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Analysis of care-seeking pathways and factors influencing early and appropriate care-seeking for malaria patients in the Republic of Guinea: a cross-sectional study

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Abstract

Background Malaria is a major public health issue in Guinea and care-seeking behaviour is dominated by self-medication and delayed access to appropriate care. However early and appropriate care-seeking are essential to control and reduce complicate forms and mortality, particularly for the most vulnerable. This study was conducted to analyse the diagnostic pathway, and the factors associated with early and appropriate care-seeking for malaria patients in the Republic of Guinea.

Methods A cross-sectional study was carried out between December 2022 to March 2023 in nine health districts within health facilities and at community level. The study population was confirmed malaria patients with RDT or microscopy. Kroeger's conceptual framework was used to design the questionnaire. Conventional recourse was defined as using a healthcare facility or community services, early and appropriate care-seeking was defined as within 24 h of symptom onset in a conventional recourse, and care pathway as the sequence of recourses followed by each patient. Sankey alluvial plots were used to represent patients' diagnostic pathways, and logistic regression to identify factors associated with early and appropriate care-seeking.

Results A total of 3300 malaria patients were studied, of which 1632 (49.45%) were female and 1132 (34.30%) were under 5 years of age, with a median age of 23 months. At the time of the survey, 1337 (40.52%), 1423 (43.12%), and 437 (13.85%) of patients were respectively in their first, second and third recourse. A total of 2002 (60.67%) patients had sought care from a conventional recourse as a first line. Of all patients, 1757 (53.25%) had sought care within 24 h, while 28.55% had sought early and appropriate care. In the initial stages of treatment, self-medication was the most common approach, used by 1214 (37.30%). Patients from the health districts of Boffa (Lower Guinea, coastal region) OR = 0.48 95% CI 0.33–0.70, Dabola (Upper Guinea, savanna region) OR = 0.43 95% CI 0.30–0.63 and Labe (Middle Guinea, mountain region) OR = 0.63 CI 95% 0.43–0.91 ($p < 0.05$) were more likely to delay appropriate care-seeking, when compared to those in Dixinn, (Conakry). However, the under 5-year-old group OR = 1.55 95% CI 1.30–1.85 ($p < 0.001$) and the availability of a stable monthly household income OR = 4.98 95% CI 3.03, 8.27 ($p < 0.001$) were positively associated with early and appropriate care seeking.

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Conclusion A low rate of early and appropriate care-seeking was observed. Patients sought care through multiple means, often resulting in a delay in adequate management. The results show the need to deploy strategies adapted to the needs of communities.

Keywords Malaria, Associated factors, Early and appropriate care seeking, Care pathways

Background

Malaria is a major public health problem in worldwide. In 2022, sub-Saharan Africa accounted 95% of cases and 96% of deaths (80% of which were in children under five years of age) [1]. In this context, early and appropriate care-seeking is essential for the control and reduction of mortality, especially among the most vulnerable (children under five years of age, pregnant women) [2]. An analysis of global data showed that malaria care-seeking rates differ within and across regions [3]. Studies carried out in sub-Saharan Africa between 2005 and 2021 show proportions of early care-seeking among the suspected malaria cases under five years of age varying between 26.7% and 54.42%, with multiple recourse possibilities [4–7]. The integrated community-based approach to of managing febrile and diarrhoeal childhood illnesses, integrated into the health system, aimed to improve access to basic essential healthcare services, promote health, and minimize geographical barriers [8, 9].

From 1990 onwards, a liberalization of health care provision occurred following structural readjustment policies. The dissemination of primary health care concepts, initiated by the Alma Ata Declaration in 1978, was a key milestone event [10, 11]. In 2006, the World Health Organization (WHO) released recommendations, regarding early access to care i.e., within 24 h, and the modalities, which included health facilities, authorized sellers of health products, and community health workers [2, 12]. Since 2010, there has been considerable progress in malaria case management with the roll-out of artemisinin-based combination therapy (ACT) and laboratory confirmation through microscopy or rapid diagnostic tests at all levels [3, 13, 14]. Over the past decade, progress has been made in case management, but there are still many threats, including syndemics, conflicts, and extreme climate events [15].

Several additional factors exert an influence on the behaviour of individuals in terms of seeking care. These include how a patient is received at a healthcare facility, the perception of the causes and severity of the disease by the patient or his or her immediate contacts, and the availability of resources to finance the associated healthcare costs [16, 17].

In endemic countries the use of non-conventional forms of care, including self-medication, represents a significant aspect of healthcare-seeking behaviour. In Guinea, malaria represents the primary reason for consultations at health facilities, accounting for 47% of cases. However, significant progress has been made in terms of case management and access to prevention methods [18]. The prevalence of non-conventional care-seeking was observed at a rate of 53% at Donka Hospital in 2000 [19] and 44% in Coyah Health District in 2019 [20]. In 2021, approximately 61% of suspected cases in the community had sought care, with 32% doing so within 24–48 h [7].

Despite the abundance of data on the factors influencing the decision to seek malaria treatment, there is a paucity of information on the pathways taken by patients, particularly in Guinea. Considering the high disease burden of malaria and delays in seeking care, an analysis of the diagnostic pathway and the factors associated with early and appropriate care-seeking for malaria patients in the Republic of Guinea was conducted.

Methods

Study setting

Guinea is a coastal country in West Africa, with an area of 245,857 km^2. It shares its border with six countries and had an estimated population of 13,261,638 inhabitants in 2022 [21]. The entire population is at risk of contracting malaria. The public healthcare sector is organized in a pyramidal style. At the primary level is the community continuum, which provides for community healthcare workers and health posts, which are affiliated with health centres. In 2021, there were 2051 Health Posts and 423 Health Centres. The secondary level consists of referral hospitals, including 26 district, eight regional hospitals and eight communal medical centres. At the tertiary level, three national hospitals make up the Conakry University Hospital [22]. The private healthcare sector is found at all three levels of the health pyramid and is less regulated. There are more than 606 private structures, with 110 integrated into the National Malaria Control Programme.

