



Original Article

Community Perceptions Regarding Chikungunya Vector Proof Housing in Lahore, Pakistan for Sustainable Development

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ABSTRACT

Sustainable Development Agenda is gaining importance, acknowledging its importance right adaptation of interventions for housing regarding vector-borne disease prevention as suggested by "Keeping the Vector Out" can make cities and human settlements vector-proof and sustainable. **Objective:** To assess community perceptions regarding chikungunya vector-proof housing for sustainable development. **Methods:** Descriptive cross-sectional study included 400 households of Aziz Bhatti Town, Lahore. A semi-structured questionnaire administered by personal interview method to the available and willing adult member of the household by Researcher with the environmental inspector and lady sanitary patrol of Dengue and Polio survey teams of DDO office Aziz Bhatti Town Lahore, using simple random sampling technique after consent and ethical approval. The questionnaire was pre-tested (Pilot). Data analyzed using SPSS 20.0. **Results:** Among 400 households interviewed, the majority 69.7% were living in houses that were built >9 years ago, 86.8 % were concrete. Climatic change and global warming can increase disease carried by mosquito *Aedes Aegypti* believed by 90.2 % and their impact can be mitigated by improved housing reported by 91.5%. Regarding community perceptions about vector-proof housing, 74.6% believed that improved house design can prevent entry and breeding of mosquitoes therefore, 86.3% screened windows doors and eaves, 83.0% believed that they always checked cracks and crevices in the wall, floor and roof and cemented them. But 58.7% believed that they do not consider mosquito prevention housing interventions as one of the important factors when constructing their house as among barriers 73.5% could not afford modern building materials, 73.5% lack detailed knowledge and 13.8% thought screening as an obstruction to ventilation. Dengue, Chikungunya, and Zika disease are spread by *Aedes* mosquito species believed by 78% who (agreed and strongly agreed) still 81.8% urged for health education regarding chikungunya vector proof housing. **Conclusion:** Housing improvement can mitigate the impacts of climatic change and vector-borne disease. But health program planners need to identify and facilitate the removal of barriers for adoption of Vector proof housing.

INTRODUCTION

Sustainable Development Agenda is gaining importance by all countries. One of the targets for SDG 3 (good health and well-being) is to end the epidemics of malaria and neglected vector-borne diseases such as Chagas disease, Leishmaniasis, Dengue, Zika, and Chikungunya. Acknowledging the importance of Sustainable

development The Global Vector Control Response 2017-2030, recommends house improvements that can mitigate the impact of climatic change. World Health Organization has issued best practice statements supporting housing improvements and environmental management which highlights the importance of housing

and living conditions as a barrier against vector-borne diseases like Dengue and Chikungunya; "Keeping the vector out" is at the core of effective housing interventions to prevent vector-borne disease which can be accomplished by Vector proof housing strategy.[1,2]

The growing population is expected to triple to 1.23 billion by 2050, needs an estimated 144 million new houses by 2030 in rural areas alone. For a little additional cost, new infrastructure and housing projects can be planned, designed, and developed with vector control in mind, making urban settlements and cities intrinsically vector-proof and healthy.[3] According to World Health Organization, vector-borne diseases are causing more than 700'000 deaths annually. Chikungunya is becoming a global problem and has been identified in nearly 40 countries. Pakistan continues to respond to an outbreak that started in 2016.[4,5] Pakistani strains shared high similarity with East/Central/South African, Indian Ocean Lineage(ECSA.IOL), and strains were closely related to those derived in India which suggests the possibility of their migration from India to Pakistan.[6,7,8]

Climate change impacted the transmission of vector-borne diseases which account for 17% of the global burden of communicable diseases.(9,10,11)Climate change and Global warming are one of the greatest environmental and health equity challenges of our times. Third-world countries are least prepared for their impacts and are most at risk. El-Nino Southern Oscillation (ENSO) event in 2014-16 caused climatic changes making the world a heaven for pathogens such as Aeaegypti and Ae. Albopictus and their vectors to emerge and propagate clusters of disease activity.(12,13) Among Asian countries Pakistan's precipitation is also under its influence.[14,15,16]

Mosquito proof houses and hospital acts as a shield in transmitting infection from an immobilized person. Field experiments are now needed to determine whether an investment in mosquito proofing cause an evolutionary reduction in pathogen virulence.[17]

To reduce the burden of mosquito-borne disease and keeping in view the low awareness practices, a study on "Community perceptions regarding Chikunguniya Vector Proof Housing in Lahore, Pakistan for Sustainable development." was carried out to help policymakers understand the need of the community regarding vector proof housing infrastructure in light of World Health Organization guidelines and prevent vector borne diseases.

