



SPATIO-TEMPORAL ANALYSIS OF PREVALENCE OF VECTOR BORNE DISEASES IN GREATER HYDERABAD: A CASE STUDY OF DENGUE

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Abstract : Vector borne diseases (VBD) are the major issues and a cause of concern in Greater Hyderabad. . In case of vector borne disease like Chikungunya, a declining trend is registered in the number of cases in Greater Hyderabad during the last decade. Even though Malaria case load has shown a declining trend, still it is more rampant in the recent times also. The most threatening among the vector borne disease in Greater Hyderabad is dengue fever. In the last decade or so, Hyderabad is facing the problem of vector borne diseases such as Dengue, Malaria and Chikungunya. Among the vector borne diseases, spread of Dengue is at alarming levels. In these diseases, mosquitoes will act as vector, transmitting the diseases causing pathogen. Keeping in view the prevalence of Dengue disease, an in-depth analysis of its prevalence is taken in this study.

Index Terms: Prevalence, Rampant, vector borne, Dengue

1. INTRODUCTION

Dengue fever is transmitted through Aedes mosquito which is highly adapted to urban environment. “The urban environment which is characterized by poor housing, absence of piped water supply and insufficient waste management are providing favorable conditions for mosquito breeding” (Arunachal et.al 2010). “Dengue mosquitoes thrive on unused plastic bottles and containers, tyres, which are dumped in the open plots and roof tops. The sources of Dengue breeding sites are overhead tanks, sumps, pit tap, other storage container or drums , flower pots, manholes etc. Aedes mosquito is active during day time. Sporadic rains enhances the chances for the breeding of Aedes mosquito vector,” Dr. C. Srinivasulu,TOI, July10,2021). Earlier research revealed that, dengue and its vectors are adapted to urban settings (Rambabu, A, 2020). Some of the infectious and viral diseases have more prevalence within the urban environment.

It is seen that, there exists a symbiotic relationship between certain diseases and quality of urban environment. Dengue is transmitted by Aedes Aegypti mosquito, which has acclimatized, adapted to urban habitat. The prevalence and distribution of mosquitoes is related to the pace of urbanization. Urban expansion facilitates the transmission of pathogens and therefore it is seen that the emergence of Dengue has been concomitant with the urban expansion”. Greater Hyderabad recorded highest number of dengue cases in the State of Telangana as compared to other districts in Telangana. Greater Hyderabad has emerged as the epicenter of vector borne diseases especially in case of dengue epidemics.

2. OBJECTIVE OF THE STUDY

- To analyze temporal and spatial distribution and prevalence of vector borne disease of Dengue in Hyderabad

3. STUDY AREA

Hyderabad is the State capital of recently formed State of Telangana. It the primate city of the Telangana State and is the dominant center of economy, policy, society and culture. . Hyderabad was the capital of undivided State of Andhra Pradesh. It is the administrative, commercial and educational hub of the State. Hyderabad has long historical legacy. The city was founded in 1591 on the banks of Musi River, a tributary of Krishna River. Since its inception as a feudal city, it has grown and emerged into one of the fastest growing mega city of India in the recent times (fig 1).