A health district was randomly selected from each administrative region. The difference in malaria prevalence between the eight regions (< 1% in Conakry and 30% in the Nzerekore region) motivated the sampling of one district within each region to ensure the representativeness of the different areas. However, two districts were sampled in the Nzerekore region due to the size of the region (six health districts) and the prevalence of

malaria (30%). A total of nine health districts were sampled. In each health district, the referral hospital (district, regional or national) was selected. Then, randomly sampled a private facility integrated by the National Malaria Control Programme, an urban health centre, two rural health centres, two health posts and four community healthcare workers (Fig. 1).

Study population

The study population consists of malaria patients confirmed by rapid diagnostic test or microscopy, with age greater than or equal to six months, at the level of health facilities (public and private) and the community level. They were patients old enough to answer questions or parents or caregivers of sick children. The minimum sample size was defined at the level of each health district and is determined by the Schwartz formula ($n = \frac{z^2 * pq}{d^2}$) [23] with z confidence level at 1.96 (95% CI), the proportion of early seeking care at 32% [7] and a caution set at 5%. The minimum sample size per district was 334 patients distributed between the different levels of the health care system. The minimum sample size at the national level (N = n*9) initially defined was 3009 malaria patients, to be recruited from community health workers and health facilities. In each health facility, malaria patients at the end of a consultation, in hospitalization and who had accepted were selected.

Study design

This is an analytical cross-sectional study, the data derived from a research project on the determinants of malaria prevention in Guinea. The data were collected between December 2022 and March 2023 at health facilities and community health workers by health agents. Kroeger's conceptual framework, developed in 1983 in the context of healthcare-seeking in developing countries [24], has been adapted to the context of Guinea and used in this study. Only the quantitative component has been analysed in this article. The variables used in the study are described on Table 1.

