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A STUDY ON SOLID WASTE MANAGEMENT AND VECTOR BORNE DISEASES (DENGUE) CONTROL IN POLLUTED AREAS (VIJAYAWADA CITY)

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ABSTRACT

Solid waste management is the most important in environment to keep clean of our surrounding. One of the most common problems associated with the poorly designed Landfills and poorly managed solid waste is that it leads to attraction of large number of vectors such as female s, *Aedes egypti* which is responsible for the proliferation of breeding sites of mosquitoes causing Vector borne diseases such as Dengue. In urban agglomeration, both man-made and other natural habitats form the mosquitogenic conditions conducive for the transmission of different vector-borne diseases. In urban area mosquito breeds mainly in drains, cesspits and cesspools containing domestic effluents and such habitats are extensive and diverse. This is due to insanitary conditions and environmental degradation. Lack of adequate housing, water supply, sanitation and solid waste management facilities, as well as knowledge, attitudes and practice (KAP) of the people are the major factors responsible for the proliferation of mosquitoes in the urban environment. The present study was carried out through survey and conducted for about 250 houses in six prone areas of vectors in Vijayawada. This study helped in detection of mosquitoes. Subsequently control measures were carried out in peri-domestic places.

Key words: Solid waste management, Aedes egypti, Dengue.

INTRODUCTION

Emergence and resurgence of mosquito-borne diseases such as malaria, dengue, Japanese encephalitis and filariasis both in tropical and subtropical regions are well known. It is estimated that 500 million – one in every ten persons suffer from one or more tropical diseases and the global situation of lymphatic filariasis is reported as the 4th rank [1-3]. The geo-climatic conditions in India are conducive for the transmission of vector-borne diseases. The magnitude of the mosquito menace and prevalence of mosquito-borne diseases depend upon various factors such as developmental activities, human interference, climatic changes, availability of parasitic load in the community and socio-cultural practices. In India, there is no separate mosquito control programme as it is linked with sanitation and solid waste disposal, which is carried out by municipalities or *panchayats*. Most of the municipalities / corporations are unable to undertake mosquito control due to various reasons and seek the help of other organizations such as the Vector Control Research Centre (VCRC), Pondicherry which has developed Master Plans for the control of mosquitoes in Pondicherry [3], Bangalore and Neyveli township [4,5].

While preparing the master plan simple, economic, ecologically sound, reliable, labour intensive and compatible methods both for the organization and the community were followed. In view of the severity of the mosquito problem, the technical guidance of VCRC was sought for the preparation of a master plan so as to undertake effective mosquito control measures in Vijayawada Municipal Corporation.

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Dengue arbovirus has recently emerged as a major public health concern with increased morbidity in Andhra Pradesh. In 2010, for the first time, 237 dengue cases were reported, followed by 1058 and 4526 cases in 2012 and 2013, respectively (data source: State Health Directorate of Assam, unpublished). Most dengue cases (>70%) were recorded in Guwahati metropolitan area during the post-monsoon months in September to December [6,7].

Among these, patients comprised all age groups of both sexes but there was a higher concentration of cases in adult males aged 26–60 years. Dengue is currently spreading to semi-urban areas and adjoining districts/states of north-east India. *Aedes aegypti* and *Ae. albopictus* are implicated as disease vectors for the spread of dengue and chikungunya, and breed in a variety of containers. Among these, *Ae. aegypti* has been incriminated for the circulating serotype of dengue virus 2, in both males and females, establishing transvarial transmission in the region (P Dutta, Regional Medical Research Centre, Dibrugarh, personal communication). It is a common species in city premises and recorded breeding is predominantly in discarded tyres and solid waste containers. *Ae. albopictus*, on the other hand, is commonly encountered in semi-urban/ rural areas, breeding in tin/plastic containers, flower vases, cut-bamboo stumps, etc. Along with dengue, few cases of chikungunya were recorded in 2012 (five cases) and 2013 (78 cases); these cases were negative for dengue antigen antibody assays. Studies on seasonal infectivity and co-circulation of these viruses are warranted, to enable better understanding of transmission dynamics, thereby helping the state control programme to prepare mitigating plans to respond to these imminent threats. Both these mosquito vector species are reported to be susceptible to malathion, the insecticide of choice for fogging operations [8].

For data based on disease prevalence and records of mosquito breeding, it is imperative that the disease has an established foothold in the state, with indigenous transmission corroborated by listing of cases without any travel history. With the continued phenomenon of urbanization and prevailing climatic conditions, it is projected that dengue will emerge as a major public health concern in north-east India [9]. For disease containment, besides malathion thermal fogging operations, source reduction and promoting personal protection measures, the state control programme has embarked upon an intensive health-awareness campaign for enhanced community-level action for prevention and control of mosquito breeding, in collaboration with civic bodies

Study area

A survey was conducted for about 250 houses in six prone areas of vectors in Vijayawada. These areas mainly included Singh nagar Vombay Colony, Chintugunta. Ranigarithota,One Town, areas near Chlorea hospital which includes hilly mountains areas, Vidhyadharipuram, etc mountains areas, Vidhyadharipuram, etc Krishna district, (10°47′ 40.56″ N, 78° 41′ 6″ E) Andhra Pradesh, India. Krishna district lies at the heart of Andhra Pradesh. The district has an area of 8,727 square kilometers Krishna river flows through the length of the district and is the principal source of irrigation and water supply. The annual rainfall in the region is about 1028 mm and is contributed to by the Southwest monsoon. The main hill range of the district known as Kondapalli runs between Nandigama and Vijayawada with a length of about 24 km. The other smaller hill ranges are Jammalavoidurgam, Mogalrajapuram and Indrakiladri hills.

