International Journal of TROPICAL DISEASE & Health
18(4): 1-11, 2016, Article no.IJTDH.27862
ISSN: 2278–1005, NLM ID: 101632866

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Prevalence and Determinants of Antimalarial Self-medication in Southern Benin

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Authors' contributions

This work was carried out in collaboration between all authors. Authors CSJ, VA and MEB did the study design and wrote the protocol. Authors MNP, CSA and YAG did the statistical analysis and literature searches while analyses of study were by authors CM, AK and GES. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2016/27862
Editor(s):
(1) Ken-ichiro Inoue, Center for Medical Science, International University of Health and Welfare, Japan.
(2) Shankar Srinivasan, Department of Health Informatics, University of Medicine and Dentistry of New Jersey, USA.
Reviewers:
(1) S. K. Ghosh, National Institute of Malaria Research (ICMR), Bangalore, India.
(2) Jephtha C. Nmor, Osaka Kyoiku University, Osaka, Japan.
(3) Aina Oluwagbemiga Olanrewaju, Nigerian Institute of Medical Research, Yaba, Nigeria.
Complete Peer review History: http://www.sciencedomain.org/review-history/15764

Original Research Article

Received 22nd June 2016
Accepted 27th July 2016
Published 12th August 2016

ABSTRACT

Aims: To determine the prevalence of antimalarial self-medication and identify its determinants in Comé, Southern Benin households.
Study Design: Cross-sectional community based study.
Place and Duration of Study: Benin southern setting, from April to July 2015.
Methodology: It was a cross-sectional study conducted from 1st to 14th July 2015 which involved 480 households randomly selected. Data on socioeconomic and demographic factors, the use of

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antimalarial drugs, health system and knowledge regarding malaria and dangers of self-medication were collected by questionnaire. Multivariate logistic regression was used to identify determinants of antimalarial self-medication in households.

Results: The prevalence of antimalarial self-medication in households was 69.77% [CI95: (65.64; 73.89)]. The use of antimalarial drug from illicit market was reported in 83.75%. In 28.73% of cases, the main anti-malarial drug used in self-medication was artemisinin-based combination. Determinants of antimalarial self-medication were level of economic status: quintiles poor (1 and 2) versus the richest quintile: OR = 6.50 [95%IC (3.43 – 10.68)]; quintiles less poor (3 et 4) versus the richest quintile: OR = 3,05 [95%IC (1,49 – 6,25)]; knowledge of the dangers of antimalarial self-medication, knowledge versus ignorance, OR = 0.26 [95%IC (0.14 – 0.48)], knowledge of dangers associated with street drugs: knowledge versus ignorance; OR =0,40 [95% (0,19 – 0,86)], knowledge of consequences of poorly treated malaria, knowledge versus ignorance: OR = 0,36 [95%IC (0,16 – 0,8)].

Conclusion: The results point out the high prevalence of antimalarial self-medication in households in Comé, Southern Benin. Strengthening knowledge on consequences of antimalarial self-medication, street drugs consumption and poorly treated malaria is needed to avert antimalarial self-medication practices in Comé in Southern Benin.

Keywords: Antimalarial self-medication; prevalence; determinants; households; Benin.

1. INTRODUCTION

Malaria is the commonest cause of fever and morbidity in the tropics and a significant source of mortality, especially among infants and young children in Sub-Saharan Africa [1-3]. To treat this disease, some individuals practice antimalarial self-medication [4-8]. According to the World Health Organization, self-medication refers to the use of a drug, on its own initiative or on relatives' advice, in order to treat a disease or symptom without recourse to a health worker [9]. Self-medication includes both modern medicines and traditional medicines [10,11]. The irrational use of antimalarial by self-medication exposes to drug poisoning and adverse drug interactions. The practice of self-medication and some unnecessary presumptive treatment prescribed by health professionals contribute to the emergence of drug resistance [3,4].