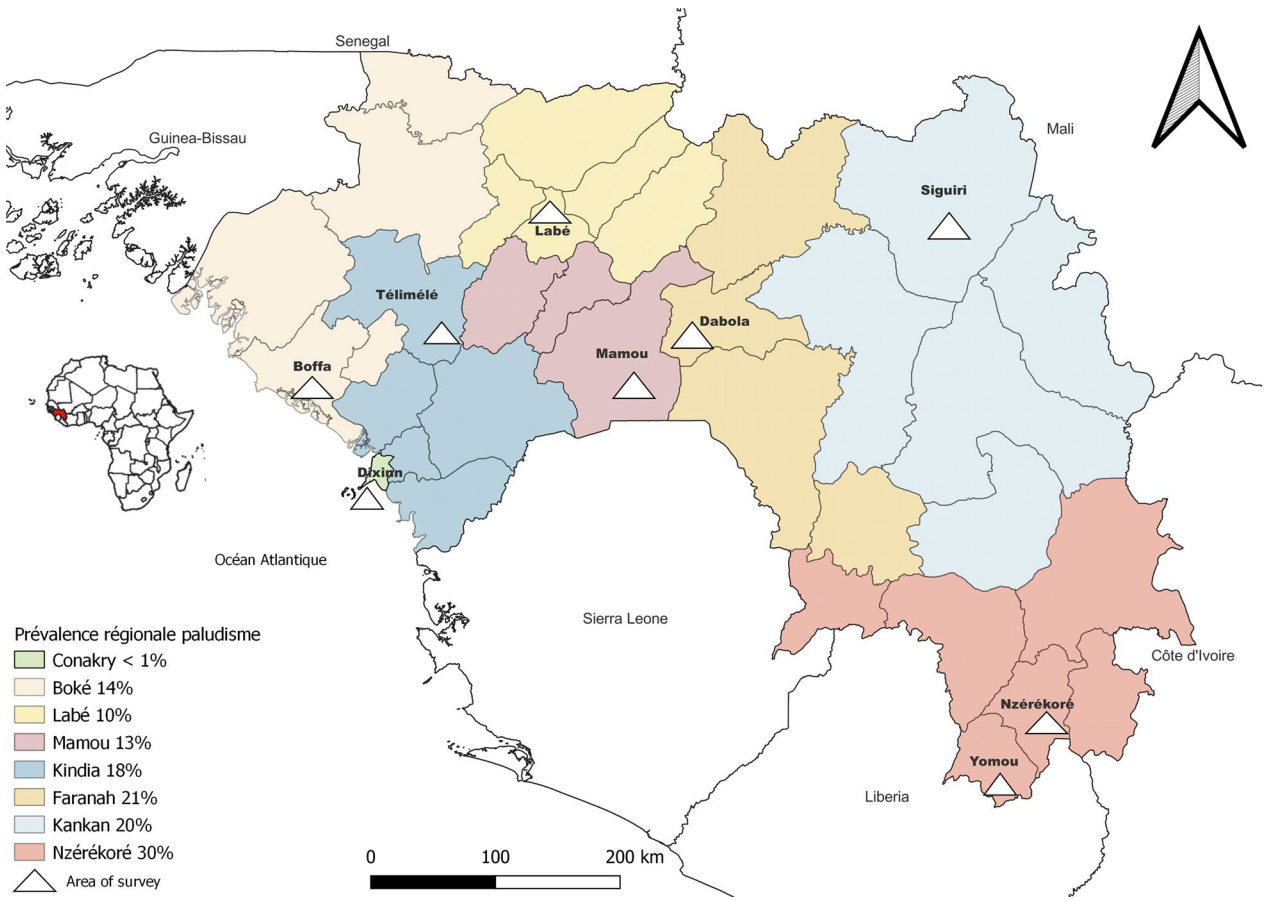

Fig. 1 Maps districts of study

Table 1 description of variables used

Variables	Definition	Type	Categories for categorical variable
Socio-demographic characteristics	Gender	Categorical	Male, Female
	Age group	Categorical	Under five years old, five years and over
	Age (Month for under five and years for others)	Continuous	
	Monthly income head of household	Categorical	No income, < 64 $, 64–116 $, 117–348$, 349–581 $, 582 $ and over
	Education level (level of education of respondents)	Categorical	No formal education, elementary level, secondary level 1, secondary level 2 (high school) and University level
	Relationship under 18 years (caregivers)	Categorical	Father, Mother, Other members and Civil autonomy
	Marital status (status of respondents)	Categorical	Married, single, widow/Widower, divorced
	Type of household (of household)	Categorical	Monogamous, polygamous
	Head of household (Manages the household)	Categorical	Husband, Wife, Co-management and Others
	Occupation (routine profession)	Categorical	Public servant, Farmer, Self-employed, Housewife, Student and Others
	Number of children under five years (for under five years group)	Categorical	No children, < =Two, three and more
	Ethnic group (These are the main ethnic groups)	Categorical	Fulani, Malinke, Soussou, Guerze, Toma, Kissi and Other
	Religion (Cult practice)	Categorical	Muslim, Christian, animist, Atheist
Geography	Natural region	Categorical	Lower Guinea (coastal region), Middle Guinea (Mountain region), Upper Guinea (Savana region, well-watered)
	Area (area of survey)	Categorical	Rural and urban
Clinical manifestations of the disease	Symptoms (set of clinical signs evoked by the patient or caregiver)	Categorical	Acute malaria symptoms, severe malaria symptoms, fever and pregnancy signs, and other symptoms
	Suspected disease (illness suspected by patients or caregivers)	Categorical	Malaria, malaria and other, pregnancy, teething, other, and don't know
	Severity of disease	Categorical	Not severe, severe and don't know
Care pathway	Recourse (means or methods used by the patient for care)	Categorical	Private facility, hospital, health Center, health post, Self-medication, Phytotherapy at Healer, Marabout
	Time symptoms and first recourse (duration between symptoms and first recourse)	Continuous	
	Care pathway (the sum of recourse to care provided by patients. When all the recourses used were conventional, the pathway was also conventional) Categorical	Categorical	Conventional and no conventional
Early and appropriate recourse	Seeking care within 24 h of the symptom's onset at the conventional sources (coded yes). This outcome variables depending on first recourse used and duration between symptoms to recourse	Categorical	Outcome (dependent variable)

Self-medication: Included the use of drug, herbal medicines without the advice of a health care provider or traditional healer

Health post: included health post and Community health workers

Marabout: religious healer according to Muslim practices

Conventional recourse: included health facilities (public or private) and Community health workers

Data collection and analysis

A structured, tested, electronic questionnaire, translated into local language used to collect data. The data collectors were undergraduate students at the end of their medical cycle and one master's degree student. Data were between December 2022 to March 2023. Informed consent was obtained from all participants. Data was collected anonymously and extracted from the ODK system in Excel format. The analyses were performed with R software 4.4.0 (RStudio 2023.12.0 + 369). A descriptive study of explanatory variables and variables of interest was conducted. Using bivariate models, differences

in first-line care-seeking by age group, gender, area, and education were explored. Multiple logistic regression was used to determine socio-demographic characteristics (region, area, age, sex, education, monthly income, occupation), clinical manifestations (signs and perception of severity) associated with the early and appropriate care-seeking. Odds ratios were estimated for each variable with corresponding 95% confidence intervals (CIs) and p values (alpha level = 0.05). The variables to be included in the multivariate model were selected based on the value of the Akaike Information Criterion (AIC) to optimize model performance via the function STEPAIC from the MASS R package (version 4.4.0). Associated factors in those under 5 years of age and those 5 years and older were analyzed separately. This approach was motivated by the stratification of malaria control strategies according to these two age groups. In addition to interpreting the results, the deployment of specific malaria prevention strategies in some districts was considered. To visualize the logistic regression results, the forest plots via function ggcoef_compare from GGally mass package of R were used. Concerning the analysis of the pathways, the alluvial diagrams of Sankey were used to represent in a general way the trajectories of the patients and specifically by the level of health facilities.

Results

Socio-demographic characteristics

A total of 3300 confirmed cases of malaria (uncomplicated, complicated and associated with other diseases) were interviewed in 60 health facilities, including 1162 (35.21%) were in rural areas. Approximately half of our sampled participants (1632, 49.45%) were female. About a third of the cases were under 5 years old, 1132 (34.30%) patients with a median of age 24 months (IQR: 12, 36). For those aged 5 years and older, the median age was 23 years (IQR: 12, 37). 1406 (42.61%) aged 18 years old and over. For under five groups, 788 (69.61%) and 283 (25,06%) were accompanied by the mother and father, respectively. In total, 1749 (53,00%) of patients and caregivers did not report any formal education, especially among under-fives, where the proportion was 658 (58,13%) of the caregivers. Our sample consisted of 1123 (34.03%) self-employed workers (salesmen, workers, and drivers), 829 (25.09%) housewives, and 557 (16.88%) farmers. Regarding marital status, 2791 (84.58%) of the respondents were married, of whom 1614 (57.83%) were in a polygamous household. The Fulani and Malinke ethnic groups were the most represented, with 1418 (43.01%) and 817 (24.78%), respectively. Most of the patients', child caregivers were Muslims, 2758 (83.60%). The average head household monthly income was $151 (SD: $131), of which 1024 (31.03%) had a monthly income between $116 and $350. Regarding clinical manifestations, 2801 (84.88%) reported signs of, uncomplicated malaria (including fever), and 366 (11.09%) reported signs of complicated malaria (convulsions, prostration, agitation, intractable vomiting). Most patients or caregivers suspected malaria 1548 (46,91%), with 46,29% and 47,23% respectively, among under five and five and over groups. Regarding the severity of the disease, 1147 (34.76%) of patients thought the disease was severe (Table 2).

Care pathways analysis

The diagnostic pathway of patients was not homogeneous. In the health facilities surveyed, 1337 (40.52%) patients were on their first recourse, 1423 (43.12%) on their second, 437 (13.85%) on their third. The most common first care recourse observed was self-medication, with 37.30%, followed by health centres at 25.24%, and hospitals at 17.48%. However, as a second option, hospitals were the most common with 41.30%, followed by health centres and self-medication with 17.41% and 16.11%, respectively. These proportions varied according to the level of the health facility surveyed and age groups. For example, for the under-five age group, self-medication was 51.43% for patients surveyed at the University Hospital and 30.23% for those seen in a private facility as first recourse (Additional file 1). The median time to seek care was 24 and 48 h, respectively, for those under 5 years old and those 5 years and over, the median time between symptoms and the use of a health facility was 72 h (IQR = 48.00–96.00). This time varies depending on the type of structure. On the other hand, the waiting time before diagnosis in the health facility was longer at the level of national hospitals and private structures, with median delays of 6.00 h (IQR = 5.00–7.00). Waiting times were shorter in rural health centres and health posts.

