Impact of Dengue Awareness for Distribution of Dengue in Urban and Rural Areas: Case study on Colombo District in Sri Lanka

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Abstract

Dengue like illnesses has been serologically confirmed in 1962 in Sri Lank. The research problem of this study is 'what is the level of Dengue awareness for distribution of dengue in urban and rural areas'. The Research methodology was quantitative methods and Primary data was collected through a structured questionnaire. Colombo districts where there was the highest number of reported dengue cases in 2012. Dehiwala and Padukka Medical Officer of Health areas were selected as urban and rural study areas and it has reported highest and lowest rate of Dengue among the Colombo District. 230 patients were selected as the sample for the study according to systematic sampling method in both areas .The outcome of the research was revealed Under the DAI (Dengue Awareness Index) urban awareness is slight better than rural. 90% Dengue patients in rural area has infected Dengue when they are associated with high Dengue spread area.

Key Words: Dengue Awareness, Dengue Awareness Index, Systematic Sampling Method.

1. Introduction of Dengue

Although there are several species of mosquitoes who is carrying dengue virus, epidemiological evidence has clearly established that *Aedes Aegypti* and *Aedes Albopictus* are responsible for the majority of dengue transmission (Gubler, 1997). Geographical distribution of *Aedes albopictus* expanded from Asia to Europe and America due to frequent used tire transportation. Spatial distribution of the dengue disease highly affects the epidemiology of the disease as dengue viruses circulate between the humans and vector mosquitoes without an intermediate host (Higa, 2011). As there is no vaccine available to prevent Dengue Fever and Dengue Hemorrhagic Fever the only way of preventing dengue transmission is reducing human-vector contact. Accordingly most of the dengue control programmes have targeted controlling vector mosquitoes but most of them have not successful (Massad et al., 2013). They have pointed out that infestation of *Aedes aegypti* and *Aedes albopictus* are modified in various environments due to different spatial distribution, different ecological zones and different environments (Massad et al., 2013).

2. Dengue Distribution in Sri Lanka

At present communicable diseases have become serious socio-economic problems in Sri Lanka. Epidemics have reached the highest proportion out of the reported diseases in Sri Lanka (Ministry of Health, Sri Lanka, 2008). Communicable diseases could be analyzed according to time and spatial structures from geographical point of view. Transmissions of epidemics take place as a result of social changes effected due to environment implication due to human behaviour. For instance, epidemics are created and spread in rainy season due to blockage and spill of drainage as a result of human behavior.

Most number of communicable diseases in Sri Lanka has been reported from the Western Provinces and these areas are the highest endemicity areas in Sri lanka (Annual Health Bulletin, 2008). Among the other epidemics[1] Dengue was the highest numbers of epidemic have been reported from the Colombo District of the Western Province (Department of Provincial Director of Health, Maligawatta, Colombo**)**. According to epidemiology unite, approximately 51.55% of dengue cases were reported from the Western province 2012 (Map 1.1) and in 2016, up to August Colombo has reported 11214 Dengue patients as a highest dengue reporting area in Sri Lanka.

**Spatial distribution of Dengue Epidemic in Sri Lanka – 2012**
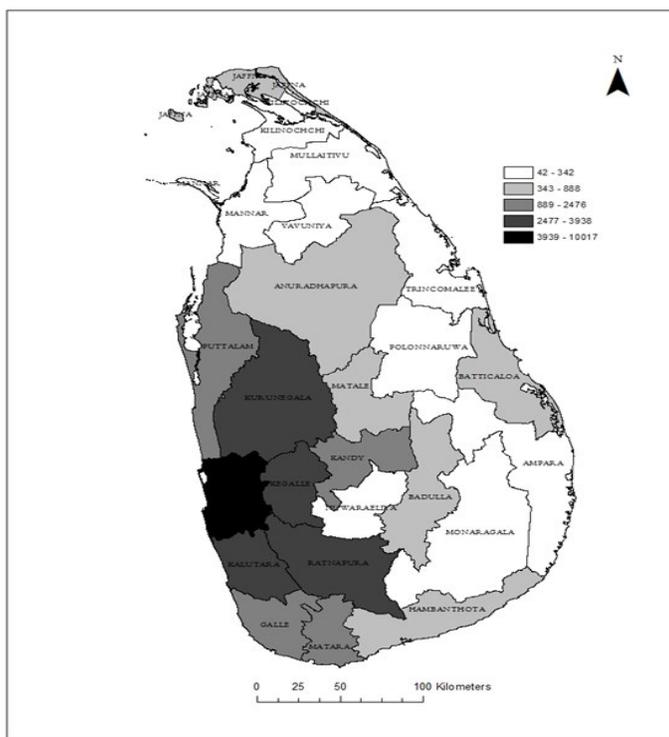
(Source: Epidemiology Unit, Ministry of Health, Sri Lanka)

