



Effect of Health Education on Malaria Control Practices among Mothers of Under-Five Children in a Rural Nigerian Community

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Authors' contributions

This work was carried out in collaboration between ALL authors. 'IIJ, MCH and EIO' designed the study. UCI performed the statistical analysis and wrote the protocol, IIJ and OSI wrote the first draft of the manuscript. "UAU" managed the literature searches. OPE and UCI reviewed the manuscript draft. Both authors read and approved the final manuscript.

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ABSTRACT

Background/Purpose: Malaria is an established health challenge and a major cause of mortality and morbidity among under-five children in Nigeria. This community-based study was designed to assess the effect of health education packages on the malaria control practices of mothers of under-five children in Ibeagwa Nike Enugu State.

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Methods: The study utilized a quasi-experimental study design with a sample size of 124 mothers that attended the infant welfare clinic at the community health center and those that received treatment of minor childhood illnesses for six months. A multistage random sampling technique was used in choosing the required samples. The instrument for the collection of data was a self-adapted and validated questionnaire. Reliability was assessed and yielded a Cronbach's correlation coefficient of 0.823. Data generated were summarized using simple descriptive statistics of frequencies and percentages and analyzed using Fishers' exact test and Chi-square.

Results: Findings of the study showed that: the practice of malaria control practices was very low below 40% before health education intervention; malaria control practices increased significantly above 40% after the health education intervention; hindrances to the practice of malaria control measures reduced after the health education intervention; there is poor awareness of environmental hygiene as a method of malaria control measure before health education.

Conclusion: Periodic health education on the importance of malaria control practices should be conducted in the community regularly, to promote control of malaria.

Keywords: Malaria control practices; health education package; mothers of under-five; Nigeria.

1. INTRODUCTION

According to World Health Organization [1], Malaria ranks as a major global health problem and also, one of the major causes of morbidity and mortality among under-five (U5). Based on the annual report on malaria by the World Health Organization (WHO) in 2011, 216 million cases of malaria have occurred in 106 countries around the world in 2010 and 86% of the victims were children below 5 years of age. Malaria affects the individual's lives by increasing poverty, limiting education opportunities, and resulting in their suffering from several complications [2].

Nigeria suffers the world's greatest malaria burden, with approximately 51 million cases and 207,000 deaths reported annually (approximately 30% of the total malaria burden in Africa), while 97% of the total population (approximately 173 million) is at risk of infection [3]. Moreover, malaria accounts for 60% of outpatient visits to hospitals and led to approximately 11% maternal mortality and 30% child mortality, especially among children less than 5 years [4]. More than 70% of all malaria-related deaths occur in children aged under 5 years [5]. The scope of malaria control is changing globally with greater emphasis on community and individual participation [6].

Prevention of malaria has been globally accepted as a significant aspect of malaria control but the majority of mothers of under-five often do not learn the tenets of prevention [7,8]. The current national malaria strategic plans (2014–2020) was aimed to achieve pre-elimination status and reduce malaria-related deaths to zero by 2020 [9]. Sadly, the goals of the plan are yet to be fulfilled. Series of myths and misconceptions exist as mothers tend to associate malaria with

fever in children leading to poor malaria prevention practice [7]. Obrist et al., [8] observed that information on utilization of preventive measures like screening of windows and doors with nets, spraying the house with insecticides aerosol, application of insecticide repellent cream, wearing of long-sleeved clothes and destruction of mosquito breeding sites are not common.

Therefore, the malaria educational preventive package program is highly essential. Effective malaria programs consist of multiple interventions with the purpose of control as well as prevention and health education [10]. It has been proven that knowledge, attitude, and malaria-related behaviors in the residents of high-risk areas can increase the awareness as well as the probability of cooperation and acceptance of preventive actions against the disease [11]. Mothers are the primary caregivers in many homes and are such, key players in malarial treatments. Malaria control programs that principally involve mothers are not reaching many rural communities as expected [3]. There is a need to integrate mothers properly into malaria control and treatment activities through health education. This study therefore was aimed at assessing the effect of health education intervention package on the malaria control practices amongst mothers of under-five (U5) children in Ibeagwa Nike local government area of Enugu state, Nigeria.

