1.12 Development of a Real-Time IT based intelligent health informatics management system in Desert with special reference to malaria - *Manjeet Singh Chalga and A. K. Dixit*

Commencement : April 2009 **Duration : Two Years** **Status** : Ongoing

Collaborator : Joint Director, Health & Medical Department, Jodhpur Zone

Objectives

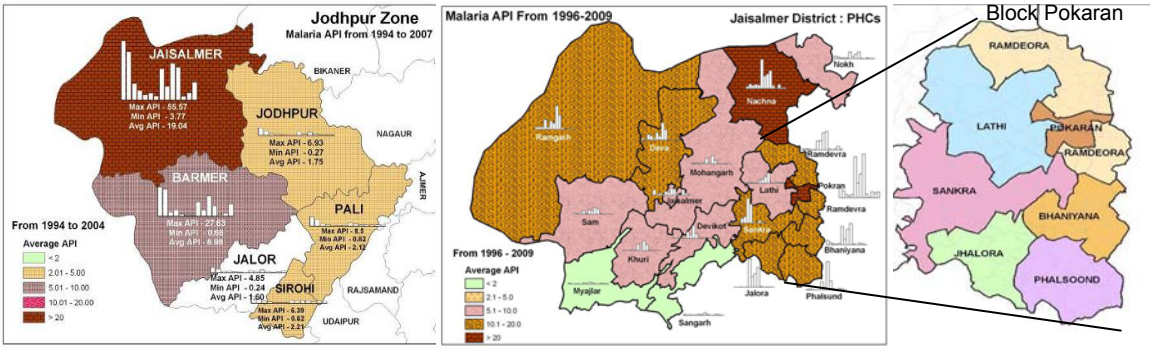
1. To develop a Real-Time IT based intelligent health information management system (RT-HIMS) for collecting real-time malaria data through existing infrastructure
2. To organize the RT-HIMS system to integrate real-time parameters with baseline parameters and environmental parameters and produce an interactive report.
3. To compare the developed system in terms of cost effectiveness, feasibility, acceptability and performance over the present information system

Progress of Work

Information technology is increasingly being applied in all dimensions of health sectors. Even after many advances in Information Technologies, manual reports and registers are the primary method of data collection in health sector in India. The health data is being generated at the local level, compiled and sent to national level successively through next higher administrative unit. The present system and various studies intends to computerize the whole health information system to improve the reporting system. But this computerization needs hardware, software, UPS, networking, skilled workers etc., thus having substantial financial implications. Therefore, there is immense need of an easy to implement, efficient information management system by choosing local available Information and Communication Techniques and solutions. The present study envisages a Real-Time IT based intelligent health information management system (RT-HIMS) with its all time ready analysis and reporting system.

Study Area: Malaria API data from 1994 to 2007 at district level in Jodhpur zone shows that Jaiselmer is facing maximum burden of malaria disease. In Jaiselmer district, malaria API data from 1994 to 2009 at PHC level shows that the population of Block Pokaran is at highest risk. Thus, block Pokaran in Jaiselmer district has been selected for the study on the basis of prepondance of malaria.

Under Block Pokaran there are two CHCs : Pokaran & Sankra and six PHCs : Bhaniyana, Ramdeora, Loharki, Lathi, Jalora & Phalsoond and 181 villages. Only one computer is working at CHC Pokaran.



Under existing System : Flow of Health Information (Malaria)

