

Annual Report

2010-2011



INDIAN COUNCIL OF MEDICAL RESEARCH
DESERT MEDICINE RESEARCH CENTRE
NEW PALI ROAD, JODHPUR-342 005

Annual Report 2010-11



**Indian Council of Medical Research
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डॉ विश्व मोहन कटोच

एम डी, एफ एन ए एससी, एफ ए एम एस, एफ ए एससी, एफ एन ए

सचिव, भारत सरकार

(स्वास्थ्य अनुसंधान विभाग)

स्वास्थ्य एवं परिवार कल्याण मंत्रालय एवं

महानिदेशक, आई सी एम आर

Dr. Vishwa Mohan Katoch

MD, FNASc, FAMS, FASc, FNA

Secretary to the Government of India

(Department of Health Research)

Ministry of Health & Family Welfare &

Director-General, ICMR



सत्यमेव जयते



DIRECTOR-GENERAL'S MESSAGE

It is a matter of immense pleasure that Desert Medicine Research Center (DMRC), is bringing out its Annual Report for the year 2010-11. During the report period the Centre has continued its efforts to carryout research on communicable and non-communicable diseases as well as nutrition related issues including dengue/DHF, malaria, tuberculosis, musculoskeletal disorders, RF/RHD, diabetes, coronary heart diseases and iodine deficiency disorders. The development of Dengue Control Plan and use of transmission specific protein to develop early warning tool for dengue transmission and use of ovitraps as alternate surveillance strategy are important studies for prevention and control of dengue. Efficacy trials of latex of *Calotropis procera* for its public use against dengue vectors and larvicidal efficacy of plant *Withania somnifera* have opened new hope in plant research. Detection of Japanese Encephalitis (JE) virus in Sri Ganganagar district has warranted potential public health risk of emergence of the disease in the region. Polymorphisms in Duffy blood group genes of *P. vivax* in malaria patients and age determination of mosquitoes by quantitative reverse transcriptase-PCR (qRT-PCR) are some new areas of research pursued during this period. A Real-Time IT based intelligent Health Information Management System (RT-HIMS) for collecting real-time malaria data through existing infrastructure is another important effort to strengthen the ongoing surveillance programme.

I hope that the research programmes of DMRC would benefit the people living in desert areas, improve their health, strengthen the scientific and technical expertise in the region by strong partnership with medical colleges as well as state system and finally catalyse the implementation of ongoing national health programmes.

(V.M. Katoch)

PREFACE

The Desert Medicine Research Centre continued its efforts in fulfilling the overall aim of addressing the wide spectrum of health related problems in the desert region covering the areas of communicable and non-communicable diseases along with attention on nutrition and public health issues. The DMRC has developed modern infrastructure for undertaking research in dengue/DHF, malaria, tuberculosis, musculoskeletal disorders, RF/RHD, diabetes and coronary heart diseases. Studies on nutritional & iodine deficiency disorders in certain vulnerable age groups and neonates were given due priority.

Translational Research for the development of a Dengue Control Plan for Department of Health & Family Welfare, Govt. of Rajasthan in different zones using larvicides was given due emphasis for preparation of operational manual for its control. Efforts were also focused on application of transmission specific protein antibodies as probe to detect and develop early warning tool of dengue transmission in the area. Evaluation of efficacy of different ovitraps for the surveillance and control of dengue vector, *Ae. aegypti* and the current status of their susceptibility against larvicides being used in National Programme is in progress. Identification of biological forms of *An. stephensi* using molecular tools was the priority area of research. Research on desert medicinal plants viz. *Withania somnifera* in larvicidal control and efficacy trials of latex of *Calotropis procera* for its public use as bio-larvicide against dengue vectors is also being tried under field conditions. Potential emergence and public health risk of JE virus in Sri Ganganagar district, polymorphisms in Duffy blood group genes of *P. vivax* malaria patients and age determination of mosquitoes by quantitative reverse transcriptase-PCR (qRT-PCR) were the other areas which were explored during this period. A Real-Time IT based intelligent Health Information Management System (RT-HIMS) for collecting real-time malaria data through existing infrastructure was also developed to compare it in terms of cost effectiveness, feasibility, acceptability and performance over the present information system. Studies on factors affecting incidence of malaria in children and their association between socio-economic factors and transmission in desert were also undertaken.

Prevalence and meta analysis of diabetes mellitus and impaired glucose tolerance in the Raika and other communities, risk factors assessment for Type 2 diabetes, musculoskeletal disorders, coronary artery disease and hypertension were some of the areas covered for strengthening the arena under Non-Communicable Diseases.

Nutrition Monitoring Survey on NNMB pattern, assessment of iodine deficiency disorders, anaemia, nutrition intervention in school age children and food and nutrient consumption in women & children with particular reference to Pearl Millet were covered under nutrition intervention programmes.

Nutritional status along with morbidity and mortality in neonates were covered under Maternal and Child Health.

A quarterly bilingual *Patrika* 'Chetna' is regularly being published from the Centre both in Hindi and English with the aim to disseminate the scientific information and achievements. The Centre strives to carry out all scientific and administrative work in a simple and lucid Rajbhasha.

The Centre aspires to achieve its targets, both in the field of basic, applied and translational research, by building and updating its infrastructure and capacity strengthening efforts.



Dr. Bela Shah
Director-in-Charge
Scientist G and Head
Division of Non-Communicable Diseases

COMMUNICABLE DISEASES

1.1 Translational Research for development and testing of ICMR-DMRC module of dengue control for Rajasthan

– Vinod Joshi, Sc. 'F', Bennet Angel, Annette Angel, Nidhi Vyas, Rameshwar Lal, Narendra Vyas and Gajendra Singh

Commencement: March, 2011 **Duration:** Two Years **Status:** Ongoing

OBJECTIVES

1. Development of an ICMR-DMRC Dengue Control Plan for 7 zones of department of health & family welfare of Rajasthan.
2. Demonstration of Dengue control/prevention in collaboration with the state health authorities using the larvicide used in programme.
3. Demonstration and monitoring of disease control/ elimination for two consecutive years and handing over the documental manual of dengue control plan for Rajasthan.

PROGRESS OF THE WORK

Based on our earlier research that mosquitoes maintain dengue virus in dengue endemic localities through the mechanism of Transovarial transmission (TOT), a subsequent translational research was conceived which was aimed to trace the virus activity in the larval mosquitoes in pre-transmission period (March-July) and get virus containing breeding habitats treated by the larvicide through state health department, so that a control over the disease transmission could be achieved in the prospective transmission season of dengue.

Entomological surveillance

During reported period the surveillance of breeding of larval *Aedes* has been undertaken in 5 district headquarters (Town/City). The areas namely Jalore, Pali, Sirohi, Barmer and Jaisalmer have been surveyed taking representative sampling from all the municipal wards of these towns. In all 193 household in Jalore, 302 in Pali, 492 in Sirohi, 335 in Barmer and 307 houses were screened in Jaisalmer town. Maximum breeding was observed in Pali town (13.2 %). The details are provided in Table 1.

Virological investigations using IFAT

The field collected larvae were reared into adults under laboratory conditions. The laboratory reared adults were subjected to Indirect Fluorescence Antibody Test (IFAT) to screen mosquitoes carrying dengue antigen. Maximum mosquito infections were observed in Barmer town (53.6%). The details for all the districts are provided in Tables 1-6.

Table 1. Pooled data showing breeding positive containers and virus activities detected at household level in 5 district towns

Study Area	No. of Houses surveyed	No. Breeding +ve	% Breeding +ve	No. Virus +ve	% Virus +ve	Total mosquitoes assayed	Positive for Dengue Virus	% +ve
Jalore	193	15	7.7	10	5.1	168	27	16.07
Pali	302	40	13.2	21	6.9	209	40	19.13
Sirohi	492	53	10.7	41	8.3	335	88	26.26
Barmer	335	28	8.3	20	5.9	82	44	53.65
Jaisalmer	307	18	5.8	9	2.9	44	16	36.36

Table 2. Household level screening of virus positive breeding containers in Jalore town

S. No.	Type of container	Suggestions
1	Cement tank	Apply larvicide
2	Cement tank	Apply larvicide
3	Clay pot	Apply larvicide
4	Plastic container	Apply larvicide
5	Cement tank	Apply larvicide
6	Cement Tank	Apply larvicide
7	Clay pot, Underground	Apply larvicide
8	Clay pot	Apply larvicide
9	Plastic container	Apply larvicide
10	Cement Tank	Apply larvicide

