

Determinants of Delay in Malaria Treatment Seeking for Under-Five Children with Malaria Attending Health Centers of Bench-Maji Zone , South-Western Ethiopia Case-Control Study

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Received: 11 December 2017 Accepted: 3 January 2018 Published: 15 January 2018

Abstract

Abstract- Introduction: Malaria has continued to be a public health problem in the World today despite concerted efforts aimed at its control and elimination. Prompt diagnosis and timely treatment of malaria within 24 hours after onset of first symptoms can reduce illness progression to severe stages, and therefore, decrease mortality. Thus the current study assessed determinants of delayed malaria treatment seeking for under-five children with malaria attending health centers of Bench-Maji zone from March 1 ? June 30/2016. Methods: Community based Unmatched Case control study design with a total sample size of 354 identified using systematic sampling. Cases were under- five children who had confirmed Malaria and Sought treatment after 24 hrs of developing sign and symptom, and controls were under-five children who had clinical malaria and came for treatment within 24 hrs of developing sign and symptom. The association between the outcome variable and the explanatory variables was analyzed by multiple Logistic regressions. The strength of association was interpreted using odds ratio and confidence interval. The P value < 0.05 was considered statistically significant in this study. Result: The study was carried out on 326 under-five children with confirmed malaria with the response rate of 92.1

Index terms— delay in malaria treatment seeking, malaria, under-five children, care takers.

1 I. Introduction

The World Health Organization recognizes that early diagnosis and prompt treatment, within 24 hours of onset of symptoms, is an essential element of malaria control. Primarily timely and appropriate treatment preferably within 24 hours of onset of illness symptoms resulted in reduced severe morbidity and probability of mortality among children under the age of five years. In addition to early diagnosis and treatment, vector control measures such as chemical, biological or environmental management remain the most effective measure to prevent malaria transmission and hence morbidity and mortality reduction (4).

The concept of treatment seeking especially as regards to time taken from recognition of the illness to do so involves how people employ the healthcare systems in their respective socio-cultural, economic circumstances which determine access to health services are the major factors that affect prevention and control of the disease. All these define the social position of health and provide a better understanding of the disease process (3,5).

Regardless of this, in malarious countries morbidity related to malaria occur at home because of delayed treatment or without receiving appropriate medical care. A considerable proportion of deaths among under-five children in sub-Saharan Africa occur in part because of delays in seeking medical care (6).

Therefore, in addition to health care service, other factors such as socioeconomic status can determine the health care seeking behavior (7).

Thus, the investigators need to address the determinants of delayed malaria treatment seeking among under-five children with confirmed malaria attending health centers of Bench-Maji zone.

2 II. Methods and Materials a) Study Design and Population

A community based unmatched case-control study conducted in 8 public health centers found in 7 woredas of Bench-Maji zone which are selected by random sampling method from March 1-June 30/2016. The study population was under five children who had confirmed malaria and sought treatment in the health centers.

The Cases were under five children who had confirmed Malaria and sought treatment after 24 hrs of developing sign and symptom, and controls were under-five children who had confirmed malaria and sought treatment within 24 hrs of developing sign and symptom.

A total of 330 under-five children (132 cases and 198 controls) were selected by two population proportion formula for unmatched case-control study design using Open Epi version 2.3.1 statistical software. By considering 22 % of the respondents sought treatment within 24 hour for their children with malaria (controls) (8); using the default odds ratio of 2.01; with 95% confidence level; 80% power of the study; 1:1.5 cases to control ratio and 5% maximum acceptable difference.

Both cases and control were allocated for each selected health centers proportional according to the under-five population. Sampling frames were prepared for both cases, and controls for each health centers. Study participant within the health centers were selected by using systematic random sampling techniques using patient history card and laboratory request. Those under-five children, who were positive for any species of Plasmodium, were included and the care takers placed in private room for interview until.

3 b) Data Collection Instrument

The data were collected through face to face interview, and record review using pre-tested structured questionnaires. The structured interview questionnaire had taken 15 minutes with closed-ended questions and predetermined response options which are developed specifically for this study.