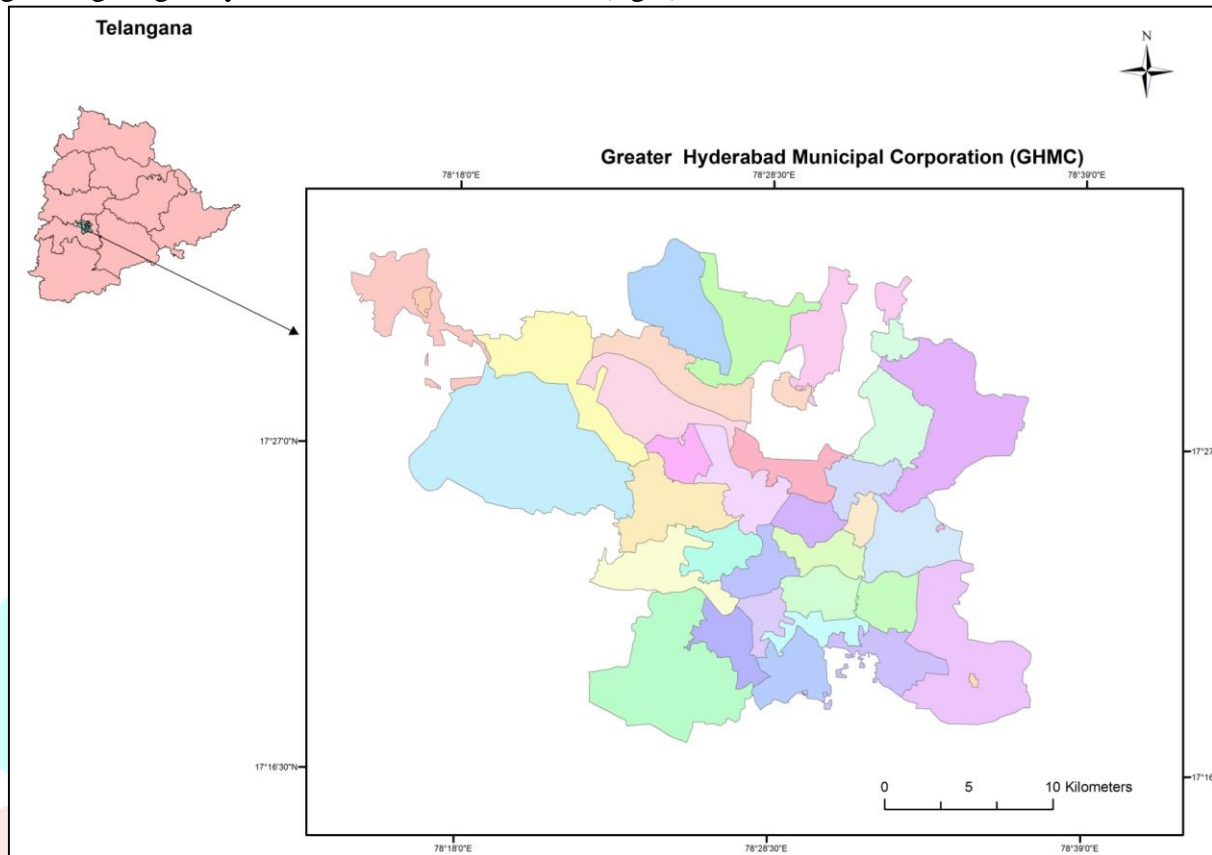


Fig 1 : Location of Greater Hyderabad, Source : Prepared in Arc using GHMC data

4. TREND OF PREVALENCE OF DENGUE DISEASE IN GREATER HYDERABAD

Among the vector borne diseases, dengue is spreading its tentacles at alarming levels across Greater Hyderabad. Dengue epidemiology poses a major threat to public health in Greater Hyderabad and is emerging as highly endemic in nature. Due to the difficulty in procuring long term data on dengue cases in Hyderabad due to Covid-19 pandemic, the temporal analysis of Dengue incidence in Greater Hyderabad is restricted to a period from 2008-2019. .The data is used from 2008 onwards since Greater Hyderabad is formed in the year 2007. The data prior to 2008 could not be used due the spatial reorganization of Hyderabad city, due to which feasibility of data comparison and spatio- temporal analysis is not possible. In Greater Hyderabad area, the incidence of dengue is witnessing a spike in cases and the numbers of cases are continuously rising since 2008 onwards. Greater Hyderabad has recorded several outbreaks of dengue incidence during the last few years.

Dengue cases recorded an upward trend and are rising at an alarming level even during Covid – 19 pandemic. Dengue cases registered an upward trend in cases which has reached a very high level in the year 2019 (3366 no.). Least number of dengue case loads was seen in the year 2008 during which 275 dengue cases were recorded.(table 1).The overall dengue disease burden has increased in Greater Hyderabad during the last few years. The extended rainy season has provided ideal conditions for the breeding of mosquitoes due to which a spike is recorded in the dengue cases.