The Dengue like illness has been reported in Sri Lanka at the beginning of the 20th century and it was serologically confirmed in 1962 (Medical Research Institute, 2011). In Sri Lanka dengue became island wide epidemic at the time during the period 1965 to 1968. In this period, there were 51 Dengue viruses 1 and 2 along with 15 deaths due to DHF. According to MRI (2011), multiple serotypes DF were circulated in urban areas but there were only occasional cases of DHF. MRI (2011) has further pointed out that DHF has

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[1] According to ministry of health, Leprosy, Tuberculosis and Leptospirosis are the highest reported other epidemics in Western Province, Sri Lanka.

become endemic in Sri Lanka from 1989 onwards and there have been 203 hospitalized clinical cases of DHF and 20 deaths. According to Vitarana (1997), in 1996 DHF cases initially occurred mainly in and around Colombo and spread to other towns and reached outbreak proportions in several provincials such as Kurunegala, Kandy, and Batticaloa. Since then, the dramatic behavior of the incidence of dengue and its severe manifestations has been observed in the country as shown in figure 1.1 below.

**Figure 1.1 Dengue Cases and Deaths in Sri Lanka**
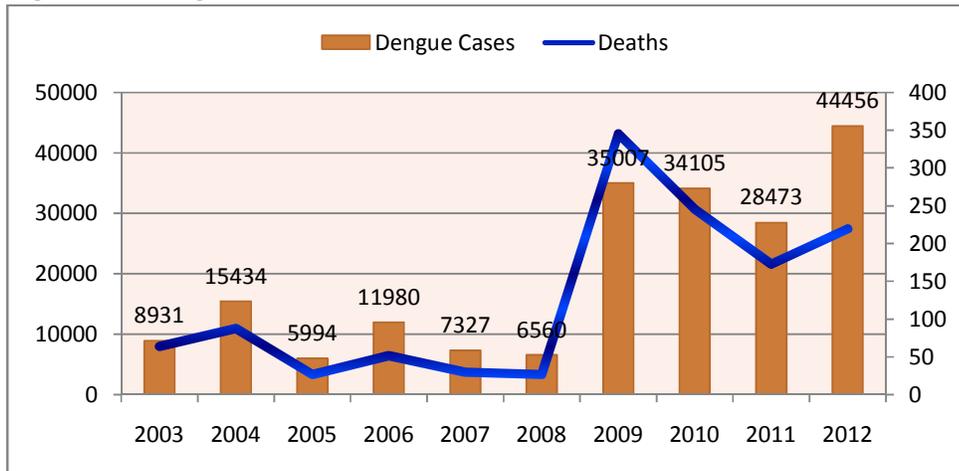
(Source: Epidemiology Unit, Ministry of Health, Sri Lanka)

