



## **The role of Home-based Communication on improving attitude regarding Utilization of Long-Lasting Mosquito Nets, Khartoum State, Sudan (2016 - 2018)**

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### **A BSTRACT**

**Background:** In the absence of a vaccine or effective and sustainable means of vector control, use of LLINs is an effective way to limit vector borne diseases.

**Objectives:** The study aimed to assess the role of home-based communication in improving attitude of nets owners and hence the LLINs utilization compared with the currently used BCC approaches in 2016 – 2018 in Khartoum state.

**Materials and methods:** A community based quasi-interventional study that utilized both pre and post design, and case – control study design study was conducted in four villages two served as intervention in Bahri Locality and the other two were selected as a control villages in Omdurman Locality. A multistage random sampling technique was used in selecting the required samples for this study and a semi- structured questionnaire was used to collect required information. The intervention composed of home-based communication includes messages and printable materials about the LLINs importance adapted from the national malaria control as well as distributing LLINs and training the community on hanging LLINs. A total of 1250 participants were deployed and divided equally between both the experimental and control groups and were followed up for a period of one year with interval every 3 months.

**Results:** There were no significant differences observed between the intervention and control groups concerning socio-demographic characteristics such as age, occupation and education level except for family monthly income,  $p$ -value  $> 0.05$ . The knowledge score about LLINs in the intervention villages was significantly increased for good knowledge in the dry season and wet season  $p$ -value = (0.001). This is most probably attributed to the four quarterly based follow-up visits, home based communication method has significant impact affecting

bed net use compared to routine behavioral change communication (BCC) and It have great role in promoting the proper use and utilization of LLINs in the study villages during dry and wet season.

**Conclusion:** The home-based communication is appearing effective in increase knowledge regarding utilization of nets. Therefore, it is suggested that there is a need to adopt by National Malaria Control Programme home-based communication during and after bed nets campaigns to enhance maximum utilization of LLINs. The study recommended adopting home-based BCC during and after LLINs campaigns and to a conduct more researches.

**Keywords:** *home based communication, knowledge, Khartoum state*

### **Introduction:**

Malaria is currently responsible for an estimated 220 million infections and 660,000 deaths, mostly in children less than five years of age, with around 90% of deaths occurring in Africa (1). Insecticide-treated nets (ITNs) have been shown to reduce the incidence of malaria episodes by 50% in endemic areas (2) and have accordingly become one of the key strategies employed in the global malaria response (3). Millions of free or highly subsidized ITNs and long-lasting insecticide treated nets (LLINs) have been distributed in the last decade (4–5) resulting in substantial increases in ITN ownership in many malaria-endemic countries (6). However, multiple studies have revealed that rates of ITN use are often lower than rates of ITN ownership (7). This presents a significant obstacle to realizing the maximum benefits of ITNs for malaria-related morbidity and mortality since ITNs are maximally protective only when utilized correctly and consistently (8).

Previous studies have explored this apparent “gap” between net ownership and use. Potential determinants of ITN use previously identified include: demographic characteristics (9); an individual’s knowledge and beliefs related to malaria and bed nets (10); dwelling construction, family size/composition and sleeping arrangements (11); physical characteristics of bed nets (11); environmental factors (11); community and cultural characteristics (12); and household net density (11). However, programmatic implications of these findings are not always obvious given that the direction and magnitude of reported associations vary by geographic location, epidemiological setting and method of analysis. This study aimed to assess the role of home-based communication in improving attitude of nets owners and hence the LLINs utilization compared with the currently used BCC approaches in 2016 – 2018 in Khartoum state.

## **MATERIALS AND METHODS:**

### **Study design:**

This was a community based quasi-interventional study that utilized both pre and post design, and case – control study design, as follows:

**A pre and post design**, to determine changes in LLINs utilization and associated knowledge, attitudes, and practices following adopting of home-based communication (HBC), as BCC strategy, among members of households in the intervention villages in Khartoum State (objective 3)

**A case – control study design**, to compare the difference in LLINs utilization in Khartoum state between members of households in the intervention villages (exposed to HBC) and household members in the control villages (exposed to BCC strategy) .