First recourse description

In total, 2002 (60.67%) of patients had taken conventional recourse as a first recourse of treatment. Based on the time limit, 1757 (53.25%) made an early recourse and 942 (28.55%) an early and conventional. However, the primary modalities used as first intention were self-medication with 1214 (37.30%), health centres with 833 (25.24%) and hospitals with 542 (17.48%). Easily accessible health posts and community workers accounted for 10.45% of the modalities used by patients. The reasons for the first recourse were multiple (financial, geographical accessibility, trust, and habit) for 1391 (42.15%).

First recourse according to age group

The first option used was the conventional source for 60.51% (95% CI 57.59–63.36%) in children under 5 years old and 60.75% (95% CI 58.65–62.80%) in those five years

Table 2 Description of socio-demographic characteristics of sample

	Under five N = 1132	Five years and older N = 2168	Overall N = 3300
Natural region			
Lower Guinea	268 (23.67%)	811 (37.41%)	1079 (32.70%)
Upper Guinea	338 (29.86%)	401 (18.50%)	739 (22.39%)
Middle Guinea	231 (20.41%)	515 (23.75%)	746 (22.61%)
Forest Guinea	295 (26.06%)	441 (20.34%)	736 (22.30%)
Area			
Urban	735 (64.93%)	1403 (64.71%)	2138 (64.79%)
Rural	397 (35.07%)	765 (35.29%)	1162 (35.21%)
Under five of age (Months, median (IQR))	24 (12–36)	–	24 (12–36)
Five years and over (years, median (IQR))	–	23 (12–37)	23 (12–37)
Gender			
Female	500 (44.17%)	1132 (52.21%)	1632 (49.45%)
Male	632 (55.83%)	1036 (47.79%)	1668 (50.55%)
Relationship under 18 years old			
Father	283 (25.00%)	273 (12.59%)	556 (16.85%)
Mother	788 (69.61%)	384 (17.71%)	1172 (35.52%)
Other members	61 (5.39%)	105 (4.84%)	166 (5.03%)
Civil autonomy	–	1406 (64.85%)	1406 (42.61%)
Education level			
No formal education	658 (58.13%)	1091 (50.32%)	1749 (53.00%)
Elementary level	189 (16.70%)	312 (14.39%)	501 (15.18%)
Secondary level 1	135 (11.93%)	282 (13.01%)	417 (12.64%)
Secondary level 2	94 (8.30%)	285 (13.15%)	379 (11.48%)
University level	56 (4.95%)	198 (9.13%)	254 (7.70%)
Profession			
Public servant	44 (3.89%)	131 (6.04%)	175 (5.30%)
Farmer	201 (17.76%)	356 (16.42%)	557 (16.88%)
Self-employed	415 (36.66%)	708 (32.66%)	1123 (34.03%)
Housewife	344 (30.39%)	484 (22.32%)	828 (25.09%)
Student	50 (4.42%)	200 (9.23%)	250 (7.58%)
Others	78 (6.89%)	289 (13.33%)	367 (11.12%)
Marital status			
Married	1,065 (94.08%)	1,726 (79.61%)	2791 (84.58%)
Single	50 (4.42%)	323 (14.90%)	373 (11.30%)
Widow/Widower	12 (1.06%)	95 (4.38%)	107 (3.24%)
Divorced	5 (0.44%)	24 (1.11%)	29 (0.88%)
Type of household			
Monogamous	624 (58.59%)	990 (57.36%)	1614 (57.83%)
Polygamous	441 (41.41%)	736 (42.64%)	1177 (42.17%)
Head of household			
Husband	1,027 (90.72%)	1,565 (72.19%)	2592 (78.55%)
Wife	38 (3.36%)	70 (3.23%)	108 (3.27%)
Co-management	6 (0.53%)	15 (0.69%)	21 (0.64%)
Others	61 (5.39%)	518 (23.89%)	579 (17.55%)
Ethnic group			
Fulani	439 (38.78%)	979 (45.16%)	1418 (42.97%)
Malinke	340 (30.04%)	477 (22.00%)	817 (24.76%)
Soussou	104 (9.19%)	298 (13.75%)	402 (12.18%)
Guerze	162 (14.31%)	236 (10.89%)	398 (12.06%)

Table 2 (continued)

	Under five N = 1132	Five years and older N = 2168	Overall N = 3300
Toma	20 (1.77%)	43 (1.98%)	63 (1.91%)
Kissi	10 (0.88%)	31 (1.43%)	41 (1.24%)
Other	57 (5.04%)	104 (4.80%)	161 (4.88%)
Religion			
Muslim	923 (81.54%)	1,835 (84.68%)	2758 (83.60%)
Christian	182 (16.08%)	287 (13.24%)	469 (14.22%)
Animist	3 (0.27%)	11 (0.51%)	14 (0.42%)
Atheist	24 (2.12%)	34 (1.57%)	58 (1.76%)
Head household monthly income			
No income	24 (2.12%)	66 (3.04%)	90 (2.73%)
< 64 $	355 (31.36%)	611 (28.18%)	966 (29.27%)
64–116 $	346 (30.57%)	673 (31.04%)	1019 (30.88%)
117–348 $	324 (28.62%)	700 (32.29%)	1024 (31.03%)
349–581 $	59 (5.21%)	89 (4.11%)	148 (4.48%)
582 $ and over	24 (2.12%)	29 (1.34%)	53 (1.61%)
Symptoms			
Acute malaria symptoms	898 (79.33%)	1,903 (87.78%)	2801 (84.88%)
Severe malaria symptoms	214 (18.90%)	152 (7.01%)	366 (11.09%)
Fever and pregnancy signs	0 (0.00%)	38 (1.75%)	38 (1.15%)
Other symptoms	20 (1.77%)	75 (3.46%)	95 (2.88%)
Disease suspect			
Malaria	524 (46.29%)	1,024 (47.23%)	1548 (46.91%)
Malaria and other	29 (2.56%)	83 (3.83%)	112 (3.39%)
Pregnancy	–	38 (1.75%)	38 (1.15%)
Teething	136 (12.01%)	–	136 (4.12%)
Other	208 (18.37%)	466 (21.49%)	674 (20.42%)
Don't know	235 (20.76%)	557 (25.69%)	792 (24.00%)
Disease severity			
Not severe	671 (59.28%)	1437 (66.28%)	2108 (63.88%)
Severe	449 (39.66%)	698 (32.20%)	1147 (34.76%)
Don't know	12 (1.06%)	33 (1.52%)	45 (1.36%)

