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Trends and seasonality of vector borne diseases in Kerala

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ABSTRACT

Background: Even though epidemiological transition of Kerala is from communicable to non-communicable diseases, re-emerging communicable diseases is a challenge to health service system. Information about disease trends and pattern and seasonal variation is necessary to ensure healthy life. This study aims to find out the trend and pattern in vector borne diseases and its association with seasons.
Methods: Study used integrated disease surveillance programme (IDSP) data of vector borne diseases from Directorate of Health Services, Kerala. Seasons are classified as summer, rainy and winter. Mean differences in frequency between two sample proportions (between seasons) were tested using analysis of variance (ANOVA) test.
Results: The fluctuations in vector borne disease are mainly due to dengue. Percent share of acute encephalitis syndrome (AES) and Japanese encephalitis (JE) is low but fatality is high among these diseases. Fatality rate for dengue and malaria is low but scrub typhus is high. Thiruvananthapuram is in the first position in reporting these diseases except in 2018, when Malappuram holds the first position. Idukki, Kottayam and Wayanad are the districts with lowest percents. Diseases increase during rainy season.
Conclusions: There is necessary monitoring from LSGD and health institutions at primary level to do grass root level sanitation and health awareness to prevent dengue fever. Proper monitoring of entering data from health institutions is needed. The study provides an insight to the vector borne diseases in Kerala which help planning the infrastructure and human resources in public hospitals.

Keywords: Kerala, Trend, Seasonal variation, Vector borne diseases

INTRODUCTION

In January 2019, the World Health Organization (WHO) announced their new 5-year strategic plan, the thirteenth general programme of work 2019–2023, to ensure that one billion more people in the world enjoy the benefits of better health and well-being.[1] According to WHO, mid-term review 2018-2019, health systems are fundamental not only to good health but also to overall development. India is deportment in playing a key role in contributing towards these targets. India launched integrated disease surveillance programme (IDSP) with World Bank assistance in November 2004 to detect and respond to disease outbreaks quickly. The project was extended for 2 years from 2010 to 2012. The programme continues during 12th plan (2012-2017) under national health mission (NHM) with outlay of Rs. 640 crores from domestic budget only. It is a laboratory-based, IT-enabled system in the country for surveillance of epidemic-prone diseases.[2]

Tuberculosis, malaria, filariasis, visceral leishmaniasis, leprosy, human immunodeficiency virus (HIV) infection, and childhood cluster of vaccine-preventable diseases are given priority for control through centrally managed vertical programmes. It is argued that the reported outbreaks represent only a part of the actual disease burden and only the symptomatic and/or geographically clustered cases identified by the health facility would have been covered in the report.[3] Among the 10 highest priority health issues presented, dengue was identified as one of the four main infections threatening global health.[4] Concerted action against dengue was proposed by the WHO in 2012 with the aim of reducing dengue mortality by 50% and dengue morbidity by 25% by the year 2020.[5] Based on global modelled data, an estimated 33 million clinically apparent dengue cases occur in India each year, contributing to a third of the total global dengue burden.[6] Meta-analysis showed that more than two dozen dengue outbreaks were reported from India till 2017; most of these were reported from southern states and most occurred after 2005.[7] In 2016, as per National Vector Borne Disease Control Programme (NVBDCP), India has reported 110,000 dengue cases along with 227 deaths. In 2017, India launched its five-year national strategic plan for malaria elimination. This is a landmark plan to fight against malaria shifting the focus from "control" to "elimination".[8] India currently accounts for 4% of the global malaria burden and contributes 87% of the total malaria cases in Southeast Asia.[9] In recent years, scrub typhus has rapidly remerged to become the major cause of acute febrile illness (AFI) in many parts of India, especially during the monsoon and post monsoon seasons.[10] Of the 29 states in India, 23 have reported the presence of scrub typhus.[11-14] A late presentation, delay in diagnosis and treatment, and varying levels of antibiotic resistance exhibited by the organism are factors responsible for high mortality.[15] Chikungunya re-emerged in India after a gap of 32 years and an estimated 1.38 million people were affected by the end of 2006 and which further declined to an estimated 68000 cases by the end of 2009.[16,17] In 2006, the epidemic accounted for nearly 391 million rupees productivity loss, in India.[18] In 2010, Chikungunya outbreaks with high epidemic magnitude were recorded in coastal areas of Orissa affecting more than 15,000 people coupled with severe arthralgia and prolonged morbidities.[19]

