
Housing Quality and Vector Control: Utilizing an Effective Strategy against common Disease Vectors

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ABSTRACT

Quality housing provides shelter from adverse elements of nature. In addition, good housing can be harnessed to guarantee protection against common disease vectors such as flies, mosquitoes and rodents, and thus reduce the burden of vector-borne diseases. This paper examines important aspects of housing such as house fittings, house screenings, housing amenities, housekeeping, and house surroundings and discusses some vector habits related to these housing features. It also emphasizes how housing quality contributes to vector control strategies.

Key words: housing quality, vectors, vector-borne diseases, vector management

INTRODUCTION

The concept of housing quality is multi-dimensional. It embraces conditions of the external environment, internal structure and associated amenities. The definition of housing quality takes into consideration factors relating to the physical condition of the building and other facilities and services that make living in a particular area conducive (Lanrewaju, 2012). Housing quality plays an important role in determining the health status of a community just as it affects the state of health of individuals. This is because many aspects of housing influence the physical, socio-economic and mental

well being of those that live in the houses (Ogundahunsi and Adejuwon, 2014; Turunen et al., 2010). In fact, some authors have incorporated some specific aspects of housing quality with direct effect on vector control such as window screening and ceiling as components of housing index (Liu et al., 2014). Good housing provides protection against weather elements as well as against vectors that are associated with various diseases. Protection against vector-borne and vector-associated diseases is achieved by minimizing or completely preventing contact between the vectors and household members, their

water and food substances, utensils, clothing and other aspects of the housing interior.

Vector-borne diseases are infections transmitted by the bite of infected arthropod species, such as mosquitoes, ticks, fleas, triatomine bugs, sandflies, and black flies. Other diseases associated with vectors or other animals in similar class such as rats and cockroaches are common. For example Lassa fever is transmitted by the *Mastomys* spp of rodents while gastroenteritis may be mechanically transmitted by cockroaches (Ogbu, Ajuluchukwu and Uneke, 2007; Awoke and Kassa, 2006). In particular, the problem of rodents in relation to Lassa fever transmission is significant in endemic rural communities where poor housing is rampant (Aigbiremolen et al., 2013). Vector-borne diseases cause a significant proportion of the overall burden of disease in many parts of the world especially developing countries (Golding et al, 2015). They account for more than 17% of all infectious diseases and result in more than 1 million deaths annually according to the World Health Organization (WHO, 2016a). Mosquitoes which are about the commonest vectors in tropical regions including Nigeria are responsible for the transmission of many diseases including malaria. Malaria is the commonest cause of death in children under 5 years and generally results in over 600, 000

deaths every year worldwide. (National Population Commission (NPopC) [Nigeria] and ICF International, 2014; WHO, 2016a).

To draw global attention to the impact of vector-borne diseases on human population, the 2014 World Health Day focused on preventing vector-borne diseases with the slogan "small bites, big threats" (WHO, 2016b). Though vectors are small creatures, the problems they cause to human health are enormous and even more so in developing countries where poor personal and environmental hygiene is rampant and worsened by prevalent poor quality housing. The first principle of healthful housing is protection against communicable diseases (Thiele, 2002). Many communicable diseases are vector-borne.

Vector Habits Related to Disease Process

It is in doubt if it is the intention of vectors to afflict man with disease when they find their way to houses. Vectors usually develop habits that help them find food, identify breeding sites, secure warmth and generally survive (Yuen, 2014). The gravitation of vectors to human dwelling is basically a survival strategy. Mosquitoes are the best known disease vector. Others include ticks, flies, sandflies, fleas, triatomine bugs and some freshwater aquatic snails. Generally, mosquitoes are the

vectors for malaria, lymphatic filariasis, Chikungunya, Zika, dengue, Rift valley, and yellow fever diseases while sandflies transmit leishmaniasis and sand fly fever. Chagas disease, sleeping sickness, plague and onchocerciasis are transmitted by triatomine bug, *tse-tse* fly, fleas and black flies respectively (WHO, 2016). Vectors often go into houses in search for warmth, protection from weather elements, for food and in search of breeding places. In their search, they come in contact with cooked and uncooked food items, water, beddings, clothes, furniture, and even waste bins. Dirty areas in the house and uncovered bins provide ready breathing sites for disease vectors. When waste bins are not routinely evacuated as at when due or when they are left unattended within or around the house, they serve as the contact points between vectors and human hosts.

