Urban Service Planning
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Lecture 56
Vector Borne Disease Control

Welcome to module 12. In this module we will talk about other municipal services and lecture 56 will cover Vector Borne Disease Control in urban areas.

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The different concepts that we will cover are on emerging vector borne issues in urban India, controlling strategies, integrated vector management. Then we will talk about malaria, malaria control strategies, source reduction for malaria vector and after malaria we will move on to dengu and chikungunya and their control strategies, filariasis. And then Kala-azar, Japanese encephalitis. And finally, we will do a case study on the NVBDC program in Tripura and the DASTAK campaign in Uttar Pradesh.

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So, when we talk about emerging vector borne diseases in urban India, our goal is to eliminate the diseases and because diseases cost money that means, whenever a person fall sick, he will not go for work, so he will lose that part that day's wage. And at the same point of time, he has to spend more money on medicines or he will, you know, lose work days.

So, it everything this all costs the country in, it is a huge economic loss. So, if I can reduce diseases, then of course, it will help in poverty alleviation as well as economic development of the country. That is the reason why where government is investing so much money in reduction of different kinds of diseases or particularly vector borne diseases in India.

Now, the major vector borne diseases that means it is borne by a vector, that means that the disease is caused by a parasite or a virus or certain microorganism but it is carried by a vector such as a mosquito. The major vector borne diseases are malaria, Japanese encephalitis, dengue, chikungunya, Kala-azar and Lymphatic Filariasis.

So, these are the ones which are very common, there are others, vector borne diseases as well, but these are the ones which are in focus. Now, the vector mosquito breeding that is the biggest problem and that is a result of haphazard and unplanned growth of urban areas. Slums with poor hygiene and sanitary conditions, there is a lot of places where water gets stagnated, and this is where the mosquitoes breed, restricted in an intermittent water supply system in most Indian urban areas, we have a intermittent water supply system that means we do not continuously provide water for 24 hours we put send it there for only certain times of the day.

And that is why people stored them in containers and stored water in containers is where the mosquito breeding happens, inadequate trained manpower for disease control. So, obviously, if we have to improve that to improve the effectiveness of our health programs and all. So, these are the different issues why mosquito breeding is a big problem in Indian urban areas. And this transmission of vector borne diseases happens from this in prevalence of this infective vectors that means the vectors first get infected.

And then because of human vector contact, that means when the vectors such as mosquitoes come in contact with human beings, that leads to the transmission of disease to the human beings. Now, the reasons why this human vector contact happens is because in certain climates, of course, certain kinds of vectors grow more, which are more conducive to the growth of these kind of vectors such as mosquito in our country, then sleeping habits of humans, some people sleep openly in the roof, without any kind of cover, or without any kind of protection.

So, all these things, places or that leads to more human vector contact, then density of the people that means, how densely people are there so that if one person gets infected, it will spread to the other parts of the community. And all this leads to more amount of human vector contact, and that leads to spread up this vector borne diseases.

So, the country has the under the National Health Mission, we have the national vector borne disease control program, which is one of the programs which is conducted and this is conducted via the ULB via the UPHC and so on. So, the idea is to prevent and control vector borne diseases in the country. And usually the states are the ones which are responsible for implementation of the program, because as you can understand the program has sought two aspects to it.

One aspect is to control the mosquito vectors which is the mosquito and the other is to control the disease or to treat the disease. So, treatment of disease is done via the primary health centers or other health facilities whereas, the control has to be done through certain measures, which could be only done by the ULBs. Now, the Directorate of NVBDCP Delhi, they provide technical assistance, policies, cash and commodities to the state government to conduct these kind of programs.

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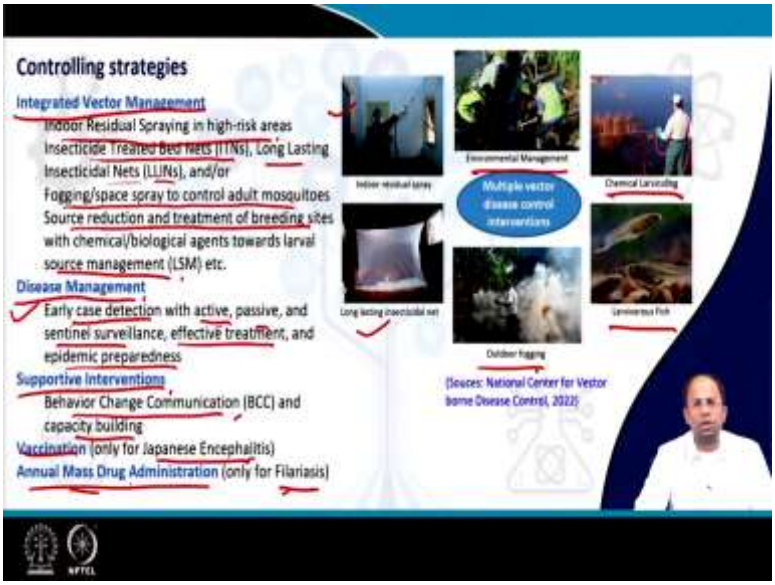