and over. However, self-medication was the principal modality as a first intention with 36.31% (95% CI 34.03–39.73%) and 37.04% (95% CI 35.51–39.63%), respectively, among those under 5 years and those five years and over ($p < 0001$). Early care seeking for all modalities is 63.61% in those under 5 years old and 47.83% in those 5 years of age. In addition, the early and conventional seeking care was 28.55% with 33.66% (95% CI 30.92–36.51%) in those under five years and 25.88% in those five years and over (95% CI 24.05–27.78%) with $p < 0.001$.

First recourse by gender

According to gender, 62.32% of women and 59.05% of men sought care in a conventional facility as a first line with 95% CIs of (59.91–64.67%) and (56.64–61.42%), respectively ($p = 0.055$). Differences by source of first care seeking were significant $p = 0.002$. The main modalities used in the first line among females were self-medication with drugs and herbs 581 (35.60%), health centres 464 (28.43%) and hospitals 241 (15.99%). For male patients, these modalities were respectively 650 (38.97%) for self-medication, 369 (22.12%) for health centres and 316 (18.94%) for hospitals. A total of 456 (27.94% 95% CI 25.79–30.20%) of women and 486 (29.14% 95% CI 26.98–31.39%) of men sought conventional care within 24 h of symptom onset. Then, 390 (23.90% 95% CI 21.86–26.06%) of women and 425 (25.48% 95% CI 23.42–27.66%) of men sought non-conventional care within 24 h ($p = 0.047$).

First recourse according to area

The search for conventional care in the first line by patients in rural areas was 689 (59.29%, 95% CI 56.40–62.13%, while in urban areas, it was 1313 (61.41%, 95% CI 59.31–63.48%) with p = 0.2. In rural areas, self-medication was 457 (39.33%, 95% CI 36.52–42.21%), health centres 375 (32.27%, 95% CI 29.60–35.06%) and health posts 263 (22.63%, 95% CI 20.28–25.17%) were the main modalities used. In urban areas, the main modalities were self-medication, hospitals, and health centres with respectively 774 (36.20%, 95% CI 34.17–38.29%), 562 (26.29%, 95% CI 24.44–28.22%) and 458 (21.42%, 95% CI 19.71–23.24%). The use of private structures as a first-line of treatment remains low in both areas 9.87% (urban) and 3.10% (rural). The difference observed is significant for early and appropriate research (p < 0.001). A total of 619 (28.95%, 95% CI 27.05–30.93%) in urban areas and 323 (27.80% CI 95% 25.26–30.4%) in rural areas sought conventional care early. Early search for non-conventional care was 476 (22.26% 95% CI 21.53–24.10%) and 339 (29.17%; 95% CI 26.59–31.90%) in urban and rural areas, respectively.

First recourse according to formal education

The conventional care seeking first-line for people who had received formal education (sick or caregivers of sick children) was 1090 (62.32%, 95% CI 60.00–64.59%), while in the group reporting no formal education, the proportion was 912 (58.80%; 95% CI 56.03–61.26%) with p = 0.039. According to the modalities used as a first recourse, self-medication accounted for 615 (35.16%, 95% CI 32.93–37.46%) and 606 (39.07%, 95% CI 37.28–42.21%) respectively in patients who received formal education and in those who reported no formal education. Health centres and hospitals accounted for 28.07% (95% CI 25.99–30.25%) and 14.75% (95% CI 13.14–16.52%), respectively in the first group, then by 22.05% (95% CI 20.03–24.21%) and 20.57% (95% CI 18.60–22.68%) for the second group (p < 0.001). Finally, according to the time frame and the modality used in the first line, the early and appropriate seeking of care was 501 (28.64%, 95% CI 26.55–30.84%) and 441 (28.43%, 95% CI 26.21–30.76%) for those with formal education and those without formal education (p = 0.14), respectively.

Pathway

In total, 1963 patients sought care on two or more occasions. Using Sankey's alluvial diagrams, the care pathways of this group of patients were visualized. Overall, the primary modalities used as first recourse were self-medication 62.61%, health centres 11.77%, and district hospitals 8.20%. The non-conventional modalities used as second recourse, were self-medication 4.43%, herbal medicine from traditional healers 0.61%, and spiritual healers ('marabout') 0.10%. This visualization demonstrates the complexity of patients' care pathways using various modalities and multiple recourses within a healthcare structure. These findings prompt inquiries into the quality of malaria care within health facilities (Fig. 2). According to health facilities level, the differences in patient's pathways were observed.

- At the University Hospital level, as a first recourse, there were mainly self-medication 59.78%, private facilities 21.23%, and hospitals 12.85%. Only one patient had used a non-conventional modality as a second recourse, and 70.95% sought their diagnostic and care recourse. This level's total number of recourses was five (Additional file 2).
- For district hospitals (regional, district), the maximum number of recourses patients use was five. At this level, self-medication was also the primary modality used as first recourse at 54.57%, followed by hospitals at 16.11% and health centres at 11.90%. The differences compared to the University Hospital are the proportions of patients using non-conventional modalities as a second recourse, 2.64% and 0.72% respectively for self-medication and traditional healers. In total, 64.18% of patients sought diagnostic and care services at district hospital in second line (Additional file 3).
- At the health centres (rural and urban), the proportion of self-medication as the first recourse was higher than the first two levels, at 69.62%. Additionally, 17.44% of patients utilized a health centre as their first recourse. The visualization also shows the use of self-medication as the second and third recourses, with 6.47% and 1.55% respectively. The number of recourses for these primary level structures was six (Additional file 4).
- At the community level (health posts and community health workers), most patients had initiated their treatment through self-medication, at 84.96%, and 67.67% were at the diagnostic and treatment stage as a second recourse (Additional file 5).
- In the private facilities integrated by the National Malaria Control Programme, as a first recourse, self-medication accounted for 55.56%, private facilities for 33.33%, and spiritual healers for 3.70% of the main recourses. At the second recourse, 83.33% of patients were at the diagnostic and management step (Additional file 6).