2. METHODS

2.1 Study Design and Population

Using a quasi-experimental pre-test post-test study design, this study was conducted between

April and December 2019 at Ibeagwa-Nike, a town in Enugu East Local Government Area of Enugu State, Nigeria among mothers with children aged between 0-4 years. A multi-stage sampling technique was employed to ensure that the study population was representative of mothers of children aged under 5 years in the study area. The first stage involved identifying specific town within the Local Government Area where the study would be conducted and the second stage involved selection of the specific health facility from a list of facilities within the identified geographical area. In the third stage, participants were randomly selected from the selected health facility. The study population included mothers of children under 5 years old attending the study site for health care. Mothers who were residents in Ibeagwa-Nike and regular attendees of the study site for health care were eligible to participate in the study. Criteria for inclusion into the study was that the women had to have at least one child who is less than 5 years old.

2.2 Research Instrument

The Section A assessed for socio-demographic data such as age of the respondents, age of child and participants' level of education. Section B is Health education and Malaria control practices while section C is the Barriers (Hindrances) to Malaria control Practices. Psychometric testing of the instrument was done by administering 20 copies of the instrument to mothers of under-five children in Edem, a close village that was not used for the study. The reliability of the questionnaire was measured using Cronbach's alpha and the value was 0.823 which was considered adequate while a panel of seven which included three Nurses, two Pediatricians and two Mothers of under-five children assessed both the content and face validity.

2.3 Procedure

This study was carried out among mothers of under-five children of a rural community in Nigeria using qualitative method of data collection. The sample size was determined using the number of women that visited the infant welfare clinic in Ibeagwa-Nike health center for a period of 6 months which is 124. The researchers trained about twelve (12) research assistants to help dissemination of questionnaires to the participants.

The study was carried out in 3 phases – Pre-intervention, Intervention and Post-Intervention phases.

2.4 Pre-Intervention Phase

These included the following

1. Obtaining official permission to proceed with the study from the Local government area (LGA).
2. Permission of the mothers of under-five children to participate in the study was obtained.
3. Twenty women from the nearby Edem community were selected for pre-testing of the scale. The scale was pre-tested with the research assistants, who had debriefing on field experiences. Amendments were made, to re-design aspects of the instrument that lacked clarity.
4. Baseline survey on malaria control practices from the mothers of under-five children.

2.5 Intervention Phase

The intervention phase consisted of a comprehensive educational programme based on a course content adapted from the national malaria control programme and the information obtained from the gaps in literature identified from the initial survey which informed the need for the training. Training sessions were conducted during which various aspects of the prevention and control of malaria was taught. The use of education materials such as posters, and post signs related to malaria (All written in Igbo Language) were utilized to teach the mothers of under-five children. Each session lasted about 45minutes. The presentation was in 3 modules (knowledge about malaria transmission, its prevention and practice of control).

2.6 Post-Intervention Phase

The post-intervention assessment was done to understand the gain in the malaria control practices of mothers of under five children 1 month after the training. Evaluation of the effects of training was done using standardized scores for the various variables during analysis.

2.7 Data Analysis

The collected data were summarized using descriptive statistics of frequency, percentage, mean and standard deviation. Specifically, the mean and standard deviation were used to summarize the 4-point scaled items that assessed hindrance. Cut-of-point of 2.5 was used to judge whether the factors (items)

constituted as hindrance or not; item/factor with mean above 2.5 ($M > 2.5$) was considered as hindrance. Data was analyzed using inferential statistics used of Chi-Square, Fishers Exact test and the t-test. The t-test was used to ascertain the effect of the intervention on practice. A practice score (level of practice) was generated by obtaining the number of preventive measures practiced by each mother. The practice score was hence used for the t-test analysis, which compared the pre-practice score and the post-practice score. Statistical decisions were made at 5% level of significance. Data analysis was done with the Statistical Package for Social Sciences (SPSS) (version 21).

3. RESULTS

The Socio-demographic characteristics of the women at pre-intervention is shown on Table 1. Their age ranged from 17-36 years with mean and standard deviation of 24.19 ± 3.90 years. Most of the women were married (71.0%). Their children numbered from 1-3, although most had either 1 (43.5%) or 2 (47.6%). Majority had secondary education (59.7%) and was unemployed (34.7%). Table 2 presents information on previous health education on malaria control received by the mothers. Majority of the mothers had previously received

information on malaria prevention (80.2%). Radio/television (77.1%) was the chief source of their information while the coverage was majorly on signs and symptoms (66.7%) and where to get treatment (55.2%).

