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# Breeding habitats and larval indices of *aedes aegypti* in different socio-economic groups of Pratap Vihar Area, Ghaziabad

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**Abstract**
Study of prevalence and distribution of *Aedes aegypti* mosquito was carried out in different socio-economic groups of selected localities in Partap Vihar, Ghaziabad. Knowledge regarding prevalence and distribution of *Aedes aegypti* mosquito is essential for appropriate interventions. This study was carried from July, 2019 to June, 2020. The study area was divided into three categories based on their socio-economic status. The three categories were High income group (HIG), Medium income group (MIG) and Low income group (LIG). A door-to-door survey was carried out to find out the *Aedes* breeding in all types of water filled containers present in and around houses and their premises. Immature stages of *Aedes aegypti* mosquitoes were collected during the larval survey and density level, was recorded using different indices. During the study it was observed that plastic containers were the most preferred breeding site for breeding of *Aedes aegypti* in all categories that is HIG.MIG and LIG. The house index was higher in the month of November in LIG and HIG categories and in MIG category it was highest during September month. The BI in all the localities was recorded below critical level (i.e. 20). Containers found in Low income group (LIG) were found to be contributing more to the *Aedes aegypti* breeding than MIG and HIG localities. The CI was observed to be higher in all the three types of categories in the month of October In the study it was concluded that sudden upsurge of dengue can be controlled by targeted interventions including sustained vector surveillance in densely populated place like Pratap Vihar.

**Keywords:** Partap Vihar, Ghaziabad, knowledge

## Introduction
Dengue is a serious Arboviral infection caused by any of the four flavivirus serotypes i.e. DEN 1, DEN 2, DEN 3 & DEN 4 mainly transmitted by *Aedes aegypti* and *Aedes albobictus* mosquitoes [1, 2] Principal vector of Dengue in India is *Aedes aegypti* [3] and has widespread distribution in many urban [4, 5] as well as rural parts of India. A recent study estimated that up to 300 million dengue virus infections including close to 100 million cases of Dengue diseases manifestation occur annually [6]. *Ae aegypti* mosquito is unique in the sense that it is closely associated with human habitation, a wide range of water holding containers around human dwellings are exploited as sites for oviposition of eggs and development of immature. The daytime biting females are commonly indooor resting and feeding mosquitoes [7, 8]. Dengue fever is spread throughout tropical and sub-tropical regions of the world and is commonly known to pose a significant threat to public health [9].

*G*eographical distribution and local intra annual (seasonal) activity pattern of *Aedes aegypti* may be impacted by climate change especially rising temperature and changes in rainfall pattern [10, 11, 12]. Peak abundance of *Aedes aegypti* increases the risk for human infection with Dengue virus The mosquito persists across a climate suitability gradient ranging from near optical at the cores of its range in the subtropics and tropics to borderline suitable at the cool range margins which occur at mid latitude or at high deviation at lower latitudes [14].

Areas where the mosquitoes and its associated pathogens present a major threat to human health include parts of southern Asia subregion (particularly India, Sri Lanka and Bangladesh), parts of eastern Asia sub region (particularly China and Taiwan) the entire region of South

Eastern Asia and North Eastern Australian islands of tropical Pacific Ocean, subtropical and tropical parts of Africa, the Caribbean islands and large parts of continental Americas with cool range to the north and south [15].

India is one of the most susceptible countries to Dengue epidemic. Major dengue/DHF outbreaks were recorded over the last few decades from almost all parts of the country including Delhi [16]. In 2013 Dengue outbreak occurred which recorded 75454 cases and 167 deaths in India out of which Delhi's contribution was 5574 dengue cases and 6 deaths [17] Delhi is one of the states of North India that has been endemic for Dengue from past several years [18, 19] In 2020, 44585 cases have been reported in India with 56 deaths, Deli reported 1269 cases of Dengue in 2020 [17].

Warm climate and monsoon season provides a favorable environment for Aedes mosquito breeding in Delhi and NCR. Poor water management system including interrupted water supply that encourages water storage practices, including poor sanitation, and lack of awareness are major factors that contribute to Delhi and NCR being an epidemic potential [20, 21].

In this context mosquito larval investigation was carried out in localities of Pratap Vihar Ghaziabad (in NCR) where Dengue cases were reported persistently during last three years. The aim of the present study was to conduct an entomological survey to determine the larval indices of Aedes and to identify the areas in Pratap Vihar that are at risk for Dengue outbreak.

## Material & Methods

Pratap Vihar falls in Ghaziabad district situated in Uttar Pradesh state. Pratap Viharhas a population of 61457 the size of the area is 2.9 Sq Kilomaters.