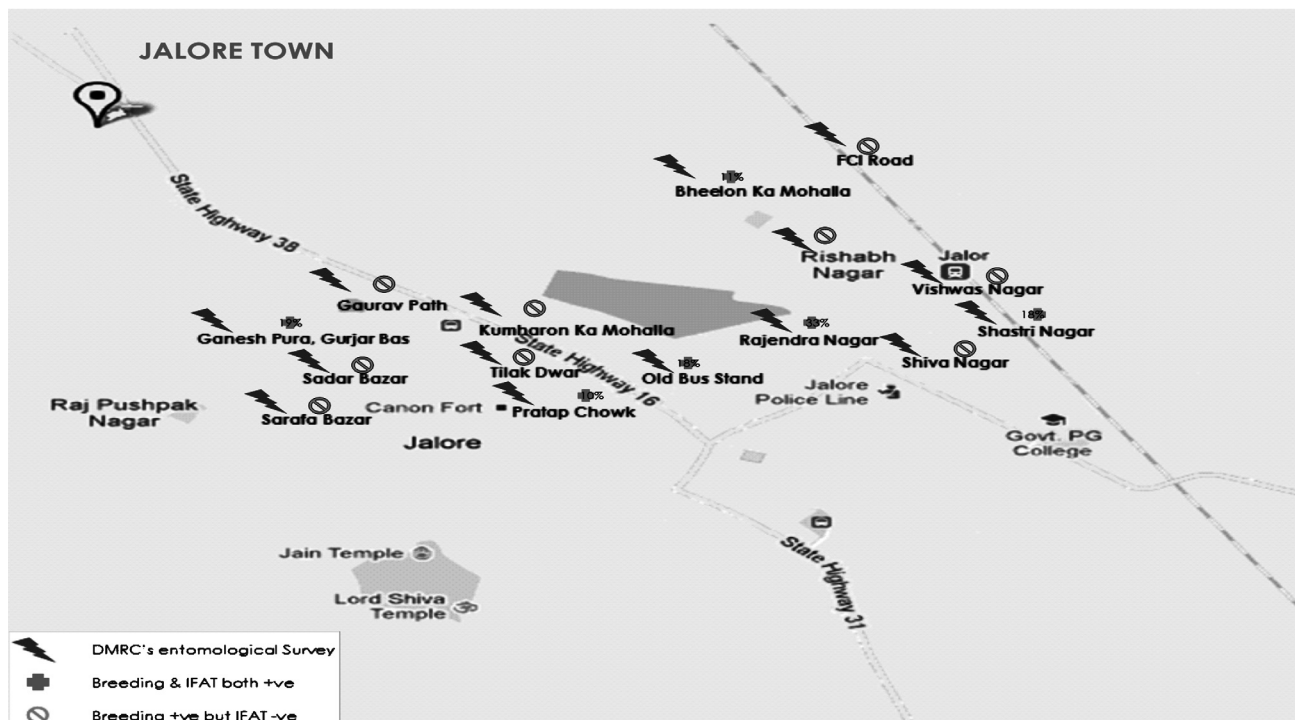


Fig. 1. Sites of *Aedes* breeding and virus activities (IFAT +ve) of mosquitoes in Jalore

Table 3. Household level screening of virus positive breeding containers in Pali town

S. No.	Type of container	Suggestions
1	Cement tank	Apply larvicide
2	Plastic container	Apply larvicide
3	Plastic container	Apply larvicide
4	Cement tank	Apply larvicide
5	Clay pot	Apply larvicide
6	Cement tank	Apply larvicide
7	Cement tank	Apply larvicide
8	Clay pot	Apply larvicide
9	Clay pot, cement tank, plastic	Apply larvicide
10	Clay pot	Apply larvicide
11	Clay pot	Apply larvicide
12	Plastic	Apply larvicide
13	Clay pot, Cement	Apply larvicide
14	Clay pot, plastic	Apply larvicide
15	Plastic	Apply larvicide
16	Clay pot	Apply larvicide
17	Clay pot	Apply larvicide
18	Clay pot	Apply larvicide
19	Clay pot	Apply larvicide
20	Plastic	Apply larvicide
21	Cement	Apply larvicide

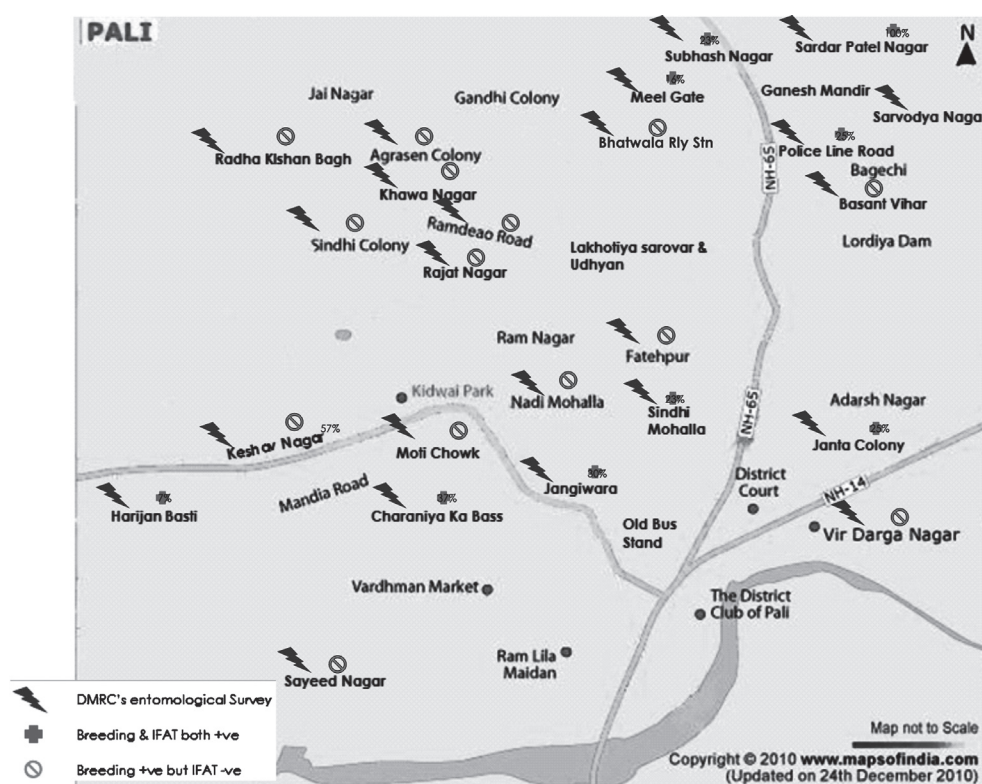


Fig. 2. Sites of *Aedes* breeding and virus activities (IFAT +ve) of mosquitoes in Pali

Table 4. Household level screening of virus positive breeding containers in Sirohi town

S. No.	Type of container	Suggestions
1	Underground	Apply larvicide
2	Clay pot	Apply larvicide
3	Clay pot	Apply larvicide
4	Clay pot	Apply larvicide
5	Plastic container	Apply larvicide
6	Clay pot	Apply larvicide
7	Plastic container	Apply larvicide
8	Cement tank	Apply larvicide
9	Clay pot	Apply larvicide
10	Clay pot, Plastic container	Apply larvicide
11	Cement tank	Apply larvicide
12	Clay pot	Apply larvicide
13	Clay pot	Apply larvicide
14	Clay pot	Apply larvicide
15	Cement tank	Apply larvicide
16	Plastic container	Apply larvicide
17	Metallic	Apply larvicide
18	Cement	Apply larvicide
19	Metallic	Apply larvicide
20	Cement,Clay pot	Apply larvicide
21	Plastic, Cement	Apply larvicide
22	Underground, Cement	Apply larvicide
23	Clay pot	Apply larvicide
24	Cement	Apply larvicide
25	Clay pot	Apply larvicide
26	Cement	Apply larvicide
27	Clay pot	Apply larvicide
28	Cement	Apply larvicide
29	Clay pot	Apply larvicide
30	Clay pot	Apply larvicide
31	Metallic	Apply larvicide
32	Clay pot	Apply larvicide
33	Underground	Apply larvicide
34	Underground	Apply larvicide
35	Cement	Apply larvicide
36	Cement	Apply larvicide
37	Clay pot	Apply larvicide
38	Plastic	Apply larvicide
39	Plastic	Apply larvicide
40	Plastic	Apply larvicide
41	Cement	Apply larvicide

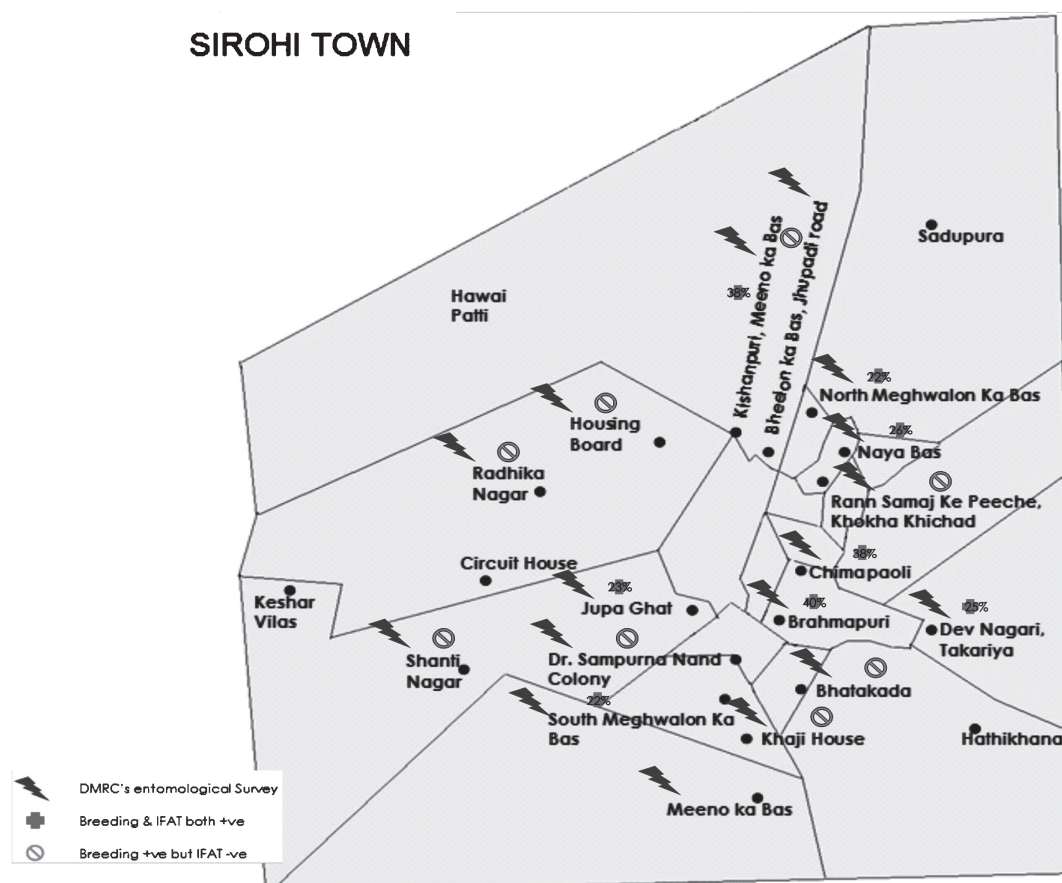


Fig.3. Sites of *Aedes* breeding and virus activities (IFAT +ve) of mosquitoes in Sirohi