Tables 3 & 4 presents the malaria control measures practiced by the mother pre-intervention and post-intervention. During the Pre-intervention phase, Practice of the listed control measures was generally poor as all the measures were practiced below 40% while Post-intervention Practice was relatively very high with the practice of covering dug wells (95.3%) and removing of stagnant water from environment (94.1%) almost practiced by all. Table 5 presents the hindrances to malaria control practices among the women pre-intervention. All the listed factors were considered as hindrances except not being learned enough to know what to do (1.93 ± 0.97). The most prominent hindrance was the inability to afford money to buy effective malaria control tools (3.59 ± 0.56). Table 6 presents the hindrances to malaria control practices among the women post-intervention. None of the listed factors was considered as hindrance to the practice of malaria prevention except that of no formulated policies on environmental control (2.81 ± 0.73).

Table 1. Socio-demographic characteristics of the mothers of U-5 children n = 124

	Frequency	Percentage	Range	M±SD
Age			17 – 36	24.19±3.90
- < 20	13	10.5		
- 20 – 24	53	42.7		
- 25 – 29	46	37.1		
- 30 +	12	9.7		
Number of Children			1 – 3	1.64±0.63
- 1	54	43.5		
- 2	59	47.6		
- 3	11	8.9		
Marital Status				
- Single	24	19.4		
- Married	88	71.0		
- Widowed	12	9.7		
Level of Education				
- Primary	35	28.3		
- Secondary	74	59.7		
- Tertiary	15	12.1		
Occupation				
- Public/Civil servant	19	15.3		
- Self-employed	38	30.7		
- Student	14	11.3		
- Employed in a private setting	10	8.1		
- Not employed	43	34.7		

Table 2. Previous health education on malaria prevention at pre-intervention

	Frequency	Percentage
Previous information on malaria prevention		
- Yes	95	76.6
- No	29	23.4
Sources of the information		
- Health Providers	17	17.7
- Teachers	9	9.4
- Village Health Workers	6	6.3
- Radio/Television	74	77.1
Coverage of the Information		
- Control methods	22	22.9
- Signs and symptoms of Malaria	64	66.7
- Where to get treatment	53	55.2
- How to take treatment	1	1.0
- Types of malaria drugs	1	1.0

Table 3. Malaria control measures practiced by the mothers pre-intervention n = 124

Malaria preventive measures	Frequency	Percentage
- Bush clearing	1	1.0
- Use of untreated bed nets	3	3.1
- Covering dug wells	1	1.0
- Removing of stagnant water	0	0.0
- Use of insecticide spray	37	38.5
- Use of insecticide treated nets	35	36.5
- Use of anti-malarial drugs	18	18.8
- Use of window nets	38	39.6
- Use of mosquito repellents	4	4.2
- Use of mosquito coils	20	20.8
- None	11	11.5

Table 4. Malaria control measures practiced by the mothers post-intervention n = 124

Malaria preventive measures	Frequency	Percentage
- Bush clearing	58	68.2
- Fumigation	10	11.8
- Use of untreated bed nets	14	16.3
- Removing of stagnant water from environment	80	94.1
- Covering dug wells	81	95.3
- Use of insecticide spray	43	50.6
- Use of insecticide treated nets	59	69.4
- Use of anti-malarial drugs	11	12.9
- Use of window nets	41	48.2
- Use of mosquito repellents	25	29.4
- Use of mosquito coils	1	1.2

Table 7 presents the result on relationship between the women's educational level and their practice of malaria control measures pre-intervention. The results revealed no significant relationship between them. Table 8 presents the result on the relationship between the women's educational level and their practice of malaria control measures post-intervention. The result revealed no significant relationship between them except use of fumigation method ($p = .049$)

and use of insecticide treated nets ($p = .014$). Table 9 presents the result on the effect of the health education intervention on practice of malaria control measures. The health education had significant effect on the practice level of the control measures ($p < .001$). The means indicated that the practice level post-intervention was significantly higher than the practice level pre-intervention.