Study was conducted in 20 localities of Pratap Vihar from July 2019 to June 2020. All localities were selected on the basis of socio economic status and residential build up. Study area was visited every month during the study period.

## Entomological Survey

A door to door entomological survey was carried out to find out the Aedes breeding in all types of water filled containers in and around houses and their premises from July 2019 to March 2020. Thereafter from April 2020 to June 2020 due to COVID restrictions survey could not be done inside the houses however outside containers were checked

Larval collections were made from each locality with help of flash light by dipping and pipetting method [22]. All kinds of breeding habitats in the study areas like coolers, overhead tanks, plastic, Earthen Pots and Iron pots, were screened for presence of immature stages of Aedes mosquitoes

In larval survey different indices were used to record *Aedes aegypti* density level. These indices are House Index (HI), Container Index (CI) and Bruteau Index (BI)

## Results

The results revealed that all localities were found positive for *Aedes aegypti* mosquito irrespective of their income group. In HIG houses 3489 houses were surveyed. Out of these 122 houses had *Aedes* breeding with HI of 3.5 Among MIG Houses 3893 houses were surveyed and 149 houses were found positive, the HI of MIG flats was 3.8. Similarly in LIG houses, 4205 houses were surveyed in transmission season and of these 181 were found positive for *Aedes aegypti* with HI of 4.3.

In HIG locality 9241 water holding containers were identified out of these 158 containers were found to have *Aedes aegypti* with CI of 1.7. In MIG locality 5863 containers were surveyed out of these 198 containers were found positive for *Aedes aegypti* with CI of 3.4. A total of 11831containers were surveyed in LIG flats and 332 containers were found to have *Aedes aegypti* the CI was 2.8.

The results revealed that all localities were found positive for *Aedes aegypti* breeding in the transmission season (i.e. August to November) it was found that House Index (HI) was very low in all the localities during winter season. Breeding of *Aedes aegypti* started increasing from the month of March and April thereafter maximum peak was observed in the month of September. Further a dip was observed in the month of October in MIG and HIG flats again there was slight increase in November and then a drastic dip in December was observed. However in LIG flats, there was increase in House Index (HI) after August. HI was highest in the month of November however slight dip was observed in October and HI was minimum in the month of January (Figure 1)

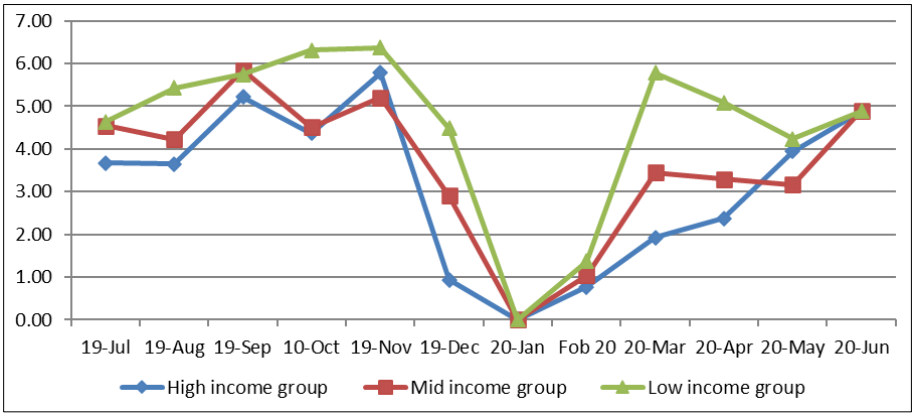


**Fig 1:** Hi in all Income group

Month wise container index was calculated from July 2019 to June 2020. Container index started increasing from month of July and was highest in October in all localities. Thereafter CI decreased in following months and was zero in month of January (Figure 2)

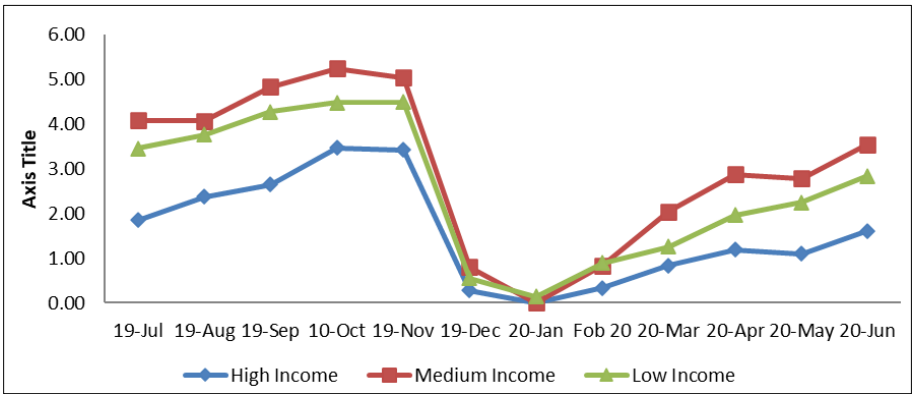


**Fig 2:** CI in all Income group

The Breteau index in all localities was below the critical value (i.e. 20). BI was highest in the month of October and November in HIG and LIG flats. However it was highest in the month of September in MIG flats. (Figure 3)