Table 5. Household level screening of virus positive breeding containers in Barmer town

S. No.	Type of container	Suggestions
1	Clay pot	Apply larvicide
2	Plastic	Apply larvicide
3	Clay pot	Apply larvicide
4	Underground	Apply larvicide
5	Underground	Apply larvicide
6	Plastic	Apply larvicide
7	Cement tank	Apply larvicide
8	Plastic	Apply larvicide
9	Clay pot	Apply larvicide
10	Clay pot, Underground	Apply larvicide
11	Plastic	Apply larvicide
12	Plastic	Apply larvicide
13	Cement	Apply larvicide
14	Clay pot	Apply larvicide
15	Plastic	Apply larvicide
16	Clay pot	Apply larvicide
17	Underground	Apply larvicide
18	Clay pot	Apply larvicide
19	Plastic	Apply larvicide
20	Metallic	Apply larvicide

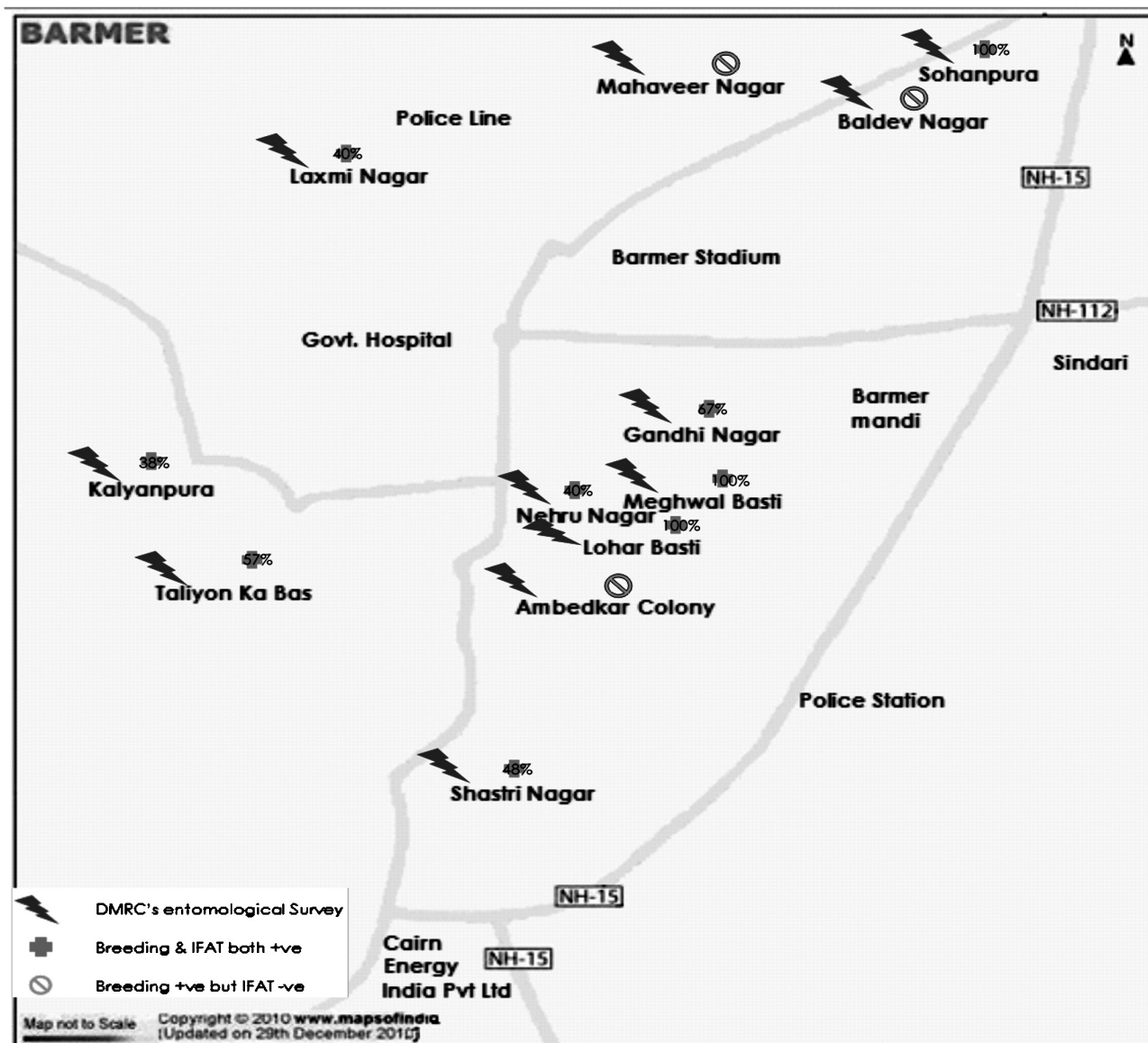


Fig. 4. Sites of *Aedes* breeding and virus activities (IFAT +ve) of mosquitoes in Barmer

Table 6. Household level screening of virus positive breeding containers in Jaisalmer town

S. No.	Type of container	Suggestions
1	Plastic	Apply larvicide
2	Clay pot	Apply larvicide
3	Cement	Apply larvicide
4	Plastic	Apply larvicide
5	Cement	Apply larvicide
6	Metallic	Apply larvicide
7	Cement	Apply larvicide
8	Cement	Apply larvicide
9	Clay pot	Apply larvicide

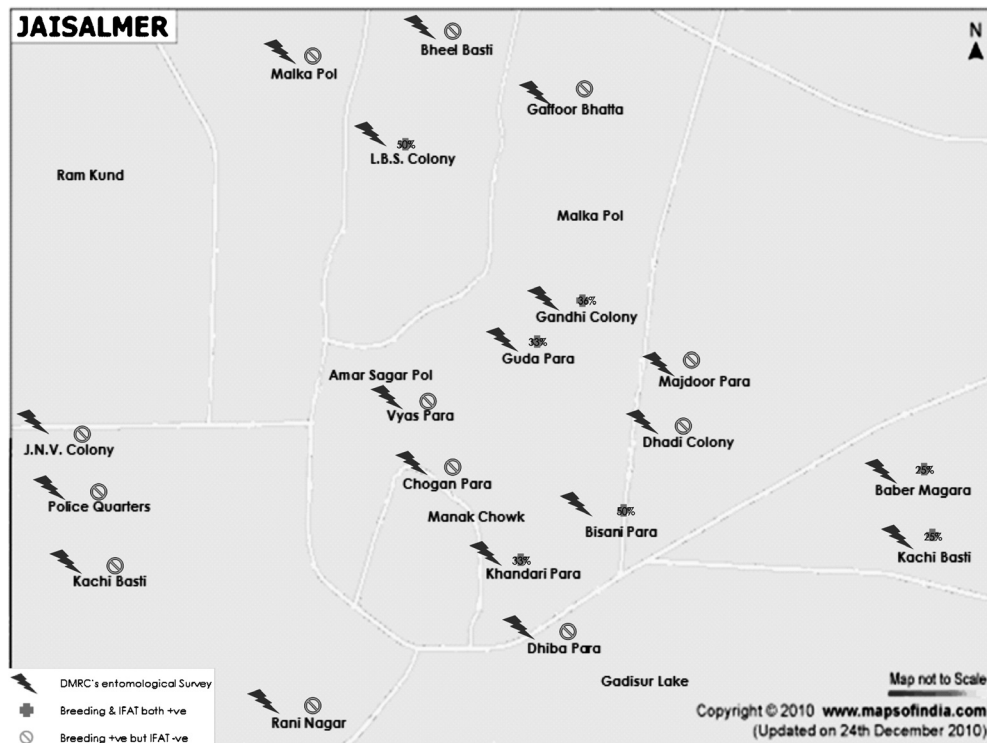
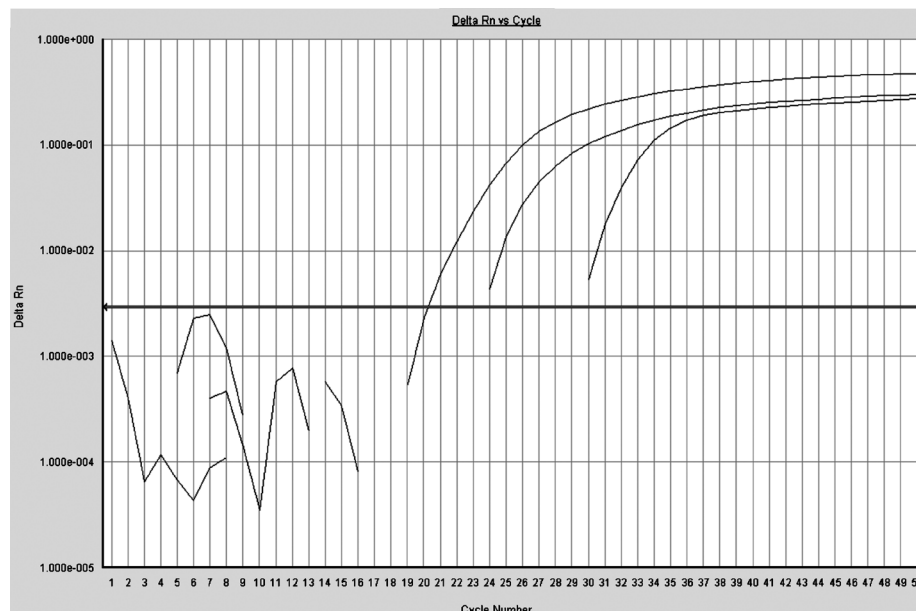


Fig. 5. Sites of *Aedes* breeding and virus activities (IFAT +ve) of mosquitoes in Jaisalmer

Virolological investigations using RT-PCR

Pools of mosquitoes as well individual mosquito body remnants showed positive results for IFAT were subjected to RT-PCR. All the individual mosquitoes showing IFAT positive showed positive result of presence of dengue viral genes (Fig.6).



