Research Article **ISSN: 2394 – 7403**

International Journal of Medicine and Health Profession Research

Journal home page: www.ijmhpr.com

https://doi.org/10.36673/IJMHPR.2023.v10.i01.A02

IMPACT OF COMMUNITY-BASED INTERVENTION ON *AEDES AEGYPTI* BREEDING CONTAINERS TO CONTROL DENGUE FEVER IN KEREN, ANSEBA REGION, ERITREA

Mensur Yenus*[1] and Samuel Jirom Wolday[2]

[1*]Malaria Control Program, MOH, Anseba Region, Keren, P.O.Box 49, Eritrea.
[2]Ministry of Health Keren Sub Zone, Anseba Region, P.O.Box 49, Eritrea.

ABSTRACT

Many studies emphasized the impact of community managed dengue vector control interventions, whose purpose was mainly to reduce *Aedes* mosquitoes breeding habitats particularly household water-holding containers. Strategies targeted to *Aedes* community based intervention are most of the time interested in areas of low-income countries which may have infrastructural problems and/or a difficulty to deploy sustainable insecticide based interventions. The objective of the study was to determine the impact of community based intervention introduced in Keren, Anseba Zone, Eritrea in late 2020. A prospective cross sectional study was used at the transmission season between August and December 2021. After intervention, entomological indices were significantly reduced. Before the intervention and soon after the intervention. HI, CI and BI was 79.8%, 37.7% and 148 respectively. Comparing to the normal range of these indices (HI<7, CI<5 and BI<20), the risk of the community to dengue epidemic was very high. A year after the intervention, a promising result was occurred. HI, Cl and BI indices were reduced to 9%, 2% and 23 respectively. Dengue fever cases were also reduced by 3 fold between 2020 and 2021. In conclusion, this study suggests that a comprehensive and enhanced dengue intervention strategy based on community engagement has significant effect to control a dengue.

KEYWORDS

Dengue fever, Community intervention and Impact.

Author for Correspondence:

Mensur Yenus,
Malaria Control Program, MOH,
Anseba Region, Keren, Eritrea.

Email: mensuryenus@gmail.com

INTRODUCTION

The strategies set against malaria in 2000; in Abuja as roll back malaria, came with high commitment of the governments and brings a great reduction in malaria morbidity and mortality[1]. So far 39 countries and territories have been certified malaria free[2]. On the contrary, Aedes borne diseases have been occurred as an epidemic in many African and Asian Countries[3]. To mention, yellow fever (YF) in Brazil (2017), the Democratic Republic of Congo (2016), Angola (2015), Zika in Latin America, very dominantly in Brazil[3,4]. Dengue fever (DF) and chikungunya (CHIKN) have got a worldwide distribution and both causes high morbidity and mortality[5]. Generally, the distribution and public health impact of these arboviruses have increased dramatically throughout the world[6-8]. At least one of the arboviral diseases was reported from 146(58.4%) countries/territories, of which 123(49.2%) reported multiple diseases[9]. Different environmental, social and developmental factors like global changes, demographic expansion, trade exchanges, international mobility of populations and urbanization attributes to this global expansion of the arboviruses and the vector[10]. However, countries are less involved in overcoming the diseases due to underuse of epidemiological and entomological data[11].

In Eritrea DF and CHIKN are well established. DF was appeared in an epidemic state in different places and time since 1991[12] and continued to be a public health problem throughout the country and CHIKN is well established at the western part of the country which introduced with the border of Sudan in late 2018.

Regional malaria control program in collaboration with regional health promotion unit, stakeholders and partners, introduced a comprehensive community based intervention (CBI). The strategy was directly adapted from world health organization global vector control response (WHO GVCR)[13]. So the present study was aimed to evaluate the impact of community action to combat DF and CHIKN.

Different Studies were highlighted the impact of CBIs whose purpose was to reduce the vectors breeding sites mainly water holding containers[14,15].

Despite the increased knowledge and awareness of different communities in dengue and its vector control measure, a satisfactory action not been taken for its prevention and control[16]. Stegomian indices have long been used as assessment tool to predict the risk of dengue fever in an area[17].