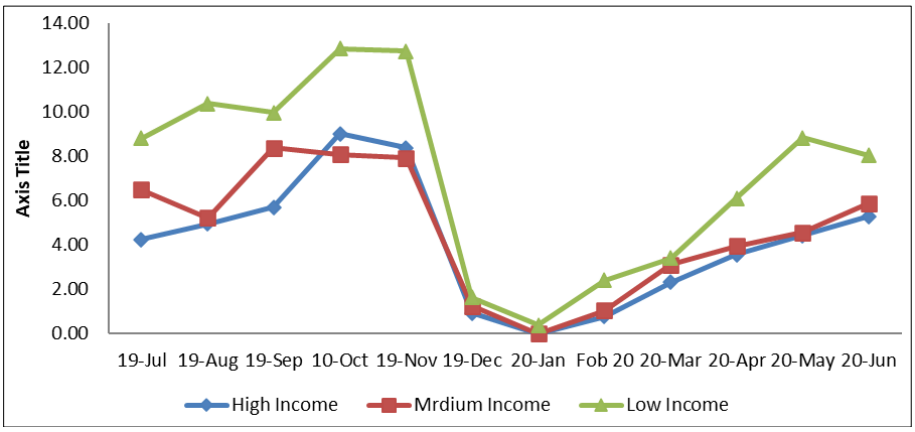


**Fig 3:** BI in all Income group

Breeding preference of *Aedes aegypti* was also studied among all types of containers. Among all positive containers maximum breeding of *Aedes aegypti* was found in plastic containers and Earthen pots. Breeding in coolers was less may be because of awareness. Less breeding was found in solid wastes.

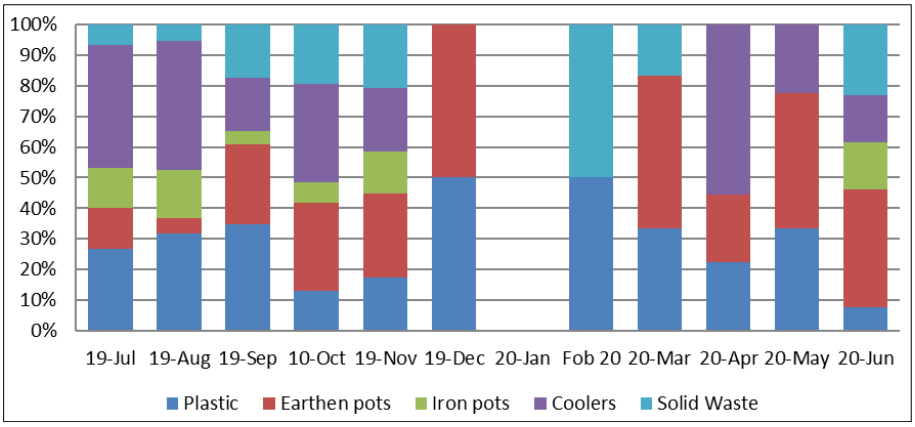


**Fig 4:** Breeding preference in High Income Group locality

Among MIG flats maximum breeding was observed in plastic containers in the month of December. Earthen pots were the preferred containers in all months except in January. Breeding was found high in coolers in the month of October