Well	Sample name	Detector	Task	Ct
A4	88 2F	Dengue	Unknown	23.7551
A4	88 2F	IEC	Unknown	20.1632
B4	88 2 F	ACTB gene	Unknown	29.608

Fig. 6. RT-PCR curves showing +ve results of IFAT +ve mosquitoes

FINDINGS

1. Of the total houses screened for *Aedes* breeding during pre-rain period of May-July, the percentage of breeding positive houses ranged from 5.8% minimum to 13.2% maximum. Data show that during pre-transmission season, mosquito breeding is confined to very limited breeding foci.
2. At household level, during pre-rain period the mosquitoes infected of dengue antigen ranged from 2.9 to 8.3% only. The observations clearly indicate that pre-rain period is the interphase of extrinsic virus activity and a translational approach of intervention during this time will eliminate the infected clusters of mosquitoes.

COMMUNICABLE DISEASES

1.2 Development of probe to detect dengue transmission or blocking proteins in mosquitoes as early warning tool of transmission risk of dengue in endemic areas (fellowship project)

- Vinod Joshi, Sc. 'F' and Bennet Angel

Commencement: February, 2010 **Duration:** Three Years **Status:** Ongoing

OBJECTIVES

1. Establishment of a Cause & Effect relationship between midgut proteins and horizontal transmission and ovarian proteins and vertical transmission of dengue virus by mosquito vectors in in-vitro and in-vivo experiments. Implication of proteins for facilitating and blocking of virus replication by mosquito cells.
2. Sequencing of observed proteins, determining complete peptide, synthesis of peptide and development of specific antibodies against peptide.
3. Application of transmission specific protein antibodies as probe to detect the field collected mosquitoes for developing early warning risk of dengue transmission in an area.

PROGRESS OF THE WORK

Entomological investigations

Aedes larvae were collected from different localities of Jodhpur and brought to the laboratory. The field collected larvae were reared into adults under laboratory conditions. The midgut and ovary of these mosquitoes were dissected out and subjected to SDS-PAGE for studying the protein profile.

Virological investigations

Field collected and laboratory reared mosquitoes were dissected for mid gut and ovarian tissues. Head squash of individual mosquitoes were subjected to Indirect Fluoresce Antibody Test (IFAT) for detecting the presence or absence of dengue antigen.

Proteomic assay of midgut and ovary

Of the 518 *Aedes* mosquitoes analysed, 58 showed presence of High Molecular Weight (HMW) band in the midgut proteins while 171 displayed HMW in their ovarian protein. One of the gel pictures of the SDS-PAGE assay is shown below.

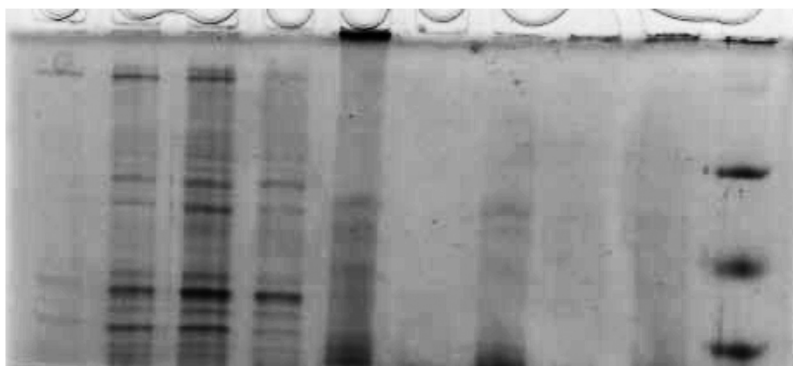


Fig. 1. SDS PAGE assay of mid gut and ovarian proteins of mosquitoes

Association of HMW band with virus presence and absence: The following table shows an association of HMW bands in the midgut as well as the ovary with virus presence and absence.

<i>Aedes species</i>	Total analyzed	Midgut protein profile		Ovarian protein profile		IFA Test result
		Number displaying HMW band	Number displaying LMW band	Number displaying HMW band	Number displaying LMW band	
<i>Aedes aegypti</i>	109	14	31	37	35	0
<i>Aedes albopictus</i>	95	15	13	21	9	12
<i>Aedes vittatus</i>	314	29	37	113	44	9
Total	518	58	81	171	88	21

Protein identification studies of High Molecular Weight (HMW) bands obtained:

The HMW bands (approximately calculated to be of 200 kDa when run along with standard) of the mosquitoes showing absence of dengue antigen in their head squash were sliced from the SDS-PAGE gel and were got subjected to protein identification through MS/MS analysis commercially.

The MS/MS analysis data was then searched against Swis Prot data base. The HMW band from the midgut of *Aedes aegypti* identified 17 proteins while that of ovary identified 36 proteins. In case of HMW band from the ovary of *Aedes albopictus* and *Aedes vittatus*, a total of 35 and 29 proteins respectively were identified. Among other proteins which are more of enzymatic nature, Myosin (muscle protein) (Molecular weight 200kDa) was found present.

COMMUNICABLE DISEASES

1.3 Evaluation of efficacy of different ovitraps for the surveillance and control of dengue vector, *Aedes aegypti* in Jodhpur city

- Karam V. Singh, Sc. 'F', S. K. Bansal, Sc. 'F' and Himmat Singh, R.A.

Commencement: October, 2007 **Duration:** Three Years **Status:** Concluded

OBJECTIVES

1. To evaluate the efficacy of ovitraps in determining the population dynamics of *Aedes aegypti* in surveillance programme
2. To determine the efficacy of different ovitraps containing either Bti or temephos in reducing the immature stages of *Ae. aegypti* and consequently to bring down vector population.

PROGRESS OF THE WORK

The experiments, carried-out in Pratap Nagar locality for the evaluation of lethal ovitraps having *Bacillus thuringiensis* var *israelensis* (Bti) as larvicide, were repeated in an another locality i.e. Chopasni Housing Board (CHB) colony, in view to verify the observations made in Pratap Nagar. The CHB was a part of the preliminary survey carried-out for the selection of the study areas for evaluation of different types of ovitraps. Moreover, CHB colony represents identical experimental conditions as both the colonies have been planned and developed by Rajasthan Housing Board. The studies were conducted in June, 2010.

In CHB a group of 30 houses was selected for the evaluation of lethal ovitraps. The lethal ovitraps used in the experiments contained grass infusion (GI) and Bti. The lethal ovitraps were evaluated mainly in view to study their role for controlling the vector population. The Bti concentration used in the ovitraps was 0.05 ppm, which was the dose caused 100% mortality in the field populations of *Ae. aegypti* collected from the experimental areas. The data on total houses inspected, no. found positive for *Ae. aegypti*, positive containers for larvae & pupae and houses positive for adults for the calculation of the entomological indices viz., house index, container index, Breteau index, larval, pupal and adult premise indices, during pre- and post-experimental conditions. The entomological ovitrap indices viz., ovitraps positive and egg-density indices were also calculated for the study month.

The experiments conducted for the evaluation of GI + Bti ovitraps revealed that the no. of larvae/pupae/adult positive houses was less than the no. of houses detected positive on the basis of positive ovitraps (Tables 1 & 2). It indicates that for the surveillance of *Ae. aegypti* the ovitraps can be proved better than the conventional methods in the arid situations also.

Table 1. Calculations of different Entomological Indices for Ovitaps containing Bti and GI during June, 2010

Entomological Indices	Pre-Exp*.	Post-Exp.
Total Houses Inspected	30	30
Total with immature <i>Ae. aegypti</i>	19	3
No. Water Holding Containers	166	167
Containers with immature	21	4
Adult House Index	6.28	0
Container Index	12.7	2.4
Breteau Index	63.3	10.0
Larval Premise Index	12.7	8.8
Adult Premise Index	23.5	0.0

*Pre-exp. –Before Experiment; Post-exp. – After Experiment

The data collected during pre- and post-experimental conditions suggested that these ovitraps were mainly responsible for reducing the *Ae. aegypti* population in the area, where GI+Bti ovitraps were used, and this was reflected by the data collected on conventional parameters like larvae/pupae/adult positive houses, premises/density indices, container and Breteau indices (Table 1).

Table 2. Calculation of different Entomological Ovitrap Indices for Bti during June, 2010

Entomological Ovitrap Indices	No./Indices
Total Houses Inspected	30
Total Ovitrap Installed	120
Total Houses with Positive Ovitrap	24
Total Positive Ovitrap with <i>Ae. aegypti</i> Eggs	79
Total No. of <i>Ae. aegypti</i> Eggs	13429
Ovitrap Positive Index	80.0
Egg Density Index	191.8

Table 3. Location-wise positivity of ovitraps in CHB experimental area

Ovitrap Installation site	No. Installed	Positive	% positive
Bathroom	50	30	60.0
Bedroom	24	12	50.0
Lobby	31	23	74.1
Other	15	05	33.3
Total	120	70	58.5

The data collected on the location-wise installations of the ovitraps in experimental area revealed that the maximum ovitraps were found positive installed in lobby areas of the houses (74.1%), followed by bathrooms (60.0%), and other locations (33.3%) representing store rooms, kitchens, shops, first floors, etc, which showed least positivity (Table 3).

On the observations so far made it can be concluded that the lethal ovitraps evaluated during the studies may be used as suitable means for the surveillance of *Ae. aegypti* population in the arid situations and also help in reduction of vector populations in the areas of their use, which is reflected through the related entomological parameters/indices.

COMMUNICABLE DISEASES

1.4 Development of molecular markers for the identification of biological forms of *Anopheles stephensi* prevalent in arid areas of Rajasthan

- Karam V. Singh, Sc. 'F', S. K. Bansal, Sc. 'F', Himmat Singh, R.A., Robin Marwal J.R.F. and Anusha Mishra, R.A.

Commencement: February, 2010 **Duration:** Two Years **Status:** Ongoing

OBJECTIVE

1. Identification of biological forms of *Anopheles stephensi* using molecular tools and studies on their bionomics and distribution in different arid environs.