In view of the major outbreak of suspected Japanese encephalitis (JE) in Eastern Uttar Pradesh in 2005, Government of India took up the initiative of introducing JE vaccine in priority in high endemic areas in 2006. Simultaneously directorate of NVBDCP was vested with the responsibility of prevention and control of JE/acute encephalitis syndrome (JE/AES) in programme mode which resulted in development of technical guidelines for operationalizing programme components in 2007 and it revised in 2009.[20]

The state of Kerala, has excellent health indicators, and is undergoing "epidemiologic transition" from infectious diseases to non-communicable diseases. But it is reported to have the highest rates of morbidity among the Indian states. Kerala, had been declared as malaria eradicated as early as in 1965. But imported and sporadic malaria used to occur even thereafter. The causes of resurgence of malaria in Kerala include interstate travel, importation of cases from other states, increased migration of labourers from other states.

The first reported AES outbreak in Kerala occurred in Kuttanad region between January 1996 and February 1996, causing 105 cases and 31 deaths. During 2012, Chikungunya emerged as a major epidemic in India affecting 151 districts in 8 States including Kerala. In 2017, all the districts reported dengue in large numbers. Districts located at higher altitudes were having low prevalence, but all others showed high incidence in 2017.[21] Although the State has been successful in controlling a number of vector borne diseases earlier, the emergence of some of them in recent years has led to considerable increase in morbidity and mortality. Information about disease trends and pattern and seasonal variation is necessary to ensure high life expectancy, low infant mortality rate and low death rate. Seasonal variation in infectious disease transmission plays an important role in determining when epidemics happen.[22] The development, reproduction and behaviour of vectors are highly influenced by climatic conditions.[23] The reproduction rate of vectors increase in warm areas is also documented.[24] Natural surroundings demolition, land use, pesticide campaign, temperature etc observed to be impact the vector behaviour (especially the biting rate) throughout the year.[25] Hence this study aims to find out the trend and pattern in vector borne diseases and its association with climatic conditions of the state.

Objectives

The objectives of the study were- to analyse the trend in rates in vector borne diseases in Kerala and its districts and to study the seasonality of vector borne diseases.

METHODS

This retrospective descriptive multi-year analytical study used communicable disease data from Directorate of Health Services (DHS) Kerala portal which provided month wise and district wise vector borne disease data during 2011 to 2019 years. Surveillance data from all tertiary level hospitals, district hospitals, sub divisional hospitals, community health centers, primary health centers, urban primary health centers and private hospitals in the 14 districts of the state were reported in the office of the DHS in Thiruvananthapuram on weekly basis and from which it compiled and uploaded monthly in the portal as communicable diseases. The WHO identifies the major global vector-borne diseases as malaria, dengue, Chikungunya, yellow fever, Zika virus disease, lymphatic filariasis, schistosomiasis, onchocerciasis, Chagas disease, leishmaniasis and JE.[26] Out of this malaria, dengue, Chikungunya and JE are documented in the portal of DHS, Kerala. Month wise and district wise vector borne disease data are analysed to find out the trend and seasonal variations. Vector borne disease includes dengue, Chikunguniya, malaria, JE, AES, scrub typhus, West Nile fever, KFD, and lyme disease. Seasons are classified as summer (March-May), rainy (June-October) and winter (November-February). Mean differences in frequency between two sample proportions (between seasons) were tested using analysis of variance (ANOVA) test. $P<0.05$ was fixed as a significant level.

RESULTS

Trend and pattern of vector borne diseases

Important vector-borne diseases for India include malaria, dengue, JE, kala-azar, lymphatic filariasis and chikungunya. DHS portal in Kerala documented all these diseases except lymphatic filariasis and kala-azar. From Table 1 and Figure 1 it can be seen that there is steady increase in 2011 and 2012 and a sudden increase in 2013 and then again steady increase during 2014-2016 but a steep increase in 2017. Almost same level of decrease in 2018 as that of 2014 and shows a small increase in 2019.

