop taking medication when it feels bad (90, 7 %), carelessness in taking the medication (70.7 %) and not taking the medication when feeling well (69.4 %).

The question with the lowest percentage of negative answers (46.6 %) was in relation to forgetting to take the medication.

Regarding characteristics, in the present study there was no statistically significant association between treatment adherence and variables. The results agree with the literature, as there are no statistically significant differences for sex, ethnicity, occupation of the caregiver, education of the caregiver and distance from the home to the hospital. In general, the vast majority of authors are unanimous in stating that adherence to treatment is not consistently associated with factors. According to Andrade (2002), female caregivers make the child better adhere to ant malarial treatment, achieving better control of the disease than male caregivers [16].

As for ethnicity, there was no statistically significant association with adherence, as well as (2000), Garcia (2003) and (2004), in the study on adherence to tuberculosis therapy, highlight that social characteristics are behind a series of behaviors that directly affect the way patients deal with their treatment. The ethnicity of each individual imposes attitudes that sometimes favor non-adherence to treatment [17,18].

Patients had a good level of knowledge about malaria, 98.7 % stated that malaria is not a lifelong disease and 98 % that it can be controlled with diet/medication. It is believed that patient education about the disease, treatment and prevention of diseases is essential as a way to benefit the process of treatment adherence.

## Conclusion

This study allowed us to estimate the frequency of adherence to malaria treatment, in Malanje-Angola, from February to March 2019, describing the epidemiology of the disease as well as the factors that contributed to its occurrence.

The reduced number of patients surveyed with a diagnosis of malaria during the research period can be considered a limitation for this study. However, the findings can be considered significant in the sense of providing information about a group of patients affected by the disease living in an endemic region.

On the other hand, the measurement of treatment adherence may have been biased in obtaining it through patients’ self-report. However, the rigorous planning and training of the researchers, as well as the careful collection of information and outcomes, contributed to the internal validity of the study and its reliability.

As has been seen, malaria has afflicted humanity since antiquity, having victimized many important characters in history and often changing the course of events. The disease remains a global public health threat.

Despite the decrease in malaria cases in recent years, the disease is still responsible for endemic diseases in the tropical and subtropical regions of the world and particularly in Angola, where the disease is spread throughout the country, with a higher incidence in the northern provinces, causing high rates of morbidity and mortality, and of these, children under five are the most vulnerable. is the main cause of the entity.

It is hoped that the present work will contribute to stimulate those who start a scientific career and want to embrace the challenge of dedicating their work towards the development of appropriate understandings for the numerous endemic diseases in Africa, such as malaria, a first and consensual example for all the world.

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