PROGRESS OF THE WORK

The studies during the report period have been carried out in Jodhpur, Jaisalmer and Barmer districts, as per project proposal. Though the project was initiated in February, 2010, however, the actual field work started in September, 2010, after the recruitment of the project staff i.e. one JRF and one Research Assistant. The main emphasis during the report period have been given on the investigations related to the distribution and bionomics of *An. stephensi* bioforms, present in the study areas. In each district two types of locations i.e. urban and rural were selected for the investigation and entomological survey was carried out for the collection of adult as well as immature stages of *An. stephensi* bioforms, besides recording the data on associated factors.

Faunal Distribution:

Two bioforms of *An. stephensi* species i.e. 'type' and variety *mysorensis* were recorded during the field studies. The distributional pattern of the bioforms have been given in Table 1. In Jodhpur district from urban areas only var. *mysorensis* was recorded, whereas, from urban locations of Jaisalmer and Barmer districts both var. *mysorensis* as well as type forms were found sharing the same habitats. In rural Jodhpur location i.e. Jhalamund village and Mahadev Nagar, both type and var. *mysorensis* bioforms were recorded, whereas, in Barmer (Baitu & Marudi villages) only type form and in Jaisalmer (Raghava & Tejpala villages) only var. *mysorensis*, were recorded. The distributional pattern of *An. stephensi* bioforms in the study areas is unique and needs further investigations to establish whether the type form reported from rural locations and var. *mysorensis* are the original forms or some eco-variants of the original forms, as these bioforms are responsible in these arid areas for the transmission of malaria, paying special attention on their behavior and vectorial capacity.

Breeding Habits:

The breeding of both the bioforms in the study area was observed mainly in cemented tanks kept on different locations i.e. Overhead (OH), Ground (G) and Underground (UG), and both larval and pupal

forms were collected during the field investigations (Table 2). The var. *mysorensis* was found breeding mainly in turbid waters having algal slime, whereas, the type form preferred clear water.

Table 1. Distribution of different bioforms of *An. stephensi* in study areas

District	Collection Localities	Type of Localities	Record of Bioforms			
			Stage of collection		Forms identified	
			Larvae	Adults	Type	mysorensis
Jodhpur	Public Park - Jodhpur City	Urban	+	-	-	+
	Rameshwar Nagar - Jodhpur City	Urban	+	-	-	+
	Jhalamand Village	Rural	+	+	+	+
	Mahadev Nagar	Rural	+	+	+	+
Jaisalmer	Hanuman Chowk - Jaisalmer City	Urban	+	-	+	+
	Raghwa Village	Rural	+	-	-	+
	Tejpala Village	Rural	+	+	-	+
Barmer	Station road - Barmer City	Urban	+	-	+	+
	Baitu Village	Rural	+	-	+	-
	Marudi Village	Rural	+	+	+	-

*+ present, - absent

Identification of bioforms:

The identification of the *An. stephensi* bioforms is possible only on the basis of the no. of ridges present on the eggs as there exists no morphological characteristics to differentiate than at adults stage. During the present studies the type form has been identified as the eggs having ridge count ≥ 16 and the var. *mysorensis* with ≤ 14 ridge count and this classification has identified the individuals so far encountered during the conduct of the field studies.

Morphological variations:

The morphological variations observed during the studies have revealed that the mean length and width of the eggs of both type and var. *mysorensis* have differences. The egg of var. *mysorensis* was found having both average length and width smaller than the length and width of the eggs of the type form (Table 3). Similarly, the Spiracular Index (Table 4), the ratio of length of spiracle and the total length of the thorax, was also found smaller in case of var. *mysorensis* (SI = 7.763) in comparison to type form (SI = 8.944), which indicate that var. *mysorensis* is more capable to withstand arid conditions than type form.

Table 2. Details of the breeding sites of bioforms of *An. stephensi* in study areas

District	Collection Localities/ Type	Breeding sites	Life-stage collected	Water Quality			Bioform Identified
				Temp (°C)	pH	Water quality	
Jodhpur	Public Park -Jodhpur City, Urban	Garden Fountain (Cemented)	Larvae & pupae	17-26	7.5-9.5	Turbid with algae	Mysorensis
	Rameshwar Nagar - Jodhpur City, Urban	Cement Tank (UG)*	Larvae	20	7.9	Clear	Mysorensis
	Jhalamand Village, Rural	Cement Tank (OH)	Larvae & pupae	22-28	7.8-9.1	Turbid with algae	Type & Mysorensis
	Mahadev Nagar, Rural	Cement Tank (G)	Larvae	28	8.2	Turbid with algae	Type & Mysorensis
Jaisalmer	Hanuman Chowk - Jaisalmer City, Urban	Plastic Drum, Cement Tank (G, UG)	Larvae & pupae	25	7.5	Clear	Type & Mysorensis
	Raghwa Village, Rural	Cement Tank (G)	Larvae	27	7.5	Turbid with algae	Mysorensis
	Tejpala Village, Rural	Cement Tank (UG)	Larvae	26	7.4	Clear	Mysorensis
Barmer	Station road - Barmer City, Urban	Cement Tank (UG,G)	Larvae & pupae	26	7.5	Clear	Type & Mysorensis
	Baitu Village, Rural	Cement Tank (UG)	Larvae	27	7.8	Clear	Type
	Marudi Village, Rural	Cement Tank (G)	Larvae & pupae	25	7.4	Clear	Type

*(G)-Ground, (UG)-Under ground, (OH)-Over head

Table 3. Ridge counts and measurements of eggs of *An. stephensi* type and *var. mysorensis* bioforms.

Bioform	Ridge count	Length (mm) Mean + SD	Width (mm) Mean + SD
Type	≥ 16	0.540 ± 0.0172	0.190 ± 0.008
Mysorensis	≤ 14	0.498 ± 0.0156	0.174 ± 0.016

Table 4. Spiracular Index of *An. stephensi* type and *var. mysorensis*

Bioforms	Length of thorax (mm) Mean + SD	Length of spiracle (mm) Mean + SD	Spiracular Index(SI) Mean + SD
Type	1.442± 0.036	0.129 ± 0.010	8.944± 0.579
Mysorensis	1.180± 0.076	0.091 ± 0.008	7.763 ± 0.453

The studies on the insecticide susceptibility of different bioforms besides some observations on their bionomics are in progress.

COMMUNICABLE DISEASES

1.5 Current status of susceptibility of *Aedes aegypti* and *Anopheles stephensi* against larvicides/insecticides being used in National Programme in Rajasthan

- Karam V. Singh, Sc. 'F', S. K. Bansal, Sc. 'F' and Himmat Singh, R.A.

Commencement: October, 2010 **Duration:** Two Year **Status:** New

OBJECTIVES

1. To determine the current status of susceptibility of *Ae. aegypti* and *An. stephensi* in rural, with particular reference to arid situations, and urban areas of Rajasthan against conventional insecticides being used under national control programme, and
2. Determination of biochemical mechanisms involved in the development of insecticide resistance, if any.

PROGRESS OF WORK

The studies were carried-out in 5 districts of Rajasthan state viz., Ajmer, Barmer, Bikaner, Jodhpur and Pali districts and only urban localities were considered during the report period. During the field investigations, the main emphasis was given on the collection of adult and larval forms of both the vector species in different habitats potential for their resting and breeding. Besides mosquito collection the record of different characteristics of breeding/resting habitats pertaining to various environmental aspects was also made.

Susceptibility tests were carried out with the adults and larvae of two mosquito species viz., *An. stephensi* and *Ae. aegypti*, collected from the field or reared in the insectary under controlled conditions of temperature ($28\pm 2^{\circ}\text{C}$) and humidity ($75\pm 5\%$). Unfed females and third or early fourth instar larvae of these mosquito species were tested as per standard WHO methods for the determination of the baseline data on their susceptibility status using diagnostic doses of the test insecticides/larvicides. The tests were conducted against adulticides viz. DDT and Malathion and larvicides, Abate and *Bacillus thuringiensis* var *israelensis* (Bti). Four to five replicates of each observation were made and the data was subjected to log probit regression analysis. WHO criteria was followed for the determination of the susceptibility status of individual species.

An. stephensi adults of districts Jodhpur and Bikaner were tested against the diagnostic doses of DDT and Malathion and the results of the tests revealed that this species has developed resistance against both the insecticides in Jodhpur and Bikaner districts (Table 1).

Table 1. Susceptibility status of *Anopheles stephensi* against DDT and Malathion

Districts	Insecticide & Diagnostic Dose	Exposure time in Hours	Mortality %	Susceptibility Status*
Jodhpur	DDT, 4%	1.0	79.0	R
	Malathion, 5%	1.0	63.0	R
Bikaner	DDT, 4%	1.0	26.9	R
	Malathion, 5%	1.0	13.0	R

*R- Resistant

The susceptibility status of *An. stephensi* was also determined against Bti larvicide in the urban localities of Jodhpur and Ajmer cities, revealed that the species was susceptible to Bti from both the cities areas of Ajmer, Bikaner (Table 2).

Table : 2 Susceptibility status of *Anopheles stephensi* against Bti

Districts	Dose	No. exposed	No. Dead	Mortality %	Susceptibility Status*
Jodhpur	1ppm	400	715	100	S
Ajmer	1ppm	100	100	100	S

*S- Susceptible

The lethal concentrations of Bti at 50 and 90 percent levels were also determined for *An. stephensi* and it was found that at 90 percent level the Bti was found more effective in Jodhpur city than Ajmer (Table 3). The heterogeneity of the response of *An. stephensi* population tested in Jodhpur was found statistically significant.