The questionnaire has three parts. The first part had socio-demographic factors that encompass age, sex, occupation, educational status, income, ethnicity, marital status, family size and communication materials. In the second, mothers/caretakers factors such as knowledge, perception, and practice were assessed, and finally, health system related factors were identified.

The questionnaire was prepared in English and translated to local language (Amharic). Then pre-tested on 5% of sample size a week before actual data collection period in other public health center and after pre-test necessary modifications were done.

Trained nurses hired from hospitals were administered the questionnaire and technical support was given by the Principal Investigator. At the time of data collection, filled questionnaires were checked for completeness and consistency of information by the supervisor on daily basis and typing errors were manually edited.

4 III. Study Variables a) Dependent Variables

Delay in malaria treatment seeking among under-five children.

5 c) Data Analysis Procedure

The coded Data was checked, cleaned and entered into Epi Info version 3.5.4 and then exported into SPSS window version 20.0 for analysis. Bivariate analysis was conducted first for each potential explanatory risk factor to select for multivariate analysis. Multivariable Logistic regressions were performed to assess the association between binary outcomes and different explanatory variables.

The strength of association was interpreted using odds ratio and confidence interval. A P value < 0.05 was considered statistically significant in this study.

6 d) Operational Definitions

Malaria Treatment-Seeking is any attempt made by the mother/caretaker to obtain expert opinion or treatment from health care provider when the child is illness. Delayed in Malaria Treatment Seeking is an attempt made by the mother/caretaker for the diagnosis and treatment of malaria after 24hrs of developing sign and symptoms of malaria for under five children. Non-Delayed in Malaria Treatment Seeking-is an attempt made by the mother/caretaker for the diagnosis and treatment of malaria within 24hrs of developing sign and symptoms of malaria for under five children Caretaker: Anybody who cares the child by providing food, cloth and other necessary support that a child needs to survive.

7 IV. Ethical Considerations

Before the data collection, Ethical clearance and Cooperation letter were written from Mizan-Tepi University, and then submitted to respective district health office and all study health centers for permission. The purpose of the study was informed to the study subjects, and their oral consent was obtained. The respondents' right to refuse or withdraw from participating in the interview was maintained, and the information provided by each respondent

was kept strictly confidential by making each questionnaire coded and not sharing personal information of any patient to the third party.

V. Result a) Socio-Demographic Characteristics

The numbers of respondents were 132 (40.5%) cases, and 194 (59.5%) controls with a total response rate of 98.8%. Seventy nine (59.8%) respondents of cases and 126 (64.9%) respondents of controls were mothers of the children. The mean age of the under-five children was 28 months (SD=14.16). One hundred eighty eight (56.4%) children (in both cases and controls) were up to 2 years of age. In 120 (90.9%) home of cases and 188 (96.9%) home of controls have children up to 2 years of age (Table 1).

Concerning the educational status and occupation of the caretakers and the father 53 (40.3%) caretakers of cases and 64 (33%) caretakers of controls were unable to read and write. Thirty five (26.5%) caretakers of cases and 70 (36.1%) caretakers of controls were able to read and write. Seventy six (57.6%) caretakers of cases and 102 (52.6%) caretakers of controls were Farmers. Twenty eight (21.2%) caretakers of cases and 57 (29.4%) caretakers of controls were Housewives. Forty-five (34.1%) fathers of cases and 64 (33%) fathers of controls were unable to read and write. Forty (30.3%) fathers of cases and 76 (39.2%) fathers of controls were able to read and write. One hundred eleven (84.1%) fathers of cases and 146 (75.3%) fathers of controls were Farmers. The average Annual income (in cash) of respondents was 22,300 ET. Birr (SD=24, 205.58) birr, and 89 (67.4%) caretakers of cases and 143 (73.7%) caretakers of controls earned more than 10,000 birr (Table 2). practice, and health system factors related factors Out of the total, 120 (90.9%), respondents from the cases and 184 (94.8%) of respondents from the control group reported malaria as a health problem in their area. Fever reported as a symptom of malaria by 112 (84.4%) of respondents from cases and 177 (91.2%) of respondents from the control group. 38 (28.8%) caretakers of cases and 87 (44.8%) caretakers of the control group responded malaria is a communicable disease. 115 (87.1%) caretakers of cases and 186 (95.9%) caretakers of the control group responded malaria is a preventable disease. 103 (78%) of caretakers of the cases and 170 (87.6%) caretakers of the controls mentioned bed net as a means of prevention. 76 (57.6%) caretakers of the cases and 134 (69.1%) caretakers of the controls responded that they are using ITN for their under five children.