METHODS:

A Community based cross-sectional observational study was conducted after Institutional Ethical committee and the Deputy District office Lahore approval in 13 Union Councils of Aziz Bhatti town an administrative town (tehsil)

in Lahore Pakistan. The town is located 18.4 km next to Wahga Border having 705311 population chosen as the area of interest due to the positive prevalence of genus Aedes mosquito and the least studied by the researchers. A total of 400 houses-holds were enrolled for the study using Simple Random Sampling Technique and Computerize generated random list of households, data was collected from October 2019 to January 2020. A semi-structured questionnaire was administered by personal interview method to the one available and willing adult member of the household. If the household member refused to participate, the member of the next household was interviewed until reaching the sample size required. The interviews were conducted by the researcher with the environmental Inspector and lady sanitary patrol of Dengue and Polio survey teams of Deputy District Office Aziz Bhatti Town Lahore. The questionnaire-based on World Health Organization guidelines "Keeping the Vector Out, 2017" translated into Urdu language and was pre-tested (Pilot) before conducting the main survey to check its precision on 10% of the study population i.e 40 respondents who were households residing in the same area but were not the part of the study sample. After the pilot study, necessary amendments were made, then the main survey was conducted. The questionnaire covered the following areas: (I) Socio-demographic information; (II) Knowledge about climatic change link to Chikunguniya vector proof housing; (III) Perceptions about practices regarding Chikunguniya vector proof housing using (Likert's 5-point scale); (IV) Chikunguniya vector proof housing practice barriers (V) Health education regarding Chikungunya vector proof housing. Data was analyzed using SPSS version 20.0. Frequency and percentage tables were generated for all possible variables related to categorical data. Bar and pie diagrams were used in the same context.

RESULTS

The present study shows the observations based upon responses received from 400 Households. As shown in Table-1 most of the respondents 69.0% were up to 34 years old, and the remaining proportion 31.0% more than 34 years old. Among households, 53.5% of the respondents were males while 46.5% were females. Regarding the family size of our study, the majority had >5 family members in the house. The literacy level was high 98.2% of respondents were literate and 70.2% respondents employed while only 1.8% were illiterate and 29.8% were unemployed. Questions on housing type and whether those who own their homes were asked, and we found that more than half of the respondents were owners 53.0% and most of the houses 86.8% were made of concrete, 13.2% mix material (Bricked bricks i.e. Brick masonry-style /Concrete). About the age of houses in town the households reported, 17.5% were

living in houses that were up to 4 years old, 12.8% were living in 5–8 years old houses, and 69.7% of respondents living in houses that were built 9 years before or more.

Variable Age	Number (Percent) N=400
18–34 years	276 (69.0)
35–49 years	98 (24.5)
50–64 years	20 (5.0)
65 years and above	6 (1.5)
Sex	
Male	214 (53.4)
Female	186 (46.5)
Total In Household	
1–4	136 (34.0)
>5	264 (66.0)
Education	
Illiterate	7 (1.8)
Primary	95 (23.8)
Secondary	162 (40.5)

University	130 (32.5)
Technical	6 (1.4)
House ownership	
Owner	212 (53.0)
Tenant	188 (47.0)
Housing Type	
Concrete Mix	347 (86.8)
(Bricked/Concrete)	53 (13.2)
Employment	
Employed	281 (70.2)
Unemployed	119 (29.8)
Age of House	
<4 years age	70 (17.5)
5–8 years age	51 (12.8)
>9 years age	279 (69.7)