Reduction of mosquito breeding sites has been the cornerstone in preventing dengue fever[18]. It is most of the time ineffective due to limited population participation[19]. At Ouagadougou, Burkina Faso, a community-based intervention was introduced and consequently evaluated. Its findings were brought to reduce *Ae. aegypti* bites, entomological indices and knowledge and actions to control mosquitoes of the respondents were extremely increased[20].

Objective of community-based intervention is to proactively reduce mosquito breeding habitats. Mosquitoes are best inhibited and multiplied in containers retain water for long time[21]. Frequently used water holding containers were found to be inconvenient for mosquito inhabitation[22,23]. Overcoming these containers by door-to-door visits and emptying water containers was found to be successful[13].

Community-based dengue control was found to be the most cost effective and relatively sustainable among the other methods in dengue reduction[24-26]. Community based intervention to be more effective, the approach needs to create committed leaders to which voluntarily and unconditionally invest them-selves to fight against the diseases[27].

Introduced strategies against DF and CHIKN

Main strategies

Integrated vector and disease surveillance

Intra- and intersectoral collaboration

Community mobilization

Vector control (VC),

Supporting strategies

Capacity building

Research

Advocacy

Community innovated laws.

METHODOLOGY

Study Design

Prospective cross sectional study was used between August and December 2021, in Keren, Anseba zone Eritrea.

Study area and period

Anseba is located in the 15^o 31' – 17^o 32' north altitudes and 36^o 53'-38^o 54' east longitudes. It has a total of 9 subzones, 92 'administrative areas' and 388 villages. According to zonal malaria control program (ZMCP), annual report (2018), Anseba zone has a total population of 394,419 evenly distributed throughout the zone (7074km^2). The climate prevailing in the zone is tropical. The temperatures range in the area is between 19 - 40^{o}C, with the altitude of 744-2404 meters above the sea level (MASL). Anseba zone has humidity level between 35-77%. The inhabitants of the area are mostly traders, farmers and nomads. The zone has 33 health facilities, (1 Referral Hospital, 3 community hospitals, 5 Health centers and 24 health stations).

The study was conducted in Keren town Anseba zone, Eritrea on August-December, 2021. Keren situated around 91 kilometres northwest of Asmara at an elevation of 1,390 meters above sea-level. The city sprawls on a wide basin surrounded by granitic mountains on all sides.

Study population

Entomological= Larva, Pupa from different larval habitats.

Epidemiological= DF cased from Keren sub-region.

Sampling Size

Entomological data

The sample size was determined using the following formula:

Where:

$$n^* = \frac{z^2 pq}{(d^2)} deff$$

n = the sample size

z = the critical value for achieving (1-α) % confidence level, here, z = 1.96.for 95% confidence interval.

p = the anticipated proportion. Here p=0.5 because there are no previous studies.

q = 1-p

d = the desired margin of error, we took d=5%

deff= deff was taken as 2 based on previous similar household surveys.

By using these values the final desired sample size for the study was 384 households.

Sampling technique

In this community-based study; cluster sampling was used based on the six administrative areas. A total of 384 households (HHs) were randomly selected from a total of 39 neighborhoods and equally distributed according the number of HH of respective neighborhood. The starting point was in the middle of every neighborhood. Pen was rolled to indicate the starting HH and a HH nearest to the sharp end was taken as a direction and starting. Then moving to the right and counting according to the sample interval (number of houses in the administrative area divided by the number of houses to be surveyed in that administration). The next house was selected. This procedure was used till the required number of HHs in the selected neighborhood reached.

Data collection

All domestic water containers (wet water containers) were recorded and classified according to two categories as: indoor water containers and Outdoor water containers. Discarded containers like tins and tyres were included in outdoor water holding containers. The presence or absence of any immature mosquito stages from each container was recorded.

Different types of breeding sites were analyzed to evaluate a potential modification of population behavior. The productivity of each kind of breeding site was analyzed and stegomyia indices were calculated and compared to the baseline. Positive barrels, tyres and other small scale water containers were empties directly into a tray or filtered through a sieve and count all the larva and pupa from each container type. Collection from a large scale water container such as cement tanks were done using a dipper in which lowering the dipper gently into the water at an angle of about 45º, until one side is just below the surface. During our dipping care were taken not to disturb the larva/pupa.

Epidemiological data was taken from the health management information system (HMIS) of Anseba region.