Larval Collection

During the survey, all the containers and reachable tree holes. Larvae collection was carried outdoors by dipping, using pipette or dipper depending on container type and location. In this study, "outdoor" refers to the outside of building but confined to its immediate area. The number, type and water condition of containers which serve as a potential breeding site was examined and recorded using container index (CI). Number of container positive Container index = × 100 Number of container inspected. The collected larvae and pupae were kept in the laboratory for adult emergence. The emerged adult mosquitoes were then pinned and identified.

Figure 1: *Aedes egypti*

Collection of Dengue Larvae

Dengue

Jars, tanks, and drums provide favorable rearing / breeding sites for *Aedes aegypti* in Vijayawada since they are also often sources of drinking water, making larval vector control difficult. We examined changes in the abundance of immature *Aedes aegypti* to evaluate the efficacy of covering ceramic jars with lids comprising one type of in inhibiting oviposition by adult females, and to evaluate the effect of treating other breeding containers, such as flower vases, inside and around the outside of houses with a slow-release pyriproxyfen formulation to kill pupae[10,11].

Figure 2: Collection of Dengue Larvae

Different Breeding containers for AEDES EGYPTI
Identification of Collected Larvae

The collected specimens were preserved in plastic vials for further identification. Immature forms of mosquito larvae were collected by dipper method reared in metal trays in the laboratory and fed with larval feed.

Figure 3: Identification of Collected Larvae

VECTOR CONTROL MEASURES

1. Source reduction
2. Anti larval activities a] Biological B} Chemical
3. Anti Adult mosquito measures a} indoor spray b} Outdoor spray
4. Health education on protection

1**. SOURCE REDUCTION**

To void water stagnations by filling low lying areas. It is carried out in two ways

1. Elimination or reduction of breeding sites primarily involving engineering methods.
2. Environmental manipulation.

Elimination or reduction of breeding sites

This aspect of source reduction are divided into

a) Drainage

1. Drainage was used in (1) eliminating breeding sites by draining away the water collections or (2) reducing vector breeding by channeling water to a few places which can be easily controlled [12].

2. **Aerosol Space Spray**

Space spraying of pyrethrum extract (2%) in 50 houses in and around every malaria and dengue positive cases to kill the infective mosquitoes is recommended.

Figure 4: Aerosol Space Spray

The Insectides like Temephos (Abate) 10%, Lambdacyhalothrin 10% are used in control of vector . Temephos affects the central nervous system through inhibition of cholinesterase.

3) **Larvicide Abate**

Survey of all water storage tanks utensils existing in and outside of the houses {peri domestic places and treating with larvicide abate to neutralize the larva mence in a week.

Figure 5: Larvicide Abate

3**. ANTI ADULT MOSQUITO MEASURES:**

A} **INDOOR SPRAY:**

1) Indoor Residual Spray: conducted malathion 25% solution spray on the surface of the walls of every house existing in high risk areas of vector borne diseases like Malaria Dengue,Filaria etc.

2) **Pyrethrum space spray:** conducted Pyrethrum indoor space spray in all the houses situated in and around of Malaria and Dengue cases and high risk areas for the control of vector borne diseases [13].

B} **OUT DOOR SPRAY**: conducted malathion fogging operation once in a week at high risk areas of malaria and Dengue fevers to control mosquitoes with hand fogging machines and vehicle mounted machines. Conducted health awareness camps in all high areas of Malaria and Dengue with all corporation Malaria staff District Observation of Friday as Day to break the life of mosquito proof nets Closure of doors in between 5' clock to 6 clock in the evening to avoid inflow of mosquitoes from outsides Using of mosquito repellents likes coils, ointments etc from mosquito bite.