Now, how do we control you know, what are the different controlling strategies? So, the first one is the integrated vector management that is how do I reduce the vectors themselves the ones which are carrying the disease, the other is disease management, then there are supportive interventions and then vaccinations which is only for Japanese encephalitis, we have got vaccines and Annual Mass Drug Administration that means, we distribute medicines, which is for Filariasis, we have medicines to treat Filariasis, whereas for others there is not you know, that kind of your we do not have direct vaccines or medicines.

So, integrated vector management talks about indoor residual spraying in high risk areas like over here you can see that person spraying chemicals inside the house so, that it will kill the mosquitoes, insecticide treated bed nets ITNs or long-lasting insecticide nets LLIN. So, these are nothing but normal mosquito nets, but it these are treated with chemicals then fogging and space spray to control adult mosquitoes so, that means you can do outdoor fogging and you can do certain kinds of you know other management as well like you can clean the drains, clean all the stagnated water bodies and so on.

Then, source reduction and treatment of breeding sites, you can do chemical treatment or biological treatment you can do chemical larviciding sprayed chemicals on the water body. So, that which kills the larva or which prevents the growth of larva or you can use biological measures such as you can use fish which consume this kind of larva and other kinds of source management measures could be also taken like overall environmental you know, cleaning or environmental you know construction which will reduce stagnated water or you know this which has or create environments where mosquitoes can grow.

Disease management is once you are infected then we have to manage the disease, we have to control the disease. So, we have to detect cases early and with active passive and sentinel surveillance systems, sentinel surveillance is voluntary surveillance by different health facilities government, individual dispense medical doctors, dispensaries and so on or clinics.

So, all with active surveillance or passive surveillance systems, then effective treatment of the disease and overall epidemic preparedness that means how prepared I am with the different test which through which I can test the incidence of disease or how often I can do some active monitoring that if some people are infected or not, so all this is part of the disease management.

Then supportive interventions like behaviour change communication and capacity building like you create this program through which you can communicate to the people that you need to you know, this you do not check for stored water or clean your house all these are behavioural change communication, then vaccination and you know, some amount of drug administration as well.

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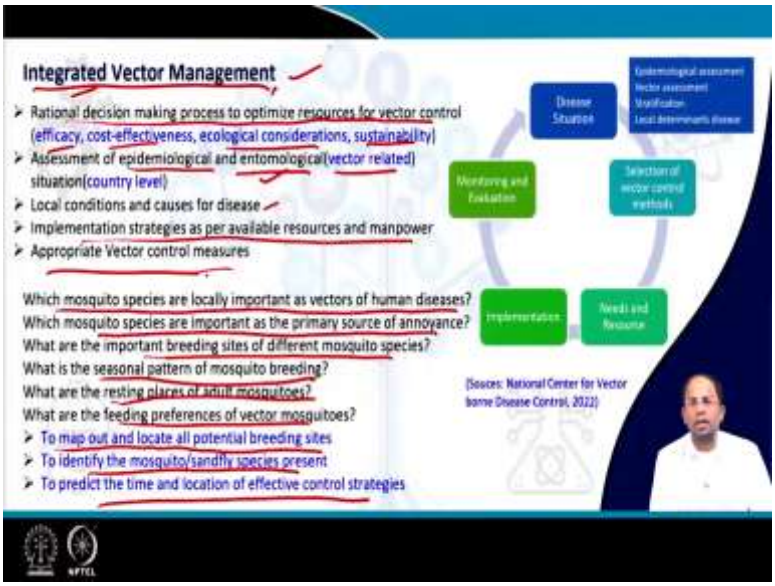

So, when we talk about integrated vector management, so, this is the first initiative that is you prevent the vector in the first place, so that that will not even result in some amount of infection. So, integrated vector management refers to rational decision-making process to optimize resources for vector control.

So, it looks into the efficacy of the entire your management process, the cost effectiveness, ecological considerations, because you have to spread chemicals on the outside environment

and so on and overall sustainability of this process. Now, this is done first you have to assess the epidemiological as well as entomological situation in the country.