Data analysis

Analysis was done on the changes in the overall proportion of positive containers for *Aedes* aquatic stages per household before and after the intervention. It was quantified within-HH change (before and after) in the proportion of positive containers for mosquito aquatic stages as an aggregated measure of these entomological indices used in this study. The total analysis was performed using SPSS version 23 and stogomyia indices were calculated according to the following formula:

The entomological indices: House Index (HI), Container Index (CI) and Breteau Index (BI), were used for measuring the larval population. These indices were measured as follows: HI (No. of houses positive/ No. of houses inspected x 100); CI (No. of containers positive / No. of containers inspected x 100); Breteau Index (No. of containers positive / No. of houses inspected x 100); PI (No. of pupae / No. of houses inspected x 100) and PDI (No. of pupae / No. of population x 100).

Ethical clearance

Clearance to conduct the study was obtained from ethical approval committee at the ministry of health, Eritrea. The objective of the study was explained to the study subjects and informed consent was guaranteed. Every participant had the right to withdraw from the study if not willing.

RESULTS AND DISCUSSION

The intervention was adapted reviewing different studies and literatures. The main conceptual framework was directly adapted from the study by Roiz *et al*[13] with a little modification to be suitable and applicable in our setting. As depicted in fig.1, the theoretical model for the intervention was adapted from the study on Community-based dengue control intervention and implementation fidelity by Sare *et al*[27]. The medium and long-term effect of the intervention was to maintain the community's mosquito-control efforts, to reduce dengue vector and finally to reduce dengue cases and all the complications and economic crises associated with it. Based on these understanding a continoues efforts were done respecting community as a core of all the strategies.

Entomological finding

During the study period, three rounds of entomological investigations were done. Two rounds by the community facilitators on a two-week difference. During the visit each and every HH was visited by their respective community facilitators for door-to-door training and entomological investigations. It was planned to be a continuous process at the transmission season since September 2020. And the third round investigation was done by health workers together with local administrators. The third round entomological investigation was accompanied by KAP study using structured questionnaire. As depicted in Table No.1, the collective finding was calculated and the impact of the intervention was resulted to a dramatic decline of entomological indices. HI, CI and BI was reduced by 89.7%, 94.7% and 84.5% respectively from the baseline. This numeric implies the area was no more a hotspot for dengue to occur as an epidemic.

Container positivity and productivity

As depicted in Figure No.2 and Figure No.3, before the intervention and soon after the intervention, *Aedes* mosquitoes were mainly collected from barrels, clay pots, cement basin, flower vase and jerry cans with a positive/total number inspected, 161/498, 4/6, 3/6, 9/61, 16/58 at the indoor respectively. At the outdoors still barrels were with the highest number of positivity that, 119 were found to be positive from the total 249 inspected. Discarded tyres, discarded tines, cement tanks and flower vases were with high number of positivity following to barrel at the outdoors.

As shown in Figure No.3, a year after the intervention, the highest positivity and productivity were shifted to cement basins, plastic/metal big water tanks and pools and others type of containers. Despite Barrel was the most dominant water storage container at the study area, the positivity rate was reduced to the minimum level. Before the intervention more than 60% of mosquito immature stages were collected from barrels, and now the larva/pupa were collected from other miscellaneous containers. All poorly constructed cement basins from all local administrations were recorded and subjected to chemical control. Hence temophose and BTI were used to treat on regular bases at the transmission season.

Handling HH water holding containers

Due to water scarcity at the study area, on average, 4 water storage containers were used by each HH. As a result, HHs were forced to store water for long period of time. The long period storage of water at HHs was a challenge for the dengue prevention program. To overcome the challenge, door-to-door health education and trainings were given and as a result, as depicted in Figure No.4 community members came to manage their water holding container (eg. Barrel) and cement tanks in a way that could never accessible to mosquitoes. Proper management and covering of barrels (the most dominant container) resulted to low entomological indices (Table No.1). Properly constructed cement tanks were additionally covered either with plastic or other types.

Dengue prevalence

The present study compared two years clinical DF cases to indicate the impact of the intervention. Figure No.5 depicted; during the period of two transmission seasons a total of 5,228 clinical DF cases were reported in Keren sub region health facilities. Among which 3945 were notified in 2020 and the rest 1283 in 2021. Annually, DF cases in 2020 were more than three-fold of the cases notified in 2021.