Table 3. Determination of lethal concentrations of Bti larvicide against *Anopheles stephensi*

Districts	Regression equation	LC ₅₀ (ppm)	LC ₉₀ (ppm)	Chi Square (df)
Jodhpur -Urban	Y= -10.0 + 9.57 X	0.060	0.149	48.6* (5)
Ajmer -Urban	Y= -3.59 + 3.52 X	0.067	0.176	7.4 (4)

*Heterogeneity of the response was found statistically significant

Aedes aegypti adults, reared from the larvae collected from urban localities of Ajmer, Bikaner Jodhpur and Pali, were tested for their insecticide susceptibility status against DDT and Malathion. The testes revealed that *Ae. aegypti* adults, collected from Ajmer, and Bikaner, exhibited intermediate resistance against both the tested insecticides, whereas, the adults from Pali city were partial resistant to Malathion but susceptible to DDT. In Jodhpur city, the adult population of *Ae. aegypti* was found susceptible to both DDT and Malathion (Table 4).

Table 4. Susceptibility status of *Ae. aegypti* against DDT and Malathioin

Districts	Insecticide	Dose	Exposure time (Hours)	Mortality %	Susceptibility Status*
Ajmer	DDT	4%	1	85.0	IR
	Malathioin	5%	1	89.2	IR
Bikaner	DDT	4%	1	83.3	IR
	Malathioin	5%	1	90.9	IR
Jodhpur	DDT	4%	1	100.0	S
	Malathioin	5%	1	100.0	S
Pali	DDT	4%	1	83.0	IR
	Malathioin	5%	1	100.0	S

*S- Susceptible, IR- Intermediate Resistance

The studies on the susceptibility status of urban mosquito vectors in other selected districts against both adulticides and larvicides are in progress.

COMMUNICABLE DISEASES

1.6 Evaluation of some plant species found in the arid region for the larvicidal/repellant potential of their oils against the major mosquito vectors

- S. K. Bansal, Sc. 'F' and Karam V. Singh, Sc. 'F'

Commencement: June, 2009 **Duration:** Three Years **Status:** Ongoing

OBJECTIVES

1. Determination of the larvicidal activity present in different parts of the plants after extraction in different organic solvents
2. Extraction of oils present in different parts especially the fruits and seeds and evaluation of their larvicidal /repellant potential against mosquito vectors
3. Identification of the active insecticidal constituents present in different parts and comparison of their larvicidal/repellant properties

PROGRESS OF THE WORK

Studies are being carried out on *W. somnifera*, also known as Ashwagandha, a plant in Solanaceae or nightshade family. Fruits, leaves and seeds of this plant have been traditionally used for the Ayurvedic system as aphrodisiacs, diuretics and for treating memory loss. Larvicidal properties have been observed in some parts of this plant while repellant action of the oils present in the seeds and fruits are going on with adults of different mosquito species. The study will suggest the actual effective constituents of the plant extract which have larvicidal/repellent properties and later can be considered for the development of a commercial product.

Susceptibility tests were carried out with larvae of three mosquito species viz. *Anopheles stephensi*, *Aedes aegypti* and *Culex quinquefasciatus*. For this purpose larvae of all the three mosquito species were collected from different areas of Jodhpur city and reared in the laboratory for further generations under controlled conditions. The different parts of the plant differ in their active constituents when extracted in different solvents. Samples of roots, leaves and fruits were chopped and shade dried between 30-40°C for 10-15 days. Dried plant material was powdered separately and dissolved in different solvents and stock solutions and duration and serial dilutions were made as per requirement. Third or early fourth instar larvae of these mosquito species were tested as per standard WHO method for determining the baseline data on their susceptibility status. Experiments were carried out in 500 ml beakers containing 249 ml of water by using 20-25 larvae of each mosquito species. Mortality was noted after 24 hr and corrected by using Abbott's formula. Average of four observations was taken and data subjected to log probit regression analysis.

Observations on the results of the larval susceptibility to aqueous extracts of green fruits of *W. somnifera* are given in Tables 1&2. With all the mosquito species mortality was dose and duration dependent i.e. mortality increased with increase in concentration. 24 and 48 hr LC₅₀ values along with their fiducial limits, regression equation and chi-square were calculated. 24 and 48 hr LC₅₀ values as observed for *An. stephensi*, *Ae. aegypti* and *Cx. quinquefasciatus* were 350.9, 372.4 & 576.9 and 238.2, 261.4 & 290.7 mg/l respectively. Larval susceptibility tests were carried out with methanol extracts of green fruits of *W. somnifera* with larvae of all the three mosquito species and the results have been given in Tables 3&4. 24 and 48 hr LC₅₀ values as determined for *An. stephensi*, *Ae. aegypti* and *Cx. quinquefasciatus* were 115.0, 197.1 & 554.6 and 77.9, 106.3 & 318.7 mg/l respectively. Susceptibility tests were also carried out with petroleum ether extracts of these fruits (Table 5&6) with these mosquito species and the 24 and 48 hr LC₅₀ values were 154.9, 312.0 & 1085.0 and 86.7, 239.6 & 964.5 mg/l respectively which revealed that larvae of *An. stephensi* were more susceptible followed by *Ae. aegypti* and *Cx. quinquefasciatus* with all the aqueous and organic solvents (Table 7).

Larval susceptibility tests were also carried out with methanol and aqueous extracts of leaves and roots of *W. somnifera* with larvae of all the three mosquito species and the results have been given in Tables 8&9. Percent mortalities determined from 50-500 mg/l for both the methanol and aqueous extracts of leaves and root with all the three mosquito species revealed that tests carried out even at the highest concentration (500 mg/l) show only up to 25-40% mortality indicating that active larvicidal principle may be present only in the fruits of *W. somnifera* and not in its leaves and roots.

Experiments are also being carried out with methanol, acetone and petroleum ether extracts of roots, leaves and seeds & fruits of this plant species in order to see the comparative efficacy of different organic solvents on these mosquito species in this arid region.

Table 1. Efficacy of aqueous extracts of *W. somnifera* (Green fruits) on larvae of different mosquito vectors

Mosquito species/ Conc. (mg/l)	No. Exposed	No. Dead		% Exptl. Mortality		% Corrected Mortality	
		24 hr	48hr	24 hr	48hr	24 hr	48hr
<i>An. stephensi</i>							
Control	99	2	7	2.0	7.1	-	-
50	98	6	22	6.1	22.4	6.1	16.5
100	98	28	44	28.6	44.9	28.6	40.7
200	100	42	56	42.0	56.0	42.0	52.6
400	97	50	58	51.5	59.8	51.5	56.7
500	97	52	64	53.6	66.0	53.6	63.4
<i>Ae. aegypti</i>							
Control	95	0	6	0.0	6.3	-	-
50	96	6	20	6.3	20.8	6.3	15.5
100	94	26	42	27.7	44.7	27.7	41.1
200	97	40	52	41.2	53.6	41.2	50.5
400	97	48	54	49.5	55.7	49.5	52.7
500	95	50	60	52.6	63.2	52.6	60.7
<i>Cx. quinquefasciatus</i>							
Control							
50	100	2	5	2.0	5.0	-	-
100	100	8	19	8.0	19.0	8.0	14.7
200	100	21	35	21.0	35.0	21.0	31.6
400	99	36	50	36.4	50.5	36.4	47.9
500	99	41	58	41.4	58.6	41.4	56.4
	100	44	59	44.0	59.0	44.0	56.8

Table 2. Log probit regression analysis of the mortality data of larvae of different mosquito vectors to aqueous extracts of green fruits of *W. somnifera*

Mosquito Species	Regression Equation	Chi- Square (DF)	24 hr LC ₅₀ (95% C. limits)	48 hr LC ₅₀ (95% C. limits)
<i>An. stephensi</i>	Y=1.46x +1.27	3.48 (3)	350.9 (239.1-514.7)	238.2 (151.0-375.8)
<i>Ae. aegypti</i>	Y=1.43x +1.32	3.18 (3)	372.4 (249.2-556.5)	261.4 (165.0-414.4)
<i>Cx. quinquefasciatus</i>	Y=1.16x +1.80	1.45 (3)	576.9 (314.4-1059.0)	290.7 (188.9-313.4)

All values of 24 and 48hr LC₅₀ along with their 95% Confidence limits are in mg/l⁻¹

DF- Degree of Freedom

Table 3. Efficacy of methanol extracts of *W. somnifera* (Green fruits) on larvae of different mosquito vectors

Mosquito species/ Conc. (mg/l)	No. Exposed	No. Dead		% Exptl. Mortality		% Corrected Mortality	
		24 hr	48hr	24 hr	48hr	24 hr	48hr
<i>An. stephensi</i>							
Control	100	0	5	0.0	5.0	-	-
25	99	8	18	8.1	18.2	8.1	13.9
50	99	18	33	18.2	33.3	18.2	29.8
100	98	45	58	45.9	59.2	45.9	57.1
200	99	68	90	68.7	90.9	68.7	90.4
400	97	90	95	92.8	97.9	92.8	97.8
<i>Ae. aegypti</i>							
Control	98	3	4	3.1	4.1	-	-
50	97	6	17	6.2	17.5	6.2	17.5
100	96	29	45	30.2	46.9	30.2	46.9
200	99	57	71	57.6	71.7	57.6	71.7
400	99	72	76	72.7	76.8	72.7	76.8
500	100	76	81	76.0	81.0	76.0	81.0
<i>Cx. quinquefasciatus</i>							
Control							
50	100	3	3	3.0	3.0	-	-
100	96	7	8	7.3	8.3	7.3	8.3
200	95	16	24	16.8	25.3	16.8	25.3
400	97	32	44	33.0	45.4	33.0	45.4
500	97	41	52	42.3	53.6	42.3	53.6
	98	44	57	44.9	58.2	44.9	58.2

Table 4. Log probit regression analysis of the mortality data of larvae of different mosquito vectors to methanol extracts of green fruits of *W. somnifera*

Mosquito Species	Regression Equation	Chi-Square (DF)	24 hr LC ₅₀ (95% C. limits)	48hr LC ₅₀ (95% C. limits)
<i>An. stephensi</i>	$Y=2.27x +0.33$	0.54 (3)	115.0 (88.6-149.3)	77.9 (60.4-100.4)
<i>Ae. aegypti</i>	$Y=2.22x -0.10$	2.16 (3)	197.1 (153.8-252.4)	106.3 (60.2-187.6)
<i>Cx. quinquefasciatus</i>	$Y=1.30x +1.44$	0.73 (3)	554.6 (324.6-947.1)	318.7 (221.9-457.6)