Figures 1 and 2 shows that trend in total vector borne is almost same as trend in dengue as number of cases of dengue is higher than other vector borne diseases.

Table 2 shows that dengue is the most reported vector borne diseases. It records less than 50 percent among the vector borne diseases in only one year (that is in 2011). From 37 percent cases in 2011 to 93 percent in 2017 vector borne diseases are due to dengue but it decreased to 70 percent in 2019. Reported figures of Chikungunya shows that there is no regular increase or decrease but diseases exist regularly in all years. AES and JE are regularly reporting. But drastic reduction after 2011 is seen for JE from the Table 2.

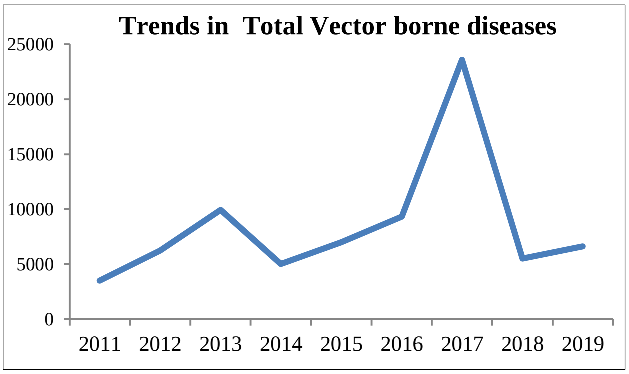

Figure 1: Trends in total vector borne diseases.