Figure No.5 shows in 2020 before the intervention the highest record of DF cases were reached more than 1000 in July and August and nearly 1000 in September and October. In 2021 after the intervention the highest DF cases were recorded in May and June and it was less than 240 per month. These numbers of cases were recorded before the reactivation of the community facilitators. At the highly transmission season (months) number of cases notified to health facilities were less than 100 in each month.

Discussion

The sustainability of community based intervention at urban sites need to create a strong determination among all community members. At rural sites the communities are homogenous most of the time, sustainability could not be an issue, and interventions take place in appropriate manner[27].

Right after the introduction of intervention on late 2020, its effectiveness was assessed and it had concluded that, community facilitators had been committed themselves for the benefit of their communities[28]. However, during impact assessment, it was found that, engagement to such strategies was a full time work and the community facilitators need motivation either by organization or by the community. More than a couple of studies were also found difficulties to find committed leaders and associations willing to invest themselves voluntarily and unconditionally in fight against mosquitoes and other community base interventions[27,29].

A short term effect of the intervention was the entomological indices. It was recorded at three times and it shows a consecutive reduction since the introduction right up to the present study. Initially before the intervention and sooner after the intervention, all the indices were very high to cause an epidemic. A year after the introduction of the community based intervention the indices were reduced below a limit to cause epidemic.

Aggressive mosquito control methods were used during intervention. All levels of the community were directly participated with the coordination of local administrators. For sure the community facilitators and health workers were the drivers of the strategy. And it came-up with rapid reduction in mosquito population. A study by Lin *et al.,* revealed: comprehensive and intensified dengue intervention strategy based on community participation was effective to reduce mosquito density and confront dengue outbreak[30]. Another study from Vietnam showed community based integrated dengue vector control strategies was very effective against DF epidemic[31]. Different studies recommended community based intervention remains the best mosquito control methods so-far[18,19]. Newton and Reiter in their study depicted, any approach to control mosquito is questionable and inefficient without active community involvement. Similarly, the present study found, *Aedes* control strategies need to focus on HHs since their breeding habitat is related to individual behavior.

Community innovative management of HH containers was observed in the study area. Each and every HH was come with its own experience in managing and covering of its water holding containers. This experience leads the project to its sustainability and the majority of HHs with cement tanks were used bleach like chemical to kill mosquito larva by putting to the bottom of the basin. The present study was found that all cement tanks applied with bleach were free of immature mosquito larva and other insects as well. All community members were advised and practiced not to drink water from such cement tanks applied with bleach because it may have some other health problems. This best innovation was tried to replicate to all the areas of the region. Activities were tried to be participatory to bring intrinsic motivation of community leaders and community facilitators because adaptability and sustainability of an intervention was found resulted from participatory nature[32,33].

With the respect to the changes brought on mosquito breeding habitat management among the community as a whole, some individuals were resisted to the change and still continued to create favorable condition to the mosquito population to breed. Same problem was noticed in Burkina Faso that, the intervention they introduced did not find a major effect on the number of breeding sites or density of mosquito populations in certain neighborhoods[34].

The present study was faced to such situation but fortunately the community itself brought a solution that community innovated penalties was introduced. A list of community innovated penalties was prepared and was given to the municipality for its approval. After the approval a copy of it was given to each and every community facilitator. The whole community was then informed with the line of their respective community facilitator.

Dengue fever is nowadays an important vector borne disease because it is emerging and re-emerging globally. With the increasing importance of it, a comprehensive dengue intervention model will become increasingly important.

