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ENVIRONMENTAL QUALITY OF LIFE IN ARIYALUR TOWN, TAMIL NADU: A SOCIAL SURVEY BASED RESEARCH

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ABSTRACT

Vector-borne disease is an infection, which is transmitted to humans or other animals by an insect or other arthropod. Some species of mosquitoes are able to transmit viruses, rickettsiae, bacteria, Japanese Encephalitis or parasites to humans. Ariyalur is one of the most polluted towns in Tamil Nadu. Due to its mining activities nearby areas of this region forms a major Lime stone lakes surround this region and many of them are abandoned filled with stagnant and waste-water. The town has the highest stray pig population and the field investigation in this region clearly depicts that it has no proper drainage system in the town. The town has always been an endemic zone of many infectious diseases due to its improper environmental conditions. The most important disease very often affects this town is the `Japanese Encephalitis', which is otherwise known as `Brain Fever' that affect the children within the age group of 6. During and aftermath of the seasonal rainfall this district is worst affected to many infectious diseases. Even in some of the mixed residential (built and huts) complexes do have 10 to 20 stray pigs and keeping them as a domestic animal. It is evident from the above fact this zone is an epidemic zone for Japanese Encephalitis and it is easy to evaluate the nature of physical, spatial, ecological, environmental, social and economic condition in which the people survive in this town and district and disturbing the balance between the host and environment relationship. When the balance is not maintained the infectious diseases finds the places of most adverse environmental condition zones.

INTRODUCTION

Each environmental change in the mosquito habitat, whether occurring as the result of a natural process or through human intervention, rearranges the ecological landscape in which these vectors breed. Every *Anopheles spp.* occupies a particular ecological niche that is genetically determined. Changes in temperature, humidity, altitude, population density of humans, and deforestation are just a few ecological factors that each play essential parts in the transmission of malaria. Temperature and humidity have a direct effect on the longevity of the mosquito. Each species can thrive at an optimal level as a result of ecological adaptation. The spread of malaria requires that conditions are favorable for the survival of both the mosquito and the parasite. Temperatures from approximately 21°-32°C and a relative humidity of at least 60per cent are most conducive for maintenance of transmission. Mosquito density is conveniently measured in terms of the number of female mosquitoes per human inhabitant of the area. Thus, malaria transmission is proportional to mosquito density. Mosquito longevity affects malaria transmission, because it takes time (approximately 1 week) for the parasite to develop. Typically, female mosquitoes live 2.5-3 weeks. The minimum length of development is temperature dependent in all mosquito habitats, even the tropics.

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Statement of the problem

Ariyalur is one of the most polluted towns in Tamil Nadu and many calcite mines surround by the town. Due to its mining activities nearby areas of this region forms a major industrial activity of cement industries. Lime stone lakes surround this region and many of them are abandoned filled with stagnant and waste water. The town has the highest pig population and the field investigation in this region clearly depicts that it has no proper drainage system in almost all the 18 wards. The town has always been an endemic zone of many infectious diseases due to its improper environmental conditions. The most important disease very often affects this town is the *`Japanese Encephalitis'*, which means *`Brain Fever'* that

affect the children within the age group of 6. During and aftermath of the seasonal rainfall this town is worst affected to many infectious diseases. The worst problem this town is facing is that it has several pig sheds which is located in the densely population zones and each shed ranging from 100 to 150 pigs. Even in some of the mixed residential (built and huts) complexes do have 10 to 20 pigs and keeping as a domestic animal. It is evident from the above that this zone is an epidemic zone for Japanese Encephalitis and it is easy to evaluate the nature of physical, spatial, ecological, environmental, social and economic condition in which the people survive in this town and disturbing the balance between the host and environment relationship. When the balance is not maintained the infectious diseases finds the places of most adverse environmental condition zones. A study relating to assess the spatio-environmental conditions of the city is very limited and after afflicting the infectious diseases very often a detailed study about the spatial environment and people's perception about their environment is necessary to suggest few remedial measures, to curtail the facing problem of this town.