Table 1: Community Perceptions Regarding Chikungunya Vector Proof Housing

Table 2 provides information regarding household perceptions about Chikungunya vector proof housing practice using Likert's 5-point scale adapted questionnaire scale of 1 to 5 given to each perception, varying from: SA = Strongly Agree, A = Agree, UN = Undecided, D = Disagree, SD = Strongly Disagree. Among 400 respondents, when asked about screening house, (47.5%) were strongly agreed that as "Necessary Intervention" against mosquito they have screened windows and eaves so that their house becomes Chikungunya vector proof, (38.8%) were agreed, (4.8%) were undecided, (4.8%) were disagreed and (4.2%) were strongly disagreed. When asked about do they think/believe, it is possible that house design can prevent entry and breeding of mosquito, (53.8%) respondents strongly agreed, while (20.8%) were agreed, (7.5%) were undecided, (16.8%) disagreed and (1.2%) were strongly disagreed with the statement. Regarding checking of cracks and crevices in wall, floor and roof and cementing them (47.0%) were strongly agreed, and (36.0%) agreed. When information about piped water supply was inquired, (57.0%) were strongly agreed that they have a reliable supply of piped water at their home, (31.0%) were agreed, (6.8%) were undecided, (1.8%) were disagreed and (3.5%) were strongly disagreed. Table 2, 3 and Figure 1 are further discussed in discussion of research.

Household Perceptions About Chikungunya Vector Proof Housing Practice	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
	N%	N%	N%	N%	N%
I think/ believe that Dengue, Chikungunya and Zika disease are spread by Aedes mosquito species.	227 (56.8)	85 (21.2)	64 (16.0)	24 (6.0)	0 (0.0)
I think/believe that mosquitoes enter my house through open doors and windows.	260 (65.0)	115 (28.8)	11 (2.8)	5 (1.2)	9 (2.2)

I do not feel concerned about the presence of mosquitoes in my house.	57 (14.2)	18 (4.5)	54 (13.5)	158 (39.5)	113 (28.2)
I think/believe that I am susceptible to be infected with mosquito bite.	208 (52.0)	144 (36.0)	27 (6.8)	9 (2.2)	12 (3.0)
We do not consider mosquito prevention interventions as one of the important factor when constructing our house.	106 (26.5)	129 (32.2)	56 (14.0)	91 (22.8)	18 (4.5)
I think/believe, it is possible that house design can prevent entry and breeding of mosquito.	215 (53.8)	83 (20.8)	30 (7.5)	67 (16.8)	5 (1.2)
I think/believe that as "Necessary Intervention" against mosquito I have screened windows, doors and eaves so that my house becomes chikungunya vector proof.	190 (47.5)	155 (38.8)	19 (4.8)	19 (4.8)	17 (4.2)
I have well fitted the ceiling of my house to prevent mosquito entry.	250 (62.5)	131 (32.8)	15 (3.75)	3 (0.75)	1 (0.25)
We frequently check that gutters in and around house are completely covered.	218 (54.5)	116 (29.0)	32 (8.0)	14 (3.5)	20 (5.0)
I do have time so that I dispose off rubbish regularly from my house.	195 (48.8)	148 (37.0)	39 (9.8)	13 (3.2)	5 (1.2)
Removal of stagnant water from water infrastructure lid is necessary.	254 (63.5)	121 (30.2)	7 (1.8)	6 (1.5)	12 (3.0)
Frequent emptying and cleaning of essential containers i.e. air cooler can prevent chikunguniya disease.	269 (67.2)	97 (24.2)	27 (6.8)	0 (0.0)	7 (1.8)
I have a reliable supply of piped water at my house.	228 (57.0)	124 (31.0)	27 (6.8)	7 (1.8)	14 (3.5)
My piped water supply had leaks and I have sealed them.	212 (53.0)	141 (35.2)	25 (6.2)	19 (4.8)	3 (0.8)
I always check cracks and crevices in wall, floor and roof and cement them.	188 (47.0)	144 (36.0)	32 (8.0)	17 (4.2)	19 (4.8)
We completely cover water storage container.	261 (65.2)	135 (33.8)	4 (1.0)	0 (0.0)	0 (0.0)
The environment surrounding house can influence mosquito density therefore house owners are responsible for mosquito management surrounding house.	215 (53.8)	136 (34.0)	15 (3.8)	34 (8.5)	0 (0.0)
Mosquito management surrounding the house is the responsibility of government.	208 (52.0)	125 (31.2)	25 (6.2)	23 (5.8)	19 (4.8)

Table 2: Household Perceptions About Chikunguniya Vector Proof Housing Practice (N=400)

Chikungunya Vector Proof Housing Practice Barriers	N %
House not owned	188 (47.0)
Financial issues	294 (73.5)
Lack of detail knowledge about mosquito preventive measures	294 (73.5)
Thinking that mosquito screening may obstruct ventilation	55 (13.8)
Knowledge About Climatic Change Link To Chikungunya Mosquito Proof Housing	
Do you think/ believe that climatic change and global warming?	
Is a matter of concern for you	355 (88.8)
Can increase disease carried by mosquito <i>Aedesaegypti</i> and <i>Ae. Albopictus</i>	361 (90.2)
Increase mosquito borne disease and climatic change impact can be mitigated by improving housing	366 (91.5)
Health Education Regarding Chikungunya Vector Proof Housing	
Do you think/believe that health education regarding chikunguniya mosquito proof housing in your area is necessary?	327 (81.8)
*Total is not 100%, as multiple responses were allowed	

Table-3: Chikunguniya vector proof housing practice barriers, health education and it's link to climatic change among 400 households of Azizbhatti town Lahore, Pakistan.