Table 5. Hindrances to malaria control practices pre-intervention n = 124

	SD	D	A	SA	M±SD
I don't have adequate health information about the dangers of malaria	13	26	37	20	2.67±0.96
I am not that learned enough to know what to do	39	33	14	9	1.93±0.97*
I am not aware of malaria control practices	3	21	50	20	2.93±0.75
I don't know of any effective control practice	4	9	45	37	3.21±0.78
I don't have any malaria control tool	6	7	46	36	3.18±0.82
I cannot afford money to buy effective malaria control tools	0	3	33	58	3.59±0.56
I don't like using malaria control tools because it does not make me feel comfortable while resting or sleeping	3	15	46	32	3.11±0.78
There are no formulated policies on environmental control	2	11	61	19	3.04±0.64

*Item with M > 2.5 was considered as hindrance; * implies item not considered as hindrance*

Table 6. Hindrances to malaria control practices post-intervention n = 124

	SD	D	A	SA	M±SD
I don't have adequate health information about the dangers of malaria	53	32	0	0	1.38±0.49
I am not that learned enough to know what to do	47	35	3	0	1.48±0.57
I am not aware of malaria control practices	38	47	0	0	1.55±0.50
I don't know of any effective control practice	38	47	0	0	1.55±0.50
I don't have any malaria control tools	36	48	1	0	1.59±0.52
I cannot afford money to buy effective malaria control tools	16	28	28	13	2.45±0.97
I don't like using malaria control tools because it does not make me feel comfortable while resting or sleeping	17	48	20	0	2.04±0.66
There are no formulated policies on environmental control	5	17	52	11	2.81±0.73*

*Item with M > 2.5 was considered as hindrance; * implies item considered as hindrance*

4. DISCUSSION

The result of the study shows that the practice of all the malaria control measures were generally poor, this may be attributed to lack of awareness or poor information of the control measures that are readily available to the mothers as malaria control practices were below 40%. However, the most practiced measure was the use of window net (39.6%), followed by the use of insecticide spray (38.5%) and the use of treated net (36.5%). Some measures like removal of stagnant water and bush clearing were never practiced. The result implies that there is poor understanding about the methods of controlling malaria which is in line with a study on perception and practice of malaria prevention and treatment among mothers by Ashikeni et al., [12]. It was observed that pre-intervention, few mothers had good knowledge of preventing malaria such as the use of insecticide treated bed net, cleaning surroundings, wearing protective clothing, use of barrier nets on the windows and doors or use of insecticide sprays etc. This was in contrast to the findings of a previous study Akaba et al., [13] on knowledge and utilization of malaria preventive measures

among pregnant women where an adequate knowledge about malaria preventive measures and reduced utilization of those measures were found.

Secondly, the most practiced measures at pre-intervention were the use of window net, use of insecticide spray and use of insecticide treated nets. Making these methods, the mostly known method of controlling malaria by these mothers. This conforms to the findings by Adeyemo et al., [14], which found window net, door net, spraying the house with insecticide aerosol and mosquito coil as the most commonly used preventive measures pre-intervention. However, the findings by Kimbi et al., [15] in contrast reported a high practice of preventive measures by the participants. Environmental measures of malaria control like bush clearing, covering of dug wells and removal of stagnant water around the home were least practiced. This can be related to the lack of knowledge that environmental sanitation is a method of malaria control. This is in agreement with the findings by Adeyemo et al [14], which observed that few of the respondents were aware that environmental sanitation like draining of pools of stagnant water can help prevent malaria.

Table 7. Relationship between the mother's educational level and their practice of malaria control measures pre-intervention