### **Study Area:**

The study was conducted in Khartoum State which includes Khartoum city the capital of Sudan. Khartoum state is one of the eighteen states of Sudan.

### **Study duration:**

2016 - 2018

### **Study populations**

These are members of households in Khartoum state.

### **Sample size estimation**

The sample size was calculated using the formula:  $n = N / (1 + N(e^2))^{(109)}$  where (n) is the sample size, (N) is the population size, and (e) is the level of precision (0.03).

$$N = 5,274,321$$

$$e = 0.03$$

$$n = 1111$$

$$\text{Refusal rate (11\%)} = 139$$

The total targeted housewives = 1250

### **Sampling technique**

Random multistage cluster sampling method was applied for the selection, as follows:

#### **First stage (selection of study localities)**

Randomly, by toss draw from the seven localities in Khartoum state, Omdurman locality was chosen as the (intervention villages) and Bahari locality was chosen as the (control villages). Also, the targeted villages in the intervention and control localities were obtained from the list of villages in the same report.

## Second stage (selection of the study villages)

### Inclusion criteria

Villages that reached the LLINs universal coverage (reached 100% LLINs total coverage according to WHO standards) were included.

### Exclusion criteria

Villages which did not reach the LLINs universal coverage (reached 100% LLINs total coverage according to WHO standards) were excluded.

**The intervention villages** (in Omdurman locality) are villages that reached the LLINs universal coverage (reached 100% LLINs total coverage according to WHO standards). There were eleven villages (table 1), with a total of (20192) population, according to 2008 census and the annual growth rate updates. These villages were chosen and named as ‘intervention cluster frame’, as they were totally covered by the study intervention package. Moreover, housewives who were living in the villages for the last 3 years and received and retained LLINs in the last 3 years were included in the study as residents of intervention villages.

Table (1): Villages in Omdurman locality where LLINs were distributed till 2016

	Village Name	No of households (HH)	No of HHs	HH Sample	Health Promoter Code
1.	Eid Abu Zaid	10969	1738		
2.	Alsero	17630	2324		
3.	Alaushara	16810	2568	308	A
4.	Eastren Salha	14261	2375		
5.	Eastren Gaiaa	19289	2823		
6.	Eid Alhad	6895	1248		
7.	Almatabier	2712	534		
8.	Alshiek Albashir	5877	1182		
9.	Alsandodab	5667	1046		
10.	Algaiaa	17156	2645	317	B
11.	Almugadab	9910	1709		
	Total	127176	20192	625	

From a list of intervention villages, Alaushara and Algaiaa villages were selected for the study, using simple random method (by toss draw). The list of household members in the two villages (Alaushara and Algaiaa) who received LLINs (as per the annual LLINs distribution report, 2016) was taken as sampling frame.

### The control villages (in Bahri locality)

The control Villages (Bahari locality): are villages that reached the LLINs universal coverage (reached 100% LLINs total coverage according to WHO standards). They were

(10) villages with (20800) population according to 2008 census and the annual growth rate updates. These villages were named as control clusters (table 2) . Moreover, housewives who were living in the villages for the last 3 years before the study and received and retained LLINs for the last 3 years were included in the study as residents of control villages.

**Table (2):** The control villages where LLINs were distributed in Bahari locality till 2016

Village Name	HH	No of HHs	HH Sample	Health Promoter Code
1. Aljaili	14787	2624	308	A
2. Dairy	3432	634		
3. Wawisi Abdg	3686	725		
4. Wawisi Ali	5054	1088		
5. Aldohom & Alabiad	6526	1187		
6. Wad ramli	7694	2700	317	B
7. Alnikhaila	8820	1781		
8. Algarari	16410	3164		
9. Alkadaro	15595	2930		
10. Northern Um algora (A&B)	17925	3967		
Total	99929	20800	625	

From the villages list by toss draw Aljaili and Wad ramli villages were chosen and the sample was proportionally divided between the two villages (308) HHs and (317) HHs respectively and given code (A) and (B) to identify the team which will conduct the study survey.