The current reporting system in block pokharan in Jaisalmer

Health workers at village level

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Sub Centre

↓ Reporting weekly the manual report

PHC/ Hospital

↓ Reporting weekly the manual report

Block PHC

↓ Reporting weekly the computer generated manual report

District HQ

↓ Reporting weekly the computer generated manual report

Zone

↓ Reporting weekly the computer generated manual report

State Health Authority

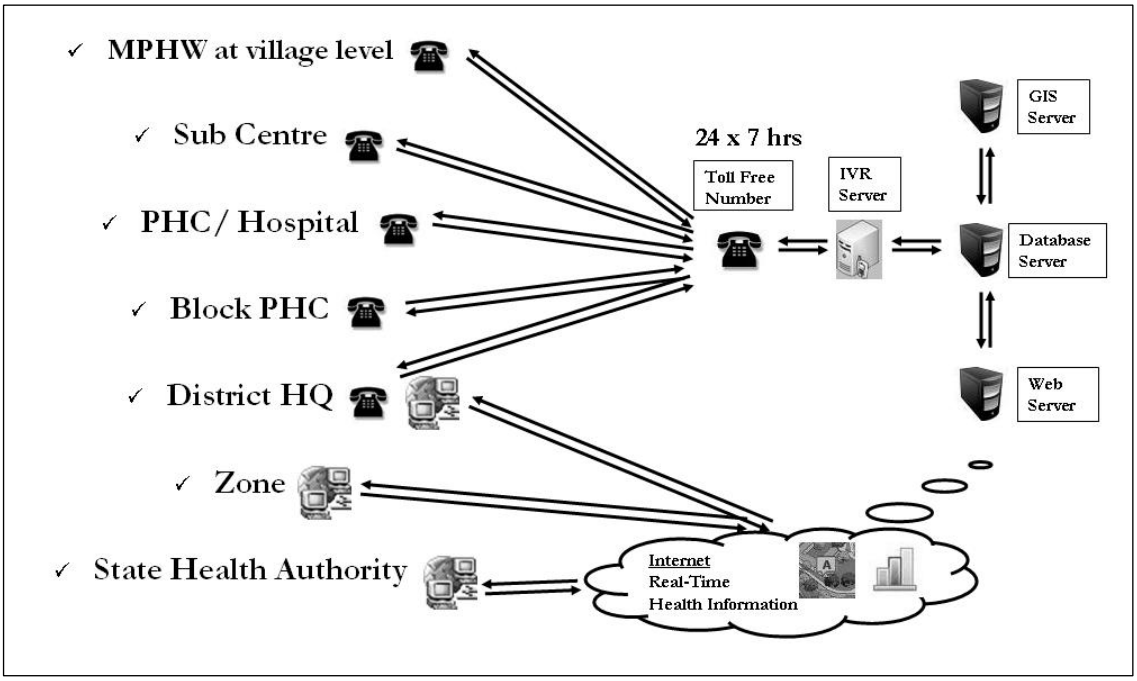
The present reporting system in Block Pokaran indicates that information flow is a manual process and it moves weekly from one health unit to other health unit.

RT-HIMS Server

The RT-HIMS Server is being developed by combining IVR Server(Interactive Voice Responce Server), Database server, GIS Server and Web Server. In India at present the IVR technology is being used for receiving complaints and marketing surveys but it has never been used for health data collection. In RT-HIMS server, the IVR Server is programmed to interact with health workers and to store the received information into Database server. The analyzing system of

RT-HIMS server is being programmed to integrate real-time parameters from IVR server with baseline parameters from Database server and with environmental parameters from GIS server. The reporting system of RT-HIMS server is being programmed to produce interactive reports on the web site through integrated Web server and interactive response through IVR server.

After full fledge implementation of the RT-HIMS Server, the present flow of the information will transform into a system as shown below.



Data Collection Method

1. Data Collection through IVR Server

   When a health unit dials out the telephone number connected to IVR Server, the IVR server is programmed to ask the questions to the caller and accordingly stores the answer received from the caller into following three log books.

   a) First log book is programmed to store the date, time of call and the telephone no. of all the callers.

   b) Second log book is programmed to store each and every interaction of IVR server with the caller during interactive session.

   c) Third log book is programmed to store processed information along with date, time of call, telephone no. into relevant log files.

2. Data transfer from IVR log files to Database server

   The RT-HIMS server is programmed to automatically transfer the processed information from IVR third log file into Database server. This information is primarily stored into database named as unchecked database.