All values of 24 and 48hr LC₅₀ along with their 95% Confidence limits are in mg/l⁻¹

DF- Degree of Freedom

Table 5. Efficacy of Petroleum Ether extracts of *W. somnifera* (Green fruits) on larvae of different mosquito vectors

Mosquito species/ Conc. (mg/l)	No. Exposed	No. Dead		% Exptl. Mortality		% Corrected Mortality	
		24 hr	48hr	24 hr	48hr	24 hr	48hr
<i>An. stephensi</i>							
Control	100	2	3	2.0	3.0	-	-
25	100	10	18	10.0	18.0	10.0	18.0
50	98	24	39	24.5	39.8	24.5	39.8
100	98	40	56	40.8	57.1	40.8	57.1
200	97	55	70	56.7	72.2	56.7	72.2
400	100	71	79	71.0	79.0	71.0	79.0
<i>Ae. aegypti</i>							
Control	98	4	6	4.1	6.1	-	-
50	98	12	20	12.2	20.4	12.2	15.2
100	100	24	36	24.0	36.0	24.0	31.8
200	96	38	50	39.6	52.1	39.6	49.0
400	96	52	60	54.2	62.5	54.2	60.1
500	95	60	65	63.2	68.4	63.2	66.3
<i>Cx. quinquefasciatus</i>							
Control							
50	100	5	6	5.0	6.0	-	-
100	100	9	13	9.0	13.0	4.2	7.4
200	99	16	21	16.2	21.2	11.8	16.2
400	97	26	32	26.8	33.0	22.9	28.7
500	97	32	36	33.0	37.1	29.5	33.1
	100	35	40	35.0	40.0	31.6	36.2

Table 6. Log probit regression analysis of the mortality data of larvae of different mosquito vectors to petroleum ether extracts of green fruits of *W. somnifera*

Mosquito Species	Regression Equation	Chi-Square (DF)	24 hr LC ₅₀ (95% C. limits)	48 hr LC ₅₀ (95% C. limits)
<i>An. stephensi</i>	Y=1.49x +1.73	0.39 (3)	154.9 (107.2-224.0)	86.7 (61.3-122.7)
<i>Ae. aegypti</i>	Y=1.45x +1.38	0.11 (3)	312.0 (212.2-458.7)	239.6 (166.8-344.3)
<i>Cx. quinquefasciatus</i>	Y=1.19x +1.39	0.81 (3)	1085.0 (692.6-1418.5)	964.5 (405.5-2294.0)

All values of 24 and 48hr LC₅₀ along with their 95% Confidence limits are in mg l⁻¹

DF- Degree of Freedom

Table 7. Comparative efficacy of red and green fruits of *W. somnifera* against different mosquito species in different organic solvents

Mosquito Species	Solvent used	Red Fruits		Green fruits	
		24hr LC ₅₀ (95% C. limits)	48hr LC ₅₀ (95% C. limits)	24hr LC ₅₀ (95% C. limits)	48hr LC ₅₀ (95% C. limits)
<i>An. stephensi</i>	Water	473.5 (306.8-628.5)	324.8 (184.1-564.7)	350.9 (239.1-514.7)	238.2 (151.0-375.8)
<i>Ae. aegypti</i>		406.4 (267.9-1033.3)	303.6 (113.2-735.6)	372.4 (249.2-556.5)	261.4 (165.0-414.4)
<i>Cx. quinquefasciatus</i>		445.2 (214.0-845.9)	266.2 (129.0-313.4)	576.9 (314.4-1059.0)	290.7 (188.9-313.4)
<i>An. stephensi</i>	Methanol	94.7 (74.6-120.2)	57.2 (44.8-73.0)	115.0 (88.6-149.3)	77.9 (60.4-100.4)
<i>Ae. aegypti</i>		94.5 (70.3-127.1)	53.5 (41.3-69.3)	197.1 (153.8-252.4)	106.3 (60.2-187.6)
<i>Cx. quinquefasciatus</i>		1013.0 (439.4-2333)	790.5 (353.6-1767)	554.6 (324.6-947.1)	318.7 (221.9-457.6)
<i>An. stephensi</i>	Petroleum Ether	241.8 (155.2-432.7)	146.4 (130.5-164.1)	154.9 (107.2-224.0)	86.7 (61.3-122.7)
<i>Ae. aegypti</i>		535.0 (476.5-622.5)	367.9 (231.6-781.9)	312.0 (212.2-458.7)	239.6 (166.8-344.3)
<i>Cx. quinquefasciatus</i>		893.3 (692.6-1418.5)	695.6 (565.2-977.0)	1085.0 (692.6-1418.5)	964.5 (405.5-2294.0)

All values of 24 and 48hr LC₅₀ along with their 95% Confidence limits are in mg l⁻¹

DF- Degree of Freedom

Table 8. Efficacy of methanol extracts of leaves and roots of *W. somnifera* on larvae of different mosquito vectors after 24 and 48hr

Mosquito species/ Concentrations (mg l ⁻¹)	Percent Mortality with methanol Leaves Extract					Percent Mortality with methanol Root Extract				
	No. Exposed	No. Dead		% Exptl. Mortality		No. Exposed	No. Dead		% Exptl. Mortality	
		24	48	24	48		24	48	24	48
<i>An. stephensi</i>										
Control	100	1	2	1.0	2.0	98	2	3	2.0	3.1
50	99	5	10	5.1	10.1	99	4	6	4.0	6.0
100	99	10	15	10.1	15.1	95	7	10	7.4	10.5
200	100	15	20	15.0	20.0	99	13	16	13.1	16.2
400	98	25	30	25.5	30.6	96	20	24	20.8	25.0
500	97	30	35	30.9	36.1	98	28	38	28.6	38.8
<i>Ae. aegypti</i>										
Control	80	0	0	0.0	0.0	100	1	1	1.0	1.0
50	80	0	4	0.0	5.0	100	3	4	3.0	4.0
100	80	4	8	5.0	10.0	98	5	7	5.1	7.1
200	80	8	12	10.0	15.0	98	10	13	10.2	13.3
400	79	12	16	15.2	20.3	97	15	18	15.5	18.6
500	80	20	24	25.0	30.0	98	20	28	20.4	28.6
<i>Cx. quinque-fasciatus</i>										
Control	80	2	4	2.5	5.0	99	2	4	2.0	4.0
50	79	2	3	2.5	3.8	100	7	9	7.0	9.0
100	80	6	11	7.5	13.8	98	9	12	9.2	12.2
200	80	18	21	22.5	26.3	97	10	14	10.3	14.4
400	80	24	28	30.0	35.0	99	12	18	12.1	18.2
500	78	29	32	37.2	41.0	100	15	20	15.0	20.0

Table 9. Efficacy of aqueous extracts of leaves and roots of *W. somnifera* on larvae of different mosquito vectors after 24 and 48hr

Mosquito species/ Concentrations (mg l ⁻¹)	Percent Mortality with aqueous Leaves Extract					Percent Mortality with aqueous Root Extract				
	No. Exposed	No. Dead		% Exptl. Mortality		No. Exposed	No. Dead		% Exptl. Mortality	
		24	48	24	48		24	48	24	48
<i>An. stephensi</i>										
Control	100	1	2	1.0	2.0	100	2	3	2.0	3.0
50	96	4	7	4.2	7.3	100	4	6	4.0	6.0
100	97	9	11	9.3	11.3	99	7	10	7.1	10.1
200	99	11	14	11.1	14.1	99	9	13	9.1	13.1
400	95	14	20	14.7	21.0	99	9	15	9.1	15.2
500	99	16	24	16.2	24.2	100	12	18	12.0	18.0
<i>Ae. aegypti</i>										
Control	97	0	1	0.0	1.0	99	1	1	1.0	1.0
50	95	0	2	0.0	2.1	99	3	4	3.0	4.0
100	94	5	10	5.3	10.6	99	5	7	5.1	7.1
200	98	10	15	10.2	15.3	97	6	10	6.2	10.3
400	99	14	19	14.1	19.2	97	9	14	9.3	14.4
500	100	15	20	15.0	20.0	96	11	15	11.5	15.6
<i>Cx. quinquefasciatus</i>										
Control										
50	99	2	5	2.0	5.1	98	2	4	2.0	4.1
100	95	3	7	3.2	7.4	98	2	3	2.0	3.1
200	95	7	13	7.4	13.7	99	3	5	3.0	5.1
400	96	12	16	12.5	16.7	99	5	8	5.1	8.1
500	100	16	20	16.0	20.0	100	7	11	7.0	11.0
	99	17	21	17.2	21.2	100	9	12	9.0	12.0

COMMUNICABLE DISEASES

1.7 A study of factors affecting incidence of malaria in children in desert part of Rajasthan

- S. P. Yadav, Sc. 'E', A. K. Dixit, Sc. 'E' and R. K. Kalundha, T.O.

Commencement: September, 2008 **Duration:** Two Years **Status:** On going

OBJECTIVES

1. To know the current status of malaria in children in desert part of Rajasthan.
2. To know the factors affecting incidence of malaria in children.

PROGRESS OF WORK

Malaria incidence

Malaria incidence was 102 per 1,000 population. Sixty-eight percent of malaria cases occurred in only 15% of households. Overall, 6.9% of individuals had a malaria episode; 5.6% of individuals had two or more malaria episodes to a maximum of four. Malaria incidence was significantly higher in children, 138.4 per 1,000 population, than adults (58.3 per 1,000 population).

Individual factors associated with malaria incidence

Few individual level factors were associated with malaria incidence. In children, only "age 5–9 years" (referent, 15–17 years) was statistically significant; in adults, only age and work status were associated with malaria risk. In both adults and children, bed net use was rare at baseline; however, no malaria case occurred in adults using bed net at baseline.