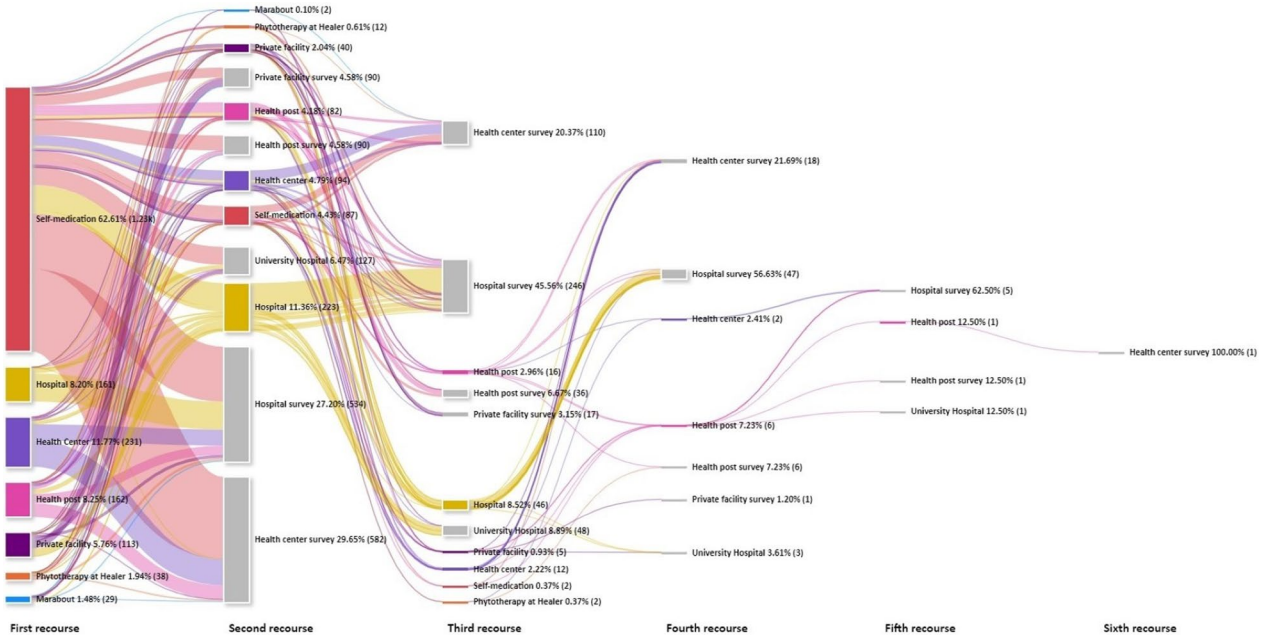

Fig. 2 Care pathway, all health facilities levels

Associated factors at early and appropriate care-seeking

A total of 942 (28,55%) cases made an early and appropriate care-seeking. In addition, significant differences were observed for early and appropriate care seeking by district, age group, relationship status, monthly head household income, and perceived severity of suspected disease ($p < 0.001$). Overall, patients from the health districts of Boffa (Lower Guinea, costal region) OR = 0.48 95% CI 0.33–0.70 ($p < 0.001$), Dabola (Upper Guinea, savanna region) OR = 0.43 95% CI 0.30–0.63 ($p < 0.001$), and Labe (Middle Guinea, mountain region) OR = 0.43–0.91 ($p = 0.016$) were more likely to delay appropriate care seeking (final ORs). However, patients in the age group 5 years and older with a final OR of 1.55 95% CI 1.30–1.85 ($p < 0.001$) and the availability of a monthly household income ($p < 0.001$) were positively associated with early and appropriate care seeking (Fig. 3).

Children under five years of age

The final logistic regression model showed that patients from the health districts of Dabola OR = 0.29 95% CI 0.11–0.71 ($p = 0.009$) and Siguiri OR = 0.38 95% CI 0.14–0.93 (0.042) in the natural region of Upper Guinea and Labe OR = 0.28 95% CI 0.10–0.70 ($p = 0.010$) in the Middle Guinea region were at risk of delayed appropriate care-seeking. On the one hand, children from households with three children under 5 years old or more OR = 4.39 95% CI 1.44–13.7 ($p = 0.009$) and suspicion of teething OR = 2.10 95% CI 1.32–3.42 ($P = 0.002$) were more likely to receive early and appropriate care. On the other hand, households reporting a monthly income were positively associated with early and proper care-seeking. However, this study showed that the perception of disease severity by child caregivers was associated with delay OR = 0.56 95% CI 0.42–0.74. (Additional file 7).

Five years old and over (adults included)

The final model showed, on one hand, that patients from the health districts of Boffa OR = 0.47 95% CI 0.31–0.73 ($p < 0.001$) in the Lower Guinea region and Dabola OR = 0.43 95% CI 0.27–0.67 ($p < 0.001$) in the Upper Guinea region, and on the other hand, those reporting a university level of education OR = 0.47 95% CI 0.32–0.69 ($p < 0.001$) were more likely to delay early and appropriate care-seeking. However, the age group of 18–24 years OR = 1.02–1.89 ($p = 0.041$), the availability of a monthly income within the household (overall $p < 0.001$), suspicion of malaria associated with other morbidities OR = 1.96 95% CI 1.07–3.85, and suspicion of diseases other than malaria OR = 1.53 95% CI 1.16–2.02 ($p < 0.003$), as well as the absence of information on the severity of the disease OR = 4.30 95% CI 1.26 to < 27.00 ($p = 0.049$), have associated with seeking care within 24 h of symptom onset at a health facility (Additional file 8: factors associated five years and over group).