Objectives

- To study the existing spatial, environmental, ecological factors that affect the status of health in the town
- The location and character of pig sheds with huge pig population and their disastrous environmental conditions which would create a conductive atmosphere for the vector growth

MATERIALS AND METHODS

To analyze the above problem, data relating to both primary and secondary have been gathered from various sources. The secondary data relating to the demographic factors particularly the population density, literacy rate, child population, morbidity and mortality rate, physical and climatic data, water quality parameters and specific environmental factors that influence the topography such as the location of pig sheds, the mosquito density count and location of public latrines that drains contaminated water on the road side which will affect the quality of life in Ariyalur Town were gathered from various sources of the Town panchayat and District administration of Ariyalur. Ariyalur is an inland district located centrally in the state of Tamil nadu. The town lies between 74° 05' to 74 ° 10' North and 11° 05' to 11° 09' East. The districts of Cuddalore, Thanjavur, Tiruchirapalli and Peramballur in the clockwise direction surround it. There are three important towns in the district. Ariyalure, Udayarpalayam and Jayankondam and they are categorized under selection Grade town panchayats. The present study area, Ariyalur Town spread over an area of 7.62 square kilometers and further subdivided into 18 wards for administrative reasons (Figure 1). According to 2001 census the total population of the town is 27, 827 among them 14,070 are males and 13,757 are females.

Location of Public Latrines

The table 1 shows the 16 locations of public latrines (Figure-2). The most observable incident among the public latrines is that the excreta are let out to open drains from the septic tank, instead of stored in the closed septic tank. The pigs are roaming in the drains and making more contamination to grow many microorganisms.

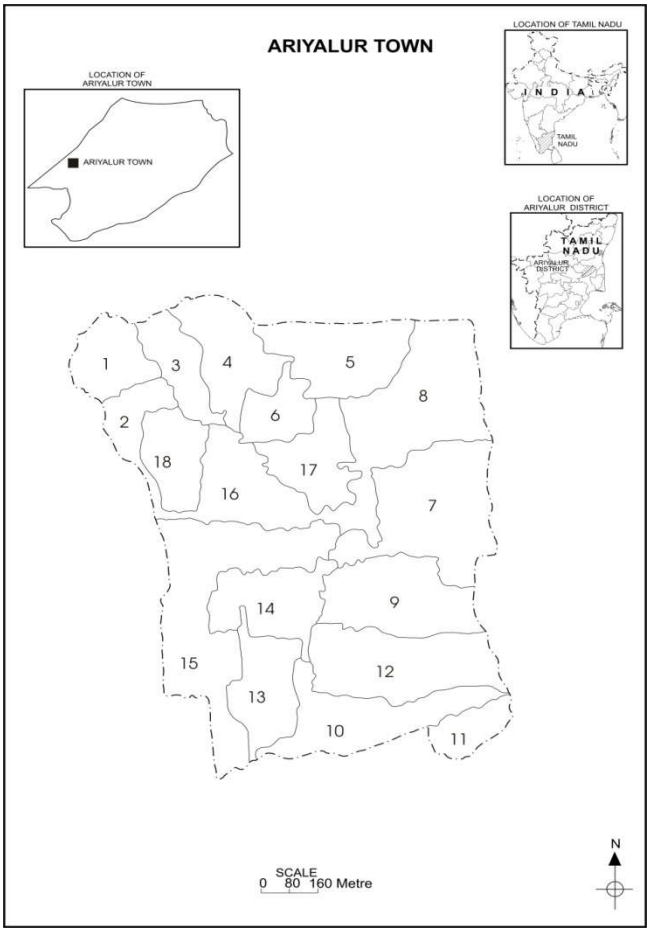

Figure 1.