According to the figure 1.1, there was a rapid increase in dengue in Sri Lanka and has become an epidemic situation from the year 2009 to 2012. Western Province has been identified as a risky zone due to transmission of dengue epidemic and the risk in the transmission of dengue has increased considerably. Especially, Colombo District could be identified as the district where the highest numbers of dengue patients were reported during the years 2011 and 2012 up to 2016. The urban expansion declines sharply from Colombo urban area towards the internal peripheral regions. Concurrently, the density of population declines. According to the migration pattern of Sri Lanka, most migrations occur towards the Colombo District. It includes both as forward migration and backward migration. This connects up to Colombo by a large number of people from peripheral areas on a daily mobility and short term mobility basis. Accordingly, most of the communicable diseases can be spread from Colombo to other suburban areas through backward migration current. eg: people arriving in Colombo for employment for education and for development projects show a higher value of population than in other districts. Especially migration for employment and visiting relations will be short term migrations on the basis of short term migration current when Colombo District is considered such migration currents take a higher value and due to this reason, communicable diseases spread through these groups to the environment in Colombo speedily. As such, Colombo District and other sub – urban areas bear a high rate of the risk of dengue epidemic. It is appropriate to identify the geographical limitations in the spread of communicable diseases than considering the administrative limitations alone but in Sri Lanka, data and other reports on the spread of diseases are based on administrative regional levels and therefore, basically the spread of diseases can be considered accordingly. According to the above situation, the spatial and temporal Dengue diseases existing in the Colombo District can be identified.

During the years 2009, 2010, 2011 and 2012, the most number of dengue cases have been recorded from the administrative region of Dehiwala Medical Office of Health (MOH).It is highly urban area. Further, high rate of spreading of dengue in the Kolonnawa, Kaduwela, Maharagama, and Moratuwa, MOH

areas could be relatively observed. During these four years, the minimum numbers of dengue cases have been reported from the administrative region of Padukka MOH. It is rural area. Accordingly, Kolonnawa and Dehiwala areas situated closer to the Colombo sub – urban shows a higher value in the spreading of Dengue patients. As shown by map 1.1 the situation has declined gradually out of the urban core areas of Colombo. eg :- Padukka, Hanwella.

Map 1.1 Dengue patients distribution according to MOH division wise in Colombo district. 2012.
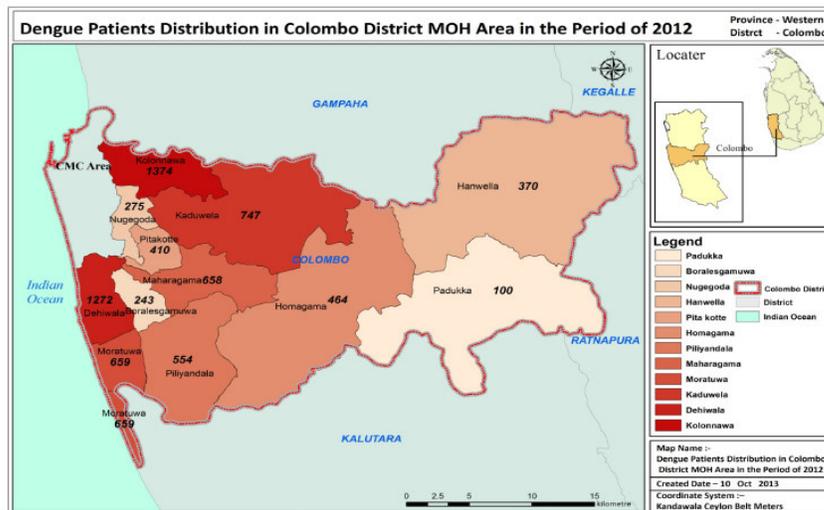
(Source - Epidemiological Unit, Sri Lanka)

Although the discrepancies in the spatial distribution of Dengue disease on the basis of MOH division in the Colombo District can be identified through the factors innate to influence the creation of Dengue disease changes within these regions. It means that human activities and the social economic cultural and the ecological situations which lead to the creation of dengue diseases occur on different levels. Within this research, the change of human awareness of Dengue is identified comparatively on the areas where the highest and the lowest records of spatial distribution of dengue disease in the Colombo District are influenced.

3. Research Methodology

The main research problem of this research is to identify '*what is the level of Dengue awareness for distribution of dengue in urban and rural areas*' lead to a high incidence of dengue epidemic in Colombo District in Sri Lanka. The main approach of this study is Regional Geographical approaches. This research has identified the highest and lowest Dengue reported areas of Colombo District as two geographical areas. Those are Dehiwala MOH area and Padukka MOH area.