With the wide drug resistance to chloroquine, several sub-Saharan countries including Benin have adopted the Artemisinin Combination Therapies (ACTs) as recommended by WHO for the effective treatment of malaria and for preventing the development of drug resistance [12]. The fight against the practice of antimalarial self-medication may help preventing the early onset of resistance to ACTs in parasites. In Benin, studies reported that antimalarial self-medication was widespread in urban area [13] but there is a dearth of information in semi-urban and rural settings.

2. OBJECTIVE

The objective of the study was to determine the prevalence of antimalarial self-medication and examine its determinants in households in a semi-urban area and its rural outskirts in southern Benin.

3. SUBJECTS AND METHODS

3.1 Setting

The study was carried out in the small size city of Comé (80 km from Cotonou, the economic capital of Benin) and its rural outskirts. Comé includes 38 villages and city neighborhoods. According to census in 2013, the population of Comé was estimated at 79 665 inhabitants. The epidemiological profile is characterized by the predominance of communicable diseases, mainly malaria and emergence of some non-communicable diseases (hypertension, diabetes and obesity).

To improve timely access to malaria treatment, the National Program against Malaria has strengthened the laboratory capacity for malaria biologic diagnosis at public, private and community levels by increasing availability of the rapid diagnostic test for malaria at health centers and in the community (for community health workers). With the updated management guidance of malaria cases in February 2011, laboratory confirmation of malaria before treatment is mandatory in health facilities and in the community [14].

3.2 Study Design and Subjects

This was a cross-sectional study conducted from April to July 2015. The study population consisted of the heads of households in Comé.

3.3 Sample Size and Subjects Selection

3.3.1 Sample size

The minimum sample size estimated was 480 heads of households using Schwartz formula and assuming α error of 5%, an accuracy of 4%, the cluster sampling effect of 3 and the prevalence of antimalarial self-medication reported in in urban areas (93.1%) [13].

3.3.2 Selection of participants

Randomised multistage cluster sampling technique was used to select participants: the villages or city neighborhoods, concessions and finally, heads of households.

- First stage: a total of 30 villages or city neighborhoods were selected by simple random sampling among the 38 villages and city neighborhoods.
- Second stage: From the center of each selected village or city neighborhood, the investigator has chosen the direction indicated by the tip of launched pen. In this direction, concessions were numbered and the first to visit was selected by simple random. From this first house visited, the investigator went from concession to concession until the expected number of house in each village.
- Third stage: in the selected concession, the head of household or his representative over 18 years was identified. If the concession had two or more eligible household chiefs, one was randomly selected. Clusters including 16 (480/30) participants were formed in each selected village or city neighbour.

3.4 The Study Variables

3.4.1 The dependent variable

The dependent variable was the practice of antimalarial self-medication. In the study, all personal initiative of consuming one or more antimalarial drugs without prior medical assessment or health worker advice was considered as self-medication. This could concern ACTs, quinine, sulfadoxin-pyrimethamin, chloroquine and other preparations such as herbal beverages and traditional products intended for treating malaria. The period considered covered the 30 days past the day before the survey.

3.4.2 The independent variables

Independent variables included:

- Socio-economic and demographic factors: age, sex, religion, educational level, occupation, socioeconomic status and household size,
- Behavioral factors: health services utilization, preference for self-treatment, opinion on health care fees;
- Factors related to households head's knowledge: knowledge of the dangers of self-medication, knowledge of symptoms of malaria, knowledge of the consequences of poorly treated malaria and knowledge of adverse effects associated with street drugs consumption.
- Environmental factors: Distance from home to the illicit drug market and exposure to advertising of antimalarial traditional medicine products.
- Factors related to the health system: the distance from home to health facilities and satisfaction regarding quality of health care.

3.5 Data Collection Procedures

Questionnaires were used for data collection in study participants. The questionnaires were pre-tested in other health district by checking the answerability and the appropriateness of questions. The result of the pre-test informed the investigator on the required adjustments in the questionnaire used.