DISCUSSION

WHO has issued optimum practice statements regarding environmental management and housing improvements that highlight the significance of housing as well as living conditions like a barrier against vector-borne diseases, for example, Chikungunya, Dengue, and Zika. Chikungunya is a mosquito-borne virus of the *Togaviridae* family. It leads to non-specific illnesses such as high fever, muscle pain, severe joint pain, nausea, rash, headache, and fatigue among infected persons. WHO document "Keeping the vector out" is important regarding effective housing interventions for the prevention of vector-borne disease that can be achieved by vector proof housing strategy. Correct intervention adaptation, for instance, house screening, installing an accurate water supply, and reducing the open water storage could help make housing vector-proof and sustainable. Keeping in mind such issues and to reduce the burden of mosquito-borne disease present community-based observational study was carried out about Community Perceptions regarding Chikungunya Vector Proof Housing in Lahore, Pakistan for Sustainable Development."

The WHO Department of Public Health, Environmental and Social Determinants of Health are developing guidelines regarding Vector proof houses, against vector-borne

disease and climatic change. This sector carries immense importance as WHO and the Roll Back Malaria initiative have considered it as a center to the multisectoral response required to reduce vector-borne diseases. "Climate change" one of the main SDGs has emerged as a major threat for Pakistan and it is struggling to meet the challenges of the Sustainable Development Goals (SDGs) emphasizing the sector of health. Our study showed a positive concern of 88.8% regarding climate change and global warming because 90.2% believed that it can increase disease carried by mosquito *Aedesaegypti* & *Ae. Albopictus* which are responsible for the spread of Dengue, Chikungunya, and Zika as reported by 56.8% who strongly agreed and 21.2% agreed. Rashid et al. 20 elucidated that 50.2% of respondents believed that dengue, chikungunya, and zika disease are spread by *Aedes* mosquito species. Furthermore, 67.7% of households had a concern about the presence of mosquitoes in their house and more than half of them believed that they are susceptible to be infected with a mosquito bite.

In our study, 91.5% of households believe that Increase mosquito-borne disease and climatic change impact can be mitigated by improving housing, and 74.6% (strongly agreed and agreed) that house design can prevent entry and breeding of mosquito but only 27.3% considered

mosquito prevention interventions as one of the important factors when constructing their house. Here it seems that most of the people have a concept of improving their house design but they are not incorporating mosquito prevention interventions as a code during construction of their houses may be due to a lack of complete knowledge about preventive interventions as mentioned by 73.5% of the households or they could not afford modern building materials, as 73.5% also reported financial issues however 13.8% households did not screen their house considering mosquito screen as a barrier obstructing ventilation. A study done by Kaindoa et al.¹⁹ researcher explored that 58.5% of respondents considered mosquito prevention interventions as a significant factor when constructing their house. The findings of our research indicated that financial issues, lack of house ownership, and knowledge about detailed mosquito preventive measures are the leading factors that affected vector-proof housing practice. These were the associated barriers that disrupted chikungunya vector-proof housing. Kaindoa et al.¹⁹ also reported financial issues as the major problem among respondents and they were compelled to reside in the poorly constructed house that had gaps on walls, eaves, and doors. Health organizations need to revise the building codes and create institutions of vocational training that teach the necessary skills to enable homeowners, local businesses, and architects to deliver the interventions, keeping in view the cost-benefit of the project and solution to the adverse effects of screening such as reduction of indoor ventilation. This not only helps to reduce the costs of interventions, but it involves and sensitizes the community while strengthens the local economy.