3. Data Consistency Check, Modification and Cleaning

   The web pages in the integrated web server are programmed to facilitate user to check and edit the information stored in unchecked database from anywhere through internet. The RT-HIMS server is programmed to automatically identify some predefined consistency errors. The user can rectify the minor correction and if needed, can ask the caller for the correct information. The user manually sends the correct information into checked database and other information into recycle database.

Implementation of the RT-HIMS Server

Since the procurement of the softwares/ equipments required for full fledge implementation of the project is under process, RT-HIMS server has been developed using available trial version of softwares & compatible small devices.

To design the program of the RT-HIMS server, the secondary data from CHC-Pokaran was collected for the period Jan, 2009 to Oct, 2009. This secondary data contains Daily Slide Collection, Test Reports and Detail of the positive cases of CHC-Pokaran. Then each CHC, PHC and villages of Block Pokaran are given unique codes.

Technical training was imparted to the nominated health workers at Block Pokaran on 19th of Nov, 2009. Detail & Working of the project, method of interacting and providing information to RT-HIMS through telephone was explained to the participants. During training it is observed that PHC Loharki, Lathi, Jalora and Phalsoond collect slides and sends them for examination in other PHCs.

Accordingly interactive questionnaire programmed in the RT-HIMS server are re-designed and incorporated into the IVR server and Database server. From 1st December 2009, the trained Lab Technicians of PHCs of Block Pokaran started providing their malaria daily reports to RT-HIMS server through telephone. RT-HIMS server is successfully recording these real-time reports.

Real-Time interaction problems are examined in the IVR second log file. The Real-time interaction errors raised due to callers fault are minimized by explaining the caller telephonically. The Real-time interaction errors raised due to RT-HIMS fault are solved by reprogramming the RT-HIMS server. The callers making more mistakes are analysed through IVR second log file and agenda for the second technical training designed accordingly.

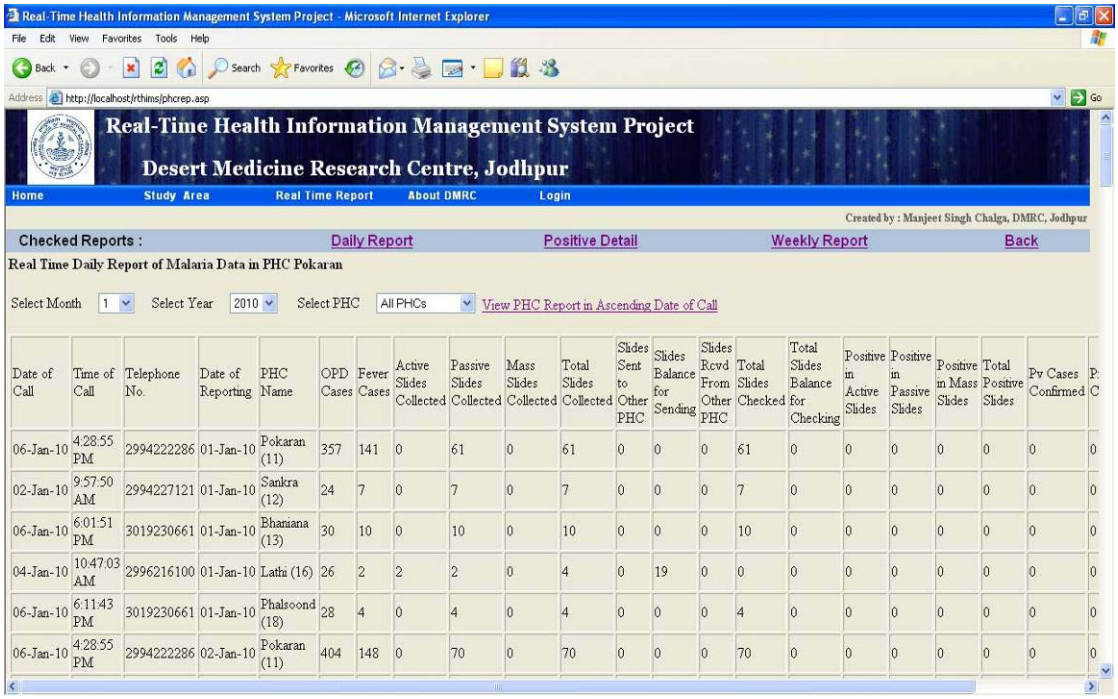
Second Interactive training was organized again at Block Pokaran on 21st of January, 2010. During the training the progress of the project and the data storage technique being used in the project were discussed. The errors made by the callers and technical limitations of the RT-HIMS server are discussed and solution to problems are provided to the health workers. Toll Free No. is launched.