Table No.1: Entomological surveillance and risk assessment of the study area, Keren Anseba zone Eritrea

S.No	Entomological index	Normal range	Before the intervention (2020	Risk to dengue	Right after intervention (late 2020)	Reduction from baseline	1 year after the intervention	Reduction from baseline
1	House index	<7	79.8%	Very high risk for dengue epidemic	32.5%	60.3%	9%	89.7%
2	Container index	<5	37.7%		12.4%	67.1%	2%	94.7%
3	Breteau index	<20	148		55.6	62.5%	23	84.5%

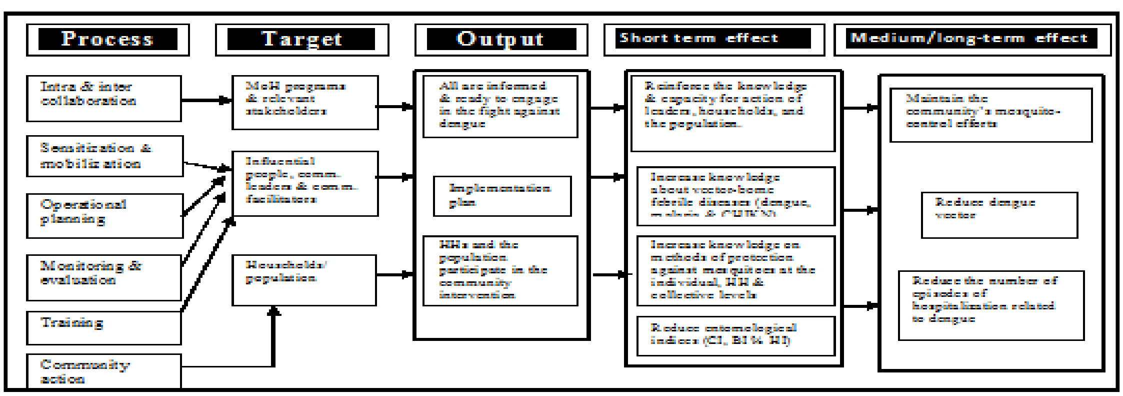

Figure No.1: Theoretical model for the community intervention against dengue fever in Keren, Anseba zone, Eritrea

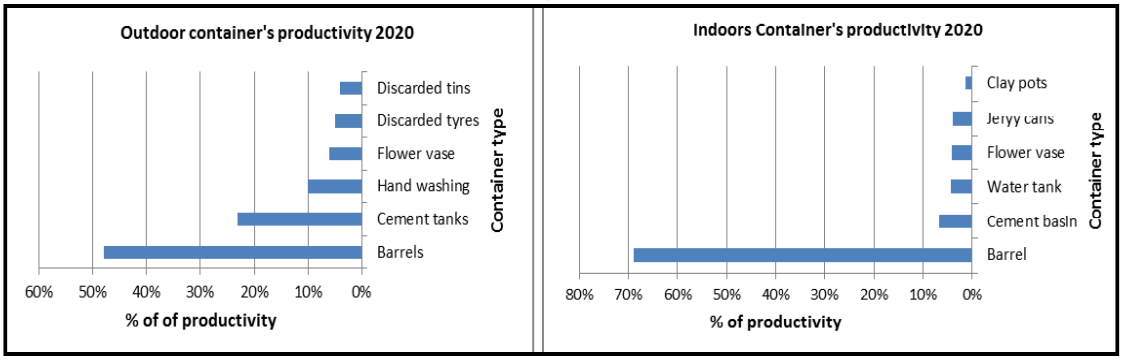

Figure No.2: Indoor and outdoor container productivity before intervention

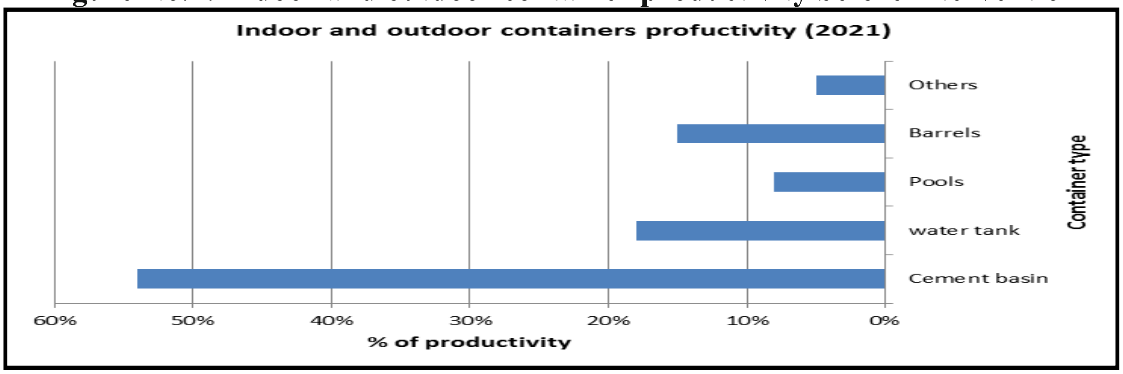

Figure No.3: Container's productivity profile after intervention (2021): keren Anseba zone: Eritrea