Table 1
Distribution of Temporal and Seasonal Dengue Cases

Year	Number of cases						Total cases
	Rainy Season	%	Winter Season	%	Summer Season	%	
2008	178	65.4	70	26.4	27	8.2	275
2009	201	69.16	71	24.32	18	6.52	290
2010	211	70.41	76	25.33	14	4.56	301
2011	224	71.78	75	24.35	13	3.87	312
2012	232	72.37	77	24.17	11	3.46	320
2013	237	72.14	75	23.33	13	4.53	325
2014	280	71.87	97	24.89	13	3.24	390
2015	244	72.83	78	23.28	12	3.89	335
2016	329	69.7	101	21.39	42	8.89	472
2017	237	73.14	69	23.39	18	5.57	324
2018	248	61.84	117	29.17	36	8.97	401
2019	2459	73.05	706	20.97	201	5.97	3366

Source: Compiled and Computed based on DHMS data

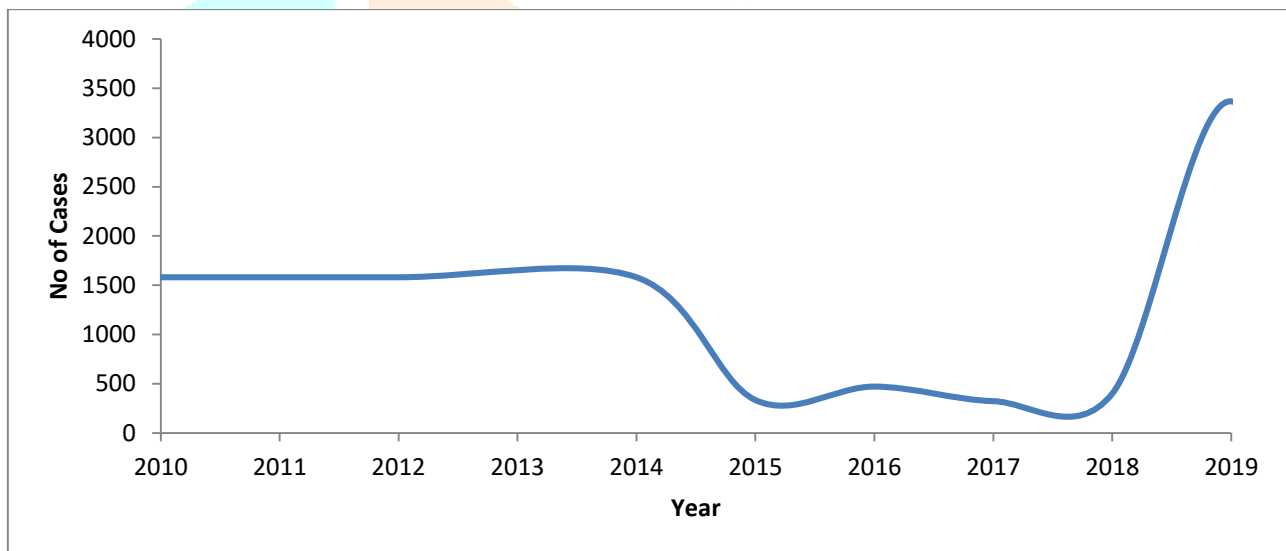


Fig 2: Trend of Dengue Cases Source: Table 1

The prevalence of dengue cases, since the onset 2019 monsoons, witnessed an upward trend in Greater Hyderabad(fig 2). Greater Hyderabad has registered highest number of Dengue case load in the Telangana State. Out of 3324 Dengue cases, the city has registered 843 cases which constitutes 25% of the total number of cases registered in Telangana (The Hindu 25 Sept, 2021)

5. DISTRIBUTION OF DENGUE VECTOR BREEDING SITES

One of the climate sensitive worrying factors in Greater Hyderabad is the prevalence of vector borne diseases which includes malaria and dengue, wherein the mosquitoes will act as vectors transmitting the diseases. Dengue virus which spreads through Aedes mosquito is quite prevalent in Telangana region more so in Greater Hyderabad Municipal Corporation. Rapid urbanization and subsequent large scale migration resulted in population explosion and densification of built up area. Population explosion has put tremendous pressure on the civic amenities. Increasing rainfall, water logging, and water pollution has led to an increase in the mosquito population.