3.6 Data Analysis

Data were analyzed by the software STATA11.0. A weighted variable was created to take into account the design of the survey. Proportions were estimated and odds ratio (OR) were calculated with confidence interval of 95% to measure the strength of the association between antimalarial self-medication and independent variables. Univariate analyzes were used initially to identify factors associated with the practice of antimalarial self-medication. To identify determinants of the practice of antimalarial self-treatment, multivariate analysis was performed

taking into account only the factors associated with the practice of self-medication in the univariate analysis. The significance level was set at p <0 .05.

3.7 Ethical Considerations

The objectives of the study were explained to participants. Voluntary free and informed oral consent was obtained before starting the interview. This consent claims that participants are not at risk by refusing to participate in the survey or stopping their collaboration during the study. The confidentiality and anonymity of information collected were ensured.

4. RESULTS

4.1 Socioeconomic and Demographic Characteristics of the Participants

Table 1 summarizes socioeconomic and demographic characteristics of the participants. Among the participants, 46.5% were women and 39.14% of the respondents aged 31-46 years. Participants with primary education accounted for 31.8% of respondents. At least one respondent in five, (20.0%) belonged to the second quintile of economic well-being. Of the respondents, 25.9% were traders.

Table 1. Socioeconomic and demographic characteristics of participants, Comé, Southern Benin, 2015, (n=480)

Characteristics	Absolute frequency	% weighted
Age (years)		
15-30	187	38,63
31-46	**178**	**39,14**
47-61	73	13,66
62-77	38	7,12
78-93	4	1,45
Sex		
Women	227	46,50
Men	**253**	**53,50**
Education		
No schooling	139	30,58
Primary	**138**	**31,83**
Secondary	167	30,56
University	36	7,03
Religion		
Catholicism	145	32,81
Protestant	20	3,91
Celestial Christianism	64	10,67
Muslim	18	3,07
Animism	142	31,62
Atheist	91	17,92
Occupation		
Official	46	8,08
Trader	121	25,97
Farmer	45	11,12
Student	78	14,12
Motor cycle taxi driver	46	9,48
House wife	73	17,33
Unemployed	19	4,00
Other	52	9,90
Economic status		
Quintile 1	96	20,02
Quintile 2	72	20,05
Quintile 3	101	19,95
Quintile 4	93	20,29
Quintile 5	118	19,69

4.2 Behavioral and Environmental Characteristics and Knowledge of Participants

Table 2 shows that among the participants, 54.7% preferred to consume antimalarial drug that was not prescribed by a health worker and 79.4% of the respondents showed a poor knowledge of dangers associated with antimalarial self-medication. Among the 480 participants, 49.3% failed to identify symptoms of malaria, 79.2% had poor knowledge of the consequences of poorly treated malaria and 68.1% were unaware of the risks associated with street drugs consumption.

Among the participants, 55.2% declared to reside close to illicit drug market and 41.6% were exposed to advertisements on traditional medicine products used as antimalarial during the month preceding the survey. Furthermore, 76.2% of respondents lived within five kilometers of a health center and 61.6% were not satisfied with care provided in health centers (Table 2.)

4.3 Antimalarial Self-medication during the Last Month

Among participants, 69.7% [95% CI (65.64 - 73.89)] reported that at least one member of their household has practiced antimalarial

Table 2. Behavioral and environmental characteristics and knowledge or participants, Comé, Southern Benin, 2015, (n=480)

Characteristics of participants	Absolute frequency	% weighted
Preference for non-prescribed by a health worker medicines		
Yes	273	54,76
No	207	45,24
Utilization of health facilities		
Yes	259	48,75
No	221	51,25
Will not to pay medical examination fees		
Yes	201	48,73
No	279	51,27
Knowledge of danger of antimalarial self-medication		
Yes	109	20,58
No	371	79,42
Knowledge of malaria symptoms		
Yes	260	50,67
No	220	49,33
Knowledge of consequences of poorly treated malaria		
Yes	107	20,76
No	373	79,24
Knowledge of dangers of street drugs consumption		
Yes	165	31,84
No	315	68,16
Distance from home to health facilities		
Long (>5 Km)	114	23,26
Short (<5 Km)	366	76,74
The proximity to the illicit market		
Yes	245	55,20
No	235	44,80
Advertising for traditional medicine products		
Yes	216	41,66
No	264	58,34
Satisfaction with health care		
Yes	267	61,63
No	213	38,37
Trust in pharmacists		
Yes	172	35,90
No	308	64,10