Locations of Pig sheds

In Ariyalur the pig sheds particularly at the center of the city are very common (Figure 3). Particularly people live around the sheds and they get good gain by selling them for meat. Few sheds are seen within 200 meters from the District Administrative Office. Stray pigs are very often seen roaming around the bus stand and some wards, elsewhere. Ariyalur is one of the endemic prone zones of `Japanese Encephalitis (JE)' (Brain Fever) which affects the child population. According to the epidemiological studies, the disease is widespread prevalence where the pig population is very high and it is spread through the pig and mosquito interaction and mosquito bite towards the children, the worst affected within the age group of 6.

Table 1. Location of Public Latrines

Location No	Name of the Location	Respective ward #
1	Pallar street	1
2	Keerai kara street	3
3	Rajaji Nagar III Cross	5
4	Pookara street	4
5	Prushothaman street	2
6	Muniya Padaiyatchi street	2
7	Vadakku Madavilagam street	14
8	Vilangara street	7
9	Sangivirayan street Bustand north	9
10	Bustand North	7
11	Mettukaran street	7
12	Bustand south	7
13	Singara street	7
14	M.G.R Nagar	7
15	Periyar street	11
16	Kallakudi street	10

Source: Ariyalur Town Panchayat

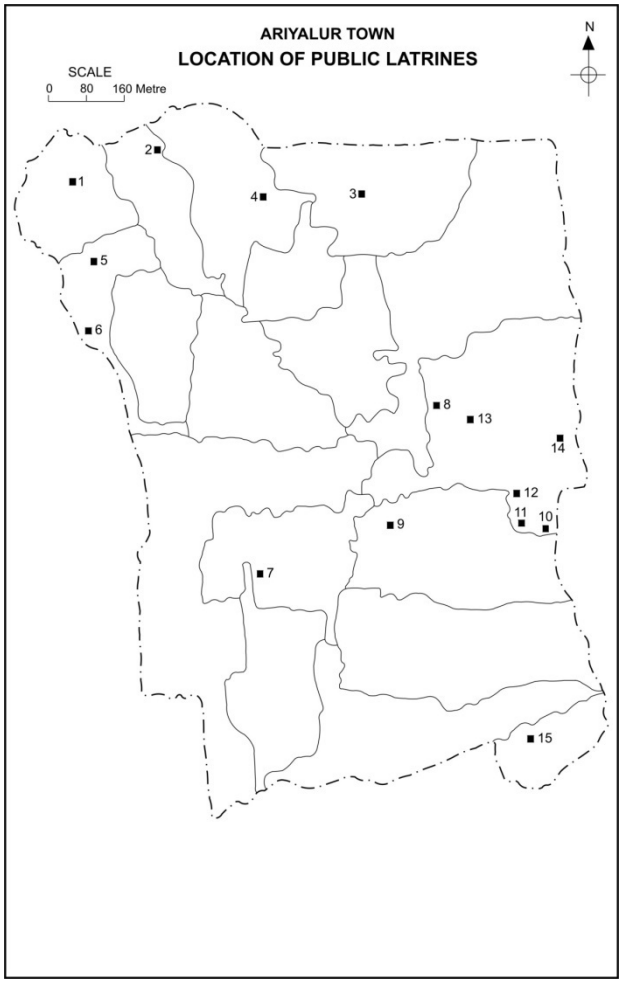

Figure 2.

Table 2. Location of pig sheds and number of pigs

S. No	Name of the Pig sheds	No of Pig	Respective ward #
1	Nallu chetty	30	9
2	Marimuthu	50	9
3	Manickam	50	12
4	Nallusamy	35	12
5	Manickam	55	12
6	Rengaraj	25	12
7	Samydurai	30	12
8	Kathavarayan	100	15
9	Ramasamy	150	1

Source: Through Field Investigation

Every year there are many reported cases of JE and the affected children are being shifted to the nearby headquarters hospitals where the facilities to treat the disease and many of the affected cases are severely affected due to paralysis/ brain stroke/ mentally retarded and so on. The above table shows the number of countable pigs the 9 pig sheds along with the number of pigs in the residential areas and the pig owners do not know the severity of the environmental problem they are facing.