So, that means in our entire country, which are the areas where there is you know, this vector related diseases are spreading, that is entomological spread, as well as the epidemiological that is how much is a disease infected people where these things are happening. Then we have to look into local conditions what is contributing to the growth of vectors on the spread of these diseases, then implementation strategies as per available resources and manpower and finally, appropriate vector control measures.

So, this is what has to be done. And to do this you can ask a few questions like for example, you can ask which mosquito species are locally important as vectors of human diseases. First you have to understand that, which mosquito species are important as the primary source of annoyance? What are the important breeding sites of different mosquito species?

So, suppose you are trying to do a vector management of an urban area. So, this is how you have to go step by step, you have to first determine that which mosquito species is creating the problem. What are the breeding areas of the mosquito species then you can go and do some interventions over there or you can take measures like the spraying and all those things over there.

What is the seasonal pattern of mosquito breeding with seasons the mosquitoes are active and accordingly we have to take measures beforehand, what are the resting places of adult mosquitoes where they are usually found, what are the feeding preferences, because at the end of the day, that is during the feeding the disease get transmitted. And to that this has to result in mapping and locating all potential breeding sites to identify the mosquito sandfly species that is involved and to predict the time and location of effective control strategies. So, that is how you do integrated vector management.

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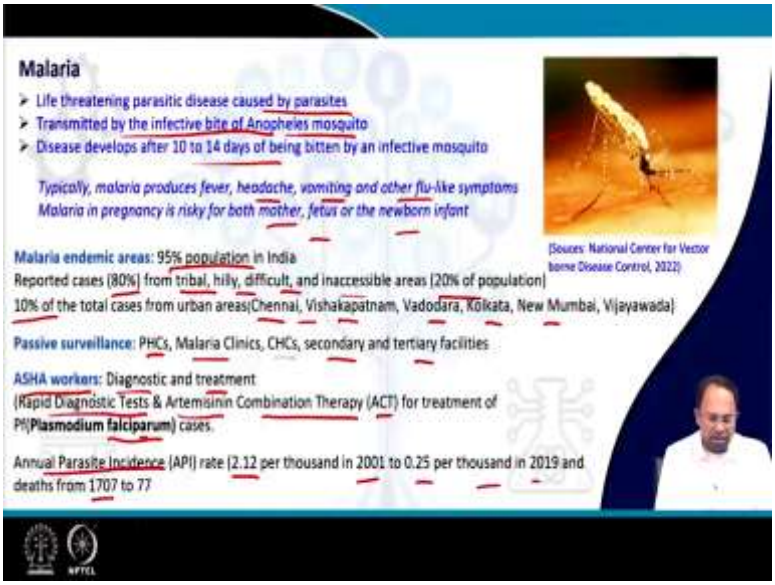

Now, coming to malaria its life-threatening parasitic disease caused by parasites. It is transmitted via the bite of Anopheles mosquito. You can see its image over here, they usually after the bite it takes 10 to 14 days for the disease to develop. So, you will not really understand when you are, you not really remember where you have got bitten and it produces this disease produces fever, headache, vomiting and other flu like symptoms.

And particularly during pregnancy. It is very very, you know, it is risky, and it is risky both for the mother, the fetus as well as any new-born infant this is a risky disease. So, around 95 percent of India is you know, we have the incidence of malaria and particularly most of the cases are reported by 20 percent people living in inaccessible in areas around a tribal, hilly difficult, inaccessible areas, which covers are only 20 percent of the people, but 80 percent of cases are reported from these areas.

Whereas, in urban areas around 10 percent of the total cases in the country are reported from urban areas and these are mostly Chennai, Vishakhapatnam, Vadodara, Kolkata, New Mumbai and Vijayawada, so, these are the cities which are mostly affected. Now, passive surveillance we have already learnt about both active as well as passive surveillance, passive surveillance is done in the primary health care centers, Malaria clinics and the community health centers as well as secondary and tertiary facilities.

That means, whenever a person comes with certain symptoms and all we this is reported, and from there we can see we can target which area this kind of problems are or malaria spreading. The ASHA workers in primary health centers are enabled to do both diagnostic as

well as treatment, that means to diagnose if this person has malaria or not as well as to treat it. So, diagnostic is done via rapid diagnostic test.

And also, the treatment is done via this Artemisinin Combination Therapy ACT for treatment and this is used for treatment of Pf cases or Plasmodium falciparum cases, which is malaria cases. So, that means, this treatment, this diagnostic treatment is done at the community level itself by ASHA workers. So, there is no need to even go to the primary health care centers.

