



RESEARCH PAPER

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Practice and quality of living environment of high dengue incidence and low dengue incidence communities: a comparative study

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Article published on August 14, 2018

Key words: Dengue prevention, Dengue prevalence, Dengue awareness, Dengue practice

Abstract

Problems with dengue are often associated with dengue preventive practices and quality of living environment as a consequence of improper solid waste disposal and inconsistent water supply. The study aims to compare 10 communities that were categorized as high dengue incidence and low dengue incidence as reflected in the 2015 Department of Health report. The communities were compared on the quality of living environment and practices of the residents related to dengue prevention. Descriptive research design was used with interview and focus group discussion as techniques in validating field observations. An adapted and validated survey questionnaire on dengue preventive practices was also employed. The on-site observations and interviews were conducted among 50 respondents who have experienced dengue and 50 randomly selected respondents who have not experienced dengue. Results indicated that high dengue incidence communities have problems with water supply and proper solid waste disposal. On the other hand, low dengue incidence communities have better discipline in handling their solid waste. A more aggressive campaign against dengue vectors may be necessary. Collaboration between the academe, Department of Health and local government units may be pursued to ensure timeliness and relevance of dengue prevention efforts. This includes among others, tailoring the education campaign to the needs of the different stakeholders.

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Introduction

Dengue is generally classified into three major types namely, dengue fever (DF), dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) affecting mainly children and some adults that resulted from the bite of an infected female *Aedes* mosquito. Dengue fever is considered as a global problem and Philippines has similar concerns regarding the disease. This is because *Aedes* mosquitoes are extremely common in areas lacking piped water systems, and these mosquitoes breed in clean and stagnant water usually in uncovered water containers. The incidence of dengue may be associated with climate. Opena and Teves (2011) stated that DF peaks at July and gradually decline until December and seems to increase again at the start of the year and ultimately will decline. This means that the threat by this mosquito-borne disease is year round. The increase of mosquito vector and dengue is observed in the first half of the year which is marked by an increase in the temperature (Kholedi *et al.*, 2012). The increase in the reported dengue fever in Jeddah, for example, is during the summer months with another peak occurring in December and January. Lam (2013) identified several factors that contribute to the rise of dengue. These include geographic spread of mosquito vector, increased temperature and precipitation, rapid population growth as a result of rural to urban migration, unreliable water supply, volume of solid waste that may have potential as larval habitat, lack of political will, increase in the international commercial trade of used tires which accumulate rain water and may contain larvae and limited financial and human resources. Other risk factors for dengue as identified by Kholedi *et al.* (2012) are presence of stagnant water in the indoor drainage holes of homes, presence of indoor larva and presence of nearby building under construction. The increase of informal settlers in the urban areas in the Philippines is often translated to challenges in proper sanitation, absence of proper drainage systems and solid waste management problems. *Aedes* mosquitoes are extremely common in densely populated communities with tendency to store water

and have high presence of discarded materials such as empty bottles, tires and other containers that can become breeding sites of dengue mosquitoes. Knowledge of dengue is inadequate in the low socioeconomic class (Syed *et al.*, 2010) and knowledge based upon preventive measures was found to be predominantly focused towards prevention of mosquito bites rather than eradication of mosquito population (Itrat *et al.*, 2008). Al-Dubai *et al.* (2013) found that although respondents knew that elimination of breeding sites is the best method of dengue vector control, many of them believe that doing this practice is a waste of time. Proper dengue education is crucial because only knowledge on dengue had a significant, direct, positive, effect on practices (Castro, Sánchez, Pérez, Sebrango, Shkedy, and Van der Stuyft, 2013). Smith (2012) warns that a “clean surrounding” does not necessarily mean that it is free from potential breeding grounds for dengue vectors as discarded materials in the surroundings can become breeding grounds for adult female mosquitoes. Rapid urbanization (WHO, 2014) and poorly designed infrastructure also contribute to dengue problem (Mulligan, Elliott, and Schuster-Wallace, 2012).