In the Greater Hyderabad, among the vector borne diseases, dengue fever has emerged as one of the most threatening disease and public health challenge. One of the major causes for the prevalence of dengue incidence in the Greater Hyderabad., according to Dr. Rambabu, et.al ((2020)is attributed to “industrial effluents and sewage release into the water bodies like lakes and tanks which is responsible for high level of pollution in the water bodies. The rising population of vectors of dengue is due the eutrophication of aquatic ecosystem. The presence of Aedes mosquito, a vector of dengue increases with the onset of rainy season”.

The main mosquitoes breeding sites are identified by the Entomology Department of Greater Hyderabad Municipal Corporation. Five different types of places provides ideal condition for the breeding of mosquitoes which includes schools, buildings or construction sites function halls, cellar and open plots. Among these breeding sites, open plots emerged as most potential sites followed by cellar and construction sites (table2). Among open plots as mosquito breeding sites, highest numbers are located in Khairatabad zone followed by Serilingampally. Least number of open plots as mosquito breeding sites is associated with L.B Nagar. Open or vacant plots are used for the dumping of garbage where rainwater is collected and stagnated. Highest number of breeding sites associated with cellars is located in Secunderabad zone and least in Khairatabad zone. Regarding function halls, Charminar has highest concentration and Serilingampally has least breeding sites. Schools as breeding sites are largely seen L.B Nagar zone and least in Serilingampally zone. Charminar zone tops in terms of construction sites as mosquito breeding sites, whereas least number is associated with Khairatabad zone. Dengue mosquitoes can breed in very small quantity of water. According to health officials, a small pool of standing water at building or the construction sites provides favorable breeding ground for the dengue mosquitoes. At the construction sites, small areas of stagnant water are enough for providing triggers to the transmission of dengue mosquitoes. Stagnant water in the sumps and tanks in the locked houses are also the favorable sites for the mosquito breeding” according to Dr. Rambabu, Chief Entomologist, GHMC (The Hindu, August 28, 2021)

Table 2 : Distribution of Mosquito Breeding Sites

Zone	Building sites	%	Schools	%	Function halls	%	Cellars	%	Open plots	%
LB Nagar	578	10.9	656	19.5	111	14.5	873	16.2	1264	7.8
Charminar	1137	21.4	612	18.2	239	31.3	607	11.3	1992	12.3
Khairatabad	573	10.8	501	14.7	112	14.7	455	8.8	4631	28.6
Secunderabad	1001	18.8	590	17.5	128	16.8	969	18.0	2409	14.9
Serilingampally	1081	20.3	372	11	82	10.7	677	12.6	3479	21.5
Kukatpally	955	17.9	541	16	92	12.0	844	15.7	2117	13.1
Total	5325	100	3372	100	764	100	5385	100	16192	100

Source: Computed based on Entomology Department data, GHMC 2021

6. SPATIAL DISTRIBUTION OF DENGUE

The spatial distribution of Dengue is restricted only for the year 2018 and 2019 due non-availability of spatial data for the earlier years. The spatial distribution of dengue is carried at the zonal level and therefore, the finer spatial variation could not be brought out. The zone wise distribution of dengue cases in the year 2018 is given in the table 3. The total number of dengue cases registered in Greater Hyderabad during the year 2018 was 401 cases. As brought by the table3.5, it is seen that, during the year 2018, highest number of cases (117) were registered in Charminar zone constituting 29.2% of the dengue cases in Greater Hyderabad followed by Secunderabad zone (20.9%). These two zones together make up about 50% of the dengue cases in Greater Hyderabad. Charminar and Secunderabad zones constitute the densely populated old habitations of Hyderabad city. Least number of cases (6.9%) was recorded by Serilingampally zone followed by L.B Nagar (10.3%). Serilingampally zone in the north west and L.B Nagar in the east are the peripheral zones developed mostly during last two decades.