In this research where theories and findings are to be test by examining the relationship among the variables it is known as a quantitative research. In this research has used the quantitative method for identifying the research problem through primary data collected in the field survey using the structured questionnaire. The questionnaire was used to collect data from the people who had been infected with Dengue in the sample areas. Accordingly, 140 questionnaires were administered with the dengue patients in Dehiwela and 90 questionnaires were administered with the dengue patients in Padukka making the total number of questionnaires 230.

In selecting the study area, the first step was selecting the national level. Colombo district was selected as the national level sample of the research. Dehiwala MOH area has reported high Dengue incidence and Padukka MOH area has reported lowest Dengue incidence in 2012. Therefore above two MOH Divisions were selected for this study as a regional level study area.

4. Awareness of Dengue

Awareness in something will create more knowledge about the thing that we are aware. Accordingly, if people's awareness about a disease could be raised and enhanced it would be a great advantage to prevent such a disease. In many countries, people are made aware of about diseases through Researches as a part of diseases communication in order to prevent diseases. Diseases communication prevails in Sri Lanka at a very primitive level. But people possess a general level of knowledge in identifying diseases. The problem is that they are not aware of the fact related to the background of such diseases. All the participants in this research possess a fair knowledge about dengue disease. In this research awareness has been identified by 6 factors as follows:

1. Awareness about the symptoms of Dengue
2. Awareness about the external physical features of Dengue Mosquitoes
3. Awareness about active peak time of the Dengue Mosquito
4. Awareness about habits and behaviors of Dengue Mosquitoes
5. Awareness about the breeding places of Dengue Mosquito
6. Awareness about Dengue transmission

'Yes' or 'No' answers has got from all questions. According to answer, if some participants give answer 'Yes' s/he should be known correct information as fallows;

Table 1.1 Question and Answers

Questions	'Yes' Answer should be given
Awareness about the symptoms of Dengue	Fever and headache more than 3 days Pain under eyes, joint in legs and hands Vomit and anorexia Emergence of red blotches under the skin
Awareness about the external features of Dengue Mosquitoes	Small and Black color mosquitoes. *Aedes aegypti* has two strate line surrounded by coured lyre - shape lines on the side in contrast. *Albopitus* has only a single line of white scale located in the middle of the thorax.
Awareness about active peak time of Dengue Mosquito	around 7.00 – 9.00 am and around 3.00 – 5.00 pm
Awareness about habits and behaviours of Dengue Mosquitoes	These mosquitoes pursue after people and attach them, in a speedy behavior. Live inside houses and dark places and remain in houses even after attacking the victims. *Aedes Albopictus* species usually can be seen in the environment outside houses.
Awareness about the breeding places of Dengue Mosquito	Any places where water stagnate more than 7 - 10 days : 3 Examples
Awareness about Dengue transmission	The mosquito that attack for Dengue patient again attack to healthy person, s/he will be a Dengue patient. When the mosquito attacks a man, the virus remains in him in the first 3 - 7 days (viraemic period). Similarly, within a period of another 8 – 12 days, the virus develops up to a condition of rupturing which paves the way to retain the virus in the body of the patient

If someone could not give at least single information s/he got 'No' for each question. All questions have focused to, before infected Dengue for the all participants.

4.1 Symptoms of Dengue

Figure 1.2   Awareness about symptoms of Dengue
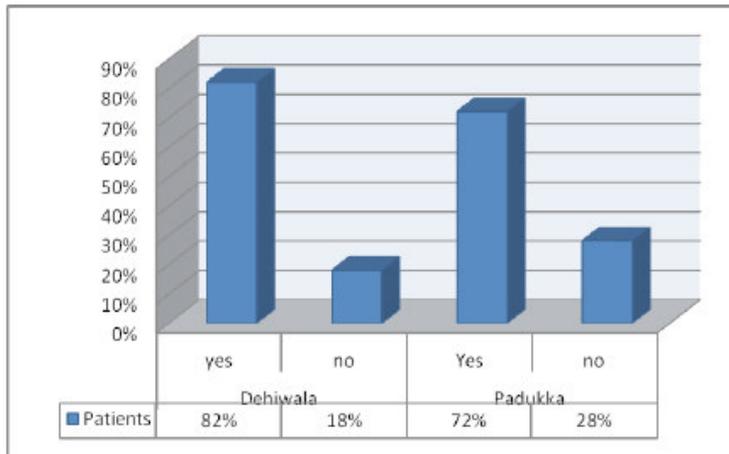
(Source – Field Survey (2015 Sept/Oct)