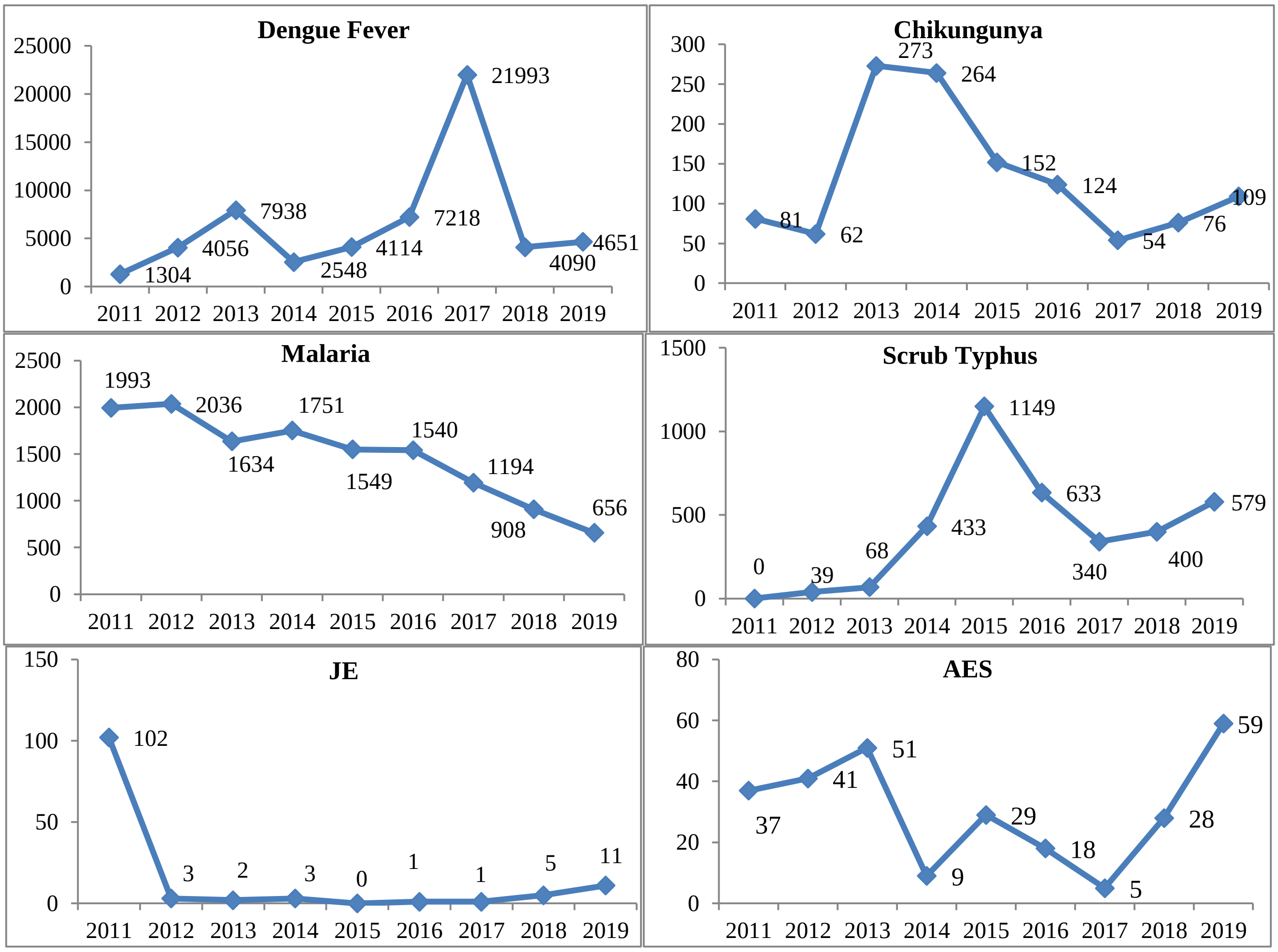

Figure 2: Trend in major vector borne diseases.

Table 2: Trend in major vector borne diseases and fatality rates from 2011-2019.

Vector borne	2011	2012	2013	2014	2015	2016	2017	2018	2019
Dengue fever number (%)	1304 (37.1)	4056 (65.0)	7938 (79.9)	2548 (50.9)	4114 (58.8)	7218 (75.2)	21993 (93.4)	4090 (74.3)	4651 (70.3)
Dengue fever death (fatality rate)	10 (0.8)	16 (0.4)	29 (0.4)	13 (0.5)	29 (0.7)	21 (0.3)	165 (0.8)	32 (0.8)	14 (0.3)
Malaria number (%)	1993 (56.7)	2036 (32.6)	1634 (16.4)	1751 (35.0)	1549 (22.2)	1540 (16.5)	1194 (5.1)	908 (16.5)	656 (9.9)
Malaria death (fatality rate)	2 (0.1)	3 (0.2)	0	6 (0.3)	4 (0.3)	3 (0.2)	2 (0.2)	0 (0)	1 (0.2)
AES number (%)	102 (2.9)	41 (0.7)	51 (0.5)	9 (0.2)	29 (0.4)	18 (0.2)	5 (0.02)	28 (0.5)	59 (0.9)
AES death (fatality rate)	2 (5.4)	10 (24.4)	6 (11.8)	2 (22.2)	3 (10.3)	6 (33.3)	4 (80.0)	15 (53.8)	5 (8.5)
JE number (%)	37 (1.2)	3 (0.1)	2 (0.0)	3 (0.1)	0 (0)	1 (0.0)	1 (0.0)	2 (0.0)	11 (0.2)
JE death (fatality rate)	8 (7.8)	1 (33.3)	0	2 (66.7)	0	0	0	2 (40.0)	2 (18.2)
Scrub typhus number (%)	0	39 (0.6)	68 (0.7)	433 (8.7)	1149 (16.4)	633 (6.8)	340 (1.4)	400 (7.3)	579 (8.8)
Scrub typhus death (fatality rate)	0	4 (10.3)	0	6 (13.9)	0	3 (0.5)	50 (14.7)	6 (1.5)	14 (2.4)
Lyme disease number (%)	0	0	8 (0.1)	0	0	0	0	0	0
Lyme disease death (fatality rate)	0	0	0	0	0	0	0	0	0
Kysanur forest disease number (%)	0	0	1 (0.0)	6 (0.1)	102 (1.4)	9 (0.1)	0	0	8 (0.1)
KFD death (fatality rate)	0	0	0	0	11 (23.4)	0	0	0	2
West Nile fever number (%)	0	0	0	0	0	0	0	1	11 (0.2)
West Nile death (fatality rate)	0	0	0	0	0	0	0	0	2
Total cases	3517	6237	9975	5014	7095	9543	23587	5508	6084

Fatality rate is deaths per 100 cases.