So, that means, if this is done at the this, immediately at this particular community, then obviously the chances of spreading of the disease reduces. Then the annual parasite incidence rate in the country has come down from around 2.12 per 1000 in 2001 to around 0.25 per 1000 in 2019. And similarly, the deaths from malaria has decreased from 1707 to only 77 patients in 2019.

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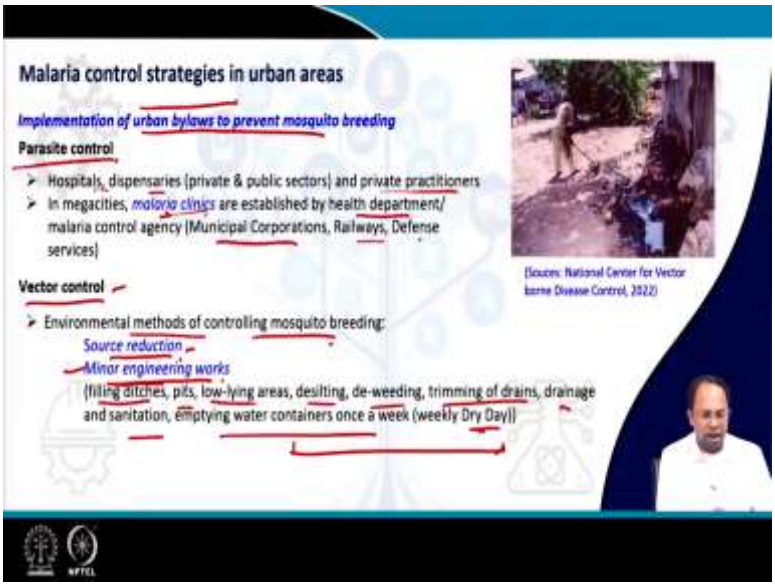

Now, how do we control malaria? So, of course, by certain urban bylaws has to be done so that we does not lead to certain amount of stagnated water and you know, areas which are unsanitary and so on. So, that means some urban bylaws could be treated based on that. But in general, we have to either go do go for parasite control or vector control.

Parasite control is where we have to set up our hospitals, dispensaries, and we have to have both private and this public sector, facilities and infrastructure to deal with the disease itself, So, because it is parasite control of the parasite, and we set up special malaria clinics in mega cities in addition to the primary health center and so on.

And usually the health department or the municipal corporation or maybe railways, defence services, they can all do this kind of treatments of this kind of diseases in different specialized clinics and so on. Whereas, the vector control is where that ULBs directly involved. So, there are different methods the methods of controlling mosquito breeding is source reduction, and also via minor engineering works, source reduction is reduction of the vectors themselves. And engineering works are in regards to reduction of the environment or cleaning of the environment so that you do not give space for the mosquitoes to breed.

So, you can fill up ditches, you can fill up pits, you can fill up low lying areas, you can desilt drains, de-weed drains, then trimming of drains, drainage and sanitation, emptying water containers once a week, also known as dry day this program is taken up by many states nowadays to reduce dengue as well as malaria. So, these are the minor engineering works which will be conducted by the ULB as well as some amount of source reduction.

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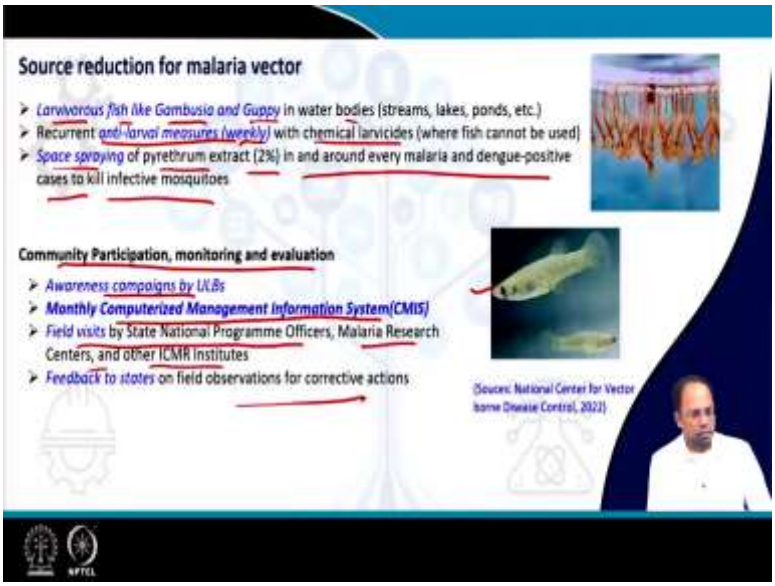

Now, source reduction again could be done both via biological as well as chemical measures. So, biological measures is introducing Larvivorous fish like Gambusia and Guppy in water bodies like over here and where this fish cannot be utilized in that case, certain anti larval measures could be taken up by spreading of chemical larvicides over this water in this water bodies.