According to Figure 1.2, participants from Dehiwala possess a higher awareness than the participants of Padukka. Further, it was revealed that those who have answered "NO' to the question were aware only about fever and low blood platelets as dengue fever. Further, participants in highest dengue reported area have high level of awareness about dengue symptoms as they have had more firsthand experience in dengue fever.

4.2 External physical features of the Dengue Mosquitoes

Figure 1.3 Awareness about external physical
**   features of the Dengue Mosquitoes**
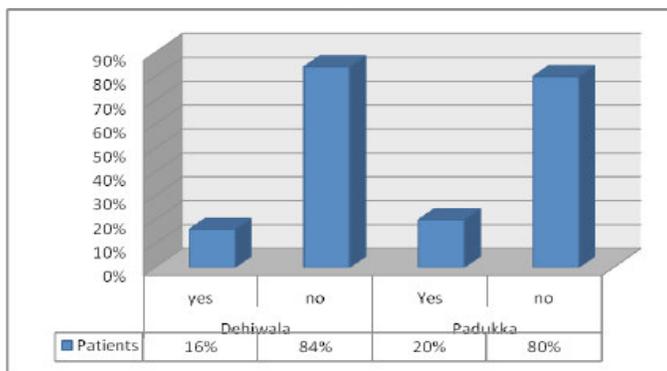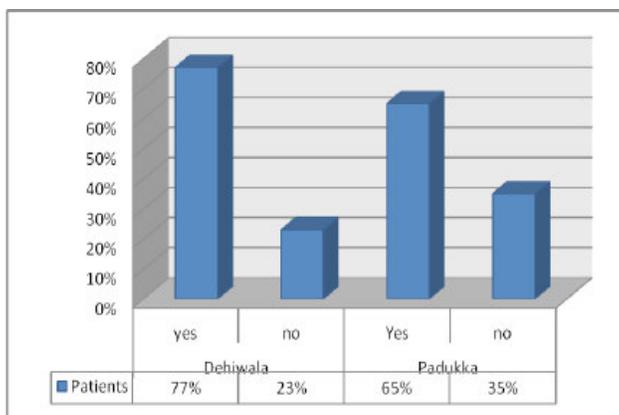

(Source – Field Survey (2015 Sept/Oct)

It was asked whether participants are aware of the external physical features of the dengue mosquito before infected Dengue and the responses give by them are shown below. According to Figure 1.3, majority of participants were not aware of the external physical features of the dengue mosquito in both MOH areas.

This may be one of the reasons to spread dengue viruses as people cannot identify the mosquito and therefore, they do not do any preventive measure to avoid them.

4.3 Active peak time of the Dengue Mosquito

In order to avoid and control of spreading of dengue disease it is important that to keep people aware about the peak active time of the particular mosquitoes to the general public. As identified at present, the active peak time of dengue mosquitoes in Sri Lanka is from 7.00 – 9.00 a.m. and 3.00 – 5.00 p.m. As this mosquito belongs to Anthropophagic category, its active time too goes in par with the active time of human. This mosquito species is known as Day time mosquitoes and attacks during the active time of humans. In order to ascertain the situation, the question was raised and responses provided by the participants were as follows.

**Figure 1.4 Awareness about Active peak time of the Dengue Mosquito**

(Source – Field Survey (2015 Sept/Oct)
Figures 1.4, Majority of participants were very well aware about the peak active time of the dengue mosquito.