The study seeks to profile the identified high dengue incidence and low dengue incidence communities in terms of their practices towards dengue and quality of living environment in relation to water supply, community organization, waste disposal and activities or programs for dengue preventive measures. This is to determine the difference between the two communities that may have something to do with dengue incidence.

Materials and methods

The study used descriptive survey method. Data were gathered through field observation and survey using interview questionnaire and focus group discussion.

Respondents and sampling

The respondents were residents of the different communities considered for this study.

The communities were selected based on the 2015 Department of Health ranking on dengue prevalence in Cagayan de Oro City, Philippines. The top five and the bottom five communities were considered. The selection of the respondents was purposive. The researcher sought 5 residents per community who had either experienced dengue infection or has a family member who had experienced the disease. Another 5 respondents from the same community who have not experienced dengue or has no family member infected by the disease were considered for the study. Consent was sought for every interview with the agreement to keep their identity confidential.

Research instruments

The study made use of an adapted questionnaire on dengue preventive practices. The questionnaire was modified to suit the purpose of the study. The questionnaire was from a study entitled, "Factors Affecting Dengue Fever knowledge, Attitude and Practices among Selected Urban, Semi-Urban and Rural Communities in Malaysia by Al-Dubai *et al.* (2013). The questionnaire on practices on dengue consists of 20 items. This questionnaire was subjected to face and content validation.

Validation of research instruments

The research instrument was validated at the local university. Fifty respondents (students, faculty members and staff) who have experienced dengue were asked to answer the questionnaire and another 50 respondents who have not experienced dengue were also asked to answer the questionnaire. The researcher also asked the respondents if there are items that they found confusing or hard to understand. The questionnaire on practices in dengue prevention was subjected for reliability analysis using Cronbach Alpha. There were 20 items on this part of the questionnaire but items # 8, #10, #11, #12, and #20 were deleted to obtain a coefficient of 0.833. These items refer to use of mosquito repellent, community fogging, larvicide, mosquito coil and chemical spray that could have economic connotation and may not be true for all respondents.

Data gathering procedure

Data were gathered through field observation and survey using questionnaire, interview and focus group discussion. Interview transcripts were processed through clustering method to find common themes and to derive insights on the respondents' need for dengue intervention program. The researcher visited the communities and coordinated with the local government units to seek permission for the data gathering. The researcher profiled the identified communities in terms of incidence of dengue cases, waste disposal, water system/supply and potential mosquito breeding sites.

The researcher conducted an in-depth interview among residents who had experienced dengue infection and with residents who have not experienced dengue infection. The interview was voluntary in nature and consent was always asked. The interviewees were assured of confidentiality of their responses and names were not asked during the interview. Only age, educational status, years in residence and marital status were collected as these data are needed for the study. Interview transcripts were analysed to determine community needs and together with observation data and other relevant information will be integrated in the formulation of an intervention program. Interview transcripts were processed through clustering method to find common themes and to derive insights on the respondents' need for dengue intervention program will be used as a basis in the design and production of educational materials that will be used for an educational campaign. Focus group discussion with selected respondents that included mothers, community health workers and local officials to validate the findings from the field observation, survey and interview. The campaign will be conducted as part of an extension project of the university to help the communities in reducing the incidence of dengue.

Results and discussion

Table 1 shows that majority of respondents are female. It was observed during the on-site visit that

majority of the respondents are mothers and a number of the respondents are grandmothers. This is true to Filipino homes where mothers will usually become the home managers while the husbands work for a living. Grandparents also live with the family and help take care of the children. As a result, women

are more available than men when it comes to house to house or community-based educational campaign. This finding is similar with the findings of Paz-Soldán *et al.* (2015) who found that majority of the respondents for a house to house survey on dengue are women.

Table 1. Demographic profile of the respondents.

