GIS-based Malaria Information Management System for Urban Malaria Scheme in India

Urban malaria control is based upon recurrent antilarval measures at all breeding sites and malaria treatment through passive case detection. An attempt has been made to construct an information management system based on Geographic Information System (GIS) for efficient planning, implementation and evaluation of urban malaria control (Srivastava *et al*., 1999, 2002). The present information management system was developed in collaboration with the State Health Authority, Tamil Nadu using GIS software Arc/Info 7.3.1 and analysis was done using ArcView 3.1 on NT platform and was implemented in Dindigul Municipality, District Dindigul, Tamil Nadu. Dindigul, is the district head quarter having a population of about 0.2 million. The town is divided into 8 municipal divisions and 48 wards.

Each ward and the street of the Dindigul town was digitized and assigned a code. Ward-wise and street-wise attribute information on 33 parameters was then attached using GIS software. These consisted of ward area, population, number of slums, slum population, street name, number of houses in each street, breeding sources such as wells, overhead tanks, tap pits, ponds and street-wise/ward-wise malaria profile, etc.

Some of the basic functionalities of the system developed are given below:

Instant Information Retrieval

Since the attributed information is attached to ward-wise/street-wise, a click of the mouse on the respective geographic unit retrieves the information attached (Fig. 20).

Zoom-in

Any geographic unit can be selected and zoomed-in and from a macro unit, one can reach at the micro level unit. For example, if a ward is selected and zoomed-in, from that ward one can reach to the streets and from the street to the houses. Even the house-wise information such as name of the house owner, number of family members, their age and sex, malaria history, drug resistance status, etc. can be attached.

Overlaying Attributes

Every breeding site such as wells, overhead tanks, outside storage tanks, inside storage tanks, tappits, etc. can be mapped. Overlaying and integration of maps of each breeding site can estimate breeding potential in an area.

Situation Analysis

It is also possible to study malaria dynamics both in space and time. One can identify the wards/streets

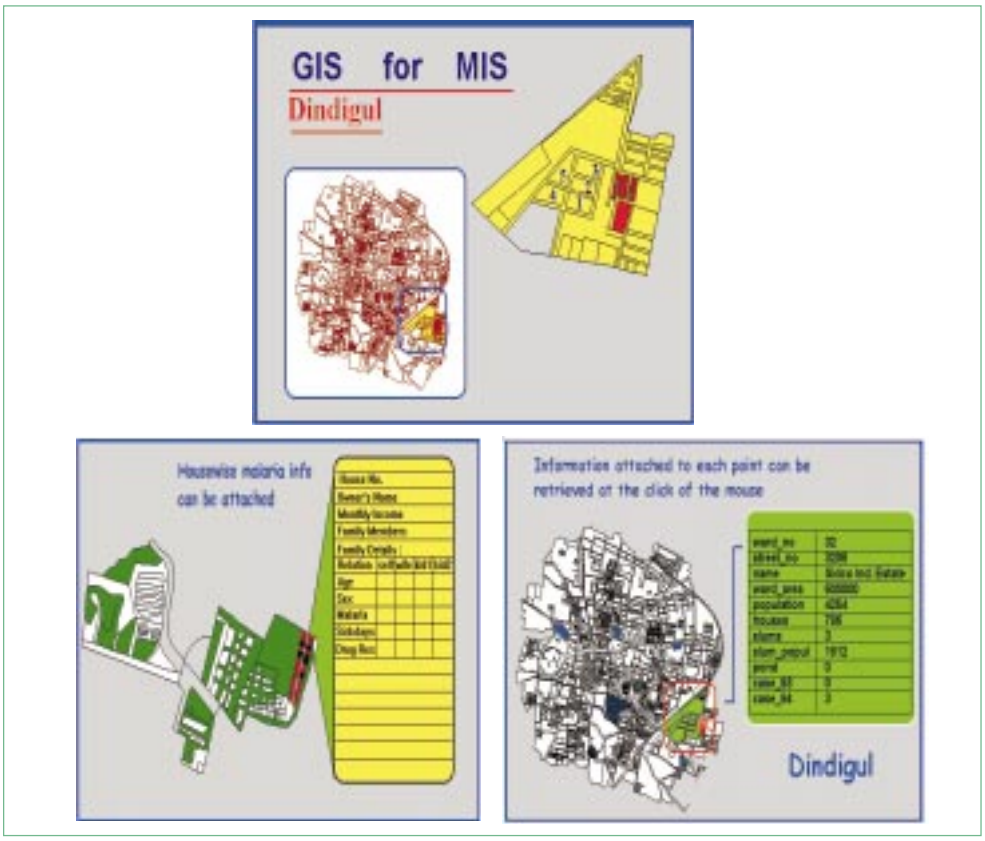

Fig. 20: **In total 33 parameters were attached to street-wise map of Dindigul a click of the mouse on the respective geographic unit retrieves the information attached. The areas can be zoomed into have micro level overview, it is possible to attach person-wise information**

where mosquito vector/larval populations or malaria incidences have increased. By overlying the breeding sources, it is possible to identify specific-problematic breeding sites and situation-specific control measures can be implemented.

As soon as new data is entered or old updated, revised maps are dynamically generated and GIS capability can highlight the trouble spots. GIS malaria surveillance system was implemented in Dindigul Municipality on November 19, 1999— The World GIS Day. Health Officers from the district and state headquarters, Tamil Nadu were trained on the GIS-based malaria information management system to aid its proper utilization. A website was constructed to demonstrate the fast dissemination of information recorded. This eliminated the need for a traditional flow of information which is instantly available globally. The Program Manager at the Centre or State HQ can instantly visualize the scenario pertaining to a village/primary health centre/district or urban area and prepare for a rapid response to the disease.

The system was developed on Arc/Info software and for implementation, a cheaper solution was worked out. Data can be updated in any RDBMS software, and to exploit the GIS functionalities and Arc Explorer (ver 1, 2 or 3) or ArcView 1.0, a free down-loadable software can be used. This allowed the system to become low cost with existing staff trained to work on the information management system. In India, 181 towns are sanctioned for urban malaria scheme but the scheme is functional in 131 towns. This system will provide immense help in planning, implementation and evaluation of a suitable control programme in a cost-effective manner. Once the basic infrastructure is ready, it is easy to convert it to surveillance system for any other disease such as filaria, dengue, DHF. One needs only to replace malaria data with other disease data and add a few disease determinants. n