4.4 Habits and behaviors of Dengue Mosquitoes

According to Entomological Reports Dehiwela and Padukka (2012), both mosquitoes *Aedes aegypti* and *Aedes albopictus* species are responsible for creating and spreading dengue virus in both Dehiwela and Padukka MOH area. These species live inside houses and dark places and remain in houses even after attacking the people who are in the house. *Aedes albopictus* species usually can be seen in the environment outside houses. But sometimes, it could be seen inside the house too. This species is a 'semi domestic' type of a mosquito. Both these species pursue after people and attach them, in a speedy behavior. People of Padukka area possess a lower awareness of this behaviour of mosquitoes than the people in MOH area, Dehiwela. *"Mosquitoes which attack us in the evening. Keep on attacking us repeatedly chasing after us in the work place" Mahinda - Padukka, worker in a snack bar.* The responses on question are given below.

Figure 1.5   Awareness of habits and behaviors of Dengue Mosquitoes
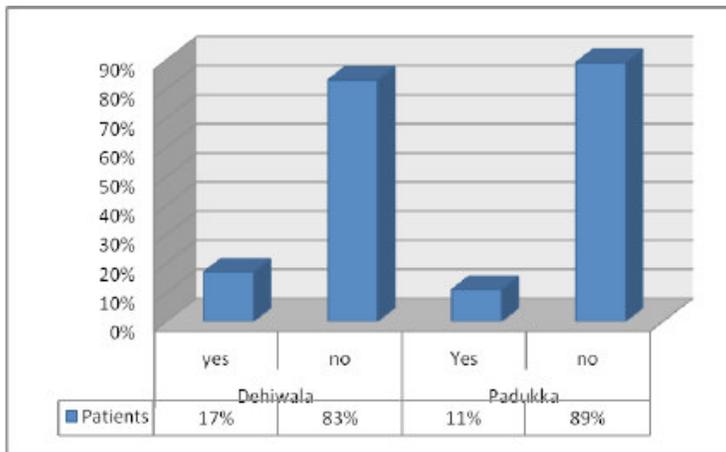
(Source – Field Survey (2013 Sept/Oct)
Awareness of the habits and the behavior of dengue mosquitoes are very low in both MOH areas amounting to overall rate of 14 percent.
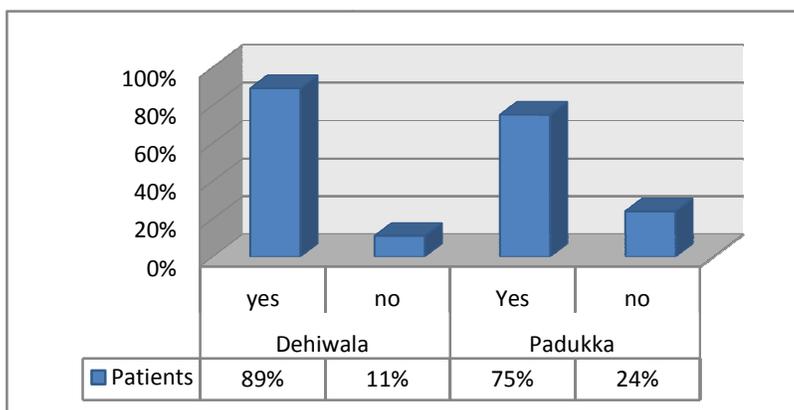
4.5 Breeding places of Dengue Mosquito

Although, the majority of people are aware of the mosquito breeding places, media reveals only about the places where water is stagnated. Generally *Aedes* mosquito lay eggs in water logged places for 07 - 10 days and at places where humidity prevails for a number of days. As these eggs are of sticky mature, the strength of protoplasm remains live even for a number of days. As such the probability of the breeding of dengue mosquito is strong. When questioning from dengue patients of these two areas, they stated that only the water stagnating places were identified by them as mosquito breeding places as published by media.

"We destroy only the places goods and items included in the card issued by the Dengue Prevention Program" - Jayatunga - Karagampitiya, Three Wheel Driver.

People of both these are scared of the officers of the Dengue Prevention Program they are very careful in clearing the water stagnating places which fact was revealed at the Field Survey. In relation to the control of dengue population, participants were asked about their awareness about the mosquito breeding places. The responses by the participants on this question are given below.

**Figure 1.6   Awareness of the breeding places of Dengue Mosquito**

(Source – Field Survey (2013 Sept/Oct)

According to the Figure 1.6, in overall 82 percent of participants were aware about the mosquito breeding place and in area wise 89 percent of participants from Dehiwela and 75 percents of participants of Dehiwela were aware of the same.