### Third stage (selection of the study households)

According to Khartoum state ministry of health LLINs were distributed to all villages however for the study purpose LLINs were again given to HHs who did not have access to LLINs before, sometimes LLINs were given to them as replacement to grantee (100%) coverage during the intervention period. The calculated sample size (1250) was divided equally between intervention villages (625) HH and control villages (625) HHs. Then the sample of (625) HH were distributed over the two selected villages in the intervention locality and also over the two selected villages from the control locality. The calculated sample size was distributed over the four villages (Algaiaa, Alaushara, Wad Ramli, Aljaili) in proportionate to their population size. So the calculated sample size was 308, 317, 308 and 317 respectively.

In each of the four villages systemic random sampling technique was used as follows:

- The geographic center of the village was identified
- A pen was drowned at the village center to choose the main rood outside the village
- The first HH outside the village to the right hand was chosen as first HH
- The interval was 5 HHs

- The movement was clockwise
- The participation was voluntary based
- In case that there was no housewife, or she refused to participate immediately data collectors used to choose the neighboring HH and carry on
- If there were many families in a single house by toss draw one was chosen also if there were more than one housewife by toss draw one was chosen.
- Data collectors were told to thank the participating HH and move to the second one
- Using random technique participating households were selected starting from the Northern east corner with a clockwise movement.

### **Study subjects**

Operational research by Khartoum malaria free initiative (KMFI) showed that at the household level housewives are usually responsible for LLINs. Also, that was clearly observed during the previous LLINs distribution campaign; that is why housewives in both intervention and control villages were targeted to be sources for data collection.

### **Study Phases**

#### **3Phase (1): Orientation of health authorities and stakeholders (1-7) Jan 2016**

During this phase the researcher offered orientation about the research objectives, benefits and methods to relevant sectors, including; the Social and Preventive Medicine dept DG (SMOH), Bahari and Omdurman localities leaders(executive DG, Health dept DG, Malaria control director, Administrative Units Officers, local community leaders as heads of People's committees (*Allijan Alshabia*), Health leaders, all were contacted by the researcher through meetings they had had full explanation to the objectives and scope of the study and the benefit that their sectors and communities will gain.

#### **Phase two: Data collectors recruitment and training (8-11) Jan 2016**

For the pre and post surveys purpose twenty data collectors were chosen according to prelisted criteria. The criteria for choosing the data collectors were restricted to data collectors with at least Bachelor degree and previous participation in community-based health research – with preference of data collectors who used to participate with (SMOH) in similar studies and surveys. Males and females were equally recruited, moreover data collectors living nearby the study villages were preferred. In addition to that a senior health officer in each locality was recruited as team facilitator to facilitate the field work. Then all data collectors and team facilitators were trained on how to conduct the survey specially how to fill the predesigned questionnaires using the predesigned manual (in Arabic language. According to the pre training and post evaluation data collectors proved that they gained the needed knowledge and skills to conduct their task perfectly.

### **Pilot study**

Under the direct supervision of the researcher Pilot testing took place in (16-19) January 2016 directly after the training of the survey team members they conducted a pilot survey in 125(10%) HHs in Khartoum locality villages which were not included in the actual study villages to test the tools and data collectors' skills and readiness. After field work, data collectors had had a session for discussion and evaluation and correction which showed clearly that they were ready to implement their assigned tasks.

### **Phase three: Health promoters recruitment and training (8-11) Jan 2016**

For the study intervention ten health promoters (all public were health officers) were recruited for house-to-house implementation of the intervention package. In addition to that a senior health officer in each locality was recruited as team facilitator to facilitate the field work. Health officers were selected according to prelisted criteria: holding Bsc degree in public health, previous engagement in similar community-based research. Males and females were equally recruited; moreover health officers who had ease access to the study villages were preferred. Then all the ten health officers and the team facilitator were trained on how to conduct the study, specially how to deliver the home-based BCC messages, they also had in depth training and orientation about how to act and react with household and community members, general interviewing skills, administration of consent forms, field work, in addition to specific training on malaria control and prevention with focus on (IVM) specially LLINs use scale up. They were trained and facilitated with the pre-designed manual of the study (in Arabic language as well as needed prints). The target of this training was to give the health promoters (health officers) basic knowledge on malaria control activities as well as giving them complete idea about their tasks. The study manual was their main reference of the training as it was designed by the researcher for that purpose.

