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ASSESSMENT OF ENVIRONMENTAL MANAGEMENT FOR CONTROLLING MALARIA IN NYALA SOUTH DARFUR MAY 2018

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ABSTRACT

Introduction: Environmental management has brought important achievements in malaria control and overall improvements of health conditions. Environmental conditions play an important role in the transmission of malaria; therefore, regulating these conditions can help to reduce disease burden. **Methodology:** Retrospective-cross sectional study was carried out to assess environmental management as method of Malaria control in Nyala, South Darfur State between the of period January, 2017 to April, 2018. **Results:** 32.3% of respondents were used to clean the environment and vegetation around their home to reduce mosquito population, 46.7% of respondents used to remove and filling breeding place of Mosquito as method of environmental management and also 42.2% used to drainage the stagnant water **Discussion:** The study revealed that the prevalence in health facilities mainly were located near Nyala valley where there were high abundance of Mosquito due to availability of breeding sites. The study showed that the environmental management methods such as cleaning environment and vegetation around the home (32.3%) as well as drainage stagnant water (27.4%) for reducing Mosquito population. **Conclusion:** The environmental management of vector is very effective and participation of community supports it, this clearly appears in this study.

KEYWORDS: Environmental management, drains, surveillance, vegetation, vector.

INTRODUCTION

Environmental management consists of installing and maintaining drains, removing pools of stagnant water, managing vegetation, irrigating intermittently, and altering rivers to create faster flowing water (Keiser *et al*, 2005). Operational research is required to develop surveillance systems that are practical, affordable, effective and acceptable, (Vanek *et al*, 2006). It is postulated that more than half of the African population will be living in urban areas by the years 2030. It is anticipated that the challenge and opportunity for tackling Malaria burden in urban areas will also grow.

The interventions against the vectors of diseases are essential for the control of these diseases. There are many methods used for vector control such as chemical, physical, biological and environmental methods. Environmental modification refers to the long–lasting or permanent changes of breeding sites in method of irrigation. Environmental manipulation refers to a temporary effect and need to be repeated. The term source reduction refers to any measures that prevents the breeding of mosquitoes or eliminates their breeding sites (Rozandaal, 1997). The control of breeding places must be carried out around human settlements in an area with a radius greater than the flight range of the target mosquito species and for many species, this is about (1.5-2) km. Control measures that are not permanently effective have to be maintained throughout the period when the mosquito acts as a disease vector. Therefore, larval control is more costly per person in sparsely populated areas than in density populated ones, (Rozandaal, 1997). Compared to rural setting, Malaria in urban Africa is generally characterized by lower intensities and more focal distribution of transmission, resulting in weaker immunity in the afflicted population and distribution of disease burden across older age groups. Compared to rural setting, urban areas usually offer more Malaria control options because relatively good transport, communication, educational and health infrastructure is available to large populations in small geographic areas. Through the relatively easy access to most urban areas breeding sites, interventions, such as an environmental control and application of larvicides may be cost-effective, but remains to be vigorously evaluated in the modern African context, (Vanek *et al*, 2006).

1. Malaria Control

The Global Strategy for Malaria Control, adopted in 1992 at the Amsterdam Ministerial Conference, outlines four

strategic technical elements, including prevention and vector control. As efforts intensified following the 1999 launch of the Roll Back Malaria Initiative by WHO, The World Bank, UNICEF and UNDP, the outside observer may have come to the conclusion that the global campaign against this killing disease relied exclusively on stepped-up case detection and treatment, and on the scaling up of the use of insecticide-treated nets (ITNs), (Mohammed, 2005; Lindsay & *et al*, 2004). The factors that govern the ecology of malaria are many and varied and depend on local conditions. These factors are known as the contextual determinants of malaria and fall into three broad categories environmental, socio-economic and biological (Lindsay & *et al*, 2004).

Malaria control is a big challenge due to many factors: There is the complexity of disease control process; the complexity of the vectors and expensiveness of the control program. There is a variation of disease patterns and transmission dynamics from place to place, by season and according to climate and environmental circumstances. The circumstances of each region's will influence the organization of practical programmes to identify local problems and priorities, and the design and implementation of appropriate interventions. Therefore, selection of suitable, sustainable and cost effective interventions must be based on local analysis, (Ministry of Health Addis Ababa, March 2002).