Scrub typhus is documented regularly from 2012 till 2019. The trend shows that it is regularly on the top than other vector borne diseases and it jumped above 1100 in 2017. West Nile fever is reported only in 2018 and 2019 years and in the latest years two deaths are also reported. Lyme disease is reported in 2013 only. KFD is reported in 2013, 2014, 2015, 2016 and in 2019. In 2015, 102 cases and 11 deaths are recorded and two deaths out of 8 cases are reported in 2019 as KFD. Fatality rate of the diseases shows that fatality rate of dengue is only 0.3 (2019) to 0.8 (2011 and 2018) whereas it is 0.1 to 0.3 for malaria in 2011 and 2014. The rate is highest for AES and JE diseases. Range of fatality rate is 5.4 in 2011 to 80 in 2017 for AES. Percent share of AES and JE is low but fatality is high among these diseases. While 7.84 was the fatality rate of JE in 2011 it jumped to 67 percent in 2014 and 40 percent in 2018 and decreased to 18.2 in 2019. No cases were reported in 2015 and no death was reported in 2016 and 2017. Scrub typhus was not documented in 2011 but all other years it is regularly reporting and, 16 percent of the vector borne diseases in 2015 are due to this disease and in years like 2012, 2014 and 2017, fatality rates of 10 to 15 is reported. Decreasing trend is observed in recent years.

Table 3 reveals that in 2011, Thiruvananthapuram shows the highest percent (28.5) of vector borne diseases (VBD) followed by Ernakulam (9) and Kasaragod (8.3). During 2012, Thiruvananthapuram is followed by Kannur and Kasaragod. The year 2013 is notable in reporting VBD more in southern districts (Thiruvananthapuram is followed by Kollam and Pathanamthitta). In 2014, Thiruvananthapuram is followed by Kozhikode (over 10 percent). Percent share of Kozhikode and Kasaragod increased to more than 10 percent in 2015. Kollam shares (over 12 percent) next to capital district in years 2016, 2017 and 2018. Share of northern district decreased after 2016. More than 40 percent of the VBD are reported from Thiruvananthapuram during 2012 and 2013 and 39 percent in 2014 and 2017. In all years except 2018, Thiruvananthapuram is the highest in reporting VBD. In 2018, Malappuram reported the highest percent among the states (about 18) in VBD followed by Kasaragod (14.4

percent). Lowest reported year is 2016 and 2017 (about 4.5 percent). Share of hilly districts Idukki and Wayanad is lowest in all years. Palakkad reported highest percent of 9.9 in 2017. Highest percent reported in 7.2 and 7.6 in 2016 and 2018 in Pathanamthitta.

Alappuzha shows its highest percent in 2016 as 9.4 percent. Kottayam shows a less percent in reporting VBD in all years. Highest percent reported in 2016 (6.2). Ernakulam which is second in its percent share in 2011 (9.0) is reduced its position in all other years. Thrissur shows almost steady trend in percent share (range is from 3.5 to 6.1). Kasaragod shares over 10 percent in 2015 and over 14 percent in 2018 of the total vector borne diseases.

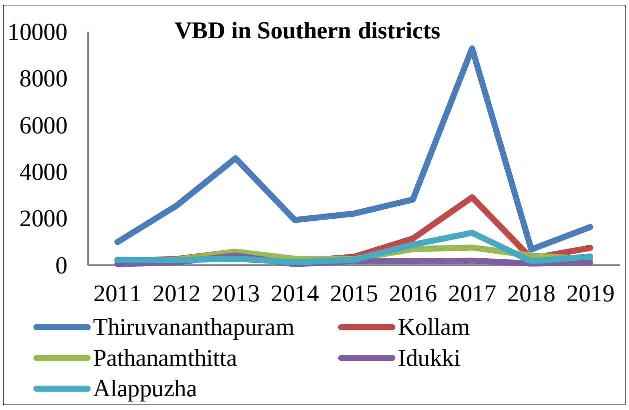

Figure 3: Trend line showing VBD in southern districts.