	Gender		Age		Educational attainment		
	Female	Male	Mean	SD	Elementary	High school	College
	% (f)	% (f)			% (f)	% (f)	% (f)
High incidence communities							
Dengue N= 25	72% (18)	28% (7)	30	16.17	8% (2)	48% (12)	44% (11)
Non-dengue N= 25	60% (15)	40% (10)	35	14.38	8% (2)	36% (9)	56% (14)
Over-all N= 50	66% (33)	34% (17)	32	15.35	8% (4)	42% (21)	50% (25)
Low incidence communities							
Dengue N= 25	76% (19)	24% (6)	24	12.95	20% (5)	48% (12)	32% (8)
Non-dengue N= 25	88% (22)	12% (3)	41	16.08	24% (6)	44% (11)	32% (8)
Over-all N = 50	82% (41)	18% (9)	32	16.64	22% (11)	46% (23)	32% (16)
N _{total} = 100							

The most common occupation was listed as housewife. Moreover, mothers with young children tend to spend more time at home making it possible for them to ensure the general cleanliness of the house and the living environment.

All members of the communities must be involved and knowledgeable on dengue prevention and control (Wong, Shakir, Atefi and AbuBakar, 2015). Hence, an educational campaign must also be directed at men to encourage them to actively take part in the prevention and control of dengue. In terms of sex distribution

pattern for dengue incidence in the Philippines, Bravo, Brett, Dizon and L’Azou (2014) claimed in their study entitled “Epidemiology of Dengue Disease in the Philippines” (2000–2011) that only one cohort study on a tertiary hospital reported that dengue cases occurred more in females than males.

Bravo *et al.* (2014) stated that there is no discernible sex distribution pattern and that dengue cases occur in approximately equal proportions among males and females. Hence, everybody has an equal chance of contracting dengue infection.

Table 2. Mean scores on practices towards dengue of the respondents.

Category	N	Mean	SD	Verbal description
High Dengue Incidence Communities	50	2.4374	0.347	Very Good
Low Dengue Incidence Communities	50	2.3894	0.347	Good
Total	100			

The respondents who have experienced dengue are the younger members of the communities. This is because dengue victims are usually young children. This finding is in agreement with Bravo *et al.* (2014) who stated that children ages 5 to 14 years old constitute the highest number of dengue cases in the Philippines in 2005 to 2009. In 2010 to 2011 report, children ages 1 to 10 years old represents the highest proportion of reported dengue cases. Bravo *et al.*

(2014) added that Filipinos ages 15 to 49 constitute the second highest proportion of dengue cases. For the interview, it is the mother or the grandmother who answered the interview question if the dengue victim is very young. The study reflects the age of the dengue respondents who are already in old enough to understand and answer the questions (Grade 6 to College students).

Table 3. Profile of the Communities in Terms of Their Level of Practices towards Dengue.

Category	Level of practices towards dengue			Total
	Very Good % (f)	Good % (f)	Poor % (f)	
High Incidence Communities	66 (33)	28 (14)	6 (3)	100 (50)
Low Incidence Communities	62 (31)	32 (16)	6 (3)	100 (50)

In terms of educational qualification, the high incidence barangay has greater number of respondents who attained college level. Table 1 also reveals that non-dengue residents in high dengue incidence barangays have higher educational qualification than those infected with dengue.

It was observed during community visits that living environment in the high dengue incidence communities is not very ideal. Homes are low rise and clustered close together in a densely populated area that can enable easy mosquito transmission of infection between households. Drainage system is also in need of improvement and most of them are open and clogged up making it difficult for people to maintain a clean surrounding.

Another Filipino trait that makes the sanitation problem worst is the tendency to hoard things that are no longer used. These things are found in the yards, around the house and stored improperly.

During the interview, many of the residents blamed the zone leaders for the lack of information dissemination on clean up drive.

They claimed that they were not able to participate because they were not informed about the activities. The researcher learned that the zone leaders and the barangay health workers are the prime movers of the dengue campaign.

These people play a vital role in the community's success in the dengue program. On how they could be empowered and made more effective is one area that can be looked into in the design of dengue campaign.

