Original Research Article

# A study on need for effective strategies for prevention and control of Vector borne diseases in Greater Visakhapatnam municipal corporation

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## Abstract

**Introduction:** The National Vector Borne Disease Control Programme (NVBDCP) is implemented in all the States/ UT's for prevention and control of vector borne diseases namely Malaria, Filariasis, Kala-azar, Japanese Encephalitis (JE), Dengue and Chikungunya. Malaria has been effectively controlled in GVMC with technical guidance of district health administration and GVMC on financial inputs and necessary staff deployment besides un-hesitant financial expenditure on logistics, heavy fogging and insecticide spraying equipment from time to time. Filariasis is a major social and economic scourge in the past and the present strategy of mass drug administration (MDA) to interrupt transmission has been still continuing with reduction in microfilaria less than 1 percent. It is found in tropical and sub-tropical regions around the world, predominantly in urban and semi-urban areas. Chikun-Gunya fever is a debilitating non-fatal viral illness, re-emerging in the country. Since the same vector is involved in the transmission of dengue and chikungunya, strategies for transmission risk reduction by vector control are also the same. **Methodology:** The present study is retrospective cohort study, collecting data from earlier records of public health wing of GVMC during 2012-2020 regarding vector borne diseases. Permission of the Chief Medical Officer is obtained. The staff of Urban Malaria wing visit sentinel centres, private health care establishments daily in their jurisdiction and collect data regarding malaria and dengue, particularly during rainy season. **Results:** There is a downward trend up to 2018 and it appears there is gross under reporting in the years 2019 and 2020 due to COVID-19. Cases due to Vivax are more in number when compared to falciparum. In the year wise time distribution of total number of malaria cases, falciparum malaria is low and did not appear to cause major public health problem unlike vivax malaria. **Conclusion:** The common strategy for control of all vector borne diseases is early detection and prompt treatment of the case (control of infection strategy) IVM to control the vector (control of Vector strategy). Vector density in GVMC both urban and peri-urban is steady over years. Among the fevers detected in both active and passive surveillance of malaria under modified plan of operation by district health administration is covering not efficient particularly for dengue infection. IVM activities under UMS are standardized in urban area of GVMC but in case of peri-urban areas GVMC and District health administration has to go a long way by providing RDT (ELISA based NS1 kits IGM capture ELISA test) kits for field staff and effective IVM activities by bringing the peri-urban area into UMS.

**Key words:** Vector borne diseases, Prevention, Control.



## Introduction

The National Vector Borne Disease Control Programme (NVBDCP) [1,2] is implemented in all the States/ UT's for prevention and control of vector borne diseases namely Malaria, Filariasis, Kala-azar, Japanese Encephalitis (JE), Dengue and Chikungunya. Malaria has been effectively controlled in GVMC with technical guidance of district health administration and GVMC on financial inputs and necessary staff deployment besides un-hesitant financial expenditure on logistics, heavy fogging and insecticide spraying equipment from time to time.

Malaria and dengue are the major vector borne diseases creating public health problem in GVMC.

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While malaria control in urban and peri-urban areas of GVMC received required attention from1971 under Urban Malaria Scheme (UMS) with technical support from district health administration, dengue hasn't, as it is recently emerged as a public health problem, every year during rainy season. Since both infections share similar dynamics in disease transmission the same IVM activities are suffice with little additional inputs of early detection of dengue cases (rapid tests) in the community. The remaining vector borne diseases i.e., kala-azar, lymphatic filariasis, scrub typhu[3,4] and large proportion of self-limiting viral fevers remained as undifferentiated and did not pose any major public health problem in GVMC.A distinct gap has been identified in GVMC, in case of vector borne disease control both in early diagnosis (clinical lab/rapid diagnostic tests) as well as providing primary health care (outpatient treatment with essential drugs as per WHO protocol). The author of this study opined that with little orientation training (capacity building training for the staff of district malaria and the staff of UMS of GVMC) it would be possible to effectively control the morbidity and mortality due to vector borne disease and reduce out of pocket expenditure for weaker sections.