Seasonal variation of vector borne diseases

Transmission of scrub typhus disease occurs throughout the year in the tropical areas, whereas in the temperate zones, transmission is seasonal. Occurrence of *L. deliense* is influenced by rainfall, with more chiggers attached to the rodents in the wetter months of the year, which may be the reason for clustering of cases during the rainy season.[27] In recent years, scrub typhus has rapidly remerged to become the major cause of AFI in many parts of India, especially during the monsoon and post monsoon seasons.[28] The intergovernmental panel on climate change noted in its 2007 report that climate change may contribute to expanding risk areas for infectious diseases such as dengue and may increase the burden of diarrhoeal diseases, putting more people at risk.[29] Rainfall alone accounted for about 45 per cent of the variation in malaria transmission.[30]

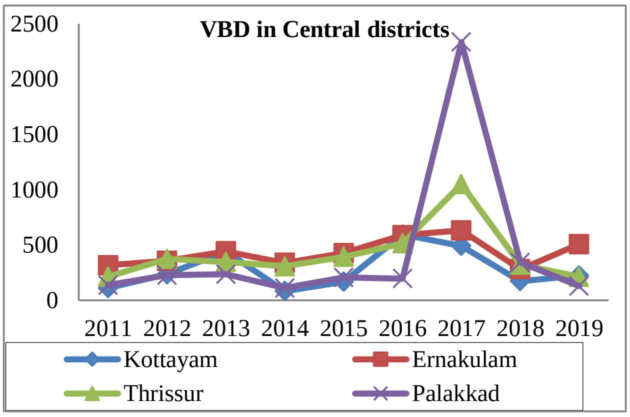

Figure 4: Trend line showing VBD in central districts.

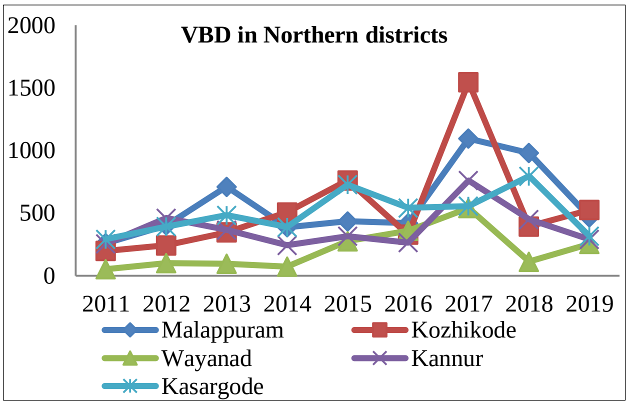

Figure 5: Trendline showing VBD in northern districts.

Table 3: Percent distribution of vector borne disease in districts, 2011-2019.

Vector borne disease	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average
Thiruvananthapuram	1003 (28.5)	2564 (41.1)	4587 (46.0)	1947 (38.8)	2225 (31.4)	2818 (29.5)	9291 (39.4)	685 (12.4)	1637 (26.9)	2973 (32.7)
Kollam	186 (5.3)	274 (4.4)	586 (5.9)	158 (3.2)	363 (5.1)	1154 (12.1)	2915 (12.4)	294 (5.3)	754 (12.4)	743 (7.3)
Pathanamthitta	206 (5.9)	248 (4.0)	582 (5.8)	287 (5.7)	265 (3.7)	691 (7.2)	772 (3.3)	418 (7.6)	268 (4.4)	415 (5.3)
Idukki	51 (1.5)	140 (2.2)	429 (4.3)	50 (1)	188 (2.6)	170 (1.8)	204 (0.9)	84 (1.5)	117 (1.9)	159 (2.0)
Kottayam	111 (3.2)	235 (3.8)	442 (4.4)	83 (1.7)	167 (2.4)	595 (6.2)	491 (2.1)	173 (3.1)	224 (3.7)	280 (3.4)
Alappuzha	238 (6.8)	224 (3.6)	290 (2.9)	128 (2.6)	244 (3.4)	894 (9.4)	1400 (5.9)	179 (3.2)	377 (6.2)	442 (4.9)
Ernakulam	316 (9.0)	357 (5.7)	442 (4.4)	338 (6.7)	427 (6.0)	588 (6.2)	632 (2.7)	280 (5.1)	508 (8.3)	432 (6.0)

Continued.