So, this could be taken up every week this kind of during the season of breeding and all you can do this kind of spreading and sudden space could we also spread like we said that in certain areas we can do space spraying as well in areas which are infected already we know by pyrethrum extract 2 percent in and around every malaria and dengue positive case to kill

infected mosquitoes. So, around located cases in households where this kind of cases are being found around that in that area, we can do this kind of space spraying to kill the mosquitoes which live there.

Now in addition, we can do community participation, monitoring and evaluation programs so that we can build awareness. The ULBs can also build awareness campaign or conduct awareness campaigns, they can do a computerized management information system on keeping record of where, how, what kind of malaria, what kind of diseases are spreading, then field visit by national program officers, malaria research centers and other institutes and all can happen so that you know, people can come to test and can see what is the conditions and they can give their feedback and based on that certain corrective measures could be also taken.

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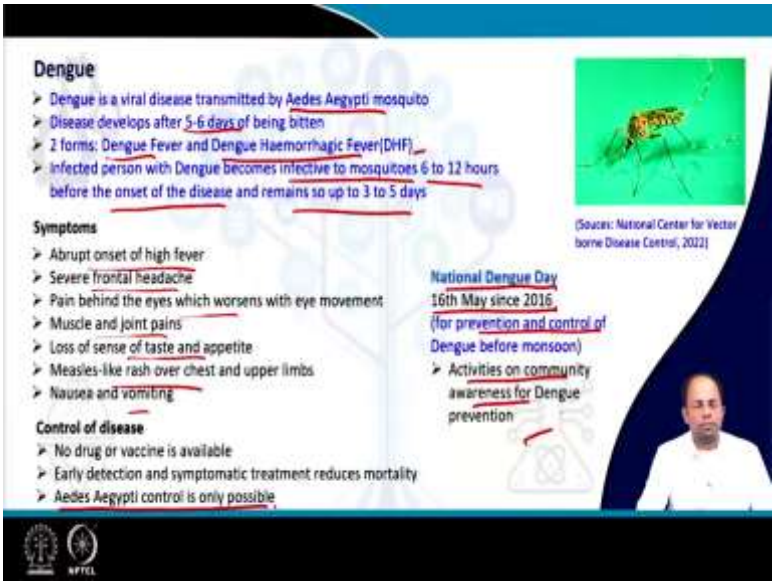

Now, coming to Dengue, dengue is more dangerous than malaria. As you know that dengue is a viral disease transmitted by Aedes aegypti mosquito, and usually it starts after 5 to 6 days after the person is bitten. And it comes dengue happens in two forms, the dengue fever and the Dengue Haemorrhagic Fever, which is very bad people, a lot of people die from Dengue Haemorrhagic Fever. And usually the infected person with dengue becomes infective to mosquitoes. That means people can mosquitoes can bite that particular person, 6 to 12 hours before the onset of the disease and remain so for 3 to 5 days.

So, before the onset of the disease and till another 5 days mosquitoes biting this dengue infected person can carry this disease to the other persons as well. So, that means if dengue is

detected, we have to protect that person and keep him inside mosquito net, so that mosquitoes do not bite him further and spread the disease to the other members of the family as well.

So, the symptoms are abrupt onset of high fever, severe frontal headache, pain behind eyes, muscle and joint pains, loss of sense of taste and appetite, measles like rash over chest and upper limbs, nausea and vomiting. And there is no drug or vaccine because it is a viral disease. And so, the more earlier you detect, you can do as a symptomatic treatment like treatment with a Pyrigesic medicine to bring out down your fever and so on and drink a lot of water. And that is the only way to treat dengue there is no other medicines or so on.

And but the control of the mosquito is possible which could be done by following similar measures as we do for malaria control as well. Now, the national dengue day has been decided to be on 16th May since and this is conducted till 2016. Now, the reason this has been done is because it is a reminder that the dengue season is coming. And we have to do prevention and certain control measures before that particular before the arrival of the monsoon, so that we can prevent dengue. And usually on this day, we carry activities or community awareness, so that people are aware and they throw away that stored water and clean their surrounding environment and so on.