## Objectives

The presenting feature of all vector borne diseases is fever either detected by active surveillance worker during house visit or fever

cases reported to the municipal dispensary /Urban Health Centre. In either case blood smear is taken and patient is offered symptomatic treatment. The blood smear is examined for malaria parasite and if positive, treated as per the type of malaria parasite (p. vivax/P.falciparum). If the smear is negative there is no much attention paid either by the malaria active surveillance worker or by municipal dispensary as the facilities are limited in both laboratory facilities as well as treatment facilities. With the result the remaining fevers are undifferentiated and left them to their choice whether to visit higher centre or private health care facility. Many of these undifferentiated fevers may be self-limiting viral fevers with few cases of other vector borne diseases like dengue, filaria, Chikun-Gunya, scrub-typhus besides enteric fevers viral hepatitis etc. Among all these fevers dengue needs special mention after malaria because of its high morbidity and mortality, where there is possibility of early diagnosis by rapid tests and prompt treatment to avoid morbidity and mortality as is done in the case of malaria. The other vector borne diseases, Kala-azar and Japanese encephalitis are not reported in Visakhapatnam city. Scrub typhus is sporadic insect borne disease, throwing challenge in routine diagnosis of fevers.

The primary objective of the present study is, since the local bodies have obligation to prevent communicable diseases it is imperative that the health section of GVMC shall be equipped with the latest knowledge about the dynamics of disease transmission, particularly prevention strategy (effective functioning of Public Health staff in the field and enforcement of provisions of various sections under Public Health chapter in Municipal Corporation Acts.) for insect borne diseases, early diagnosis by using rapid diagnostic Test (RDT) kits[5,6] and made available by supplying ELISA based NS1 kits and IGM capture ELISA test kits to the field functionaries to identify cases at the earliest. One of the milestones in malaria control is introduction of RDT in the programme control activities in 2005 and, introduction of bivalent RDT in 2012 paved the way for strategy of malaria elimination in our country. To make a positive change in the strategy of dengue control the same facility may also be extended to dengue besides treatment of all un-complicated vector borne diseases.

**Methodology**

Most of the fever episodes occurring in a community are generally infections in nature and usually either vector, air or water borne. The primary function of local bodies in the cities or towns is to safeguard the health of the inhabitants by supplying potable water, maintenance of sanitation, control of communicable diseases, regulation of trades to avoid public health hazards. There are certain Act provisions (Greater Hyderabad Municipal Corporation Act 1955 as applicable to Visakhapatnam and Vijayawada)[7] empowering Health officers (public health qualified doctors) to take action against offenders who create insanitary conditions favouring the spred of the communicable diseases by breeding of mosquitos, propagation of house flies, contamination of drinking water sources etc. Vector borne diseases particularly malaria and dengue fall under such category and every year local body allocates funds to purchase insecticides, disinfectants etc for this purpose.