Some of the respondents expressed futility of their clean-up efforts saying many of their neighbours are not helping in the clean-up nor they clean their own yards. One grandmother who was interviewed blamed the owner of the unoccupied house for the dengue infection of her grandchild.

Table 4. Distribution of respondents’ response on practices towards dengue.

Item	Statement	High Dengue Incidence			Low Dengue Incidence		
		Always	Sometimes	Never	Always	Sometimes	Never
		f	f	f	f	f	f
1	I make sure that water jars are covered.	41	7	2	42	8	10
2	I make sure that water tanks and drums are covered.	36	8	6	38	7	5
3	I regularly inspect refrigerator tray for presence of stagnant water.	28	7	15	29	9	12
4	I check for stagnant water in both indoors and outdoor pots.	30	14	6	34	10	6
5	I drain water from flower pots.	33	10	7	27	9	14
6	I examine any discarded material like tires and plastics that holds water around my house.	32	10	8	21	16	13
7	I use mosquito net while sleeping at night.	31	5	14	21	14	15
8	I participate in community ‘clean our surroundings’ activities.	25	15	10	22	22	6
9	I have mosquito screens installed for windows and doors.	23	3	24	17	24	9
10	I read about Dengue to understand the disease.	19	22	9	17	24	9
11	I share my knowledge about dengue with friends and relatives.	32	17	1	29	19	2
12	I regularly remind my family about the threats of dengue.	37	10	3	37	10	3
13	I make sure that our gutters are not keeping stagnant water.	26	14	10	29	10	11
14	I regularly clean the canals.	21	22	7	23	18	9
15	I make sure family members are aware of the symptoms of dengue.	40	6	4	43	6	1

According to her, she is very conscious of the cleanliness of her own backyard but was discouraged upon learning that her next door house has a number of discarded materials that became larvae infested. She told the researcher that she would even enter the yard next door to do the clean-up and make sure that no mosquito larvae are present. The respondents claimed that the dengue campaign will not be successful if not everybody is doing their part. Some of them claimed that although they are also concerned about the increase of dengue incidence, they simply do not have the time to clean because their time is consumed by their livelihood activities. People are just too busy to take part in the community’s program to reduce dengue cases.

Table 2 shows the mean scores of the respondents on their practices towards dengue when grouped according to the type of community. Analysis reveals that high incidence communities perceived that they have very good practices when it comes to dengue prevention while low dengue incidence communities perceived that their practice is good. This finding is in agreement with Chandren, Wong, and Abu Bakar (2015) who claimed that people living in communities with problematic water supply have to rely on water containers for their water needs. Practices related to such situation are limited to regularly cleaning of containers, keeping the containers closed and visually inspecting for the presence of mosquito larvae. As there is limitation to the use of chemical control,

people would often unknowingly breed mosquitoes even inside the house.

This result however something to do with cleaning habit and practices on taking care of stagnant water in order to reduce potential breeding. Based on the observation of the different communities, the high incidence communities have the biggest population and number of informal settlers which is an indication for the tendency to store water. The close proximity of houses and the lack of sanitation are risks for the spread of diseases. On the other hand, the low dengue incidence communities were careful on making sure that water containers are covered well. Moreover, the researcher learned that even if the water container is empty, residents kept it well-covered to prevent adult mosquitoes from laying their egg in the water container. The residents from the low dengue incidence communities also disclosed that they scrubbed clean the containers regularly using chlorine solution hoping to remove any mosquito egg that might have been deposited within its walls.

Table 3 indicates that most people from the two communities perceived that their preventive practices towards dengue are already the best that they can do given the situation. This is similar to the findings of Malhotra, Yadav, and Dudeja (2014) who stated that people are mostly aware on what to do to avoid dengue infection. Yet dengue infection continues to exist. Poor living conditions in highly populated communities made the spread of infection easier and vector control more difficult to implement.