Regarding malaria-related information, 113 (85.6%) caretakers of cases and 188 (96.9%) caretakers of controls reported that they have seen or heard about malaria-related messages from different sources.

Most caretakers of cases, 128 (97.0%), and 181 (93.3%) caretakers of controls seek treatment from health centers when their children's are ill. 107 81.1% respondents of the cases, and 180 (92.8%) respondents of the controls traveled > 1km to arrive at the health centers, and 26 (19.7%) caretakers of cases and 20 (10.3%) caretakers of control reported perceived the cost of transport rate as expensive. (Table 3) The final model was constructed using enter method of logistic regression method. On Bivariate analysis, the factors found to fulfill the minimum requirement (p-value < 0.2 in this study) were entered in to multivariable logistic regression for further analysis in order to control confounding effects.

Annual income of the caretaker; Number of under-five children; having heard or observed message about malaria; distance from residence to the health center and the cost of transport to reach to the health center were significantly associated with malaria treatment seeking among under-five children (Table 4).

Caretakers of the children's with malaria who earned an annual income of 5000-10,000 Birr were 5 times more likely to delay the child for the treatment of malaria than caretakers who earned an annual income of > 10,000 Birr (OR, 5.415; 95% CI, 1.98, 14.83).

Caretakers/mothers of the children's with malaria who had two children and less were 0.15 times less likely to delay the child for the treatment of malaria than caretakers who had > two children (OR, 0.15; 95% CI, 0.03,0.68).

Caretakers/mothers of the children's with malaria who ever heard or observed about malariarelated message were 0.12 times less likely to delay the child for the treatment of malaria than caretakers who never heard or observed about malaria-related information (OR, 0.12; 95% CI, 0.04,0.40).

Mothers/caretakers who perceive the distance between the residence and health center as optimum during visit were 0.13 times less likely to delay in seeking treatment for their than those who perceive the distance between residence and health center as near to during the current visit (OR, 0.13; 95% CI, 0.04, 0.40).

Mothers/caretakers who perceive the cost of transport to reach to the health center as expensive were 4 times more likely to delay in seeking treatment for their children than those who perceive the distance between residence and health center as near (OR, 4.01; 95% CI, 1.30, 12.36).

Also mothers who perceive the cost of transport to reach to the health center as fair were 5 times more likely to delay in seeking treatment for their children than those who perceive the distance between residence and health center as near (OR, 5.36, 95% CI, 2.09, 13.77) (Table 4).

VI. Discussion

Ensuring prompt diagnosis and timely malaria treatment will prevent most cases of uncomplicated malaria from progressing to severe and fatal illness. To avoid this, treatment must begin as soon as possible, generally within 24 hours after symptoms onset. The reason why mothers/caretakers delay in malaria prompt diagnosis and timely treatment for under-five is not well studied in the study area as well as in many parts of Ethiopia.