The most preferred breeding sites are pools, seepage, quiet places in slow running streams, rice field, leaf axils of certain epiphytic plants and puddles of rainwater, (Rozendaal,1997). Most aquatic habitats are fresh-water, while some Anopheline species breed in saline water, but most anopheline avoid organically polluted waters, such as those contaminated with human or animal faeces or rotting vegetation, (Warrell & Gilles, 2002). Artificial containers such as pots, tubs, cisterns and overhead tanks are not usually suitable, except in the case of Anopheles stephensi in south-west Asia, (Rozendaal, 1997). Malaria has major and multifaceted linkages with agriculture, both in a rural and peri-urban context, (Klinkenberg, et al 2005 & Wang, 2005). Agricultural environments provide conditions well suited for anopheline breeding, with clear, temporary water bodies coinciding with the time of crop cultivation, and human and animal hosts at flying distance. Clearing of land for agriculture opens up breeding habitats for heliophilic vectors, whereas "informal" smallholder farming systems located near natural water sources, such as streams and rivers, open up vector breeding opportunities, Moreover, mounting evidence indicates that the widespread agricultural use of broad-spectrum insecticides contributes to insecticide-resistance in mosquito vectors, (Georghiou, *et al* 1990). In Africa, the larvae of A, gambiae can be found in roadside pools, small puddles and hoof prints as well as in borrow pits and rice field and , very occasionally , in water-filled village pots, (Warrell & Gilles, 2002). In the cities, the other sites for mosquito breeding are the water tanks.

Larval surveillance and control is a critical component of any effective Integrated Mosquito Management (IMM) program because when mosquitoes are eliminated prior to becoming adults, they cannot pose a nuisance or disease problem. (Daniel, 2015).

1.1. Environmental Management of Malaria

Environmental management for vector control aims to induce changes in ecosystems that help reduce their receptivity to the propagation of disease vectors, (Lindsay & et al, 2004).Environmental management involves the modification of the environment to make it unfavourable for the vectors to breed. These include draining or filling up of ponds and borrow pits, intermittent draining of irrigated areas and maintenance of irrigation channels. Construction of drainage channels, environmental management can effectively be used in urban settings to control mosquito breeding, (Ministry of Health Addis Ababa, March 2002). The specific techniques of EM are generally grouped into three main categories:

1.1.1. Environmental modification

Environmental modification means infrastructure development, to make changes to the environment as a periodic routine (Lindsay & *et al*, 2004). By measures are long-lasting or permanent changes in method of irrigation, (Rozendaal, 1997).

1.1.2. Environmental manipulation

Environmental manipulation requires individuals/communities to make changes to the environment as a periodic routine, (Lindsay *& et al*, 2004). Measures have a temporary effect and need to be repeated, (Rosendale, 1997).

1.1.3. Modification of human habitations & behaviours

Modification of human habitation and behaviours refers to changes in placement and structures of human habitation as well as changes in behaviour to reduce human -vector contact.

2. MATERIALS AND METHODS

2.1. Study Design

The study is retrospective-cross sectional study to assess environmental management as method of Malaria control in Nyala, South Darfur State between the period January, 2017 to April, 2018.

2.2. Study Area

The study conducted in South Darfur State mainly in Nyala South locality targeted two area, Alwadi and Kararee area where located around Nyala valley which considered as high area of Malaria incidence.

2.3. Study Population

The study was carried among households of the Alwadi and Kararee area in Nyala.

2.4. Sample Size
A cluster simple random sample technique was used to select the household of two areas where a total of 25 questionnaires were admitted to study the environmental management practises among the community and record review of 5 health facilities.

2.5. Data Collection
Data was collected using a structured and validated close-ended questionnaire consist of demographic and socioeconomic characteristics of respondents, environmental methods use to reduce Mosquito and larvae population at community level, location of Mosquito can be found and environmental management. In addition to the annual number of cases visiting the health facilities, total number of patients admitted to Malaria test and total number of positive Malaria test across the five targeted health facilities.

2.6. Data cleaning and analysis
Data analysis preformed using Statistical Package for Social Sciences software (SPSS. Chicago, USA, version 20) and Microsoft office excel 2007. The data was cleaned to ensure consistency of responses and analysed using descriptive statistic including; mean, frequency and percentage as well as multiple response analysis for the questions that have more than two responses.

3. RESULT
3.1. Environmental Methods use to reduce Mosquito and larvae population at community level
During the survey it was established, 32.3% of respondents were used to clean the environment and vegetation around their home to reduce mosquito population while 27.4% of them explain that drainage of stagnant water around their home was used as method to reduce population of the Mosquito. The use of Mosquito net and insecticides were also stated by respondent respectively 24.2% and 16.1%. (Table 1).