RESULT

DENGUE

FIRST WEEK

About 26 larvae of aedes egypti were being identified in Vombay colony colonynear singh nagar. Out of these we were able to control 23 mosquitoes. When as in

Ranigarithota 22 mosquitoes larvae hence being identified using various sampling methods. We were able to kill 20 mosquitoes which otherwise cause Dengue For the control of these moisquitoes mainly chemical & sources-reduction methods were followed. The Insectides like Temephos (Abate) 10%, Lambdacyhalothrin 10% are used in control of vector *Aedes Egypti* about 0.125 kg of Temephos, .125kg of Lambdacyhalothrin are used of prepare 10 liters of suspension About 31larvae of aedes egypti were being identified in Chintugunta . Out of these we were able to control 28 mosquitoes. Where as in Ayodhya Nagar 32 mosquitoes larvae hence being identified using various sampling methods. We were able to kill 27 mosquitoes which otherwise cause Dengue. About 24 larvae of aedes egypti were being identified in Vidhyadhara Puram. Out of these we were able to control 21 mosquitoes About23 larvae of aedes egypti were being identified in area near cholera hospital area (hilly areas). Out of these we were able to control 17 mosquitoes. For the control of these moisquitoes mainly chemical & sources-reduction methods were followed. The Insectides like Temephos(Abate) 10%, Lambdacyhalothrin 10% are used in control of vector Aedes Egypti about o.125 kg of Temephos, .125kg of Lambdacyhalothrin are used of prepare 10liters of suspension.

1. Indoor Residual Spray: conducted malathion 25% solution spray on the surface of the walls of every house existing in high risk areas of vector borne diseases like Malaria, Dengue and Filaria etc.

2 Pyrethrum space spray: conducted Pyrethrum indoor space spray in all the houses situated in and around of Malaria and Denguemainly chemical & sources-reduction methods were followedM.L.OIL BALLS:- dosage of 80 l/ ha of a mixture of 70% waste engine oil +30% diesel +0.5% teepol was applied per hectare of water surface. The amount for treatment of a gem pit was calculated from its water surface area. This mixture of oil was applied using a Hudson compression spray.

Table 1: Observations

Name of the Vector	Vector-Borne Disease	Causative Agent	Breeding areas	Feeding Habits	Characterisitc of Larvae	Life Span
AEDES EGYPTI	DENGUE	ARBOVIRUS DENGUE VIRUS	Desert coolers, Drums, Jars, Pots, Buckets, Flower vases, Plant saucers	Day biter Mainly feeds on human beings in domestic Bites repeatedly	It lays 20-55 eggs It can travel upto 100Kms Larvaes move constantly along its length	20 DAYS

PV = (*Plasmodium vivax*) PF= (*Plasmodium Falciparum*)

Table 2: First Week

AREAS DENGUE VIRUS	IDENTIFIED	CONTROLLED
VOMBAY COLONY(singh nagar)	26	23
RANI GARITHOTA	22	20

Table 3: Second Week

AREAS DENGUE VIRUS	IDENTIFIED	CONTROLLED
CHINTUGUNTA AREA	31	28
AYODHYA NAGAR	32	27

Table 4: Third Week

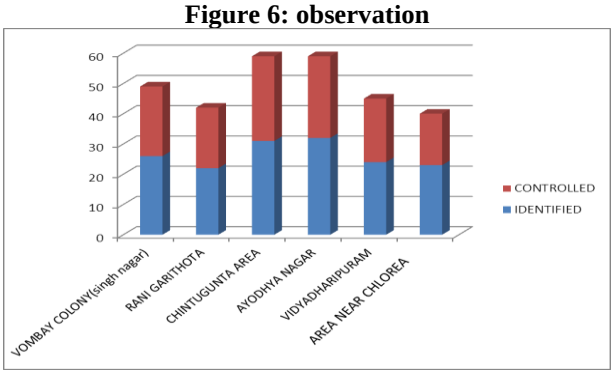
AREAS DENGUE VIRUS	IDENTIFIED	CONTROLLED
VIDYADHARIPURAM	24	21

Table 45: Fourth Week

AREAS DENGUE VIRUS	IDENTIFIED	CONTROLLED
AREA NEAR CHLOREA HOSTIPALONE TOWN (hilly areas)	23	17

The X axis represents areas in which project was carried out, it mainly includes, Singh Nagar Vombay Colony, Chintugunta. Ranigarithota, One Town, areas near Chlorea hospital which includes hilly mountains areas, Vidhyadharipuram. Y Axis represents the number of vector of Dengue that is being indentified and controlled. The total number of Dengue vector indentified is 158. Out of this 136 vectors were controlled using different controlled measures in different areas.

Figure 6: observation



CONCLUSION

Among all type of containers surveyed, cement cistern (59.25%), mud pot (53.84), tyre (42.85), unused well (33.33), plastic container and vessels (25%) were positive for the mosquito larvae. The collected mosquito larvae included *Aedes Egypti*. Our study clearly indicates that *Ae. aegypti* and *Ae. vittatus* larvae were found in wide range in artificial containers like cement cistern and mud pot. *Aedes* adult mosquito has exposed patterns of the thorax formed by black, White or silvery scales. The legs were often black with white rings The source reduction is an effective way for the community The source reduction is an effective way for the community to manage the populations of many kinds of mosquitoes The eradication of mosquito breeding containers or breeding sites inand around living, working areas should be taken into consideration, since the presence of water in containers is probably the most important factor in determining the breeding of mosquito, especially *Aedes* sp. As a result, mosquito control programme should be established at Krishna district. Such a programme would reduce the risk to both animals and human, and hence prevent the development of disease motivations in surrounding locations.

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CONFLICT OF INTEREST:
The authors declare that they have no conflict of interest.

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