Visakhapatnam urban local body (GVMC) under the technical guidance of district health administration (DM&HO), the health officer (Chief Medical Officer of Health) of municipal corporation control seasonal diseases particularly malaria and dengue. For vector (anopheles, culex and aedes mosquitos) control, Integrated Vector Management (IVM) i.e., indoor insecticide spraying, usage of insecticide treated bed- nets, release of Gambusia fish in ponds and un-used wells, anti-larval measures (temephos and ML oil), minor-environmental engineering measures to fill the ditches by levelling to avoid water collections) activities are implemented in the jurisdiction of GVMC by Biologist (senior entomologist, trained in vector control) working under CMOH. Control of malaria parasite (plasmodium vivax and falciparum) by early detection and prompt treatment are under taken by malaria surveillance workers from district health administration. Fevers are detected by house visits fortnightly under active surveillance by malaria surveillance worker (MSW) from DM&HO. For all fever cases blood smears were collected and handed over in laboratory maintained by DM&HO. If the slide is positive for malaria parasite, prompt radical treatment is instituted by administering chloroquine and primaquine for 14 days in case of vivax malaria and artesunate compound 3 days for falciparum malaria. In both the cases the health worker visits the house and see that the patient swallow tablets in his presence every day till the completion of the treatment. Simultaneously from the GVMC side action is taken under Urban Malaria Scheme (UMS) immediately to kill the infected mosquitoes by focal spraying in surrounding 50 houses besides taking other components of IVM activities. If the smear is negative for MP while informing negative result to the patient, the IVM activities are continued as usual. Under passive surveillance UHCs/ dispensaries, collect the blood smears of fever cases with address, door numbers are collected and handed over to concerned sanitary inspectors every day to take up immediate IVM activities, including focal spraying are conducted to kill infected vector. In addition, fever survey (house to house survey) is conducted during rainy season by public health staff for early case detection. Surveillance activities on malaria parameters are conducted by district health administration and entomological surveillance by zonal malaria office. In both the cases GVMC is well informed about the surveillance parameters for efficient public health follow up action by GVMC. The rest of the fevers are undifferentiated and for cases like dengue, Chikun Gunya, scrub typhus though they are also insect borne, no distinct activities are taken as taken against malaria. In GVMC after excluding malaria the rest of the fevers are undifferentiated and the patients are left to attend either government or private health care facilities as per their convenience. With the result even fevers like dengue, carrying high mortality, which is also mosquito (aedes) born are not detected like malaria are under reported and hence deaths due to dengue are also not differentiated.

**Sampling and study design**

The present study is retrospective cohort study, collecting data from earlier records of public health wing of GVMC during 2012-2020 regarding vector borne diseases. Permission of the Chief Medical Officer is obtained. The staff of Urban Malaria wing visit sentinel centres, private health care establishments daily in their jurisdiction and collect data regarding malaria and dengue, particularly during rainy season.

**Results**

**Table 1: Visakhapatnam city (GVMC) malaria surveillance data 2012-2020**

| year | BSE | Malaria cases | | | Malaria indices | | | | Malaria deaths |
|---|---|---|---|---|---|---|---|---|---|
| | | vivax | f.parum | total | ABER | API | SPR | SFR | 0 |
| 2012 | 131568 | 3125 | 62 | 3187 | 9.49 | 2.30 | 2.42 | 0.05 | 0 |
| 2013 | 95535 | 3061 | 39 | 3100 | 6.81 | 2.21 | 3.24 | 0.05 | 0 |
| 2014 | 136298 | 2283 | 125 | 2409 | 9.72 | 1.72 | 1.77 | 0.04 | 0 |
| 2015 | 145311 | 2494 | 76 | 2570 | 10.37 | 1.83 | 1.77 | 0.09 | 0 |
| 2016 | 136605 | 1495 | 33 | 1528 | 9.74 | 1.09 | 1.12 | 0.05 | 0 |
| 2017 | 95825 | 685 | 34 | 719 | 6.83 | 0.51 | 0.75 | 0.02 | 0 |
| 2018 | 135455 | 404 | 17 | 421 | 9.66 | 0.30 | 0.31 | 0.04 | 0 |
| 2019 | 120087 | 101 | 10 | 111 | 8.46 | 0.08 | 0.09 | 0.01 | 0 |
| 2020 | 79828 | 36 | 5 | 41 | 4.46 | 0.02 | 0.05 | 0.01 | 0 |

From Table -1 shows year wis occurrence of malaria cases, both vivax and falciparum from the year 2012 to 2020 In GVMC. There is a downward trend up to 2018 and it appears there is gross under reporting in the years 2019 and 2020 due to COVID-19. Cases due to Vivax are more in number when compared to falciparum. In the year wise time distribution of total number of malaria cases, falciparum malaria is low and did not appear to cause major public health problem unlike vivax malaria.