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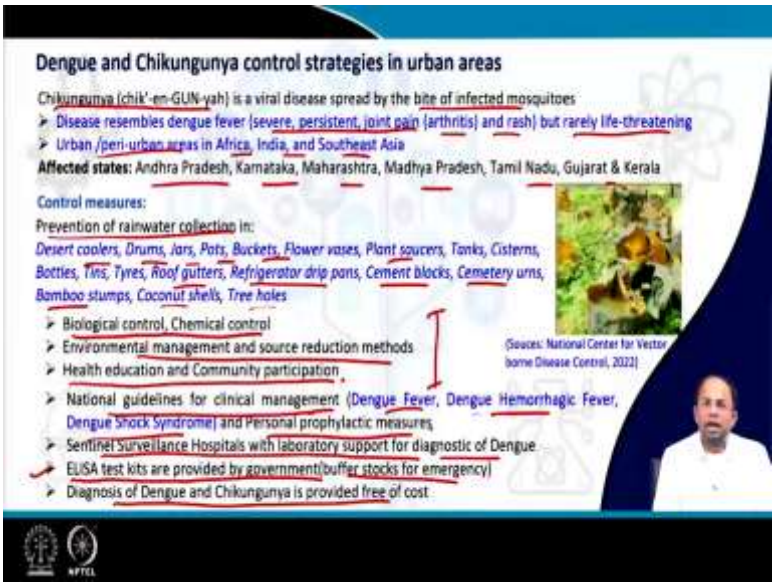

So, along with dengue, there is another disease called chikungunya, which is also a viral disease and it is spread similarly from mosquitoes itself. And it resembles the dengue fever with severe persistent joint pain like arthritis and rash, but it is much more you know, less risky than dengue and usually it is rarely life threatening, whereas in case of dengue a lot of people also die.

So, usually this disease was found in the urban and peri urban areas in Africa, India and Southeast Asia particularly, and the states which are affected from Chikungunya are Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh, Tamil Nadu and Gujarat and Kerala. And the control measures for both dengue and chikungunya are more or less same.

And the prevention is to prevent storage of rainwater in different parts of your building in the surrounding areas in the tree holes, may be in the coconut shells, in the streets, in the bamboo stumps, cemetery urns, cement blocks, refrigerated drip pans, roof gutter, desert coolers, drums, jars, pots, buckets, wherever any kind of container where there is a chance for water to get stood, you check it and throw that water away so that the dengue mosquito cannot breed over there.

So, in addition, we can go for biological and chemical control similar to malaria. And so, this is these are environmental management and source reduction methods. So, we can clean the environment do some minor engineering repair and so on. We can do health education and community participation in, participate in this kind of activities. And in addition to this for this is the you know, the vector reduction site whereas for treatment of the disease, there are national guidelines for clinical management of dengue fever, Dengue Hemorrhagic Fever and the Dengue Shock Syndrome. So, how to treat with that and personal prophylactic measures like your own some disease, some medicines you can take so that it can prevent incidents or this kind of diseases and so on.

So, these kind of guidelines are created which will help people to deal with this kind of disease, and then Sentinel Surveillance in hospitals with laboratory support for diagnostic of dengue this is encouraged, so that we know exactly where the it is starting to spread and then again we can do measures of fumigation measures or you know, this kind of environmental measures and so on.

ELISA test kits are provided by the government and buffer stocks are also kept for emergency and these kits are even spread given to the ASHA workers and all so that some community health center or to the primary health centers from there, we can do this kind of test and determine that if the person is infected with dengue or not. And diagnosis of dengue and chikungunya is provided free of cost.

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Now, another disease which is malaria, which is also a major public health problem in India, just after malaria. This is the second most incident disease, and this is Lymphatic Filariasis or also known as elephantiasis. As you can see this person's leg is swollen. And that is why the name elephantiasis is given. It is a leading cause of disability and usually it is acquired in the childhood and it is caused by parasitic worms and it results in swelling of leg and also hydrocele.

Now, this kind of from the image you can understand it leads to social stigma people avoid this kind of people, so it is better to avoid this kind of disease. Now, WHO in 1997, and subsequently in our National Health Policy, in 2002, it was determined that this Lymphatic Filariasis has to be removed, and WHO has determined that overall in the world, this should be removed by 2020.

In our country in 2021, this was extended and now we are at a stage where we can remove filariasis permanently from our country. So, how do we control that? We control it via awareness on simple food hygiene and self-practice, like cleaning of food and all and must then there is medicine for this, Mass Drug Administration campaign in 2004. With this medicine you can prevent.