Table 3 : Spatial Distribution of Dengue

Zone	2018	%	2019	%	2020(Till June)	%
L B Nagar	43	10.3	503	14.9	15	10.6
Charminar	117	29.2	886	26.3	39	27.3
Khairatabad	69	17.3	623	18.5	25	17.7
Secunderabad	83	20.9	806	23.9	30	21.6
Seriligampally	28	6.9	250	7.5	13	9.3
Kukatpally	61	15.4	298	8.9	19	13.5
Total	401	100	3366	100	141	100

Source: Entomology Dept., GHMC

The spatial distribution pattern of dengue cases as evident from fig 3 revealed that, higher concentration of cases is associated with Charminar zone in the south, which is a densely populated older part of the city. The figures in the table 3 and fig 3, supports the hypothesis which states that prevalence of dengue is higher in the older parts of the city. Zones with medium concentration of dengue cases in seen in central zones such as Khairatabad and Secunderabad and peripheral zone i.e. Kukatpally in the north. The spatial association of these zones shows that, they are contiguous in nature. Least concentration of dengue cases is associated peripheral zones like Serilingampally in North West and L.B Nagar in East.

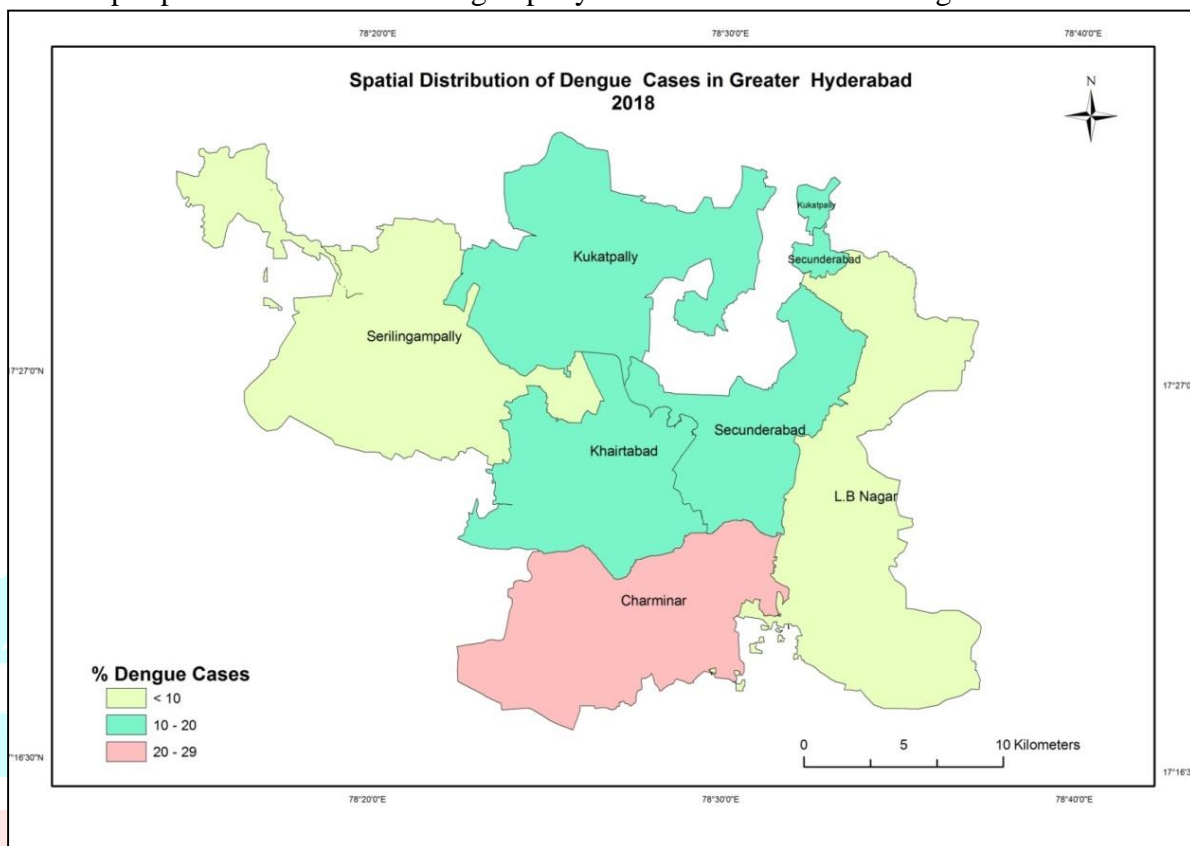


Fig 3 : Spatial Distribution of Dengue Cases in Greater Hyderabad -2018 Source: table 3

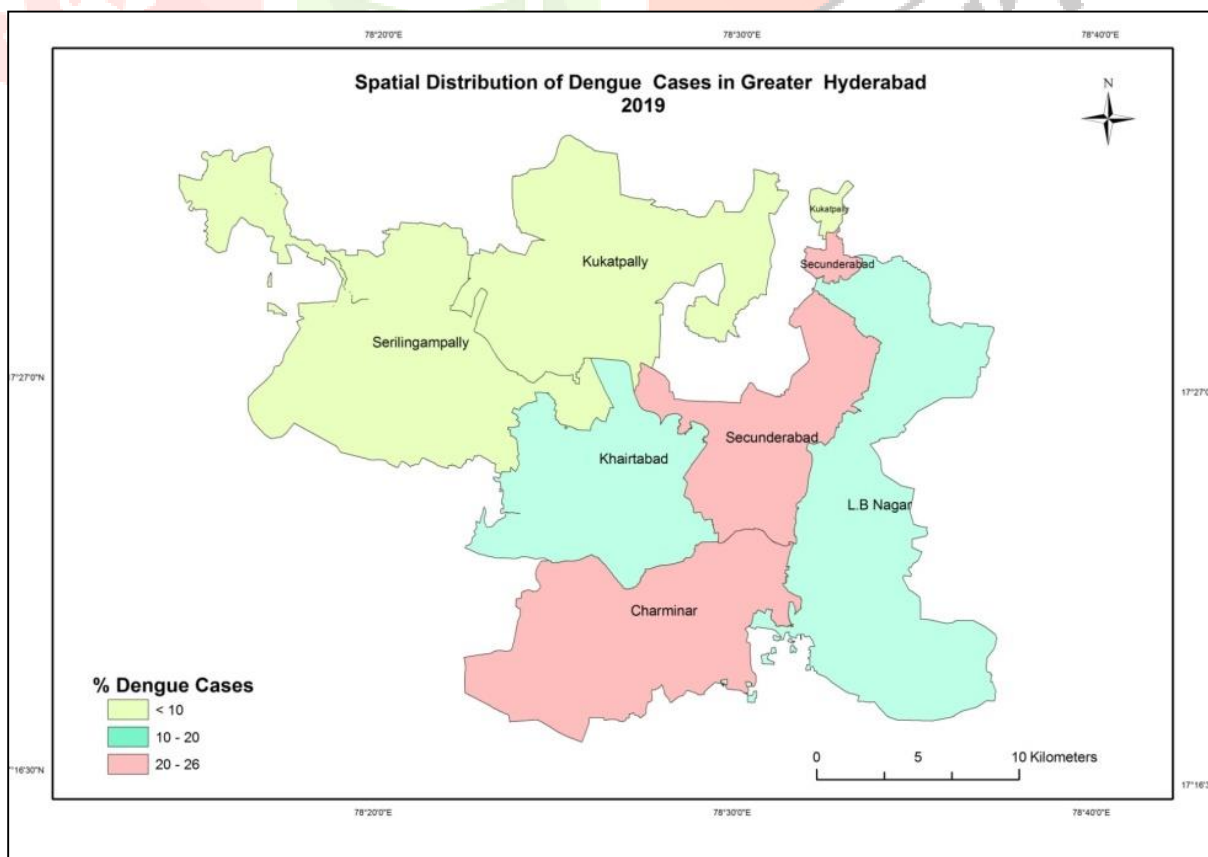


Fig 4: Spatial Distribution of Dengue Cases in Greater Hyderabad -2019 Source: table 3