Figure No.4: Properly fitted and covered barrels and cement basins

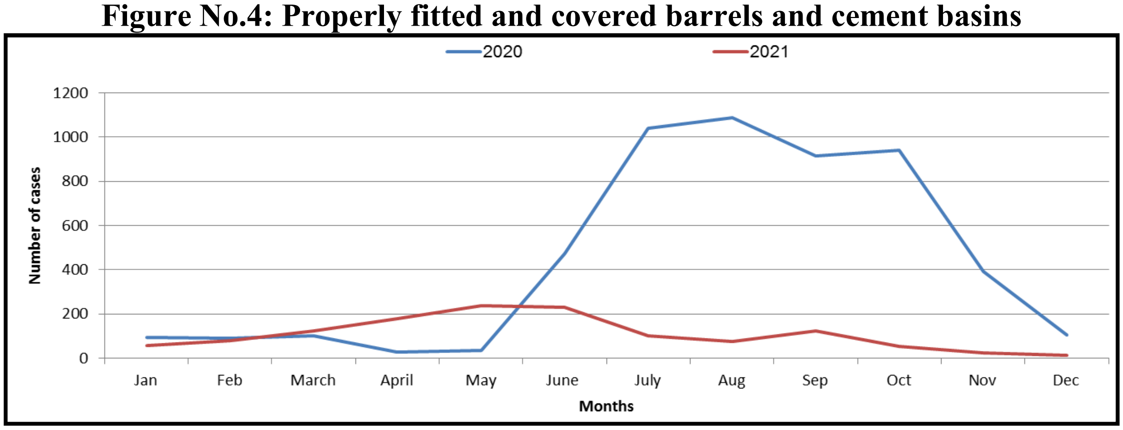

Figure No.5: Comparison of dengue fever cases in 2020 and 2021 in Keren, anseba zone Eritrea

CONCLUSION

In conclusion, this study suggests that a comprehensive and enhanced dengue intervention Strategy based on community engagement has significant effect to control a dengue.

RECOMMENDATIONS

WHO recommends the use of communication for behavioral impact (COMBI), an approach that integrates behavior and social communication to reduce risk and prevent diseases. So this approach has to be introduced to our strategies in controlling and preventing communicable and non-communicable diseases.

Community leaders need to be motivated by community innovative incentives.

ABBREVIATIONS

BI: Breteu Index; CBI: Community Based Intervention; CHIKN: Chikungunya; CI: Container Index; DF: Dengue Fever; HH: House Hold; HI: House Index; KAP: Knowledge Attitude and Practice; MOH: Ministry of Health; SPSS: Statistical Package for Social Sciences.

ACKNOWLEDGEMENT

We would like to thank Keren municipality, Local administrations, zone leaders and the community as a whole, experts who were involved in the validation survey, data analysis and the people who were reviewed the study.

CONSENT FOR PUBLICATION

This manuscript has not been published elsewhere and is not under consideration by another journal. All authors have approved the final manuscript and agreed for its publication.

SOURCE OF FUNDING

There was no source of funding for the study, for the authors or manuscript preparation.

CONFLICT OF INTEREST

None declared.

AUTHORS' CONTRIBUTIONS

All authors participated in all phases of the study including topic selection, design, data collection, data analysis and interpretation.

AVAILABILITY OF DATA AND MATERIALS

The complete data set supporting the conclusions of this article is available from the corresponding author and can be accessed up on reasonable request.