self-medication during the thirty days preceding the survey. Among households who practiced self-medication, 83.7% have bought drug at illicit market. Antimalarial drugs that have been used for self-medication were: ACT (28.7%), quinine (26.5%), chloroquine (23.3%), sulfadoxin-pyrimethamin (8.38%) and other preparations such as herbal beverages and other traditional products intended to treat malaria (13.0%).

4.4 Factors Associated with Antimalarial Self-medication

Univariate analyzes identified twelve variables that were associated with the practice of antimalarial self-medication as shown in Table 3.

Table 4, presents the determinants of self-medication antimalarial according to the multivariate model. Determinants of antimalarial self-medication were: the level of socioeconomic welfare quintiles poor (1 and 2) versus the richest quintile OR = 6.50 [95% CI (3.43 to 10.68)], less poor quintiles (3 and 4) versus the richest quintile OR = 3.05 [95% CI (1.49 to 6.25)]; knowledge of the dangers of self-medication antimalarial: knowledge versus ignorance: OR = 0.26 [95% CI (0.14 to 0.48)]; knowledge of risks associated with street drugs consumption, knowledge versus ignorance: OR = 0.40 [95% (0.19 to 0.86)] and knowledge of the consequences of a poorly treated malaria, knowledge versus ignorance: OR = 0.36 [95% CI (0.16 to 0.8)].

Variables such as age, sex, preference for drugs non-prescribed by a health worker, knowledge of symptoms of malaria, satisfaction with care provided were not associated with the practice of self-medication antimalarial.

Table 3. Factors associated with antimalarial self-medication in households in Comé, Southern Benin, 2015, univariate analysis (n=480)

Independent variables	Antimalarial self-medication				
	Yes	No	OR	$IC_{95\%}$	P-value
Education					
No schooling	101	38	1		
Primary	99	39	1,08	[0,63 – 1,85]	0,752
Secondary	94	73	0,68	[0,34 – 1,38]	0,281
University	9	27	0,083	[0,02 – 0,28]	**0,000**
Religion					
Catholicism	81	64	1		
Protestant	15	5	3,59	[0,96 – 13,43]	0,056
Celestial Christianism	38	26	0,80	[0,40 – 1,57]	0,509
Muslim	10	8	1,58	[0,40 – 6,21]	0,500
Animist	109	33	1,94	[1,05 – 3,58]	**0,035**
Atheist	50	41	1,11	[0,52 – 2,37]	0,771
Occupation					
Official	11	35	1		
Trader	86	35	5,96	[2,17 – 16,3]	**0,001**
Farmer	33	12	6,31	[2,64 – 15,06]	**0,000**
Student	40	38	1,57	[0,30 – 8,12]	0,578
Motor cycle taxi driver	37	9	4,5	[0,69 – 29,09]	0,110
House wife	52	21	6,22	[2,03 – 19,07]	**0,002**
Unemployed	13	6	4,51	[1,30 – 15,65]	**0,019**
Others	31	21	2,69	[0,54 – 13,34]	0,214
Socioeconomic status					
Quintile 5	43	75	1		
Quintile 1	72	24	5,58	[2,49 – 12,49]	
Quintile 2	59	13	8,05	[3,46 – 18,75]	**0,000**
Quintile 3	70	31	5,00	[2,33 – 10,73]	**0,000**
Quintile 4	59	34	3,23	[1,64 – 6,35]	**0,000**
Utilization of health facilities					
No	170	51	1		
Yes	133	126	0,50	[0,27 – 0,93]	**0,03**