During the year 2019, surge in number of dengue cases were registered. In the year 2019, 3366 cases were registered. During the 2019, Charminar zone emerged as the zone with highest number of dengue cases (886) followed by Secunderabad zone (806 cases). Even though Charminar zone registered highest number of cases during 2018 and 2019 in absolute terms, its relative percentage share to total number of cases decreased from 29.2 % in 2018 to 26.3 % in the year 2019. On the other hand, the percent share of dengue in Secunderabad zone has increased from 20.9% (2018) to 23.9% in 2019. Serilingampally zone registered least number of cases (250 No.) followed by Kukatpally (298 No). The spatial distribution of dengue cases during the 2019 has shown a totally different pattern(fig 4). The southern zone i.e. Charminar and central zone like Secunderabad registered higher number of dengue cases. Lowest numbers of cases were recorded by the peripheral zones like Serilingampally in the north-west and Kukatpally in the north.

7. DENGUE HOT SPOTS /RISK ZONES

Based on the disease incidence, dengue high risk areas or “hotspots” in various zones along with circles and wards have been identified by the Entomology Department, GHMC in the year 2020 to take up vector control intervention. To understand the disease profile and its prevalence, it is a prerequisite to identify the trend and risk zones. In Greater Hyderabad, certain locations are emerging as hot spots of vector borne diseases like dengue. The spatial pattern of prevalence of diseases can focus on the risk zones or the disease prone areas. Prevalence of dengue is localized in the denser and older densely populated historical core of the city. Hyderabad is at greater risk especially in case of highly densely populated zones like Charminar and Khairatabad. In the Charminar zone, the major dengue hotspots are identified in the circles like Falaknuma, Rajendranagar, Goshamahal etc. At the micro level, it is seen that within Charminar zone, Jahanuma, Falaknuma, Shastripuram and Mangalhat wards are identified as dengue high risk zones(table 4). These areas are the oldest and crowded areas of Charminar circle excepting Rajendranagar circle, which is the peripheral ward (fig 5). In the Khairatabad zone, the dengue high risk areas include Musheerabad,, Amberpet and Goshamahal circles, which are oldest and densely populated circles of Khairatabad zone. Amberpet circle is located alongside the Musi River. In the Secunderabad zone, the circles which emerged as dengue high risk areas include mostly Yousufguda, Begumpet and Malkajgiri circles. The most probable reasons for these areas being classified as dengue hot spots could be attributed to the presence of low-lying area which often gets flooded and the other reasons being location of slums and nalas. In the Kukatpally zone, Alwal circle is the most prone area for the prevalence of dengue.

Table 4 : Dengue High Risk Zones- 2020

Ward No	Ward Name	Circle No.	Circle Name	Zone
54	Jahanuma	10	Falaknuma	Charminar
46	Falaknuma	10	Falaknuma	Charminar
58	Shastripuram	11	Rajendranagar	Charminar
63	Mangalhat	14	Goshamahal	Charminar
77	Jambagh	14	Goshamahal	Khairatabad
88	Bholakpur	15	Musheerabad	Khairatabad
79	Himayatnagar	16	Amberpet	Khairatabad
101	Yerragadda	19	Yousufguda	Secunderabad
143	Tarnaka	29	Secunderabad	Secunderabad
141	Gautamnagar	26	Secunderabad	Malkajgiri
147	Bansilalpet	30	Begumpet	Secunderabad
138	Moulali	28	Malkajgiri	Secunderabad
133	Machabolaram	27	Alwal	Kukatpally
134	Alwal	27	Alwal	Kukatpally
135	Venkatapuram	27	Alwal	Kukatpally

Source:

Entomology Dept, GHMC

The reason could be both presence of open plots and a large number of construction sites which are identified by the Greater Hyderabad Municipal Corporation as the major breeding ground for the mosquitoes.