Preventive measures	Level of education			Chi-Square	p-Value
	Primary	Secondary	Tertiary		
Bush clearing					
- Yes	0 (0.0)	1 (1.8)	0 (0.0)	-	1.000*
- No	25 (100.0)	55 (98.2)	15 (100)		
Use of untreated bed nets					
- Yes	0 (0.0)	3 (5.4)	0 (0.0)	-	.731*
- No	25 (100.0)	53 (94.6)	15 (100)		
Covering dug wells					
- Yes	0 (0.0)	1 (1.8)	0 (0.0)	-	1.000*
- No	25 (100.0)	55 (98.2)	15 (100)		
Use of insecticide spray					
- Yes	6 (24.0)	22 (39.3)	9 (60)	5.161	0.076 ⁺
- No	19 (76.0)	34 (60.7)	6 (40.0)		
Use of Insecticide treated net					
- Yes	5 (20.0)	22 (39.3)	8 (53.3)	4.960	.084 ⁺
- No	20 (80.0)	34 (60.7)	7 (46.7)		
Use of anti-malarial drugs					
- Yes	2 (8.0)	13 (23.2)	3 (20.0)	-	.287*
- No	23 (92.0)	43 (76.8)	12 (80.0)		
Use of window nets					
- Yes	11 (44.0)	21 (37.5)	6 (40.0)	.307	.858 ⁺
- No	14 (56.0)	35 (62.5)	9 (60.0)		
Using mosquito repellents					
- Yes	1 (4.0)	3 (5.4)	0 (0.0)	-	1.000*
- No	24 (96.0)	53 (94.6)	15 (100)		
Using mosquito coil					
- Yes	5 (20.0)	13 (23.2)	2 (13.3)	.715	.700 ⁺
- No	20 (80.0)	43 (76.8)	13 (86.7)		
No measure practiced					
- Yes	4 (16)	7 (12.5)	0 (0)	-	.328*
- No	21 (84)	49 (87.5)	15 (100)		

Inferential statistics used: Chi square test of independence (+); Fishers exact test ()*

After conducting the health education intervention, the practice of control measure experienced a drastic increase with some control practices being practiced by 40% of the mothers. This indicated that health education played a very significant role in driving home the importance of control measures in fighting malaria. The mothers discovered their role in the control of malaria like making sure that their children wear adequate covering clothes (50.6%), using mosquito treated net (69.4%), using window net (48.2%), clearing of nearby bushes (68.2%), covering of dug wells (95.3%), removing of stagnant waters (94.1%) and using mosquito repellent spray and creams (29.4%). This was in agreement with the findings by Olorunfemi [16], which showed that the practice of using insecticide

treated net, indoor spraying, mosquito coil, cleaning of environment and window and door nets showed improvement after health education.

Interestingly, majority of the participants started becoming aware of environmental control as a control measure as seen post-intervention. They increased their involvement in the practice of making the environment less conducive for the breeding of mosquitoes by removing stagnant water, covering of dug wells, and clearing of bushes. This agrees with the findings by Randell et al., [17] who reported that the respondents gained knowledge of link between mosquito, the environment and malaria after the health education but in contrast with the study by Ayalew [18] who reported that there was no

Table 8. Relationship between the mother's educational level and their practice of malaria control measures post-intervention

Preventive measures	Level of education			Fishers exact p-value
	Primary	Secondary	Tertiary	
Bush Clearing				
- Yes	9 (75.0)	45 (68.2)	4 (57.1)	.775
- No	3 (25.0)	21 (31.8)	3 (42.9)	
Fumigation				
- Yes	1 (8.3)	6 (9.1)	3 (42.9)	.049
- No	11 (91.7)	60 (90.9)	4 (57.1)	
Use of untreated bed nets				
- Yes	3 (25.0)	11 (16.7)	0 (0.0)	.377
- No	25 (100.0)	55 (98.2)	15 (100)	
Removing stagnant water				
- Yes	11 (91.7)	62 (93.9)	7 (100)	.728
- No	19 (76.0)	34 (60.7)	6 (40.0)	
Covering dug wells				
- Yes	12 (100)	62 (93.9)	7 (100)	1.000
- No	0 (0.0)	4 (6.1)	0 (0.0)	
Use of insecticide sprays				
- Yes	6 (50.0)	35 (53.0)	2 (28.6)	.590
- No	6 (50.0)	31 (47.0)	5 (71.4)	
Use of insecticide treated nets				
- Yes	4 (33.3)	49 (74.2)	6 (85.7)	.014
- No	8 (66.7)	17 (25.8)	1 (14.3)	
Use of anti-malarial drugs				
- Yes	1 (8.3)	10 (15.2)	0 (0.0)	.730
- No	11 (91.7)	56 (84.8)	7 (100)	
Use of window nets				
- Yes	4 (33.3)	34 (51.5)	3 (42.9)	.551
- No	8 (66.7)	32 (48.5)	4 (57.1)	
Using mosquito repellents				
- Yes	3 (25)	19 (28.8)	3 (42.9)	.704
- No	9 (75)	47 (71.2)	4 (57.1)	
Using mosquito coil				
- Yes	0 (0.0)	1 (1.5)	0 (0.0)	1.000
- No	12 (100)	65 (98.5)	7 (100)	