Discussion

In this study, 2 out of 5 patients were at their first care option, and the others were at their second or more recourses. In the first intention, about two-thirds of

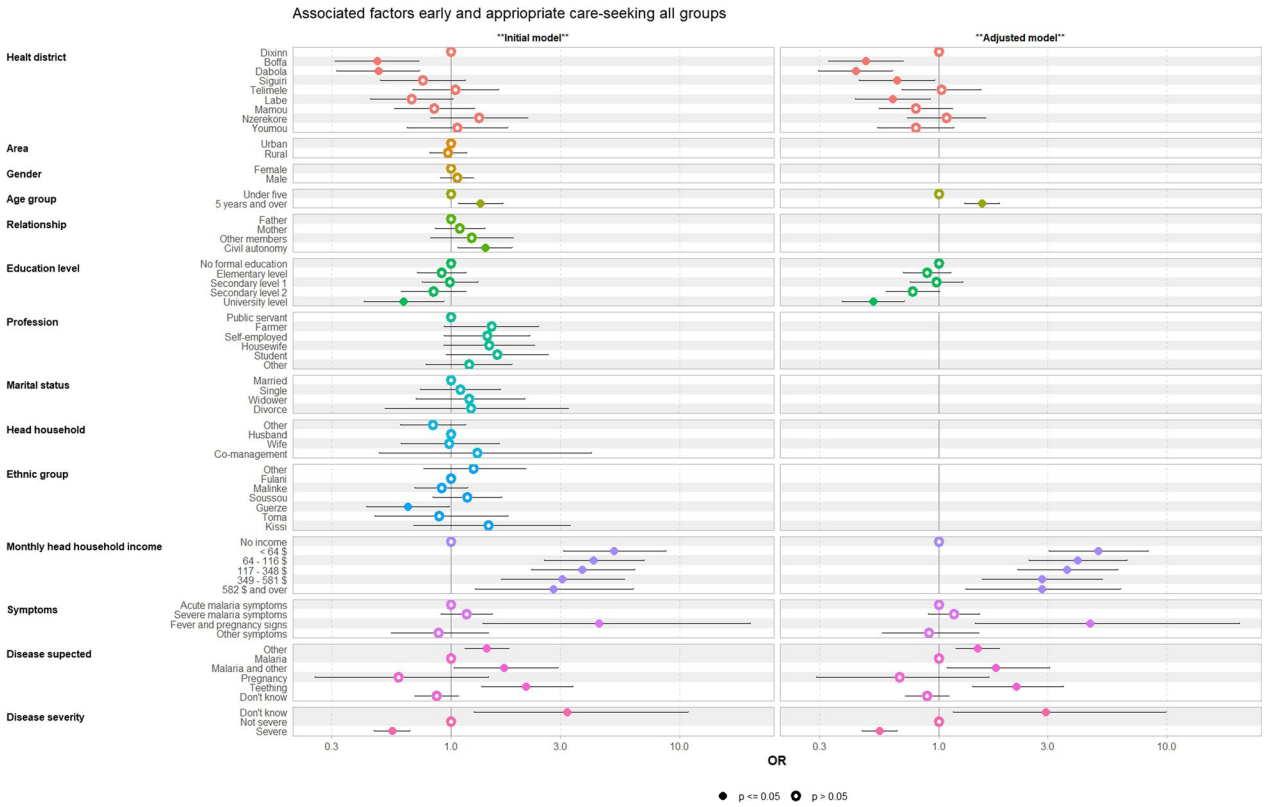

Fig. 3 Factors associated early and appropriated care-seeking

patients had used the conventional modalities and a quarter within 24 h of the onset of the symptoms. Then taken individually, self-medication was the main modality used first intention. Both children under five and those over five years from the health districts in the natural regions of Middle Guinea and Upper Guinea were more likely to delay early and appropriate care-seeking. Although progress has been made in the management of malaria cases, these results show the need for a more specific approach in health districts to improve early and appropriate care-seeking and reduce the complicated malaria forms. Previous studies of care-seeking behaviours in endemic countries in sub-Saharan Africa report high prevalences of self-medication in the first line [25–27]. These observations in different countries show the need to expand the malaria diagnostic package to licensed drug sellers and pharmacies.

Regarding early care-seeking, half of patients had sought care early and about third had made an early and appropriate recourse. The under five years groups, the early and appropriate seeking was 33.66% CI 95% 30.92–36.51%. In 2021, the survey on malaria and anemia indicators in Guinea reported an early seeking care of 32% of children under 5 years old [7]. A study carried out in Burkina Faso and published in 2022 as part of a pilot project shows an early and appropriate care seek of 65.5% (95% CI 63.9–68.9%) in the general population [28]. Other studies show prevalences of 30.4% of children under 15 years of age with simple malaria in Uganda in 2018 [29], 38.0% in Liberia in 2018 among children under five years old [30] and 18.6% in a health facility in Nigeria's Imo State in 2019 [31]. However, it is important to note that several studies use the 24–48-h as a reference for the earliest time sought care and in this case the proportions of early seeking are higher. On the other hand, studies conducted in the context of pilot projects to improve conventional care-seeking may show higher trends. But in general, in the endemic countries of sub-Saharan Africa, early and appropriate care-seeking is not optimal. Whereas early access to care could reduce the incidence of severe forms.