Specifically, the ability of mosquitoes to fly upwards when they hit a wall helps them to locate window openings and openings in the upper parts of doors and subsequently fly into the house where they bite humans (Anderson, Simpson and Stephens, 2014). The survival habit of the housefly depends largely on its feeding habit. It is able to digest portions of exposed food and regurgitate it onto the food (Mackean and Mackean, 2016). Therefore, any housing factor that encourages food exposure

promotes disease transmission by houseflies. Rodents that transmit Lassa fever breed in peri-domestic bushes and so are attracted to near-by houses. Insanitary house surroundings and generally poor housing quality have been implicated in the risk of Lassa fever while housing measures are recommended in the control of Lassa fever (Bonner et al., 2007; Adewuyi, Fowotade and Adewuyi, 2009)

Poor Housing Quality and its Implication on Vector Control

The definition of housing quality covers the conditions of the physical structure, its amenities as well as the state of the surroundings (Lanrewaju, 2012). With respect to vector control and for the purpose of this paper, the aspects of housing quality that have implications on vector situations may be classified into house fittings, house screenings, housing amenities, housekeeping, and house surroundings. House fittings encompasses how well the doors, windows and ceilings fit to their frames such that there is not enough space to permit the invasion of any form of vector. When disease vectors like rats, cockroaches and flies can pass through closed doors and windows or through ceilings, the fittings of these structures have, thus, impacted poor quality to housing (Bonner et al., 2007). Poor housing conditions such as structural defects

including leaky roofs were found by researchers in Ghana to be linked with health conditions such as malaria and cough (Tackie-ofosu et al., 2014).

The installation of screens (for example, mosquito nets) on windows and doors is what constitutes house screening. These components are meant to protect against the influx of mosquitoes, flies and cockroaches or even rats from gaining entrance into the home. They practically keep insects and other vectors out of the home (WHO, 2014). Screens are meant to provide protection even when the windows or doors are themselves open. Improperly fixed or defective screens expose the residents to vectors and the diseases they carry. Amenities important to vector control in house include waste disposal systems, bathing facilities, potable water supply and food storage facilities. Generally, housing amenities enhance the level of personal hygiene among residents. Poor hygiene has been associated with triatomine infestation (Bustamante et al., 2009). The bulk of household solid waste is agricultural waste largely consisting spoilt food items, left-over food and other waste generated from the kitchen. These are usually very good feeding sources for many vectors. Thus, when there are no adequate disposal means for them in the form of storage bins and means of evacuation, vector take advantage of them for their own survival and proliferation. Sewage in particular

when exposed in the event of lack of proper means of disposal, results in open dumping or open pit toilets. Then, flies and cockroaches breed in them. Poor housing conditions with particular regards to poor sanitary conditions has been linked to high prevalence of vector-borne diseases in Nigeria (Omole, 2010).

Disordered and unkempt rooms in a house constitute poor housekeeping. The internal furnishing of a house with wardrobes, cupboards, lockers, racks and other furniture enhances good housekeeping by allowing for appropriate placement of food items, clothes, shoes, utensils and household equipment. Vectors such as rats, cockroaches and fleas crouch and breed undisturbed in poorly kept houses. They make use of the warmth and comfort of such houses to multiply in numbers and so constitute greater nuisance. In addition, poor housekeeping may produce many damp areas in the house that attract vectors. Dirty and bushy surroundings attract and provide hiding places for rodents, flies and other disease vectors which, soon afterwards, find their way into the house. Clean house surroundings are not only aesthetic but also repel disease vectors by denying them of shelter and harborage (Awoke and Kassa, 2006). Empty tins, plastic bottles, unused drums, coconut shells and used car tyres which constitute waste in house surroundings can serve as important

breeding sites for mosquitoes (WHO, 2014). One may assume that just like neat surroundings tell visitors what the inside of the house will look like, in the same manner, vectors sense that the inside of a house with neat surroundings will be too clean for breeding.

Integrating Housing Quality into Vector Management

The evidence-based approach to vector control is integrated vector management (IVM) (WHO, 2012). Some of the reasons for adopting the IVM strategy by WHO were the problem of insecticide resistance and the environmental pollution associated with the use of chemicals in the control of vectors. An important aspect of the IVM strategy is the use of environmental modification as a non-chemical approach. This comprise housing improvement, source reduction, habitat manipulation, irrigation management and design, natural enemy conservation and use of botanicals (Weber, Mbogo and Chandra, 2013). Housing improvement has been found to be highly applicable in terms of effectiveness, safety and community participation for non-chemical control of vectors, and as an important aspect of integrated vector management. When considering affordability, improving housing factors is also highly applicable to vector control. Though housing improvement is recognized as

component of IVM, there is the need to further promote all aspects of housing quality as effective means of vector control in the overall integrated vector control strategy.

CONCLUSION AND RECOMMENDATIONS

The external and internal conditions of a house are important in dealing with common disease vectors and in reducing the prevalence of vector-borne diseases. In the face of rising resistance to the use of chemicals, giving the necessary attention to improved housing as a more sustainable and effective strategy in vector control is desirable. Relevant authorities and stakeholders should implement policies that will enhance better housing standards in our communities as part of the overall strategy for integrated vector management.

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