A crucial element in the prevention of vector-borne diseases is behavioral change. Health education can improve awareness among people so that they know how to protect themselves and their communities from mosquitoes. In our study, 93.8% of respondents were aware that mosquitoes enter their house through open doors and windows, and mainstream of the respondents adopted preventive practices such as 86.3% of respondents believed that as "Necessary Intervention" against mosquito they have screened windows and eaves so that their home becomes chikungunya vector proof, 95.3% respondents well fitted the ceiling of their house to avoid mosquito entry. A large number of respondents had leakage in their piped water supply and they sealed them, 83.0% always checked cracks and crevices in the wall, floor and roof and cemented them, and 99.0% completely covered water storage container.

Continue studying mosquito breeding preventive measures adopted by households. It is pertinent to

mention that majority of participants checked frequently that gutters in and around their house are completely covered, about 85.8% of the households had time to dispose of rubbish from their house, 93.7% of respondents believed that removal of stagnant water from water infrastructure lid is necessary and 91.4% of the respondents were aware that frequent emptying and cleaning of essential containers such as air cooler can prevent chikungunya disease. Kaindoa et al.¹⁹ showed quite similar results that 61.5% of respondents employed strategies such as netting on the window, blocking eaves, using bricks on the wall, using cement on the wall to make their homes vector proof. Sharma et al.¹⁸ reported only 25.7% of the households had time to dispose of garbage regularly from their house.

Despite adopting most of the preventive measures against mosquito, 81.8% of households desired that health education regarding Chikungunya mosquito-proof housing is necessary for their area, this shows that the community was previously sensitized by Dengue and Malaria disease therefore they adopted preventive practices, But still, they need to know and get detail knowledge about Chikungunya vector proof housing interventions. As in our study, 64.0% of the population was undecided about their belief that "Dengue, Chikungunya and Zika disease is spread by Aedes mosquito species."

Health communication and education is an art that requires combined efforts of mass media and health personal knowing the principles of health promotion or behavioral change for changes in behavior and not just for changes in knowledge or attitudes.

In our study of households, we found that majority of respondents had the concept of changing house design and its impact on their protection against climatic change and vector-borne diseases but due to lack of detailed knowledge and other multiple reasons they were not adopting the mosquito-proof interventions. Therefore, they urged the need for a health communication channel for appropriate knowledge regarding Chikungunya mosquito prevention. Among the respondents, 90.8% believed that the most effective way of transmitting health information regarding Chikungunya vector proof housing is health worker home visit, followed by television/radio 81.8%, social media 74.2%, newspaper 73.0%, online information, and free brochure from health authorities 69.0% and community events 60.5%. Rashid et al.²⁰ observed that effective mode of communication among 23.2% respondents was social media, followed by television 21.0%, newspaper 14.6%, family members/friends 12.6%, school teachers 12.4%, doctors 9.5% and radio 6.0% while 0.5% respondents had no knowledge. This shows a progressive change in the trend of

society getting more inclined towards the use of electronic media and lady sanitary patrol home visits. A communication specialist on mass media is not an epidemiologist. Therefore, there is a need for epidemiologists and medical personnel on mass media to address accurate and useful information with the broader community through the media for behavior change and to reduce the chance to sensationalize or misinterpret the content.

Also, information, education, and communication (IEC) intervention programs may need to be reviewed so that health workers can maximize the opportunity to educate the community.

Vector-proof housing intervention only without surrounding environmental control is of no worth. Our 87.8% of respondents believed that the environment surrounding the house can influence mosquito density, therefore, they are responsible for mosquito management surrounding the house while 83.2% of the respondents believed that mosquito management surrounding the house is the responsibility of the government or we can say that they considered government and households as equally responsible for maintaining the cleanliness of environment surrounding the house. Alobuia et al. (21) showed quite similar behavior exhibited by households 54.7% who believed that both government and households are responsible for maintaining the vector-proof environment outside the houses. Such results are primarily because the population was mostly educated belonging to urban background already sensitized by Malaria and Dengue, if a similar study was conducted at an area having a rural background or unsensitized population, we may have found different results.

Some of the limitations of our study include study was conducted only in one town of Lahore having a small sample size. Further studies, with or without housing intervention on large scale are needed to fully assess the benefits of vector-proof housing in light of vector-borne disease prevention.

CONCLUSIONS :

Respondents believed that climatic change and global warming increase the Chikungunya disease carried by mosquito *Aedes aegypti* and *Ae. albopictus* and its impact can be mitigated by vector-proof housing, but the practice of vector-proof housing intervention was given less priority by respondents when it came to house construction. Health program planners need to identify and facilitate the removal of barriers such as household's financial issues, lack of detailed information about vector proof house, and cost-benefit of the project for behavior change.

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