About two out of five patients had made only one recourse, and the others two or more recourse. In a study conducted at Coyah District Hospital in 2019, a patient' maximum number of recourses was three [20]. In Equatorial Guinea, in a study published in 2015, patients who started treatment at home had made a maximum of three recourses and those in health facilities had made two recourse, including a small proportion of those who had started treatment at home in rural areas [32]. With

Sankey's alluvial diagrams, the complexity of the patient pathways encountered in hospitals and health centres. This complexity can be explained by the forms of malaria admitted to these health facilities with recourse already made elsewhere (mainly self-medication), the poor quality of care and some extent, the lack of treatment adherence. This observation of successive recourses to the conventional facilities calls into question the quality of malaria case management in healthcare facilities. A study carried out in Nigeria and published in 2014 shows that 45.5% of children under five years old used informal sources of care in first line (drug sellers) [33]. Regarding self-medication as a first-line modality, some studies report similar trends with 33.5% in Kaduna State in Nigeria in 2020, Burkina Faso 34.2% in 2016 and Zambia 41% CI95% 36—46% in 2016 [25–27]. Other studies report higher trends of self-medication as the first-line treatment for fever or malaria, sometimes reaching 86.00% [34]. Using self-medication on first intention can be explained on the one hand by over-the-counter access to anti-malarial and antipyretic drugs, the recognition of the signs of malaria (fever + asthenia = malaria) and the experience of a malaria attack treated by a health care provider using the available drugs. In second-line, self-medication was identified as care option. Some studies report using self-medication as a second-line treatment, with 54.4% for uncomplicated forms and 33.7% for severe malaria in Mali in 2005 and 14.8% in urban areas in Bata, Equatorial Guinea in 2015 [32, 34]. The trends observed for self-medication show the risk of resistance to ATC due to incorrect use of anti-malarial drug by patients. In addition, the need to bring care closer to the population through differentiated screening, community players, traditional therapists and improving the quality of care in health facilities.

Factors associated with early and appropriate care-seeking in children under five were geographical area, monthly income of the head of household, number of children under five, suspected disease and perception of disease severity. In our study, the level of education of caregivers was not associated with early and appropriate care-seeking, this situation can be explained by the fact, that communication activities, not evaluated in this study, are carried out in the local languages of the country and are therefore accessible to most communities. Regarding the monthly household income, a study based on population survey data from 16 countries in sub-Saharan Africa and published in 2022 shows that increasing one unit of women's social and economic empowerment increased the likelihood of early and appropriate seeking care for children under five years of age by 32% [35]. In addition, another study carried out in published in 2018 showed the socioeconomic position of the household is associated with early and appropriate care-seeking [29]. The suspicion of teething in children increased the likelihood of seeking early care in a health facility. This result can be explained by the desire to resolve the symptoms associated with teething. The perceived severity of the child's illness was associated with delayed care-seeking, like 2009 Uganda study [36].

Patients in the group aged five and over, who were the majority, the factors associated with early and appropriate care-seeking were the location of the health district. Patients in Boffa (Lower Guinea, coastal region) and Dabola (Upper Guinea, savanna region) were more likely to delay care-seeking, at health facilities or with community health workers. It should be noted that these are areas with moderate malaria transmission with seasonal trends and preventive strategies, especially in Dabola (Seasonal malaria chemoprevention). A study conducted in Ethiopia and published in 2017 among children aged 2 to 9 years old shows that the intensive deployment of preventive strategies and the reduction of the transmission rate reduces the use of health facilities [37]. Our study shows that monthly income was positively associated with care-seeking earlier and appropriate ($p < 0.001$). The availability of a daily income encourages investment in proper health care. Studies in Ebonyi State, published in 2021, and Imo State, published in 2019, Nigeria, show that mothers with employment (daily income guarantor) were quick to seek conventional care in children [31, 38].

These highlights of the associated factors show the influence of socio-economic factors such as income and geographical area on health-seeking behaviour. Including these factors in the implementation of malaria control programs through a patient-centreed approach could improve the care-seeking behaviour.

Overall, studies to discuss the results have been identified. The originality of this approach lies in analysing the factors associated with the early and appropriate care-seeking (combinate variable) and the visualization of the pathway to assess the succession of recourse to care. The detailed descriptive analysis of first-line treatment was discussed, along with results from studies carried out in sub-Saharan Africa, which showed the place of self-medication as a first-line treatment. The following studies, piloted by the principal author will focus on analysing the costs associated with diagnostic pathways from the patient's perspective, and the perception of malaria prevention services (primary and secondary) in Guinea by providers and users.

Limitations

A cross-sectional study, which collected data after malaria diagnosis in health facilities was conducted. Some elements of the care pathway, including adherence

and the result of the treatment, were not addressed. In addition, the history of the pathway was based on the report of patients or caregivers. Patients who did not present themselves at a health facility or at community health workers were not interviewed. These are the main limitations of this study.

Conclusion

Majority of the malaria cases admitted to health facilities used more than one recourse during their illness, with a predominance to self-medication as first-line treatment. Significant differences were observed in the use of first-intention care modalities on the one hand and the low proportion of early and appropriate seeking care, an essential element for the reduction of severe forms responsible for mortality on other hand. The results also revealed that factors such as the head household's monthly income and the geographical area also influence the early care-seeking in health facilities or at community health workers' level. This study highlights the importance of community awareness on early and appropriate care use in areas identified as at risk and the development of area-specific plans based on care-seeking behaviour. These findings must be considered when developing malaria cases management strategies and support activities such as communication.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12936-024-05102-x.

Additional file 1. Description of care-pathways for under five of age and five years and over.

Additional file 2. Care pathway of patients surveyed at University hospital.

Additional file 3. Care pathway of patients surveyed at district hospital.

Additional file 4. Care pathway of patients surveyed at health center.

Additional file 5. Care pathway of patients surveyed at health post.

Additional file 6. Care pathway of patients surveyed at private facility.

Additional file 7. Factors associated under five years group.

Additional file 8. Factors associated five and over year group.

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Author contributions

Elhadj Marouf Diallo is the main and corresponding author of this article, written under the co-supervision of Professors Laurent GERBAUD and Alioune CAMARA. The co-authors (FBT, AL, BSC and OOM) contributed to reviewing the analyses (logistic regression: Additional file 7 & 8), formatting the tables and proofreading the manuscript. Professor Alexandre DELAMOU supported the English translation of the paper and the proof-reading of the document. All authors reviewed the final version of the paper before submission.

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Data availability

No datasets were generated or analysed during the current study.

Code availability

Analysis code R is available on request.

Declarations

Ethics approval and consent to participate

The protocol was submitted to the National Health Research Ethics Committee and approval was obtained subject to some clarification and correction. The reference number of the Ethics Committee was 151/CNERS/22. Data were collected anonymously.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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