**Table -2: Incidence of dengue year wise urban and peri urban**

| month | 2019 | | | 2020 | | | 2021 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Urban | Per-Urban | Total | Urban | Peri-urban | Total | Urban | Peri-Urban | Total |
| Jan | 4 | 2 | 6 | 23 | 2 | 25 | 14 | 2 | 16 |
| Feb | 6 | 1 | 7 | 20 | 4 | 24 | 11 | 1 | 12 |
| Mar | 6 | 1 | 7 | 12 | 1 | 13 | - | - | - |
| Apr | 7 | 1 | 8 | 0 | 0 | 0 | - | - | - |
| May | 8 | 2 | 10 | 0 | 0 | 0 | - | - | - |
| Jun | 7 | 6 | 13 | 2 | 0 | 2 | - | - | - |
| Jul | 14 | 1 | 15 | 0 | 0 | 0 | - | - | - |
| Aug | 34 | 11 | 45 | 6 | 0 | 6 | - | - | - |
| Sep | 116 | 56 | 172 | 2 | 1 | 3 | - | - | - |
| Oct | 204 | 75 | 279 | 11 | 5 | 16 | - | - | - |
| Nov | 181 | 51 | 232 | 17 | 6 | 23 | - | - | - |
| Dec | 57 | 18 | 75 | 25 | 2 | 27 | - | - | - |
| Tot | 643 | 226 | 869 | 118 | 21 | 139 | - | - | - |

From table-2, it shows the incidence of dengue in GVMC month wise and year wise. There is high incidence from July to December. It almost corresponds to rainy season. There appear to be gross under reporting. The occurrence of cases may be much more like incidence of malaria which needs some more studies to support.

**Tabl-3: Mosquito density species wise-month wise and year wise distribution-GVMC**

| | 2017 | | | 2018 | | | 2019 | | | 2020 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Month | Anopheles | Culex | Aedes | Anopheles | Culex | Aedes | Anopheles | Culex | Aedes | Anopheles | Culex | Aedes |
| | Stephensi | fatigans | aegypti | Stephensi | fatigans | aegypti | Stephensi | fatigans | aegypti | Stephensi | fatigans | aegypti |
| Jan | 30 | 159 | 85 | 20 | 101 | 51 | 37 | 204 | 76 | 39 | 161 | 74 |
| Feb | 29 | 199 | 76 | 5 | 50 | 15 | 30 | 207 | 50 | 36 | 130 | 51 |
| Mar | 46 | 297 | 134 | 34 | 166 | 70 | 32 | 114 | 51 | 24 | 89 | 37 |
| Apr | 47 | 267 | 115 | 30 | 164 | 72 | 39 | 179 | 69 | 24 | 99 | 30 |
| May | 27 | 122 | 61 | 22 | 154 | 62 | 41 | 199 | 70 | 27 | 92 | 36 |
| Jun | 35 | 231 | 102 | 35 | 199 | 110 | 33 | 141 | 59 | 19 | 81 | 35 |
| July | 39 | 215 | 94 | 62 | 291 | 125 | 46 | 214 | 64 | 45 | 166 | 67 |
| Aug | 29 | 140 | 67 | 40 | 179 | 92 | 39 | 136 | 55 | 52 | 190 | 69 |
| Sep | 45 | 215 | 99 | 39 | 172 | 78 | 35 | 131 | 51 | 66 | 207 | 66 |
| Oct | 45 | 177 | 97 | 61 | 286 | 131 | 39 | 153 | 55 | 65 | 227 | 95 |
| Nov | 44 | 218 | 109 | 29 | 157 | 74 | 26 | 121 | 45 | 60 | 172 | 101 |
| Dec | 47 | 280 | 112 | 24 | 235 | 37 | 39 | 155 | 67 | 42 | 151 | 65 |

Table -3 shows density of three important group of mosquitos Anopheles, Culex and Aedes transmitting malaria, filaria, dengue, Chikun Gunya, JE. It needs critical mosquito density for transmission of disease agent. House Index, Container Index, Breteau index are the indices which decide the critical density to predict outbreak of transmission in a particular locality.