Table 4 shows the distribution of responses on practices towards dengue. There is a number of interesting information that can be taken from these perceptions on how people behave in terms of sanitation and community participation in order to help reduce dengue incidence. Many of the respondents claimed that they are afraid of contracting dengue and professed that cleanliness and elimination of mosquito breeding sites are good preventive measures. Yet, when it comes to actions

that will benefit the entire community such as participation in a regular clean-up drive initiated by the local government unit, many of the respondents were not able to do so. This is an important challenge for dengue campaigns. To identify the motivating factor and how to translate this willingness to participate in dengue prevention programs into actual action is the key to a more successful dengue campaign.

Reasons provided for this failure include having no time, lack of information or was not informed by authorities and not available during the scheduled clean-up. Moreover, the people do not care about discarded materials like empty bottles and used tires outside their homes or found in streets or vacant lots. When asked about it, they will merely shrugged their shoulders claiming that their neighbors are not taking care of their own garbage and they lacked discipline when it comes to keeping their surrounding litter free.

Moreover, the respondents claimed that many residents and even passers-by are not afraid to throw garbage anywhere despite ordinances on proper waste disposal. Wong and Abu Bakar (2013) claimed that this lack of concerted effort for dengue prevention can discouraged people from sustaining the efforts of the anti-dengue campaign.

The quality of the living environment is greatly affected by the lacked of proper drainage and sewerage system, inconsistent water supply and failure to implement solid waste management system. Experience with dengue infection does not warrant proper management of environmental conditions (Daudé, Mazumdar, and Solanki, 2017). Large households are at-risk for dengue infection (Koyadun, Butraporn, and Kittayapong, 2012). Families with more than 5 members are also less likely to keep their living environment clean and less likely to afford preventive measures because of economic constraint (Alobuia, Missikpode, Aung and Jolly, 2015). House are also built very close to each other in some communities preventing good air circulation and

blocking natural light. Some houses are under big trees that cast shadows that made it attractive to mosquitoes. One family with three children infected with dengue virus was living in a house located under a big tree. The family has to keep their light bulb on all day just to have illumination. Unfortunately this family also store water in big open containers as they do not have a working tap water supply. In some communities, people use discarded tires to stabilize their roof during the bad weather.

The tendency to hoard items and non-functioning appliances in the yard also contributed to the dengue problem. Mosquito larvae were also found inside houses particularly under the sink especially true with leaking pipes, in water dispensers, and flower vases. Dengue mosquitoes tend to adapt to high rise human dwellings and thrive under various water utilization practices (Roslan, Shafie Ngui, Lim, and Sulaiman, 2013). Within the yard, mosquito larvae were also observed in flower pots, discarded empty containers like such as ice cream tubs, soda bottles and discarded tires. As majority of the respondents did not report the use of commercially available insecticide and use of screened doors and windows, Yboa, and Labrague (2013) suggested that the government can focus on cost effective measures of dengue prevention through environmental management and natural control of dengue vectors.

This is very essential since Philippines is no stranger to natural disasters such as floods that can increase incidence of dengue (Kouadio, Aljunid, Kamigaki, Hammad, and Oshitani, 2012). Gunasekara *et al.* (2015) recommends improving the communication line between community health workers and residents especially in terms of reporting observed dengue mosquito breeding sites. Lastly, government efforts should be on enhancing effectively dengue knowledge among its people. People with low knowledge on dengue will less likely perform preventive dengue measures to help reduce incidence of dengue infection in the community (Chandren, Wong, and Abu Bakar, 2015).

Conclusion

High dengue incidence communities are found to be highly congested, with irregular water supply and having difficulty in participation for clean-up drives as well as in proper solid waste management. Practice is not demonstrated as real action. Although low dengue incidence communities are facing almost the same challenges, dengue preventive practice is more consistent and participation in clean-up drives is part of the commitment for dengue preventive measures.

Acknowledgement

The author would like to acknowledge the city health workers for the assistance in the field observation and interview. Special thanks also to the community health workers and housewives who participated in the focus group discussion.

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