### **Intervention Pilot study**

Under the direct supervision of the researcher Pilot testing took place in (20 to 23) January 2016 directly after the training of the health promoters pilot covered 125(10%) HHs in Khartoum locality villages which were not included in the actual study villages to test the tools and health promoters skills and readiness. After field work, health promoters had had a session for discussion and evaluation and correction which showed clearly that they were ready to achieve their jobs.

**Phase four:** This phase included two surveys, as follows: a) Dry season Pre-intervention survey (1-2) January 2016, and b) Wet season Pre-intervention survey (1-2) Sept 2016. The pre intervention surveys were conducted during the dry season and the wet season for the study purpose in the four selected villages: Algaiaa and Alaushara in Omdurman locality and Wad Ramli & Aljaili in Bahari locality. As calculated, 1250 HHs was divided equally

between the two localities, 625 HH per each locality, divided proportionally to the population in each village. Data collectors were distributed in Algaiaa, Alaushara, Wad Rramli, Aljailito interview the study subjects in the selected households, using systemic random sample technique as follows:

- The geographic Centre of the village was identified
- A pen was drowned to choose the main rood outside the village
- The first HH outside the village to the right hand was chosen as first HH
- The interval was 5 HHs
- The movement was clockwise
- The participation was voluntary based
- In case that there was no housewife, or she refused to participate immediately data collectors used to choose the neighboring HH and carry on
- If there were many families in a single household, then the data collectors used to select (by toss draw) one housewife to interview.
- When they finish data collection, data collectors used to thank the participating HH and move to the second one

#### **Phase (5): Intervention 5 Jan- 31Dec 2016**

**LLINs promotion educational package was designed to address the following aspects:**

##### **Attitude**

- a. The need to sleep under LLINs
- b. The importance of using LLINs in daily basis.
- c. The need for information about bed nets

#### **The first home visit (Jan - March) 2016**

In the intervention villages, the trained health promoters (n, 10) were distributed in two groups of five, each group responsible of one village in Omdurman (Algaiaa&Alaushara), they used to move from HH to the other in each selected village till they covered all the targeted number of households with home-based (BCC). In each HH, they used to conduct LLINs promotion plan in the wet and dry seasons as follows:

1. Conduct **LLINs promotion plan**
2. Distributing and explaining content of printable materials including posters, manuals and pamphlets about the LLINs importance
3. Distribute (LLINs) to the targeted (HHs) if they lost their LLINs or their LLINs became not effective.
5. Giving the targeted (HHs) full chance to explain their ideas, beliefs, practice, and their experience and barriers using LLINs, if any.



7. Training the targeted (HHs) on how to hang the (LLINs) properly, how to keep it and how to wash it. The team of health promoters includes two members (male and female). They targeted the housewife and all HHs members who were present at the visit time. The visits usually used to start at eleven o'clock in the morning till 2 o'clock afternoon. However, if the housewife is absent or she chooses certain time as suitable time, then the visit used to be postponed to that time. Moreover, the team of health promoters used to leave the house only after being sure that the health messages they delivered were well understood and the skills of hanging the LLIN were well acquired, wrong believes and misconceptions and fears were alleviated. The ten Health promoters used to cover (30 – 50) HHs per day covering the (625) HHs in (2-3) weeks this represents one round, the household visits used to be conducted once every (3) months, and this continued for one year so that 4 rounds were conducted throughout the study period.

#### **The second home visit (April - June) 2016**

1. LLINs promotion plan contents were again reviewed to make sure that HHs remember the messages
2. Distributing and explaining content of printable materials about the LLINs importance
3. Inspect the LLINs to see if it is used, well-kept and if it needs replacement
3. Distribute(LLINs) to the targeted (HHs) if they lost their LLINs or their LLINs became not effective.
5. Give the targeted (HHs) full chance to explain their ideas, beliefs, practice, and their barriers using LLINs, if any.
6. Ask the HHs to demonstrate how the LLINs hang.