BCMO, Pokaran asked to add the ANM report to RT-HIMS server as ANMs play an important role in the identification, treatment and control of the malaria. BCMO, Pokaran also asked for the full fledge implementation of the RT-HIMS server.

After data consistency check, Real-Time information is made available on website, which is being browsed by health authorities. Website has been programmed and launched over the static IP available with the Centre. The information available on website is follows.

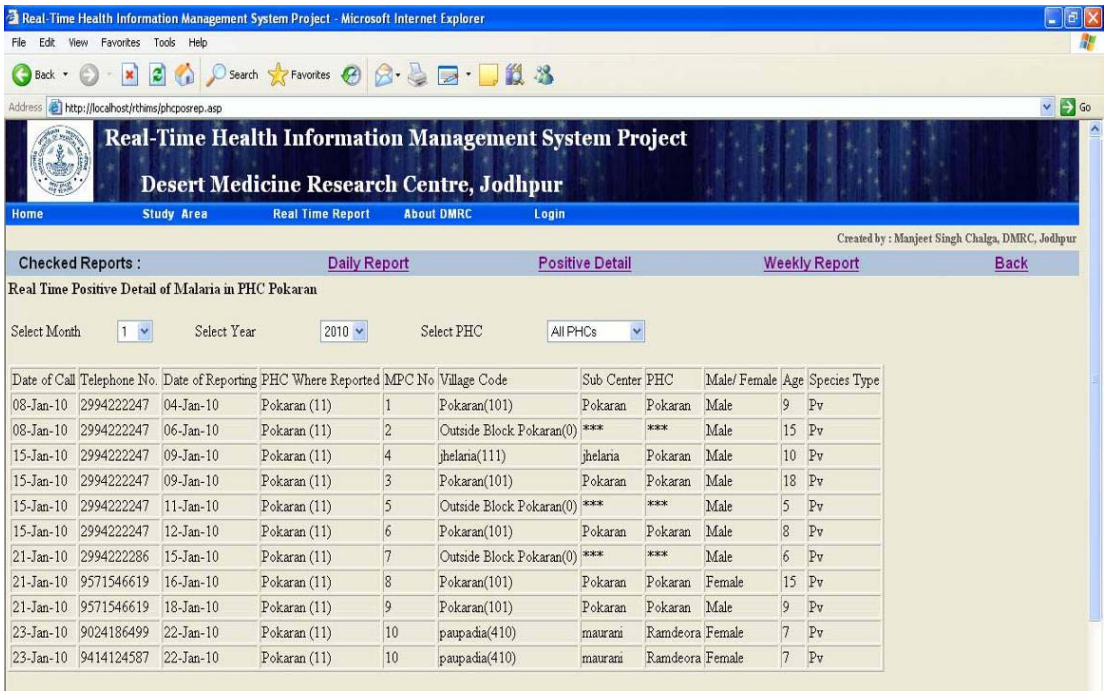
- ✓ Project and Study Area Detail
- ✓ Daily Report showing OPD Cases, Fever cases, Slide Collection and their testing report etc. as per MF-8 register available with CHCs/ PHCs.
- ✓ Daily Positive Case Detail showing MPC No.(Unique No.), Village, Sex, Age etc. of the patient and the species of malaria.
- ✓ Unchecked and Checked reports available as PHC wise, Month/ Year wise.
- ✓ Customized graphical report having option to compare two variables.
- ✓ Weekly Reports