Vector borne disease	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average
Thrissur	214 (6.1)	374 (6.0)	347 (3.5)	308 (6.1)	393 (5.5)	515 (5.4)	1050 (4.5)	322 (5.8)	212 (3.5)	415 (5.2)
Palakkad	137 (3.9)	227 (3.6)	235 (2.4)	111 (2.2)	207 (2.9)	197 (2.1)	2335 (9.9)	343 (6.2)	128 (2.1)	436 (3.9)
Malappuram	259 (7.4)	402 (6.4)	710 (7.1)	387 (7.7)	435 (6.1)	419 (4.4)	1095 (4.6)	980 (17.8)	467 (7.7)	573 (7.9)
Kozhikode	198 (5.6)	243 (3.9)	346 (3.5)	506 (10.1)	761 (10.7)	328 (3.4)	1545 (6.6)	393 (7.1)	525 (8.6)	538 (6.6)
Wayanad	52 (1.5)	101 (1.6)	96 (1.0)	73 (1.5)	276 (3.9)	359 (3.8)	541 (2.3)	112 (2.0)	254 (4.2)	207 (2.4)
Kannur	255 (7.3)	460 (7.4)	365 (3.7)	243 (4.8)	315 (4.4)	264 (2.8)	760 (3.2)	450 (8.2)	290 (4.8)	378 (5.2)
Kasaragod	291 (8.3)	392 (6.3)	483 (4.8)	389 (7.8)	727 (10.2)	542 (5.7)	556 (2.4)	794 (14.4)	315 (5.2)	499 (7.2)
Kerala	3517	6237	9975	5014	7095	9543	23587	5508	6084	8507

Table 4: Seasonal variation in vector borne diseases.

Year	Season	N	Mean	F	P	Group	Difference	P
2011	Winter	4	221.75	13.89	0.002	Winter versus summer	39.78	0.74
	Summer	3	182.00			Winter versus rainy	195.05	0.006
	Rainy	5	416.80			Summer versus rainy	234.80	0.003
2012	Winter	4	412.00	0.888	0.445	Winter versus summer	309.67	0.586
	Summer	3	721.67			Winter versus rainy	334.20	0.456
	Rainy	5	746.20			Summer versus rainy	24.533	0.996
2013	Winter	4	343.0	2.967	0.102	Winter versus summer	331.0	0.760
	Summer	3	674.0			Winter versus rainy	966.2	0.094
	Rainy	5	1309.2			Summer versus rainy	635.20	0.363
2014	Winter	4	325.75	22.930	0.000	Winter versus summer	129.083	0.214
	Summer	3	196.67			Winter versus rainy	297.25	0.003
	Rainy	5	623.0			Summer versus rainy	426.33	0.000
2015	Winter	4	464.75	6.292	0.020	Winter versus summer	214.75	0.537
	Summer	3	250.0			Winter versus rainy	412.05	0.091
	Rainy	5	876.80			Summer versus rainy	626.80	0.021
2016	Winter	4	490.75	8.464	0.009	Winter versus summer	104.42	0.912
	Summer	3	386.33			Winter versus rainy	751.65	0.020
	Rainy	5	1242.4			Summer versus rainy	856.06	0.016
2017	Winter	4	468.5	4.028	0.056	Winter versus summer	1051.5	0.673
	Summer	3	1520.0			Winter versus rainy	2962.10	0.051
	Rainy	5	3430.6			Summer versus rainy	1910.6	0.276
2018	Winter	4	237.5	2.594	0.129	Winter versus summer	39.17	0.989
	Summer	3	276.67			Winter versus rainy	507.90	0.155
	Rainy	5	745.40			Summer versus rainy	468.73	0.243
2019	Winter	4	459.5	6.276	0.020	Winter versus summer	299.833	0.255
	Summer	3	159.67			Winter versus rainy	290.10	0.200
	Rainy	5	749.60			Summer versus rainy	589.93	0.016

In 2011 significant F value shows that there is variability in mean values within groups. Hence, we go for the multiple comparisons through Tukey post hoc test. As p is 0.74, there is no statistically significant difference in mean number of diseases in winter and summer in 2011 but there is high significant in variability between winter versus rainy and summer versus rainy seasons in the year. In year 2012, there is no difference in variability with the seasons.