Chemical Qualities of Ground Water

Chemical qualities of ground water are yet another parameter which determines the quality of life in this region. Geologically this region belongs to sand stone region and that is the reason for the high concentration of mining and cement manufacturing industries. Naturally this region is devoid of water and air pollution.

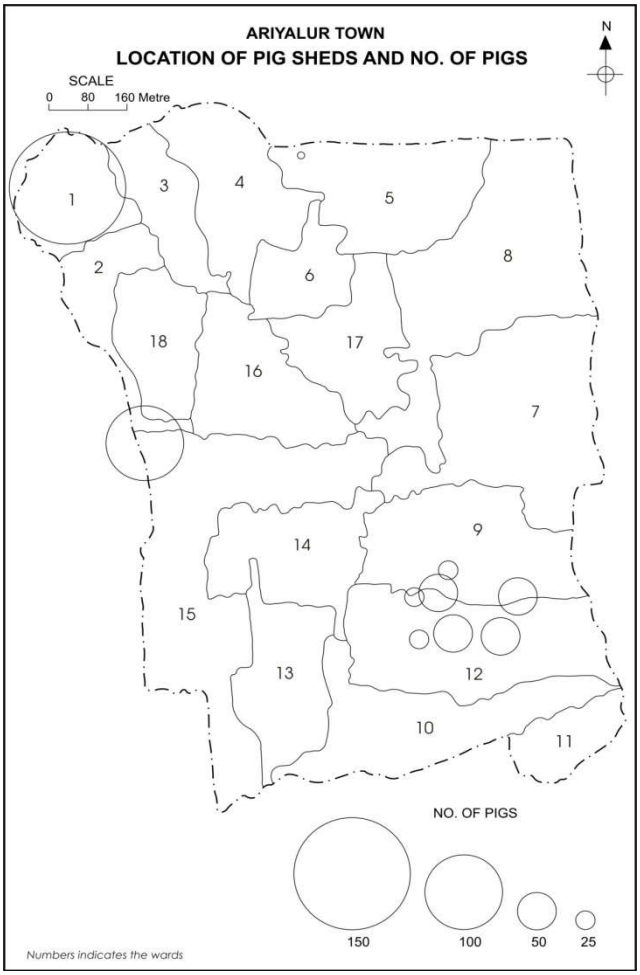

Figure 3.

The Table 3 shows the 8 chemical parameters for 21 wells in this region. The results of the parameters are depicted in 8 different isoline maps, which indicate the regions and the levels of harm ness of the chemical parameters. Table 3 shows the Geo-chemical parameters of Turbidity, EC, TDS and Iron. From the figure, the Turbidity is high in the northern end with the level of 14, which is the highest in this region. Lowest is found in the northern mid parts of the regions with the level of 1. Turbidity is moderate in the western parts of the town. Highest values of EC are spread in the regions of southern end and the western parts of the town. Less EC is recorded in the mid eastern parts of the town. Similarly Total Dissolved Solids (TDS) is high in the southern parts and in the north western and northern part the concentration is less when compared to the other areas. The level of Iron content ranges from 0.6 to 1.8 and it is high in the southern parts and less in the east, west and northern parts.

Table 3 displays the concentration levels of four parameters of Nitrate, Fluoride, TH and Alkalinity. The highest concentration of nitrate is distributed in the northern end and southern parts of the town and it ranges from 30 to 90. Lowest nitrate is found in the Middle Eastern parts of the town. The middle parts of the southern portion have the highest concentration of nitrate when compared to the other parts of the town. Fluoride is one of the most healths affecting constituent and it ranges from 0.6 to 1.4. Generally fluoride in the highest levels is found in the centre and Eastern parts of the town and the rest of the areas it is from the ranges between 0.8 to 1.0. Total hardness is again high in the southern parts with the highest recorded values of 1200.