Table 1: Method of reduce Mosquito in the population.

	Responses	
Method used to reduce Mosquito population	***N***	***Percent***
Clean environment and Vegetation around home	20	32.3%
Use Mosquito net	15	24.2%
Drain stagnant water around home	17	27.4%
Use insecticides	10	16.1%
Total	62	100.0%

Drainage of stagnant water as method to reduce Mosquito larvae stated by 32.7% of respondents followed by clean of vegetation around the home 22.4% and remove of garbage and environmental cleaning method was stated by 18.4% of the respondents while use of insecticides as method was stated by 20.4%. (Table 2).

Table 2: Methods of reduce larvae population.

	Responses	
Method used to reduce larvae population	***N***	***Percent***
Drainage of stagnant water	16	32.7%
Use insecticides	10	20.4%
Clean vegetation around home	11	22.4%
Remove garbage/clean environment	9	18.4%
I do not know	3	6.1%
Total	49	100.0%

3.2. Location of Mosquito can be found and environmental management
During the survey, the respondent were asked about the environment or location where Mosquito can be found to control transmission of Malaria, a total of 49 responses were collected, where existing of mosquito in the vegetation around stated by 44.4%, existing of Mosquito inside the home stated by 36.1%, stagnant water 8.3% and 11.1% of them stated that they do not know the main location where can Mosquito can be found.

The survey revealed that, 46.7% of respondents used to remove and filling breeding place of Mosquito as method of environmental management, 42.2% used to drainage the stagnant water and 11.1% used an intermittent irrigation as method of environmental management.

3.3. Method of prevention from Malaria
During the survey, the respondents were asked if they include environmental management in prevention method of Malaria, 19.1% of them stated that they clean grass/bushes around home to prevent from Malaria and 22,1% of them stated that they used to drainage the

stagnant water around home to be safe from Malaria. (Figure 1).

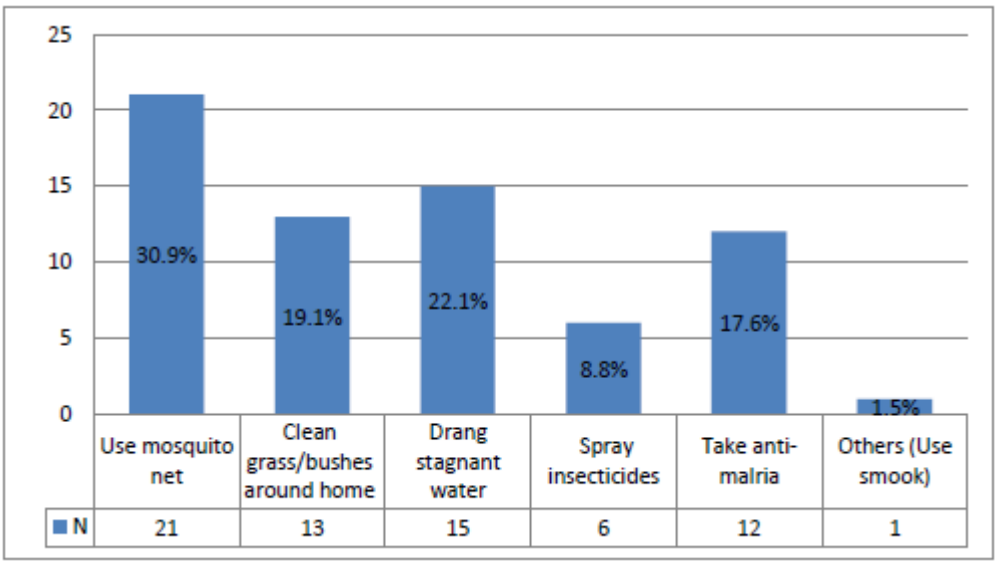

Figure 1: Malaria prevention Methods including environmental management.

DISCUSSION

The study revealed that the prevalence in health facilities of Kararee (37.8%), Alshaikh and (28.8%) Aljabal (17.1%) were high when compared to other surveyed health facilities and when refer to geographical location of the facilities mainly were located near Nyala valley where there were high abundance of Mosquito due to availability of breeding sites. This in line with scenario articulated by (Georghiou, 1999) where "informal" smallholder farming systems located near natural water sources, such as streams and rivers, open up vector breeding opportunities.