According to the current study, caretakers of the children's with malaria who earned an annual income of 5000-10,000 Birr were 5 times more likely to delay the child for the treatment than those who earned annual income of > 10,000 Birr. This shows that having more income could motivate parents to bring their children for early diagnosis and treatment of malaria and also those who had better income could have better access to a health care facility as well as those with better income can able to cover any expenses related to diagnosis and treatment of malaria. Because of limited resources, an individual caretaker may fail to take timely treatment seeking decision for her perceived sick child because she might be forced to first attend to income-generating activities to meet basic day-to-day needs, including food for the household. This finding is similar with the result of a study done in southern Ethiopia which shows parents who had a monthly income 500 Birr and below were a more likely delay to get their children for prompt diagnosis and timely malaria treatment than who had 1000 ETB and above (9). Also, the research finding from Myanmar is in line with this study and states that families with an average yearly income per person more than US\$200 were more likely to seek treatment for malaria within 24 hours (10). Similarly, some Nigerian study revealed that children's from higher social class were the predictor of early presentation of the children to the health institution (11), and 21.4% of mothers who sought treatment for their children after 24 hours were due to financial difficulties (3). But the current study finding is not consistent with the Tanzanian study which showed household wealth status was not associated with delay to seek medical care (12,13).

Caretakers of the children's with malaria who had two children and less were 0.15 times less likely to delay the child for the treatment of malaria than caretakers who had > two children. This finding is supported by the study done in central Tanzania children from households with two to three under-five children were more likely to be delayed for medical care compared to children from households with only one child (12). Having planned and limited number of children increases the family's financial capabilities, enough time to care for the children and the whole family; generally it could contribute to the early diagnosis and treatment of malaria.

The current study finding indicates the importance of having information among the parents about malaria as a determinant of delay in treatment of malaria. Caretakers/mothers of the children's with malaria who ever heard or observed about malariarelated information were 0.12 times less likely to delay the child for the treatment of malaria than caretakers who never ever heard or observed about malariarelated message. Those parents who are knowledgeable of the fatal consequence of malaria can bring the child to the health institution earlier. Since most of the study subjects (62.9%) are mothers of the underfive children the information or message related to malaria may show the knowledge or educational level of the mothers. Some literature indicates the educational attainment of the mothers as a predictor of treatment seeking for children with malaria (9,3). The study from southern Ethiopia revealed that illiteracy of mothers was one of the factors which contributed to the delay in malaria prompt diagnosis and timely treatment of underfive children (9). In contrary, one of Nigerian study finding indicates attending secondary school were a predictor of late presentation of children's to health institutions (11).

Caretaker's perception of distance from residence to the Health Center was among the current study findings. Caretakers of the child who perceived the distance as optimum were 0.13 times less likely to delay for treatment than those who perceived the distance from home to health center as near). This finding was supported by a study report from southern Ethiopia that, caretakers of children who had difficulties to cover the costs transport were more likely to receive delayed malaria treatment (14). Also, the current finding is supported by Tanzanian study showing children living at a distance of ?5 kilometers from the nearest health facility were about twice as likely to delay to be taken for medical care as those in the shorter distances (12). Households located more than 3 km from a health facility were more likely to delay seeking malaria treatment. Similarly, the study finding form Myanmar reveals households located more than 3 km from a health facility were more likely to delay seeking malaria treatment (10). The present study finding is also consistent with a study from Uganda found that shorter distances were associated with timely malaria treatment seeking (15).

According to the current finding, one of the factors which affect malaria treatment seeking among children < 5 years was caretaker's perception of the cost of transportation to reach to the health centers. Caretakers who perceived the cost of transportation is expensive and fair was 4.01 and 5.36 more likely to delay respectively than those who perceive the cost was free. This is obvious that as the parents perceive the cost of transport is expensive they will try other treatment modalities which are found in their locality, which will, in turn, decrease the chance of the child to be treated at the health institutions. This study finding is similar with the study finding from Jimma, which states that Mothers of children who complained about the higher cost of transportation to reach the health institutions were more likely to be late for the treatment of malaria in under-five children (14).

10 VII. Conclusion and Recommendation

Most of fewer than five children seek malaria diagnosis and treatment earlier (within 24 hrs) from the surrounding health centers. Low or middle income of the caretaker, having more children in the household, having malaria-related message by the caretaker, Caretaker's perception of distance and the cost of transport to reach to the health center were the determinants for the delay in malaria treatment seeking among under-five children.

The study finding indicates the need to improve awareness of mothers and caretakers about seeking early, appropriate and effective treatment for their children who have malaria.