4.6 Transmission of Dengue Virus

Asked from the participants as to their awareness about how dengue virus is transmitted as knowledge about the transmission is important in controlling the spreading of the virus. Responses received to this question are shown below. According to responses, 75 percent of the entire participants were aware of as to how dengue virus is transmitted. The special feature of this awareness is participants of Padukka have greater awareness on transmission of dengue than participants of Dehiwela.

Figure 1.7 Awareness about the Dengue transmission

	Dehiwala		Padukka	
	yes	no	Yes	no
Patients	70%	30%	81%	19%
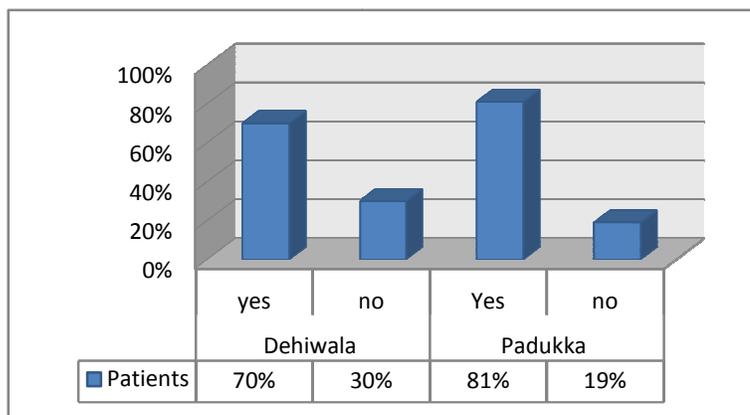
(Source – Field Survey (2013 Sept/Oct)

5. Dengue Awareness Index

Further to above data collected through the questionnaire to ascertain the awareness about the dengue by the participants, there is another way of measuring the awareness on the same questions through calculation of an index shown below.

$$ DAI = \left[\left(\frac{\sum_{i=1}^{n} X_i}{n} \right) \div F \right] $$

DAI   =   Dengue Awareness Index
F   =   Number of questions
X   =   Total Numbers of Yes answers
n   =   Number of Patients

$\left(\dfrac{\sum_{i=1}^{n} X_i}{n} \right)$ =   Mean value of the answers

$\sum x_1 = (x1 + x2 + x3 \ldots\ldots x140/90)$

i   =   factors (i1 to i6)

Accordingly, mean values for the "YES" answers for the questions was summarized for individual participant wise and mean value was calculated for both individual participants of Dehiwela and Padukka and average index was then obtained from the formula. According to the calculations, the awareness indexes

were 3.5 and 3.2 for Dehiwela and Padukka respectively. In theoretically indication of the awareness index is as follows.

> Index value = 6/6 point, awareness is best
> Index value = 5/6 point, awareness is very good
> Index value = 4/6 point, awareness is quite good
> Index value = 3/6 point, awareness is neither good nor bad
> Index value = 2/6 point, awareness is quite bad
> Index value = 1/6 point, awareness is very bad
> Index value = 0 point, awareness is worst

As the indexes for Dehiwela and Padukka were 3.5 and 3.2, it reflects that the awareness about the dengue disease by the Dehiwela participants were quite god and it was neither good or nor bad by the Padukka participants. Accordingly, Dehiwala awareness is slight better than Padukka but overall awareness of both areas are same. Further it was revealed that the awareness of the dengue breeding places by the participants of Dehiwela was higher than the Padukka while low level of awareness on external features of the particular mosquitoes.

6. Conclusion

The disease has become more generalized and normalized in urban area as it was widely deployed in the area. As dengue has widely spread in the urban area, people in the area was had not much interest to acquire more knowledge related to the disease and preventive measures. There were especially low income people who are not much concerned about the disease and living with the same. As infection level in the rural area was very low, although there is low level of awareness, they are much concerned about the disease and concerned about the preventive measures due to the reason of the low risk. This was evident by attending counseling services carried out by the health authorities in the area.

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