Now, we do triple drug therapy, which includes DEC Albendazole and Ivermectin in from and this started from 2018, and homebased management is also there and hydrocele operations could be carried out in this community health centers and district hospitals, which is another part another problem that arises from this particular disease.

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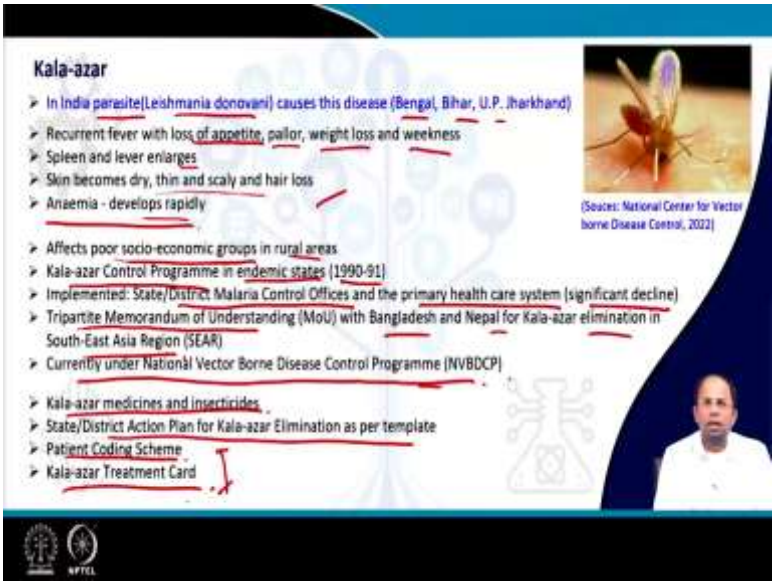

Then coming to Kala-azar this is another vector borne disease it is again results from parasite leishmania donovani. And this usually you find this in Bengal, Bihar, UP, Jharkhand and this is where the fever comes recurrently and intermittently and multiple times it will come it results in loss of appetite, it loses pallor, weight loss and results in weakness, spleen and liver enlarges, spleen particularly at skin becomes dry thin, scaly lot of hair loss happens, anaemia develops rapidly. So, it is a bad disease it you we should be really careful about Kala-azar.

And usually these poor socio-economic groups and in rural areas people are affected by Kala-azar and the endemic states government has started the Kala-azar control program started in 1990-91. And it is implemented via the district malaria control officers and the primary health care system after this there was significant decline in Kala-azar now, but still it remains.

So, there has been a Tripartite Memorandum Agreement has been signed with Bangladesh, Nepal and for reduction of or elimination of this disease from Southeast Asian region, because you cannot only remove it from our country because the surrounding areas are affected and this will again come back so it has to be removed from the entire region as well.

So, currently under the National Vector Borne Disease Control Program, so under this program kala-azar is being addressed. So, there are medicines and insecticides both can be utilized, state district action plan for Kala-azar elimination templates have been created using which we can follow the plan. Patient coding schemes and Kala-azar treatment cards are also created or encouraged, so that these are some measures which has been taken up to reduce Kala-azar in the country.

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Then Japanese Encephalitis it is a viral disease, it is transmitted by female mosquitoes, this disease affects the central nervous system. And for this we have conducted the vaccination campaign starting from 2006 and particularly in sensitive and endemic districts of the country. And for case management also or both for acute encephalitis syndrome as well as Japanese encephalitis there are case detailed guidelines on case management which could be utilized for treatment of patients and vector borne disease surveillance unit and specialized treatment facilities are created for dealing with this kind of disease.

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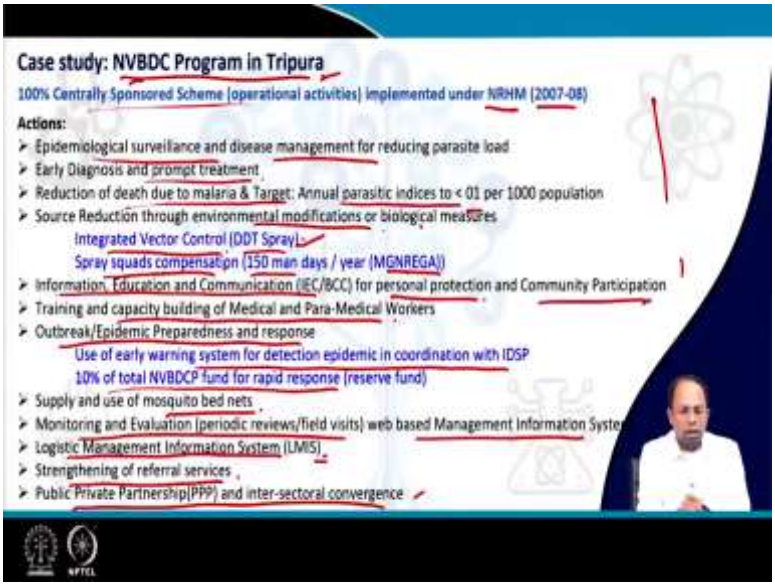