#### **The third home visit (July - Sept) 2016**

#### **The fourth home visits (Oct - Dec) 2016**

The third and fourth home visits followed the same procedure as in visit one and two.

#### **3Phase (6):**

Dry season Post intervention evaluation was on (6<sup>th</sup> - 8<sup>th</sup>) Jan 2017 while the wet season Post intervention evaluation was conducted on (30<sup>th</sup> - 31<sup>st</sup>) Dec 2017. After the intervention, data collectors who have participated in the pre-evaluation in the wet and dry season again participated in the post intervention evaluation in both the intervention and control villages. For the post test the same sampling process used in the pre-evaluation was followed again. To measure the change in the knowledge

1. The predesigned questionnaire was used as too
2. Respondents were asked to explain their knowledge about vectors, malaria and LLINs and hang the LLIN

Evaluating the attitude of the respondents was identified through group discussions and individual discussion to know what they believe after they have participated in the study. Respondents acquired practice was noticed through the remarks of the evaluators who were asked to do that beside the respondent were asked to hang the LLINs as demonstration to what they gain.

### **Data entry and analysis 15 Feb - 15 Aug 2018**

Data was processed and entered in SPSS software version 16.0. Descriptive statistic and inferential statistic have been used where appropriate. P-value was considered significant at 0.05 levels.

### **Ethical considerations**

1. Ethical clearance and permission to conduct the interviews were obtained from the Ministry of Health, Khartoum state also the local authorities and the community committees (ligan shabia) were told.
2. Informed verbal consent was obtained from all individuals interviewed respectively.
3. Respondent housewives were told that the participation is voluntary, and they have the right to accept or refuse, moreover they were told that codes are used to guarantee their confidentiality, then the questionnaire was completed.
4. Measures were taken to ensure the respect, dignity, and freedom of each individual participating in the study.
5. During training of the interviewers, emphasis was placed on the importance of obtaining informed consent (orally) and the avoidance of any kind of coercion.
6. To ensure confidentiality, all household members were identified by a unique code and the main researcher, beside the health promoter, were the only persons who could access for personal data.

### **RESULTS:**

Table 1 explains the attitudes of respondents towards the use of LLINs during dry and wet seasons. The increase in respondents, in the intervention villages, with positive perception towards the need to sleep under LLINs was significantly increased from (60.0%) to (94.6%) in the dry season and from (62.6%) to (93.8%) in the wet season (p – value, 0.001). In the control villages the increase was from (61.8 %) to (62.9%) in the dry season and from (60.3%) to (61.0%) in the wet season (p – value, 0.226 and 0.895 respectively). During the dry season in intervention villages the positive perception among respondents regarding the possibility of sleeping under bed nets on daily basis was significantly increased from (63.0%) to (93.3%) in the dry season and from (57.0%) to (93.0%) in the wet season (p – value,

0.001), compared to the control villages where the increase was from (50.28 %) to (50.6%) in the dry season and from (30.9%) to (31.4%) in the wet season (p - value, 0.742 and 0.085 respectively). During the dry season in intervention villages the positive belief among respondents regarding the need for information about LLINs was significantly increased from (22.6%) to (91.8%) in the dry season and from (38.2%) to (91.0%) in the wet season (p - value 0.001) in both seasons, compared to the increase from (30.9 %) to (31.4%) in control villages was during the dry season, and from (48.1%) to (61.3%) in the wet season - p - value (0.085 and 0.29) respectively.

**Table 1:** The reported changes in attitudes towards the use of LLINs during dry and wet seasons among housewives in the intervention and control villages in Omdurman & Bahri localities, Khartoum state, 2016 – 2018(n,625).