The study showed that the environmental management methods such as cleaning environment and vegetation around the home (32.3%) as well as drainage stagnant water (27.4%) for reducing Mosquito population. Additionally, drainage of stagnant water (32.7%), clean vegetation around home (22.4%) and removal of garbage /clean environment (18.4%) for reducing larvae population. The practice of cutting grass and bushes may effectively reduce malaria burden in areas where the particular species of mosquito vectors are exophilic (prefer to rest outdoors). Removing vegetation would limit locations near the homes where adult mosquitoes could rest, and could therefore reduce mosquito abundance near houses. The results highlight that the environmental management activities such as intermittent irrigation (11.1%), drainage the stagnant water around home (42.2%) and remove and filling breeding place of Mosquito (46.7%) were used in the surveyed communities. In addition to used of Mosquito net in prevention against Malaria (30.9%), two environmental management activities also were ranked as main methods of Malaria prevention respectively, clean grass/bushes around home (19.1%) drainage the stagnant water around home (22,1%). These findings serve as a baseline indicator of current knowledge and practices among residents of Nyala area, illustrating that many people believe that environmental conditions are an important factor in determining malaria burden this consistence with stated by [(Lindsay *et al*, 2004) & (Rosendale, 1997)].

CONCLUSION

The two communities of Nyala, Alwadi and Kararee were practiced the environmental management activities to control Malaria in their area and has slight impact to reduce the prevalence of Malaria in their area.

RECOMMENDATION

- Systematic surveillance of environmental management is effective tool to identify and understand the role of environmental management in controlling Malaria
- Involvement of community to practice and participate in environmental management activities.
- Review of desk record of Malaria such incidence and prevalence rate is landmark in controlling Malaria in the area of high abundance of Mosquito.

REFERENCES

1. Daniel M., Larval Mosquito Surveillance and Control Methods. Available at: http://www.vdci.net/blog/author/ daniel-markowski-ph-dCited at 3\10\2018, 2015.
2. Georghiou G. P., The effect of agrochemicals on vector populations. Pesticide Resistance in Arthropods, R, T, Roush & B, E, Tabashnik, 1990; 183-202.
3. Keiser J., Singer B.H. &Utzinger J., Reducing the burden of malaria in different eco-epidemiological

settings with environmental management: a systematic review. Lancet Infectious Diseases, 2005; 5: 695-708.
4. Klinkenberg E., McCall P. J., Hastings I. A., Wilson M. D., Amerasinghe F. P. & Donnelly M. J., Malaria and irrigated crops, Accra, Ghana, Emerging Infectious Diseases Journal, 2005; 11: 1290-1293.
5. Lindsay S. W., Jawara M., Paine K., Pinder M., Walraven G. & Emerson P., Changes in house design reduces exposure to malaria mosquitoes, International Journal of Tropical Health submitted, 2004.
6. Lindsay Steve, Kirby Matthew, Baris Enis and Bos Robert., Options for including environmental management in integrated vector management, Environmental management for malaria control in Pacific (EAP) region, 2004.
7. Ministry of Health, Addis Ababa., Guideline for Malaria vector Control in Ethiopia. Malaria and Other Vector-borne Diseases Control Unit, 2002; (1 –11).
8. Mohammed E. B., Assessment of Environmental Management as Method of Malaria Vector Control in Khartoum State; A thesis Submitted in Partial Fulfillment MPEH Degree in Medical Entomology; University of Khartoum Faculty of Public and Environmental Health Department of Epidemiology, 2005.
9. Rozendaal, J. A. & W H O., Mosquitoes and other biting Diptera, Vector Control Methods for use by individuals and communities, prepared by Jan A. Rozendaal. Geneva: World Health Organization, 1997; 5 - 131. Available at: http://www.who.int/iris/handle/10665/41968.
10. Warrell A. D. & Gilles M. H., larval habitats, Essential Malariology, Publisher: CRC Press, 2002; 27-56.
11. Wang S.J., Lengeler C., Smith T.A., Vounatsou P., Diadie D. A., Pritroipa X., Convelbo N., Kientga M., Tanner M., Rapid urban malaria appraisal (RUMA) I: Epidemiology of urban malaria in Ouagadougou. Marla J, 2005; 4: 43.
12. WHO., Global Strategic Framework for Integrated Vector Management, (2004 – 2010) Geneva, 2004.
13. Vanek J., Michael, Shoo B., Doe M., Kiama M., Lindsay W. S., Flinger U., Kannady K., Tanner M. and Killeen F. G., Community-based Surveillance of Malaria Vector larval habitats: a base line study in Urban Dares Salam, Tanzania, BMC Public Health, 2006; 6.