BIBLIOGRAPHY

1. WHO. World Malaria Report 2020, 2020.
2. WHO, Zeroing in malaria elimination: Final report of the E-2020 initiative.
3. Kraemer M U G, Faria N R, Reiner R C, Golding N, Stasse S. Spread of yellow fever virus outbreak in Angola and the Democratic Republic of the Congo 2015-2016: A modelling study, *Lancet Infect,* 17(3), 2017, 330-338.
4. Weaver S C, Costa F, Garcia-Blanco M A, Ko A I, Ribeiro G S, Saade G. Zika virus: History, emergence, biology and prospects for control, *Antiviral Res,* 130, 2017, 69-80.
5. Akiner M M, Robert V, Schaffner F. Spread of the invasive mosquitoes *aedes aegypti* and *aedes albopictus* in the black sea region increases risk of chikungunya, dengue and Zika outbreaks in Europe, *PLoS Neglected Tropical Diseases,* 10(4), 2016, e0004664.
6. Carlson C, Dougherty E, Getz W. An ecological assessment of the pandemic threat of Zika virus, *PLoS Neglected Tropical Diseases,* 10(8), 2016, e0004968.
7. Hafiz M Y, Mahmood S U, Shoaib M, Yusuf F H. Concern over Zika virus outbreak: Another alarming global threat, *Infect Drug Resistance,* 9, 2016, 149-151.
8. Messina J P, Kraemer M U, Brady O J. Mapping global environmental suitability for Zika virus, *Elife,* 5, 2016, e15272.
9. Leta S, Beyene T J, Kraemer M U, Revie C W. Global risk mapping for major diseases transmitted by Aedes aegypti and Aedes albopictus, *International Journal of Infectious Diseases,* 67, 2018, 25-35.

10. WHO. Comprehensive guidelines for prevention and control of dengue and dengue haemorrhagic fever, Revised and expanded guidelines, *SEARO Tech Pub,* 60, 2011.
11. Oliveira E C, Santos E S, Zeilhofer P, Souza-Santos R, Atanaka-Santos M, Atanaka-Santos. Geographic information systems and logistic regression for high-resolution malaria risk mapping in a rural settlement of the southern Brazilian Amazon, *Malaria Journal,* 12(1), 2013, 420.
12. Usman A, Ball J D, Rojas D P, Berhane A, Ghebrat Y, Mebrahtu G, Gebresellasie A, Zehaie A, Mufunda J, Liseth O, Haque U. Dengue fever outbreaks in Eritrea: 2005-2015, *Global Health Research and Policy,* 1(1), 2016, 17.
13. Roiz, David, Wilson, Anne L, Scott, Thomas W, Fonseca, Dina M, Jourdain, Frederic, Muller, Pie, Velayudhan, Raman, Corbel, Vincent. Integrated aedes management for the control of aedes-borne diseases, *PLOS Neglected Tropical Diseases,* 12(12), 2018, e0006845.
14. Bermudez-Tamayo C, Mukamana O, Carabali M, Osorio L, Fournet F, Dabire K R. Priorities and needs for research on urban interventions targeting vector-borne diseases: rapid review of scoping and systematic reviews, *Infectious Diseases and Poverty,* 5(1), 2016, 104.
15. Regis L N, Acioli R V, Silveira J C, Melo-Santos M A, Souza W V, Ribeiro C M. Sustained reduction of the dengue vector population resulting from an integrated control strategy applied in two Brazilian cities, *PLoS One,* 8(7), 2013, e67682.
16. Parks W, Lloyd L. Planning social mobilization and communication for dengue fever prevention and control: A step-by-step guide (No.WHO/CDS/WMC/2004.2), *World Health Organization,* 2004, 149.
17. Bowman L R, Donegan S, McCall P J. Is dengue vector control deficient in effectiveness or evidence? Systematic review and meta-analysis, *PLoS Neglected Tropical Diseases,* 10(3), 2016, e0004551.
18. Hermann L L, Gupta S B, Manoff S B, Kalayanarooj S, Gibbons R V. Advances in the understanding, management and prevention of dengue, *Journal of Clinical Virology,* 64, 2015, 153-159.
19. Newton E, Reiter P. A model of the transmission of dengue fever with an evaluation of the impact of ultra-low volume (ULV) insecticide applications on dengue epidemics, *The American Journal of Tropical Medicine and Hygiene,* 47(6), 1992, 709-720.
20. Ouedraogo S, Benmarhnia T, Bonnet E, Some P A, Barro A S, Kafando Y, Soma D D, Dabire R K, Sare D, Fournet F, Ridde V. Evaluation of effectiveness of a community-based intervention for control of dengue virus vector, Ouagadougou, Burkina Faso, *Emerging Infectious Diseases*, 24(10), 2018, 1859-1867.
21. Wilson J J, Sevarkodiyone S P. Spatial and temporal distribution of mosquitoes (Culicidae) in Virudhunagar district, Tamil Nadu, South India, *International Journal of Mosquito Research,* 1(3), 2014, 4-9.
22. Nebinur, Mensur Y S, Nabil HH Bashir, Mustafa Y H Dukeen. Presence, characterization and productivity profiles of aedes mosquitoes (Diptera: Culicidae), in Barentu, Gash Barka Zone, Eritrea, *International Journal of Mosquito Research,* 6(5), 2019, 10-19.
23. Ngugi H N, Mutuku F M, Ndenga B A, Musunzaji P S, Mbakaya J O, Aswani P, Irungu L W, Mukoko D, Vulule J, Kitron U, LaBeaud A D. Characterization and productivity profiles of *Aedes aegypti* (L.): Breeding habitats across rural and urban landscapes in western and coastal Kenya, *Parasites and Vectors,* 10(1), 2017, 331.
24. George, Leyanna, Susan, Aswathy S, Nimitha, Paul, K, Leelamoni. Community based interventional study on dengue awareness and vector control in a rural population in Ernakulam, Kerala, *International Journal of Community Medicine and Public Health,* 4(4), 2017, 962-967.