Independent variables	Antimalarial self-medication				
	Yes	No	OR	$IC_{95\%}$	P-value
Will not to pay medical examinations fees					
No	161	118	1		
Yes	142	59	1,95	[1,33 – 2,85]	**0,001**
Knowledge of danger of antimalarial self-medication					
No	263	108	1		
Yes	40	69	0,23	[0,13 – 0,41]	**0,000**
Knowledge of consequences of poorly treated malaria					
No	253	120	1		
Yes	50	57	0,35	[0,19 – 0,64]	**0,001**
Knowledge of dangers of street drugs consumption					
Yes	182	133	1		
No	121	44	2,43	[1,20 – 4,85]	**0,015**
Distance from home to health facilities					
Long (>5 Km)	90	24	1		
Short (<5 Km)	213	153	0,32	[0,15 – 0,69]	**0,005**
Proximity of illicit drug market					
No	111	124	1		
Yes	192	53	3,59	[1,70 – 7,18]	**0,001**
Advertising for traditional medicine products					
No	188	76	1		
Yes	115	101	0,53	[0,31 – 0,91]	**0,025**

Table 4. Determinants of antimalarial self-medication in households in Comé, Southern Benin, multivariate analysis, 2015 (n=480)

Independent variables	OR	$IC_{95\%}$	P
Economic status			
Quintile 5	1		
Quintile 1 et 2	6,05	[3,43 – 10,68]	**<0,000**
Quintile 3 et 4	3,05	[1,49 – 6,25]	**0,003**
Knowledge of consequences of poorly treated malaria			
No	1		
Yes	0,36	[0,16 – 0,8]	**0,014**
Knowledge of danger of antimalarial self-medication			
No	1		
Yes	0,26	[0,14 – 0,48]	**<0,000**
Knowledge of dangers of street drugs consumption			
No	1		
Yes	0,40	[0,19 - 0,86]	**0,021**

5. DISCUSSION

The study examined the prevalence and determinants of antimalarial self-medication in a semi-urban city and its rural outskirts in southern Benin. The prevalence of antimalarial self-medication among households was 69.7% and ACT (28.7%), quinine (26.5%) and chloroquine (23.3%) were the most concerned drugs. Determinants of antimalarial self-medication were socioeconomic status, knowledge of the dangers of antimalarial self-

medication, knowledge of dangers associated with street of drugs consumption and knowledge the consequences of poorly treated malaria.

5.1 Prevalence of Antimalarial Self-medication in Households

The prevalence of antimalarial self-medication reported in this study is lower than 93.1% previously reported in Benin in children under five years [14] and (89.6%) in Kisangani [15] and (99%) in Lubumbashi [5] in Democratic Republic of Congo. The reported prevalence in this study is similar to 72.7% observed in a survey conducted in Burkina Faso in 2014 [16]. Lower prevalence were observed among children under five in Ghana (16.8%) [17] and in Togo (42%) [18]. Inconsistences in results could be explained by the fact that studies had different targets, geographic scope and participants' ages. Indeed, the study previously carried out in Benin involved children under 5 years [13] as well as the Ghana study [17] while the present study concerned adults. The study in Burkina Faso was carried out in hospital [16].

Since counterfeit CTAs are widespread in Benin, the high prevalence of antimalarial self-medication reported in the study is disturbing. A study analyzed 195 packs of anti-malarials that were sold in six African countries and reported that 35 percent of them contain non-efficacious levels of active ingredients [19]. The authors reported also that the danger of consuming drugs with inadequate levels of active ingredient is two-fold. First, the individuals receive no therapeutic value from the drug, which increases their risk of death, and secondly, the low levels of active ingredient help the microorganisms in adapting to the drugs making them less effective [19].

5.2 Factors Associated with Self-medication Antimalarial

5.2.1 Socioeconomic and demographic factors

The low economic status was a determinant of the practice of antimalarial self-medication. Tshomba et al. [15] had observed that higher monthly income to 60,000 FCFA protected against the practice of self-medication. Also Dargicho et al. [20] reported in Ethiopia that the monthly income was negatively and significantly associated with antimalarial self-medication [19]. Indeed, the person with low economic status prefers to buy drugs at illicit market to avoid paying medical examination fees in health centers. In contrast with results of Tshomba et al. [15] and Dargicho et al. [20], this study confirms that the level of education were not directly associated with the practice self-medication.