Table 3. Water Quality Parameters: 2001 (January)

Sample No	Location	Turbidity	Ec	TDS	Fe	No3	F	TH	Alk
3124	Pallan street colony	7	1550	1085	0.70	42	1.4	292	384
3126	Kallankurichy Road	1	1375	962	0	4	1.4	270	370
3127	Ennaikara street	8	5780	4045	0.95	83	1	905	496
3125	Keeraikara street	6	3150	2205	0.47	87	1.4	600	400
3128	Kallakudi street	8	3790	2650	0.95	84	1.2	470	620
3129	Mela agraharam street	4	7230	5060	0	62	1.2	1200	400
3130	Periyaaranmanai street	6	4860	3400	0	82	0.8	636	450
3131	Ayyappan eari	23	1500	1050	1.9	2	1.2	120	260
3132	Ponnusamy aranmai	4	3530	2470	0	87	1.2	400	400
3133	Sanjeevarayan koil	6	2246	1570	0.47	74	1.2	326	516
3134	Singara street	1	1900	1330	0	28	1.2	428	416
3135	Periyar nagar Ic	4	2300	1610	0.47	31	1.2	386	440
3139	Ambethkar street	1	3780	2645	0	59	0.8	532	504
3140	Muniya padayatchi street	4	3780	2645	0.63	28	0.6	400	595
3141	Rajaji Nagar Third cross	14	2310	1615	1.1	92	0.6	520	440
3142	K.K.Nagar	8	1664	1165	0.95	88	1.2	225	512
3143	College Road	1	2030	1420	0	33	0.6	376	524
3144	Melakara street	1	2570	1800	0	31	1.2	328	516
3145	Kaliyamman koil street	8	2650	1855	0.79	89	1.2	312	500
3146	Singara street colony	4	1606	1125	0.63	33	1.2	260	485
3147	Sellamuthu naicker	1	2430	1700	0	31	1.2	296	512

Source : TWAD Board , Perambalur

Twr -Turbidity Ec – Electrical condectivity TDS - Total dissolved solids
Fe - Iron No3 – Nitrate F - Fluride
TH - Total Hardness Allc - Allcalinity

Ariyalur Town: Water quality Parameters: 2001: Beyond Excess Limit ***(as per the TWAD Board, Government of Tamil Nadu)***

Wells->	3125	26	27	28	29	30	31	32	33	34	35	39	40	41	42	43	44	45	46	47
CaCo3			■		■	■														
No3	■		■	■	■	■		■	■			■		■	■			■		
Fe								■												
TDS	■		■	■	■	■		■	■		■	■	■	■			■	■		■
Tur							■							■						