Inferential statistics used: Fishers exact test

Table 9. Effect of the health education intervention on malaria control practices

	M±SD	Mean difference	T	p-value
Pre-Intervention	1.75±0.62	-3.23	-32.415	<.001
Post-Intervention	4.98±0.72			

Inferential statistics used: t test

improvement by the respondents in the use of environmental management as a protective measure against malaria even though they had knowledge of environmental cleanness as a means of malaria prevention.

In respect to the hindrances to malaria control practice before intervention, all the listed factors were considered as hindrances except not being learned enough to know what to do (1.93±0.97). The most prominent hindrance was the inability

to afford money to buy effective malaria control tools (3.59 ± 0.56). Other prominent hindrances were: not knowing any effective control practice (3.21 ± 0.78), not having any control tool (3.18 ± 0.82), not liking the use of some tools (like bed net) due to its inconvenience (3.11 ± 0.78) and no formulated policies on environmental control (3.04 ± 0.64). This agrees with the study by David et al. [19] where they discovered that several barriers to effective preventive practices as stated by the participants, like cost, ease of use and unpleasant side effect from coil smoke and insecticide spray. The most prominent hindrance to the practice of malaria control practices by these mothers was the inability to afford malaria control tools. Cost is a basic hindrance to the practice of malaria control, as that they are aware of the need to control malaria but does not have adequate funds or don't see it as an important need to squeeze acquiring these control tools into their budget. Therefore, there is a need for health education intervention to enlighten these mothers of the importance of these control measures, informing them that these measures are not very expensive as it is readily available in the health centers.

The hindrance of discomfort in the practice of control measure was high (3.11 ± 0.78) before the health education intervention. This discomfort attributed to the practice of a control measure could lead the participants to decline the use of these measures. This was seen in the study by David et al. [19] where the participants complained "that the problem associated with the use of a bed net is that it makes the user sweat a lot". This magnified the need for health education on the dangers of malaria as opposed to these discomforts. The participants' needs to know that it is better to sleep under a mosquito treated net with these discomforts than to have your children sick everyday with malaria.

After health education, the hindrances as seen in Table 6 interestingly, was a good reduction in the hindrances to the practice of malaria control, indicating that most of these hindrances the participants indicated before the health education intervention was because of poor knowledge on the importance of these control measures, thereby preventing its use. This concurs with the study by Bauch et al. [20] where they stated that maintaining and continuing to reduce malaria transmission will require ongoing education for both health care providers and residents to reinforce the importance of using preventive measures. Non availability of formulated policy

on environmental control was a hindrance even after the health education intervention as it was still (2.81 ± 0.73). This shows that this hindrance is not as a result of lack of knowledge but the need for government involvement in the eradication and control of malaria. Moreover, it implies the need for the government to collaborate with health organizations in order to formulate a policy that will promote environmental control of malaria.

5. CONCLUSION

This present study conducted among mothers of under-five concludes that there is lack of knowledge and awareness on the practice of malaria control measures, as the practice of malaria control measures increased with health education on the various control measures readily available and the importance of actively practicing them. Therefore, the findings of this study implies that health education has a vital role in improving the knowledge and practice of malaria control practices in mothers of under-five.

CONSENT AND ETHICAL APPROVAL

Before data collection, ethical approval was obtained from the Research and Ethics Committee of the institutional review committee, University of Nigeria Teaching Hospital, Ituku-Ozalla (NHREC/05/01/2008B-FWA00002468-1RB00002105) in Nigeria. Study participants voluntarily signed written informed consent forms without any incentives. They consented because they believed their responses would contribute to greater effective control of malaria. The participants were also assured of confidentiality. A semi-structured interviewer administered questionnaire was used to collect data from the consenting study participants. The purpose of the study was explained to each participant, which was also contained in the informed consent form. Only those who consented were included in the study. A cover note explaining the study along with consent forms was submitted to the institution/health facility seeking permission to recruit mothers (participants) to participate in this study. Consent of the mothers of under-five children to participate in the study was obtained.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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