Participants' age was not associated with antimalarial self-medication according to studies conducted by Tshomba et al. in Congo [15], Yameogo et al. Burkina [21] and Deressa et al. Ethiopia [22]. However some authors had identified age as a factor associated with antimalarial self-medication. In Ghana, authors reported that older than five subjects were more likely to experience antimalarial self-medicate than those less than five years [17]. In Senegal, in a study conducted in hospitals, authors observed that self-medication for malaria fever was significantly more frequent among patients under fifteen [23]. Among students in Nigeria, authors found that the prevalence of self-medication was higher in the age group 25 to 44 years and lower in age from 15 to 24 years [4].

The present study found that both men and women equally practiced antimalarial self-medication but studies conducted in Saudi Arabia and Tanzania reported that men were most concerned [24-26] by this practice. Variations in gender considerations according to different societies may explain divergences in results.

5.2.2 Behavioral factors

The preference for drug consumption without health workers' advice and the non-utilization, health care facilities were not associated with antimalarial self-medication. This finding may be explained by the fact that these behaviors are partly related to the economic level which was associated with the practice of self-medication. The effect of these behavioral factors would therefore be mediated by the economic level. The results of this study are not in contradiction with those observed in Tanzania Chipwaza et al. [25] Kenya by Watsierah et al. [27] and Afolabi Nigeria [28] who reported that some behaviour such as the preference for drug non-recommended by health workers, the non-utilization of health care facilities were associated with antimalarial self-medication.

5.2.3 Factors related to patient knowledge

A significant relationship was observed between antimalarial self-medication and ignorance of its dangers, knowledge of the consequences of

poorly treated malaria and dangers associated with street drugs consumption.

Dangers of antimalarial self-medication with street drugs are relative to the inadequate dosages of active chemicals [29]. Inadequate contents in active chemicals contribute to emergence of drug resistance, but overdoses can also be dangerous for health. This shows the importance for the population to be informed not only on the dangers of antimalarial self-medication but also the consequences of poorly treated malaria. This study showed that the participants were sensitized on the poor quality of street drugs. Nearly 32% of respondents declared that drugs sold in illicit market had no consequence on health. The poor storage of street antimalarial drugs could enhance their toxicity and the suboptimal content in active chemicals was factor that could contribute to drug-resistance of Plasmodium falciparum [30].

5.2.4 Environmental factors

Exposure to advertising on traditional medicine products used as malaria and living close to illicit drug market were not associated with antimalarial self-medication. These results are not consistent with other studies. In Lomé in Togo, d'Almeida observed that drug advertising and living near illicit drug market were factors promoting self-medication [18]. Study participants declared that vehicles were used to advertise supposed effective products against malaria. This encouraged antimalarial self-medication.

5.2.5 Factors related to the health system

The distance to health facilities was not significantly associated with antimalarial self-medication. This result is not consistent with those observed in a study conducted in the Middle East where the authors had shown that geographic access to health centers contributed to self-medication practices [26]. In Comé, dwellers use motorcycle for transportation for low fee. For this, it is possible that the distance to the health center does not influence the behavior of antimalarial self-medication practices.

Furthermore, non-satisfaction with the care provided in health centers was not associated with the practice of self-medication in contrast to results of Alghanim et al. [26] who reported that health care quality strongly influenced self-medication.

The limitations of the present study are relative to the fact that the results can be only extrapolated to the city and its rural outskirts but not to all the South Benin. However, the results reported in this study are very useful for the design and implementation of interventions against the antimalarial self-medication.

6. CONCLUSION

Antimalarial self-medication was common in households in Comé. Interventions to increase knowledge on consequences of antimalarial self-medication, dangers of poorly treated malaria and adverse effects of street drugs consumption are timely for rational use of antimalarial drugs and prevention of drug resistance in household in Comé, southern Benin.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to field workers and participants in the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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