Fig : Website showing Daily Report



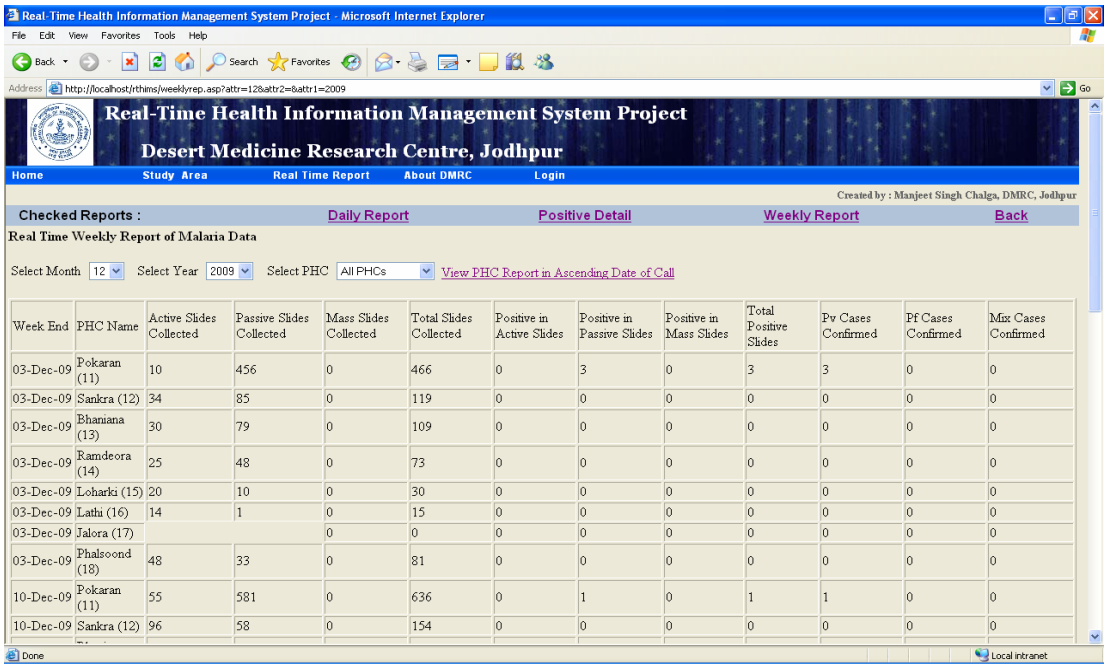
Date of Call	Time of Call	Telephone No.	Date of Reporting	PHC Name	OPD Cases	Fever Cases	Active Slides Collected	Passive Slides Collected	Mass Slides Collected	Total Slides Collected	Slides Sent to Other PHC	Slides Balance for Sending	Slides Rcvd From Other PHC	Total Slides Checked	Total Slides Balance for Checking	Positive in Active Slides	Positive in Passive Slides	Positive in Mass Slides	Total Positive Slides	Pv Cases Confirmed	P: C
06-Jan-10	4:28:55 PM	2994222286	01-Jan-10	Pokaran (11)	357	141	0	61	0	61	0	0	0	61	0	0	0	0	0	0	0
02-Jan-10	9:57:50 AM	2994227121	01-Jan-10	Sankra (12)	24	7	0	7	0	7	0	0	0	7	0	0	0	0	0	0	0
06-Jan-10	6:01:51 PM	3019230661	01-Jan-10	Bhaniana (13)	30	10	0	10	0	10	0	0	0	10	0	0	0	0	0	0	0
04-Jan-10	10:47:03 AM	2996216100	01-Jan-10	Lathi (16)	26	2	2	2	0	4	0	19	0	0	0	0	0	0	0	0	0
06-Jan-10	6:11:43 PM	3019230661	01-Jan-10	Phalsoond (18)	28	4	0	4	0	4	0	0	0	4	0	0	0	0	0	0	0
06-Jan-10	4:28:55 PM	2994222286	02-Jan-10	Pokaran (11)	404	148	0	70	0	70	0	0	0	70	0	0	0	0	0	0	0