As per another study, it is seen that, the high risk areas of Dengue localities in the Khairatabad zone includes the old densely populated areas like Amberpet, Nallakunta, Khairatabad as well as recently outgrown area like Shaikpet. The zone also includes the high income locales like Banjara hills and up market areas like Ameerpet also. The Secunderabad zone mostly includes the densely built up and congested localities like Monda market, Sitaphalmandi, Bhoiguda etc.

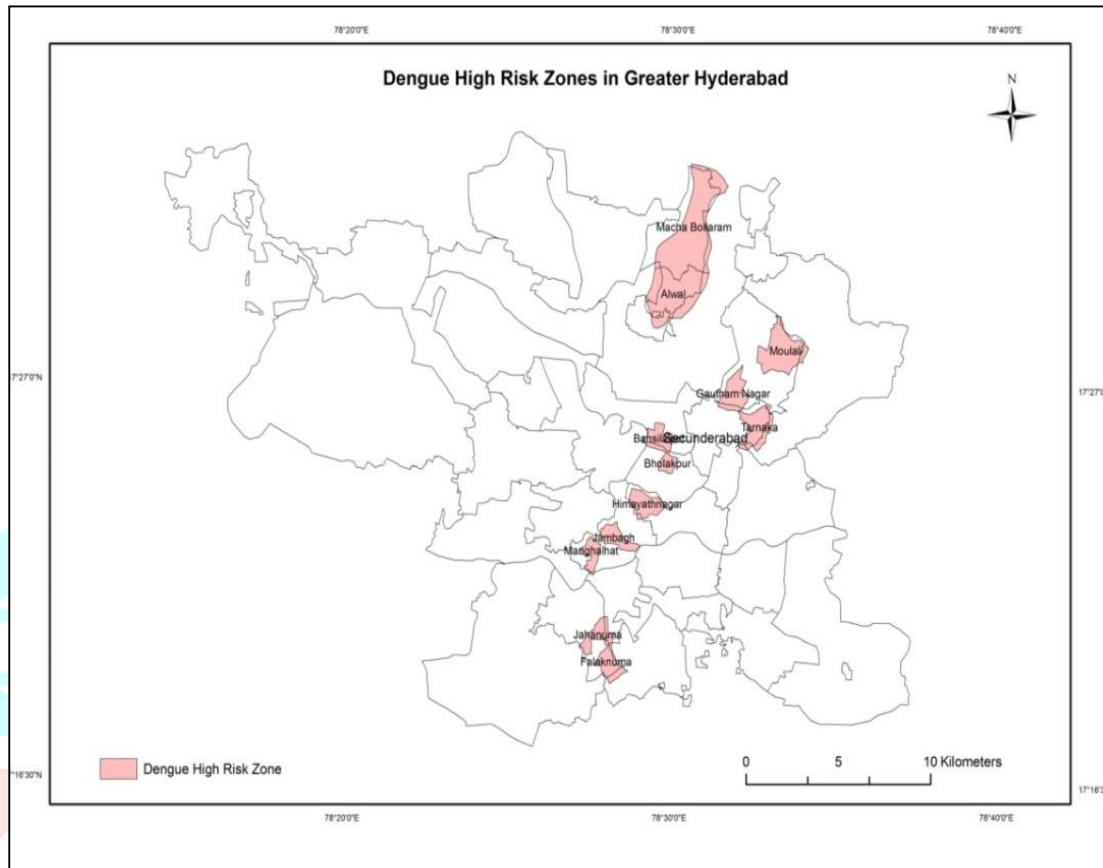


Fig 5 : Dengue High Risk Zones in Greater Hyderabad -2018 Source: table 4

8. CONCLUSION

This study revealed that, not only the peripheral and newly developed zones like Kukatpally has witnessed the prevalence of dengue but the other localities in the peripheral zones like Serilingampally also emerged as “dengue Hotspots”. From the foregoing analysis, it can be concluded that the high risk areas of the dengue cases are not very location specific and they are ubiquitous in the environs of Greater Hyderabad. In Greater Hyderabad dengue is endemic and is one of the most vulnerable areas in the State of Telangana

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