**Table 4: Year wise Un-differentiated fevers incidence in GVMC**

| year | Urban | | | | Peri-urban | | | |
|---|---|---|---|---|---|---|---|---|
| | fevers | malaria | Un-differentiated | | fevers | malaria | Undifferentiated | |
| | | | number | % | | | number | % |
| 2012 | 90272 | 3053 | 87215 | 96 | 60041 | 297 | 59744 | % |
| 2013 | 70849 | 3017 | 67832 | 96 | 40463 | 188 | 40275 | 99 |
| 2014 | 98221 | 2227 | 95994 | 97 | 59208 | 508 | 58700 | 99 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2015 | 111595 | 2453 | 109142 | 97 | 53209 | 237 | 52972 | 99 |
| 2016 | 103115 | 1446 | 102969 | 99 | 52670 | 146 | 52656 | 99 |
| 2017 | 62340 | 639 | 61701 | 98 | 48549 | 169 | 48380 | 99 |
| 2018 | 93714 | 377 | 93337 | 99 | 64650 | 98 | 64552 | 99 |
| 2019 | 78414 | 80 | 78334 | 99 | 60445 | 42 | 60403 | 99 |
| 2020 | 56326 | 18 | 56308 | 99 | 35913 | 25 | 35888 | 99 |

Table-4 shows year wise acute fever incidence in GVMC. Surveillance workers during house-to-house survey collect smears from each fever case. The slides are subjected to JSB staining to detect the malaria parasite. 1% to 3% smears show positive for malaria. The rest of the fevers are left as undifferentiated fevers. For the last one-decade Dengue is assuming public health importance because of its life-threatening complications. It needs early diagnosis to avoid complications, replacement of fluids, avoid usage of non-steroidal anti-inflammatory drugs antibiotics and other drugs which are not indicated.

**Discussions**

Acute undifferentiated fevers**[8]** are common particularly during rainy season in India. The earlier National malaria eradication programme (1961)/modified plan of operation (1977)[9,10,11] presently called as NVBDCP mainly covering anti-malaria activities by the field workers. Though the other mosquito borne diseases like Dengue, Chikun Gunya are similar in dynamics of disease(malaria) transmission, the field workers are not equipped with skills of early detection of cases other than malaria. We all know that in case of malaria, the detection of cases increased after introduction of RDTs**[12,13]**, there by early detection of large number of malaria cases by the field workers both in rural and urban areas and institute prompt treatment, paving the way for planning malaria elimination in India. GVMC is also on line with national frame work for malaria elimination from India. If the same strategy extended other vector borne diseases particularly Dengue**[14]** by introducing RDTs it not only avoids under reporting but also reduce mortality from dengue preventing serious complications, DHF and DSS. Urban Malaria control Scheme (UMS)[15] is effectively functioning with efficient strategy of Integrated Vector Management (IVM)[16]. High density for all species of mosquitoes in GVMC is correspond to rainy season during every year due to water collections in unused artificial containers. Where as in the reference[17,18,19] cited Irrigation practices seem to have affected the mosquito population density patterns in these regions as brought out in Indore and Bilaspur zone, where high density pattern is observed between November and February. These findings have obvious implications in selecting the appropriate intervention methods of choice for interruption of transmission.

**Conclusions**

NVBDCP implementation in large urban areas including our present study area GVMC needs different strategies. Though all of them are vector borne in nature each disease had distinct method of transmission through vector. Malaria transmitted by female anopheles mosquito breeding in fresh water collection in rice fields surrounding villages, dengue transmitted by Aedes mosquito breeding in artificial water collection, habituated to bite during dawn and desk on the extremities like legs and hands. Culex mosquitos breed in dirty water stagnated in drains in front of the house transmitting microfilaria and JE through intermediate host pig. Lymphatic filariasis had similar transmission. The common strategy for control of all vector borne diseases is early detection and prompt treatment of the case (control of infection strategy) IVM to control the vector (control of Vector strategy). Vector density in GVMC both urban and peri-urban is steady over years. Among the fevers detected in both active and passive surveillance of malaria under modified plan of operation by district health administration is covering not efficient particularly for dengue infection. IVM activities under UMS are standardized in urban area of GVMC but in case of peri-urban areas GVMC and District health administration has to go a long way by providing RDT (ELISA based NS1 kits IGM capture ELISA test) kits for field staff and effective IVM activities by bringing the peri-urban area into UMS

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