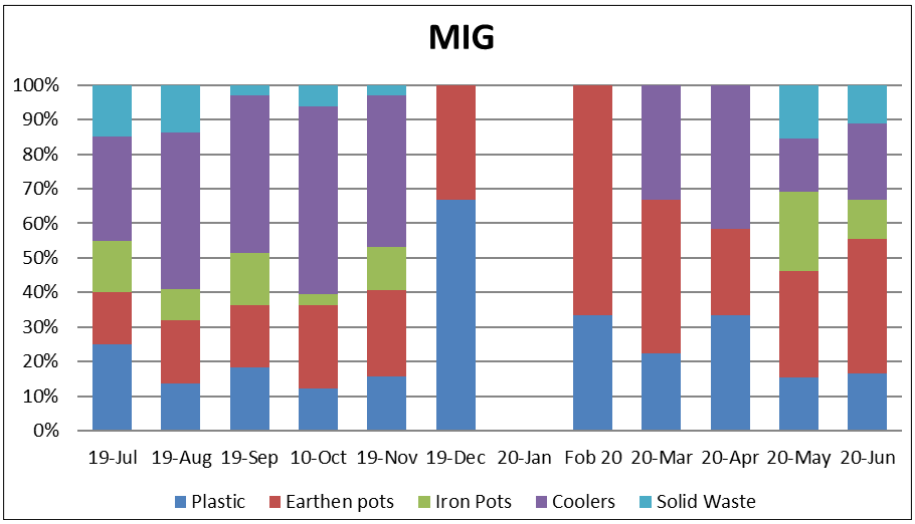


**Fig 5:** Breeding preference in Medium Income Group locality

Among LIG flats breeding was found only in Coolers in the month of January. During other months plastic containers were preferred containers for *Aedes aegypti* Larvae.

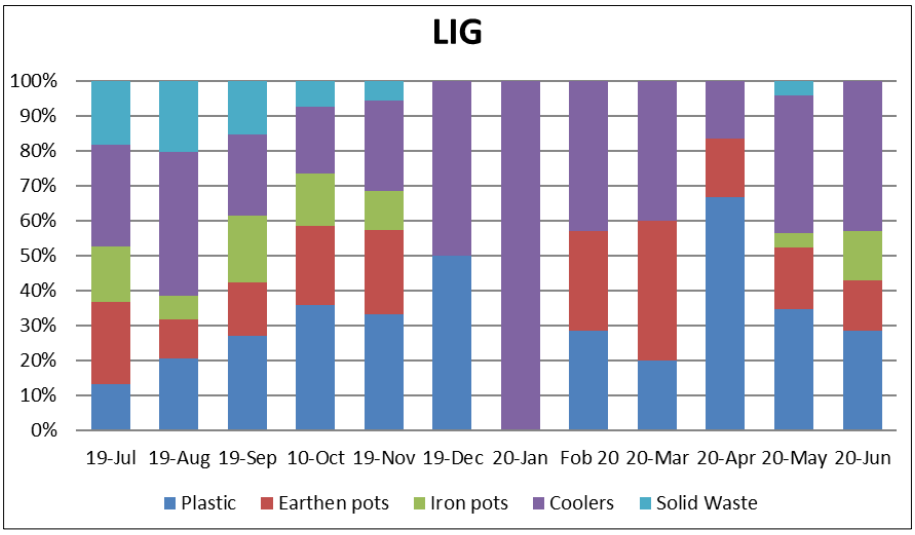


**Fig 5:** Breeding preference in Low Income Group locality

## Discussion

The study demonstrated that in all localities plastic containers are preferred breeding site followed by earthen pots. Iron pots were positive in all localities but few in number. Moderate breeding was found in coolers because of awareness by IEC/BCC activities through media. The results are in confirmation with the studies done in 2016 where plastic containers and earthen pots were predominant habitats for *Aedes aegypti* breeding [15]. The results of larval indices study show that HI and CI was zero or very low during winter season i.e., January to March, Larval breeding was zero or negligible in all localities during the month of December. Larval breeding started increasing from the month of March and larval indices (HI, CI, and BI) were higher from August to November and thereafter it decreased and reached zero in the month of December. All the indices were very high in October, due to water storage practices in these areas as they do not have regular water supply.

In the study, it was observed that prevalence of *Aedes aegypti* is high from August to November as water accumulation of post rains water in the area provides a suitable breeding habitat for *Aedes aegypti* mosquito. Breeding was mainly found in the plastic and earthenware containers which are placed outside the houses. Moderate breeding in Coolers was probably due to awareness among the community to regularly change the water of cooler or to add suitable larvicide or oil in the containers. Studies in 2020 have also demonstrated seasonal variation of breeding preference of *Aedes aegypti* in different containers in Delhi [16].

## Conclusion

The study showed that larval indices (HI, CI and BI) were high from the month of August to November and it was almost zero or negligible during the winter. The study showed plastic containers and earthen pots were the most productive container for breeding. Role of cooler for breeding of *Aedes aegypti* mosquito was found negligible. Therefore, emphasis should be made for control of breeding in plastic and earthen pots as compared to coolers. Vector control activities should be geared up before monsoon. IEC/BCC activities should be strengthened and health care workers should be encouraged to spread awareness among the community on measures that

should be taken to prevent breeding of *Aedes aegypti* larva.

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