Fig : Website showing Positive Case Detail



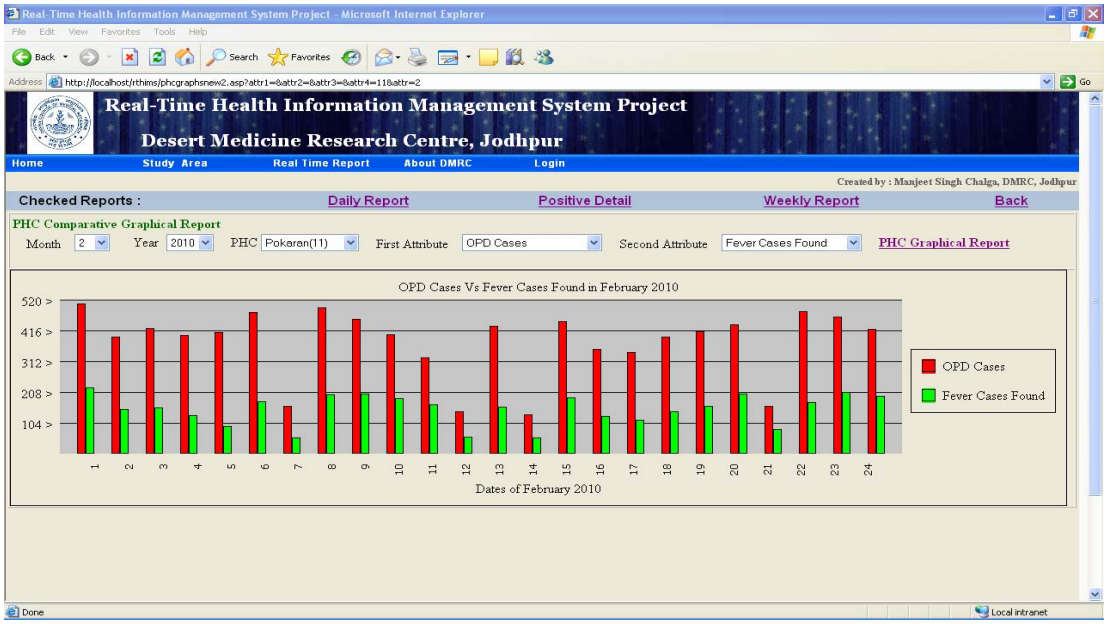
Date of Call	Telephone No.	Date of Reporting	PHC Where Reported	MPC No	Village Code	Sub Center	PHC	Male/ Female	Age	Species Type
08-Jan-10	2994222247	04-Jan-10	Pokaran (11)	1	Pokaran(101)	Pokaran	Pokaran	Male	9	Pv
08-Jan-10	2994222247	06-Jan-10	Pokaran (11)	2	Outside Block Pokaran(0)	***	***	Male	15	Pv
15-Jan-10	2994222247	09-Jan-10	Pokaran (11)	4	jhelaria(111)	jhelaria	Pokaran	Male	10	Pv
15-Jan-10	2994222247	09-Jan-10	Pokaran (11)	3	Pokaran(101)	Pokaran	Pokaran	Male	18	Pv
15-Jan-10	2994222247	11-Jan-10	Pokaran (11)	5	Outside Block Pokaran(0)	***	***	Male	5	Pv
15-Jan-10	2994222247	12-Jan-10	Pokaran (11)	6	Pokaran(101)	Pokaran	Pokaran	Male	8	Pv
21-Jan-10	2994222286	15-Jan-10	Pokaran (11)	7	Outside Block Pokaran(0)	***	***	Male	6	Pv
21-Jan-10	9571546619	16-Jan-10	Pokaran (11)	8	Pokaran(101)	Pokaran	Pokaran	Female	15	Pv
21-Jan-10	9571546619	18-Jan-10	Pokaran (11)	9	Pokaran(101)	Pokaran	Pokaran	Male	9	Pv
23-Jan-10	9024186499	22-Jan-10	Pokaran (11)	10	paupadia(410)	maurani	Ramdeora	Female	7	Pv
23-Jan-10	9414124587	22-Jan-10	Pokaran (11)	10	paupadia(410)	maurani	Ramdeora	Female	7	Pv