Note: Shaded wells are beyond excess limits as per the TWAD Board, Chennai

Table 4. Calculation of Mosquito Density for Weekly Record for the year 2004

	Anaphlex		Culex		A	C		A		C		A			C	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
JAN. MON	45	35	55	40	45	60	45	40	50	30	45	65	45	35	65	70
TUE	55	50	30	80	50	50	60	65	55	45	35	55	70	80	65	85
WED	40	47	33	53	80	60	27	60	53	33	27	53	53	47	113	93
THU	55	45	65	40	35	50	55	65	65	55	65	45	60	70	70	85
FRI	55	25	55	45	40	50	70	65	60	55	35	55	55	35	60	60
SAT	47	47	53	73	60	33	40	47	53	33	73	67	53	47	67	100
FEB.MON	50	40	50	35	40	65	50	35	75	60	75	65	45	45	55	60
TUE	48	40	52	44	48	40	44	44	64	36	56	48	28	52	92	84
WED	50	55	45	35	35	60	35	65	70	80	50	35	50	65	75	90
THU	50	55	50	60	55	35	30	40	55	65	50	65	65	60	70	115
FRI	30	30	65	35	30	65	80	40	40	55	30	50	50	60	95	115
SAT	45	40	40	60	45	65	45	60	60	50	50	50	50	45	60	90
MAR.MON	40	45	45	40	40	40	55	35	45	45	55	60	60	65	65	90
TUE	55	45	55	45	50	60	45	80	40	40	45	35	45	45	75	85
WED	48	52	48	52	40	48	40	64	52	60	48	48	48	36	68	80
THU	36	28	60	48	28	60	52	56	40	76	60	40	56	44	76	96
FRI	55	50	45	55	20	32	25	65	75	50	30	60	45	55	75	80
SAT	35	30	40	50	55	65	45	70	40	55	45	45	35	35	80	75
APR.MON	60	30	45	40	40	55	40	60	50	65	35	30	40	25	90	110
TUE	40	30	55	55	60	60	45	50	30	70	70	45	45	40	75	90
WED	53	40	47	93	60	53	40	67	40	47	40	53	27	67	87	113
THU	60	40	47	20	27	60	53	67	33	27	47	47	47	47	67	87
FRI	47	40	47	60	53	47	53	60	33	33	37	53	73	67	73	67
MAY.MON	35	60	50	55	30	45	35	45	60	55	45	35	40	60	75	70
TUE	44	52	32	40	44	44	56	52	44	44	52	56	56	52	48	68
WED	40	44	52	52	40	48	28	44	48	46	60	48	44	56	80	72
THU	45	35	50	50	50	30	70	450	45	30	55	70	45	50	70	90
FRI	55	50	40	60	40	50	30	50	65	45	55	35	50	50	65	95
SAT	35	40	55	50	65	45	65	45	40	35	30	50	45	85	85	110
JUNMON	45	35	45	85	50	55	50	70	60	45	35	45	55	50	80	90
TUE	50	35	35	40	25	45	60	50	45	50	40	55	55	45	60	95
WED	50	50	45	35	20	55	55	45	35	60	40	25	45	60	90	75
THU	65	40	40	70	40	45	45	45	70	55	46	25	65	55	90	95
FRI	40	60	48	64	48	40	32	64	56	68	56	48	40	44	88	76
SAT	60	27	47	47	40	40	60	27	33	60	80	47	20	40	73	93

Continue……

JUL.MON	40	40	40	48	32	44	44	56	36	48	68	44	52	56	76	80
TUE.	50	45	35	50	50	50	45	50	35	50	40	50	40	65	60	55
WED	50	55	45	50	45	50	50	40	45	60	45	65	40	40	65	85
THU	45	35	45	60	45	30	25	40	55	40	55	65	40	45	65	80
FRI	40	45	25	40	45	50	55	35	70	70	45	25	45	40	60	80
SAT	40	28	44	36	60	60	48	48	56	56	40	28	68	60	68	44
AUG.MON	30	45	35	60	40	50	35	45	45	35	45	50	55	50	105	85
TUE	40	40	50	65	45	50	35	45	65	65	75	45	55	65	85	110
WED	48	36	44	48	48	48	40	32	60	40	40	44	48	48	88	96
THU	36	94	48	36	52	40	60	48	48	60	56	48	52	32	68	104
FRI	40	40	45	45	40	45	55	45	40	40	65	35	55	60	60	100
SAT	40	45	45	35	50	65	35	50	60	40	35	50	45	70	85	110
SEP.MON	30	35	45	35	60	30	35	45	45	60	40	40	60	55	85	85
TUE	35	40	35	35	30	50	60	50	45	60	30	50	40	55	80	95
WED	35	40	55	65	60	35	55	45	55	50	70	80	65	35	85	85
THU	40	40	50	25	55	65	50	65	75	60	45	50	60	70	100	100
FRI	35	50	60	55	55	55	50	50	40	35	35	60	85	75	95	90
SAT	50	25	45	40	60	55	70	50	50	40	45	55	75	50	85	80
OCT.MON	40	25	30	40	60	60	40	45	25	45	55	70	40	60	65	125
TUE	36	36	24	44	36	44	44	52	52	76	68	48	52	52	76	120
WED	30	40	55	40	45	25	55	55	45	60	70	45	50	30	70	85
THU	40	40	33	33	47	40	53	67	47	53	47	33	53	60	93	100
FRI	40	20	47	60	60	40	33	33	47	80	53	33	47	67	60	93
NOV.MON	50	30	45	70	40	50	50	80	50	35	65	65	50	60	70	80
TUE	35	55	35	65	50	35	60	65	65	50	30	55	45	40	80	75
WED	32	64	44	52	36	44	56	48	52	40	52	40	36	84	84	88
THU	44	48	44	40	44	40	56	60	36	28	48	48	40	36	76	84
FRI	60	60	45	50	50	40	55	45	40	45	45	70	30	35	80	85
SAT	25	40	40	50	40	35	60	55	45	40	55	60	40	50	85	65
DEC.MON	47	33	67	60	33	73	73	47	33	53	80	87	47	47	80	87
TUE	20	35	50	105	30	30	90	65	40	25	70	70	60	70	75	100
WED	55	30	50	85	40	35	65	65	35	50	60	65	40	40	65	80
THU	44	20	73	73	40	27	80	47	53	47	60	80	27	47	60	87
FRI	65	40	50	40	65	55	60	55	55	55	80	65	35	60	60	90
SAT	44	20	48	48	32	52	80	96	48	60	80	68	40	48	80	88