Attitudes	Season	Housewives in intervention villages n=625				Housewives in control villages n=625			
		Pre # (%)	Post # (%)	$\chi^2$	p-value	Pre # (%)	Post # (%)	$\chi^2$	p-value
to the commitment to sleep under LLINs	Dry season	375 (60.0%)	591 (94.6%)	52.5	<b>0.001</b>	386 (61.8%)	393 (62.9%)	23.4	<b>0.226</b>
	Wet season	391 (62.6%)	586 (93.8%)	48.1	<b>0.001</b>	377 (60.3%)	381 (61.0%)	6.3	<b>0.895</b>
The use of LLINs in daily basis is possible	Dry season	394 (63.0%)	583 (93.3%)	49.1	<b>0.001</b>	314 (50.2%)	316 (50.6%)	4.6	<b>0.893</b>
	Wet season	356 (57.0%)	581 (93%)	351	<b>0.001</b>	316 (50.6%)	324 (51.8%)	18.3	<b>0.742</b>
A need for information about LLINs	Dry season	141 (22.6%)	574 (91.8%)	58.3	<b>0.001</b>	193 (30.9%)	196 (31.4%)	12.7	<b>0.085</b>
	Wet season	239 (38.2%)	569 (91.0%)	34.5	<b>0.001</b>	301 (48.1%)	383 (61.3%)	38.1	<b>0.29</b>

## DISCUSSION:

The present study aimed to assess the role of home-based communication in improving attitude of LLINs owners and hence the LLINs utilization compared with the currently used BCC approaches in 2015-2017. The study showed that, the positive attitudes about the need to sleep under LLINs in the intervention villages significantly increased during dry season

from 375(60.0%) to 591(94.6%) p- value (0.001) and from 391(62.6%) to 586(93.8%) p-value (0.001) during the wet season, with no significant increase in the control villages. This finding supports the efficiency of home-based BCC; other studies also supported this finding. The findings of a study in Nigeria (2015) revealed that 43.2% of the respondents used LLINs every night, while 38.4% used LLINs most nights. The study recommends that home visits are important to promote consistent attitude regarding the use of LLINs (13). Also, the study findings were supported by another study in Uganda that resulted in both hanging and use of LLIN/ITN increased during follow-up. The proportion of the population using an ITN/LLIN the previous night was 64.0% (95% CI 60.8, 67.2), for one additional visit, 68.2% (63.8, 72.2) for two visits and 64.0% (59.4, 68.5). The proportion of households with all campaign nets hanging increased from 55.7% to 72.5% at end line ( $p < 0.0005$  for trend) the study concluded that Behavior change communication provided during the home - based visits was sufficient to induce high levels of net hanging.(14) The study revealed that, sleeping under LLINs last night was significantly greater from 83(13.3%) to 509(81.4%) p-value (0.001) in the wet season and from 97(15.5%) to 507(81.1%) p-value (0.001) in the dry season while there was no significant change in the control villages, this slight improvement in LLINs utilizations attributed to the home-based BCC. This finding is in agreement with the previous study in Uganda which showed that both hanging and use of LLINs increased during follow-up, where the proportion of the population using an LLINs the previous night was 64.0% (95% CI 60.8, 67.2), for one additional visit, 68.2% (63.8, 72.2) for two visits. (15)

#### **Limitations of the study:**

1. Budgetary constraints made the study to be only restricted to two localities in Khartoum State. Such studies will have more beneficial results if done on more representative communities with complete randomization all over Khartoum State or the Country.
2. The lack of internet, communication network, electricity in many cases, in addition to transportation difficulties and road cuts due to the rain and floods in the wet season and its consequences constituted a great challenge and limitation during the study period.
3. The closure of the country due to the COVID-19 pandemic and its consequences constituted a great challenge and limitation during the study period.

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We want to acknowledge the Khartoum locality health promotion staffs for their great support during data collection. Further, our appreciation is also extended to the study subjects for their voluntary involvement in the study.

#### **CONCLUSION:**

The home-based communication is appearing effective in improving attitude regarding

utilization of nets. Therefore, it is suggested that there is a need to adopt by National Malaria Control Programme home-based communication during and after bed nets campaigns to enhance maximum utilization of LLINs. The study recommended adopting home-based BCC during and after LLINs campaigns and to a conduct more researches.

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### **CONFLICTS OF INTEREST**

The authors declare no conflicts of interest.

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