Fig : Website showing Weekly Report

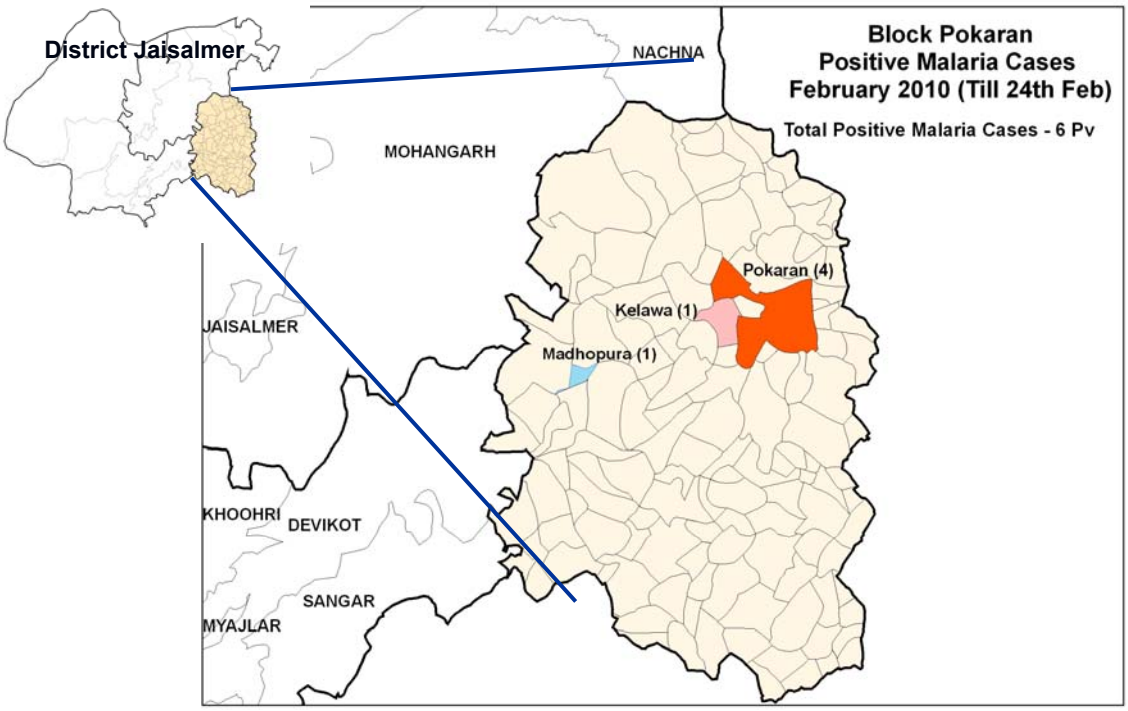


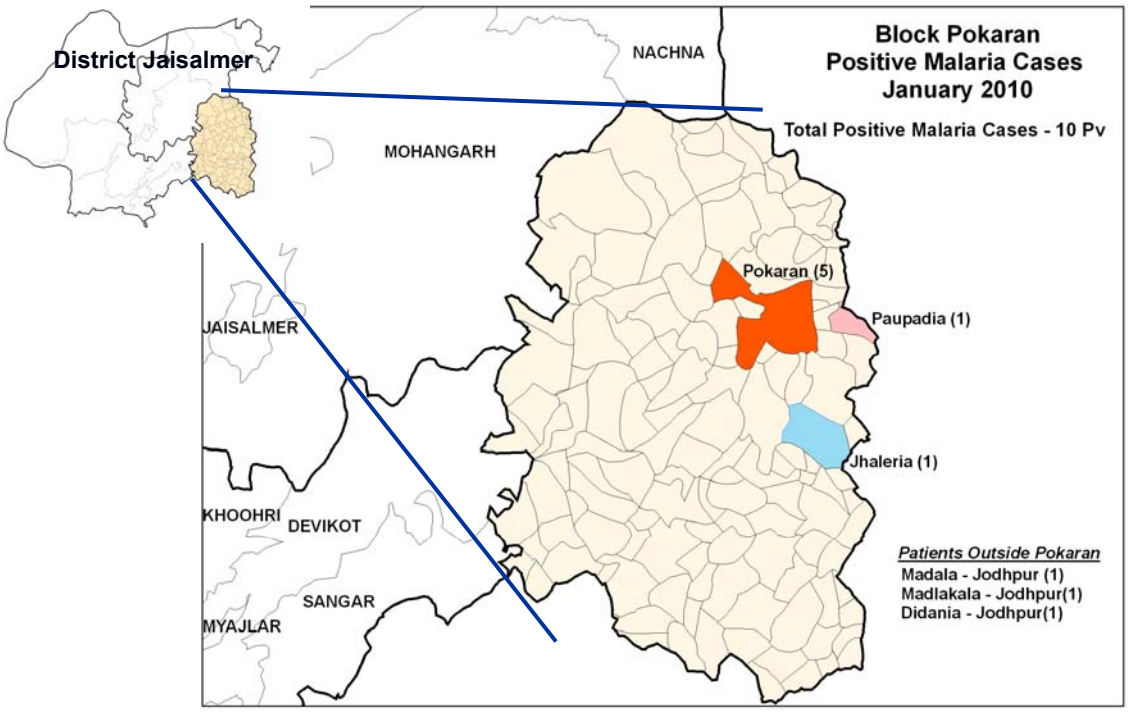
Week End	PHC Name	Active Slides Collected	Passive Slides Collected	Mass Slides Collected	Total Slides Collected	Positive in Active Slides	Positive in Passive Slides	Positive in Mass Slides	Total Positive Slides	Pv Cases Confirmed	Pf Cases Confirmed	Mix Cases Confirmed
03-Dec-09	Pokaran (11)	10	456	0	466	0	3	0	3	3	0	0
03-Dec-09	Sankra (12)	34	85	0	119	0	0	0	0	0	0	0
03-Dec-09	Bhaniana (13)	30	79	0	109	0	0	0	0	0	0	0
03-Dec-09	Ramdeora (14)	25	48	0	73	0	0	0	0	0	0	0
03-Dec-09	Loharki (15)	20	10	0	30	0	0	0	0	0	0	0
03-Dec-09	Lathi (16)	14	1	0	15	0	0	0	0	0	0	0
03-Dec-09	Jalora (17)			0	0	0	0	0	0	0	0	0
03-Dec-09	Phalsoond (18)	48	33	0	81	0	0	0	0	0	0	0
10-Dec-09	Pokaran (11)	55	581	0	636	0	1	0	1	1	0	0
10-Dec-09	Sankra (12)	96	58	0	154	0	0	0	0	0	0	0

Fig : Website showing Graphical Report



Positive case reported by health workers to RT-HIMS server through telephone mapped using GIS for the month January 2009 & Februray 2010 are shown below.





Remaining Work to be Done

- Full Fledge implementation of RTHIMS Server
- Set up of SMS system
- Making RT-HIMS intelligent
- Setup of root level reporting (Sub Centre-ANMs report)
- Adding more Analytical Reports
- More GIS Reports
- Web Data Security & User Authentication
- Training to State Health Workers

Possible Outcome and Utilization

The main advantage of this study over other studies is its real-time data collection, analysis, networking of different parameters, robotic nature and cost effectiveness. Malaria disease can be addressed at its development stage. Effect of intervention can be addressed. Any number of variables can be added or deleted as and when desired. Prepared model is quite flexible and can be extended for any number of diseases and health units viz. other states, private hospitals etc. IT skilled staff is required only at RT-HIMS server. Non-IT skilled staff can send and extract information from RT-HIMS server.