Malaria control programmed should focus on increasing access to malaria treatment through increasing access

to public health facilities such as health center. Stakeholders should address raising family source of income. Also emphasis should be given on planned and limited number of children. Increasing awareness of the community about malaria prevention, and early diagnosis and treatment by means of different source of information such as radio, TV, posters and health education sessions is important. Distance and cost of transport to reach to health institutions should be addressed through the expansion of infrastructures such as road and additional health centers in the localities.

VIII. Declarations a) Ethical Approval

Before the data collection, Ethical clearance and Cooperation letter were written from Mizan-Tepi

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1 Brother, Sister, Grandmother

Figure 1: Table 1 :

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Variable	Patient Category	Controls
Occupational Status of the Care Takers		
Farmer	102(52.6%)	76(57.6%)
Housewives	57(29.4%)	28(21.2%)
Government Employee	21(10.8%)	12(9.1%)
Students	12(6.2%)	10(7.6%)
Others 1	2(1%)	6(4.5%)
Educational Status of the Care Takers		
Unable to read and write	64(33%)	53(40.3%)
Able to read and write	70(36.1%)	35(26.5%)
Primary school	18(9.1%)	23(17.4%)
Secondary school	21(10.8%)	9(6.8%)
Preparatory school	4(2.1%)	2(1.4%)
College and above	17 (8.9%)	10(7.6%)
Educational Status of the Father		
Unable to read and write	64 (33%)	45 (34.1%)
Able and	76 (39.2%)	40 (30.3%)
Primary school	21(10.8%)	31 (23.5%)
Secondary school	4 (2.1%)	6 (4.5%)
College and above	29 (14.5%)	10 (7.6%)
Occupation of the Father		
Farmer	146 (75.3%)	111 (84.1%)
Government employee	29 (14.9%)	11 (8.3%)
Merchant	19 (9.8%)	8 (7.6%)
Others 2	8 (4.1%)	2 (1.5%)
Annual Income (birr)		
? 5,000	28(14.4%)	8(6.1%)
5,000-10,000	23(11.9%)	35(26.5%)
>10,000	143(73.7%)	89(67.4%)
	1 Nongovernmental organization & Merchant	
	2 Student, NGO Employee, Daily Laborers	
b) Caretaker /mother's perception, Knowledge and		

Figure 2: Table 2 :

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Variable	Patient Category	Controls Cases
Use ITN for the child		
Yes	134(69.1%)	76(57.6%)
No	60(30.9%)	56(42.4%)
Malaria-Related Message		
Yes	188(96.9%)	113(85.6%)
No	6(3.1%)	17(14.4%)
Perceived Cost of Transport Rate		
Expensive	20(10.3%)	26(19.7%)
Fair	46(23.7%)	36(27.3%)
Cheap	30(15.5%)	2(1.5%)
Free	74(38.1%)	38(28.8%)
Perceived Distance from Home to Health Centers		
Very far	22(11.3%)	26(19.7%)
Far	85(43.8%)	29(23%)
Optimum	56(28.9%)	32(24.4%)
Near	31(16%)	45(34.1%)
Mode of Transport		
Foot	92(47.4%)	70(53.1%)
Public transport	70(36.1%)	54(40.9%)
Animal's Back	19(9.8%)	2(1.5%)
Others 1	13(6.7%)	6(4.5%)
Distance from Home to HC (In KM)		
? 1km	14(7.2%)	25(18.9%)
>1km	180(92.8%)	107(81.1%)
The Time Taken from Home to HC on Foot (In hr)		
? 1hr	100(75.6%)	108(55.7%)
>1hrs	32(24.4%)	86(44.3%)
	1 Ambulance & Carried by People	
c) Determinants of delay in malaria treatment seeking for under-five with malaria attending Selected Health centers of Bench-Maji Zone, South-Western Ethiopia in 2016		

Figure 3: Table 3 :