The most of the northern parts of the town it is less and ranges of 200 to 400. Alkalinity is equally distributed both in the north and south and in the eastern parts it is very less when compared to the western parts. They highest values are ranges from 400 to 600 and in some of the areas they are present in the ranges of 200.

Mosquito Density Calculation

The following table -4 shows the Mosquito density calculated for weekly record for the year 2004 in Ariyalur Town taking ward samples.

Mosquito Density zonation

The mosquito density calculated for year 2004. The Municipal administration has selected six fixed wards and the survey is carried our in different houses among them in different street. The wards are categorized as: Residential houses with cement structures, huts with adverse environmental conditions, mixed residential areas, huts with pig and animal farms and most vulnerable areas like the location surrounded by the pig sheds. Every day six locations and every week in different locations in the fixed wards are being selected to capture mosquitoes in a test tube classify them according to character within the pre designed time periods. The locations are: Monday/ Pallar stree (in ward # 1); Tuesday/ Muniyapadayachi street (in ward # 2); Wednesday/ Chellamuthu street (in ward # 17); Thursday/ Singara street (in ward # 7); Friday/ Sadaiyappar street (in ward # 10); Saturday/ Big street (in ward # 8). The collected mosquitoes are categorized in different categories of Anaplex, Culex in both male and female categories. The mosquito density is being calculated with: the number of culex divided by the total time spent, multiplied by the man hours spent (in this case 10).

The above table shows the mosquito density in different wards and in different locations and the values above 50 indicate that the mosquito density in that location/region is very high.

Conclusion

During rainy season particularly the abandoned mining areas that are present in the low lying areas are filled with water and due to seepage most of the places are with wet soil. Because of this reason the low-lying areas becomes the stagnant wastewater areas that allows the mosquitoes to breed and search for `blood meal'. This environment is further deteriorated with the growth of stray pigs and cattles, which supplements the conducive environment for the vectors in this region. Social survey indicates that total number of persons accommodated and the living area plays a major role in determining the quality of life because the basic amenities matter. The people who are under the category of low income comes the next and they an unable to upkeep the environment due to the income constraint. Level of education is also one among the variable and if the lower the educational standards the perception about the environment by the people should also be low and they do not understand properly if the quality of environment is poor that creates a conducive atmosphere for many vector born disease.

In Ariyalur town majority of the septic tank is let open to drain in the open drainage and due to large scale pig population they make the environment uglier and creates an environment to grow bacterial organisms. Solid wastes are disposed on the roads with out any proper care by the administration and some time they are disposed on the open drainage and that is the reason majority of the open drainage is blocked and the water flows on the road side as well in front of the residential areas. The majority of the residential areas in the centre of the town

is having cattle sheds either at the backyard or adjacent to the residential house. The housing pattern in the town is mixed, that is some residences are with concrete roof, some are with thatched sheds and some are very poor conditions with adverse environmental quality. In the center of the town more than 90 per cent of the town us dirty/ dusty and this has been proved in the analysis and will be a Japanese encephalitis endemic zone.

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