So, coming to a case study of the National Vector Borne Disease Control Program and with the implemented in Tripura. So, this is 100 percent centrally sponsored scheme and

implemented by the National Rural Health Mission because we do not have large cities there, that was there and is these case studies from 2007-2008.

So, the different actions that were taken were Epidemiological surveillance and disease management, then early diagnosis and prompt treatment of the diseases and reduction of death due to malaria and target was created like annual parasite indices should be brought down to 1 per 1000 population less than 1 per 1000 population.

Then source reduction through environmental modification and biological measures were carried out such as integrated vector control via DDT spray. So, this was a chemical which was sprayed for remove, you know at the different areas, then spray squads were created and they were compensated from MGNREGA funds like for 150-man days per year as you know, in MNREGA, he can pay that money.

So, usually the payment was done through that and addition information, education, communication and community level programs for what conducted for awareness creation regarding personal protection like using mosquito nets and so on, as well as community participation in effective measures.

Training and capacity building of medical and paramedical workers were carried out and you and an outbreak epidemic preparedness and response system was put in and this warning system for detecting epidemic was it done with coordination with IDSP programs and 10 percent of total fund was reserved for this rapid response and which helped during emergencies.

So, mosquito bed nets was supplied. Chemical insecticide treated once was supplied and monitoring and evaluation and web-based management information management system was created and this data was updated after periodic visits and field visits. Then logistic management information system particularly for vaccine and all that was created, strengthening of reference services, public private partnership and inter sectoral group convergences were also looked into. So, this is the basic charter or basic way this kind of programs are undertaken. So, this gives you an idea about in any other state when we conduct this kind of program, we have to do, these are the different steps that has to be conducted.

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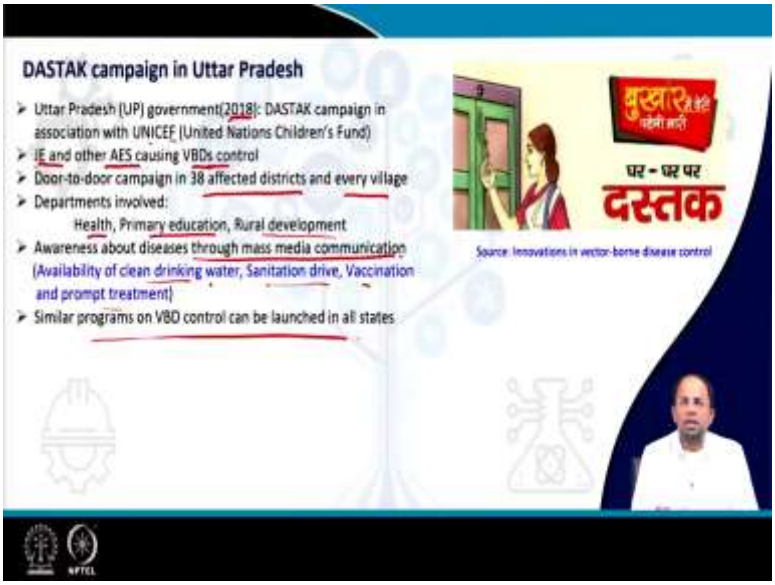

Then, DASTAK campaign in Uttar Pradesh was conducted in 2018, which was in association with UNICEF and this was in regards to control of JE and AES causing vector borne disease control. So, Japanese encephalitis and you know, that vector control in regards to that was taken up, door to door campaign was conducted in 38 affected districts and in every village people this campaign was conducted, multiple departments had to be involved such as health, primary education, rural development.

So, there has to be, you know, cooperation between the different departments and awareness about disease through mass media communication, availability of clean drinking water sanitation drive, vaccination and prompt treatment, all this information was spread by this awareness campaign, and similar programs on VBD control can be launched in other states as well.

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So, these are some of the references you can study. To conclude, implementation of NVBDC programs require coordination between different government departments and the ULBs, the primary responsibility and activities related to vector borne disease control lies with the primary health centers and the municipal body in urban areas. Thank you.