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Variables	Patient Category	Control Cases	Crude (95% CI)	OR	Adjusted (95% CI)	OR
Annual income of the care-taker (in Birr)						
<=5,000	28(14.4%)	8(6.1%)	0.46(0.20, 1.05)		0.325 (.087,1.219)	
5001-10,000	23(11.9%)	35(26.5%)	2.45(1.36, 4.41)*		5.415(1.98, 14.83)*	
>10,000	143(73.7%)	89(67.4%)	1.00		1.00	
Number of under-five children in the house						
?2	188(96.9%)	120(90.9%)	0.32 (0.12,0.87)*		0.15 (0.03, 0.68)*	
>2	6(3.1%)	12(9.1%)	1.00		1.00	
Care takers ever heard or seen about malaria related message						
Yes	188(96.9%)	113(85.6%)	0.21(0.81, 0.55)*		0.118(0.04, 0.40)*	
No	6(3.1%)	17(14.4%)	1.00		1.00	
Caretaker's perception of distance from residence to the Health Center						
Very Far	22(11.3%)	26(19.7%)	0.81 (0.39, 1.69)	(0.39, 0.37(0.10, 1.40)		
Far	85(43.8%)	29(23%)	0.24 (0.13,0.44)		0.08(0.02, 0.27)	
Optimum	56(28.9%)	32(24.4%)	0.39 (0.21, 0.74)*		0.13(0.04,0.40)*	
Near	31(16%)	45(34.1%)	1.00		1.00	
Caretakers perception of the cost of transport to reach to the Health Centers						
Expensive	20(10.3%)	26(19.7%)	2.53 (1.25, 5.11)*	(1.25, 4.01(1.30,2.36)*		
Fair	46(23.7%)	36(27.3%)	1.52 (0.85, 2.74)		5.36(2.09,13.77)*	
Cheap	30(15.5%)	2(1.5%)	0.13 (0.03, 0.57)*	(0.03, 0.37 (0.07, 1.93)		
Free	74(38.1%)	38(28.8%)	1.00		1.00	

*P value<0.05

Figure 4: Table 4 :

.1 Acknowledgments

We would like to express gratitude to Mizan-Tepi University research and community service directorate, College of health science, and department of nursing for giving this opportunity to perform this study.

Also we need to extend thanks to Bench-Maji zone health office, respective health centers, data collectors and our respondents for valuable information for this research.

University, and then submitted to respective district health office and all of the selected health centers for permission. The purpose of the study was informed to the respondents, and their oral consent was obtained. The respondents' right to refuse or withdraw from participating in the interview was maintained, and the information provided by each respondent was kept strictly confidential by making each questionnaire coded and not sharing personal information of any patient to the third party.

.2 b) Consent for participants or Respondants

Survey Questionnaire developed to Collect Information on Determinants Delay in Malaria Treatment Seeking among care under five in selected health centers of Bench-Maji Zone. Dear respondent my name is _____ and I am working as data collector of research from Mizan-Tepi University. The aim of this study is to assess determinants of delay in malaria treatment seeking among care takers of under five children with malaria attending this health center and you are chosen to participate in this study. Your genuine response will help us to find out the real factors responsible for delay in malaria treatment seeking, so that possible intervention will be conducted by responsible bodies including the community. The interview will take about 15 minutes. You have the right not to participate or withdraw at the middle of the interview. All the information you will give us will be used for research purposes only and kept confidential.

.3 Do you agree to participate? 1. Yes 2. No c) Consent for Publication

All authors are agreed to disseminate and publish the current research result

.4 d) Availability of Data and Materials

All the data sets used and analyzed during this study are included in the article.

.5 e) Competing Interests

The study was done by Daniel S. Mesfine G. and Abera K. only. The authors have declared that no competing interests exist.

.6 f) Funding

The total cost of the research, from the proposal preparation till the result, was covered by Mizan-Tepi university research directorate from budget code: 4101.

.7 g) Authors' Contributions

DS initiated the study, DS and MG designed the study. DS, MG and AK supervised the data collection. DS, MG and AK did the data analysis and interpretation; DS wrote and reviewed the manuscript. All authors read and approved the final manuscript.

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