25. Andersson N, Nava-Aguilera E, Arostegui J, Morales-Perez A, Suazo-Laguna H, Legorreta-Soberanis J. Evidence based community mobilization for dengue prevention in Nicaragua and Mexico (Camino Verde, the Green Way): Cluster randomized controlled trial, *BMJ,* 351, 2015, 3267.
26. Alvarado-Castro V, Paredes-Solis S, Nava-Aguilera E, Morales-Perez A, Alarcon-Morales, L, Balderas-Vargas N A. Assessing the effects of interventions for *Aedes aegypti* control: Systematic review and meta-analysis of cluster randomised controlled trials, *BMC Public Health,* 17(1), 2017, 384.
27. Sare, Diane, Perez, Dennis, Some, Paul-Andre, Kafando, Yamba, Barro, Ahmed, Ridde, Valery. Community-based dengue control intervention in Ouagadougou: Intervention theory and implementation fidelity, *Global Health Research and Policy,* 3(1), 2018, 12.
28. Yenus, Mensur, Micheal Berhe, Micheal Brhane, Amanuel Kiflemariam, Kiros Sereke. Assessment the effectiveness of community based dengue and chikungunya intervention: Keren, Anseba zone Eritrea (2020*), International Journal of Mosquito Research,* 8(2), 2021, 145-154.
29. CDI Study Group. Community-directed interventions for priority health problems in Africa: results of a multicountry study, *Bull World Health Organ,* 88(7), 2010, 509-518.
30. Lin H, Liu T, Song T, Lin L, Xiao J, Lin J. Community involvement in dengue outbreak control: An integrated rigorous intervention strategy, *PLoS Neglected Tropical Diseases,* 10(8), 2016, e0004919.
31. Kay B, Nam V S. New strategy against *Aedes aegypti* in Vietnam, *The Lancet,* 365(9459), 2005, 613-617.
32. Perez D, Van Der Stuyft P, Zabala M C, Castro M, Lefevre P. A modified theoretical framework to assess implementation fidelity of adaptive public health interventions, *Implement Sci,* 11(1), 2016, 91.
33. Ridde V, Druetz T, Poppy S, Kouanda S, Haddad S. Implementation fidelity of the national malaria control program in Burkina Faso, *PLoS One,* 8(7), 2013, e69865.
34. Bonnet, Emmanuel, Foumet, Florence, Benmarhnia, Tarik, Ouedraogo, Samiratou, Dabire, Roch, Ridee Valery. Impact of community-based intervention on Aedes aegypti and its spatial distribution in Ouagadougou, Burkina Fas, *Infectious Diseases and Poverty,* 9(1), 2020, 61.

Please cite this article in press as: Mensur Yenus and Samuel Jirom Wolday. Impact of community-based intervention on *aedes aegypti* breeding containers to control dengue fever in Keren, Anseba Region, Eritrea, *International Journal of Medicine and Health Profession Research,* 10(1), 2023, 10-19.