In 2013 a statistical significance at 10% and in 2017 significance of 5% is showing in winter versus rainy seasons. No other group variability is found in these two years. There is statistically significant difference between groups as determined by one way ANOVA in 2014 (F=22.93, p=0.000) is observed. A Tukey post hoc test revealed that number of vector borne diseases in rainy season was higher than winter (p=0.003) and summer (p=0.000). In 2018, there is no significant variation in VBD in seasons and in 2019 there is significant difference in cases between summer and rainy seasons. There is no statistically significant difference between winter and summer seasons during 2011 to 2019.

DISCUSSION

Although the state has been successful in controlling a number of vector borne diseases earlier, the emergence of dengue, malaria and Chikungunya in recent years has led to considerable increase in morbidity and mortality. Information about trends and pattern of disease is necessary for planning the infrastructure, human resources and to combat with the health needs. Hence it is necessary to understand the trend and pattern of communicable diseases and seasonal variation of the diseases. Official portal data of Kerala state from the year 2011 to 2019 is used here. Seasons are classified as summer (March-May), rainy (June-October) and winter (November-February). Mean differences in frequency between two sample proportions (between seasons) were tested using ANOVA test. P<0.05 was fixed as a significant level.

The fluctuations in vector borne disease are mainly due to dengue which is highly reported in 2013 and 2017. Malaria and Chikungunya are showing almost same decreasing trend. Malaria was reported more than dengue in 2011 shows a declining trend after that year. Above 90 percent of the vector bone diseases in 2017 is due to dengue. Vector borne disease which are regularly documented in the portal are dengue, Chikungunya, AES, JE and scrub typhus. Percent share of AES and JE is low but fatality is high among these diseases. Fatality rate for dengue and malaria is low. Scrub typhus is the third one vector borne disease after dengue and malaria but its fatality rate is higher than these diseases. In all years except in 2018, Thiruvananthapuram is the first position in reporting VBD and in 2018 Malappuram holds the first position. Idukki, Kottayam and Wayanad are the districts with lowest percents. During the reference period there is no significant difference between winter and summer seasons in number of vector borne diseases but except in 2012, 2013, 2018 there is significant variability in VBD between winter versus rainy and summer versus rainy seasons. Hence VBD increases during rainy season are observed in the study.

VBD is highly reported by Thiruvananthapuram is proved by Kerala Sastra Sahitya Parishad and Department of Community Medicine, Medical College, Thiruvananthapuram which estimated the prevalence of Chikungunya in 2007 as high as 56.6%.[31] In the district, dengue incidence per one lakh population was >2 and during the year 2006 and about 65% of the dengue cases in Kerala were reported from Thiruvananthapuram district.[32]

Seasonality of vector borne diseases is found by many studies.[33-35] The eco-climatic conditions associated with the emergence of Chikungunya fever along coastal Kenya were assessed using epidemiologic investigations and satellite data. The major finding was that unusually dry, warm conditions preceded the outbreaks in the coastal regions.[35] Water stored in the houses during summer season in the coastal regions and water collected in the latex cups kept in rubber plantations in non coastal areas are proved to be the potential breeding source of Kerala.[33] In contrast to our study, one model found that although diseases spread all the year round in summer their impact is very high.[25]

Limitations

As some diseases are missing in some years, we could not be able to find out whether the disease is not recorded or actually the disease is absent. There is no regularity in recorded data in the portal. Another limitation is only month-wise and district-wise variations are compiled. Other variables like age, sex or socioeconomic background are not collecting.

CONCLUSION

In conclusion reported communicable diseases from health institutions shows that dengue fever is the most reported vector borne diseases and is mostly affected by the rainy season. So, there is necessary monitoring from LSGD and health institutions at primary level to do grass root level sanitation and prevent water logging. Awareness in population is necessary for early detection of dengue fever not only for the individual health but also for the community. Each and every household should be free from mosquito breeding by awareness creating and source reduction activities. IDSP data should be monitored because some years jumping in some districts in data pose data quality issues.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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