Household factors associated with malaria incidence

The average family size was 6.1. On an average, there were 0.6 malaria episodes per household. Eighty-one percent of households were in hamlets, 77% kept cows, camels, goats, sheep, 95% had no running water in their home, and 97.1% had no toilet. Agriculture was common in study households, a fact reflected by the low occurrence (25%) of household compounds with a low level of vegetation. Many households used household-level prevention against malaria (72%; primarily burning cow dung or cutting vegetation around the home). However, few (3.1%) had any window screens or owned bed nets at baseline (3.4%). A number of household level factors were associated with malaria including household use of preventive measures, absence of toilet or outhouse on compound, greater than seven livestock animals kept within 10 m of home, distance in meters vector breeding site, < 350 m from vector breeding site, household has children age 5–9 years, and household has member(s) with outdoor job(s), or indoor job(s).

Factors associated with malaria infection

Distance from the major vector breeding site and number of adults with indoor jobs were the only factors significantly associated with malaria incidence in children. No interaction terms were found to be significant. In children of all ages, house distance to the breeding site exerted a profound effect on malaria incidence, particularly within 350 m from the breeding site. At 150 m from the breeding site, the mean adjusted malaria incidence in children 0–17 years of age was 1,374 per 1,000 population compared with 373 per 1,000 population at 350 m. Keeping more than seven livestock animals < 10 m from the house was associated with higher incidence. Adult malaria incidence was also strongly associated with house distance to the vector breeding site, particularly for adults < 60 years of age. Thus, there is no evidence that the observed association is attributable to malaria transmission from children to adults within households.

INFERENCE

Findings of the study have important policy implications. The importance of house distance to the major vector-breeding site in determining malaria risk suggests that vector control strategies targeted at such sites could greatly reduce the malaria burden in the desert.

IMPORTANT LEADS/OUTCOME FROM THE STUDY

Data will be useful to planners, researchers and implementers in regard to malaria control. SAC 2010 advised to continue the project and present the findings in the next meeting.

COMMUNICABLE DISEASES

1.8 A study of association between socio-economic factors and transmission of malaria in desert

- S. P. Yadav, Sc. 'E', A. K. Dixit, Sc. 'E' and R. K. Kalundha, T.O.

Commencement: October, 2007 **Duration:** Two Years **Status:** Completed

OBJECTIVES

1. To study the socio-economic factors associated with malaria transmission in desert.
2. To find out the social solutions to control desert malaria.

PROGRESS OF WORK

Socio-demographic characteristics of the subjects

Majority of respondents in both groups (Command Villages (CVs) 69.6% and Non- Command Villages (NCVs) 68.5%) were < 40 years of age. Nearly one fifth (21.5% in CVs and 20.4% in NCVs) were female among the study subjects. About eighty two per cent (82.4%) were Hindus and among them 53.9% general caste (GC), 24.1% schedule caste/schedule tribe (SC/ST) and 22.0% other backward castes (OBC). Over all literacy rate was 65.7% and it was higher amongst the CVs (78.2%) as compare to NCVs (53.3%). Majority (64.3%) respondents were earning their livelihood from agriculture and its related work (Table 1).

Malaria illness perception:

The major 492 (91.1%) of the combined respondents were considered 'TAV' as fever. These respondents explained TAV is raised temperature of body (hot body) as compare to normal. They confirm fever by touching body of febrile person and classified as low, moderate and high based on the degree of past experiences. Further more in depth TAV was classified and Malaria considered as a one kind of classification of TAV which defined as 'HEETAV' (fever with shivering) or 'EKANTRATAV' (fever on alternate days).

Symptoms of disease:

The important symptoms of malaria such as fever with shivering and vomiting were substantially less known to respondents of NCVs (39.3 and 4.4%) as compared to CVs (56.3 and 6.3%). Other symptoms such as loss of appetite, headache and giddiness and yellow eye were told more by the respondents of the NCVs as compare to CVs. However, respondents were almost equal number in stating malaria

with multiple symptoms i.e. 21 (7.8%) and 21 (7.8%) by both the groups. Besides in depth discussions combined respondents out of 42 (21+21) 38 (90.5%) {CVs=20(52.6%+NCVs=18(47.4%)} expressed fever is dangerous, if it is not cured, it leads further complications in the body and ultimately death (Table 2).

Table 1. Socio-demographic characteristics of the study population

Variables	Villages				Total (n=540)	
	Command (n=270)		Non-Command (n=270)			
	No.	%	No.	%	No.	%
Age						
<30	105	38.9	119	44.1	224	41.5
31-40	83	30.7	66	24.4	149	27.6
41-50	30	11.1	42	15.6	72	13.3
>50	52	19.3	43	15.9	95	17.6
Sex						
Male	212	78.5	215	79.6	427	79.1
Female	58	21.5	55	20.4	113	20.9
Religion						
Hindus	224	83.0	221	81.9	445	82.4
Others	46	17.0	49	18.1	95	17.6
Castes among Hindus						
G C	137	61.1	103	46.6	240	53.9
OBC	47	21.0	51	23.1	98	22.0
SC/ST	40	17.9	67	30.3	107	24.1
Education						
Illiterate	59	21.8	126	46.7	185	34.3
Literate	121	44.8	100	37.0	221	40.9
Primary	35	13.0	24	8.9	59	10.9
Middle and above	55	20.4	20	7.4	75	13.9
Occupation						
Agriculture	143	53.0	74	27.4	217	40.2
Agricultural Labour	64	23.7	66	24.5	130	24.1
Labour	16	5.9	49	18.1	65	12.0
Artesian	19	7.0	28	10.4	47	8.7
Others	28	10.4	53	19.6	81	5.0

GC= General Caste OBC= Other Backward Caste SC/ST= Schedule Caste/Schedule Tribe

Table 2. Knowledge and practice regarding malaria in the desert population

Variables	Villages				Total (n=540)		x²	P-value
	Command (n=270)		Non-Command (n=270)					
	No.	%	No.	%	No.	%		
Symptoms								
Fever with shivering	152	56.3	106	39.3	258	47.5	8.2	0.005
Loss of appetite	46	17.0	76	28.1	122	22.6	7.3	0.01
Headache and giddiness	20	7.4	30	11.1	50	9.3	2.0	
Yellow eye	14	5.2	25	9.3	39	7.2	3.1	
Multiple symptoms	21	7.8	21	7.8	42	7.7	0.0	
Vomiting	17	6.3	12	4.4	29	5.4	0.86	
Causation of disease								
Malaria parasite	155	57.4	93	34.4	248	45.9	15.5	0.001
Changing environment	49	18.1	91	33.7	140	25.9	12.6	0.001
Multiple causes	25	9.3	33	12.2	58	10.8	1.1	
Personal hygiene	19	7.0	26	9.6	45	8.3	1.08	
Impure water and edible items	12	4.4	14	5.2	30	5.6	0.15	
Don't know	10	3.7	13	4.8	23	4.3	0.39	
Factors approached for problem solving								
Family	175	64.8	126	46.7	300	55.6	7.97	0.05
Individual	68	25.2	102	37.8	170	31.5	6.8	0.01
Village	29	10.3	42	15.5	71	13.1	2.3	
Traditional treatment prescribed by								
Relatives	171	63.3	125	46.3	296	54.8	7.14	0.01
Traditional healer	64	23.7	93	34.4	157	29.1	5.3	
Self Medication	21	7.8	33	12.2	54	10.0	2.6	
Friend	14	5.2	19	7.0	33	6.1	0.75	
Preferred treatment of the sick person								
Traditional	192	71.1	137	50.7	329	60.9	9.1	0.05
Modern	59	21.9	99	36.7	158	29.3	10.1	0.05
Did not know	19	7.0	34	12.6	53	9.8	4.2	
Diseases transmitted by mosquitoes								
Malaria	156	57.8	98	36.3	254	47.0	13.2	0.001
Pimples (wheals)	59	21.9	83	30.7	142	26.3	4.0	
Fever	23	8.5	28	10.4	51	9.4	10.4	0.001
Itching	14	5.2	20	7.4	34	6.3	1.05	
Did not know	18	6.7	41	15.1	59	10.9	8.9	0.05
Measures against mosquitoes								
Removal of vegetation	168	62.2	110	40.7	270	50.0	12.1	0.001
Removal of stagnant water	69	25.6	91	33.7	160	29.6	3.0	
Use of insecticides	19	7.0	31	11.5	50	9.3	2.8	
Bush fire	14	5.2	38	14.0	52	9.6	11.07	0.001

Cause of disease:

Knowledge about causation of disease as malarial parasite was 57.4% in the CVs while it was 34.4% in the NCVs. Apart from this 3.7% in CVs and 4.8% in NCVs respondents stated that they didn't know the cause of malaria. Knowledge regarding malarial parasite as the cause of disease was found higher with increased level of education (90.4% in secondary and above as compared to 31.4% primary school) of the respondents in both type of villages. Nearly one third (32.9%) illiterate respondents of both study villages showed multiple cause of malaria such as changing environment, unhygienic conditions surrounding the household, impure water, and also through divine intervention of God or ancestors (Table-2).

Identification of malaria and utilization of health facility:

Nearly nineteen per cent (19.1%) of respondents confirmed 'hot body' and other symptoms such as headache, restlessness, diarrhoea, rash on the body as symptoms of the disease. Few identified fever or fever with other signs and symptoms as a common cause followed by cold and cough or chest infection. Besides in depth discussions almost one third (32.1%) respondents expressed their views that fever is dangerous, if it is not cured, it leads further complications in the body and ultimately death. Without naming disease, they explained signs and symptoms of malaria *i. e.* loss of appetite, vomiting, spleen enlargement, shivering and so on. More than two third (69.6%) from both the groups of the respondents stated that they had suffered at least once from malaria within the year and 10.5% of the rest within the last three months from the date of the interview. About twenty four per cent (23.9%) respondents from both the types of villages utilized health facility such as hospital/community health centre/primary health centre/sub centre during past six months for the treatment of malaria. These respondents further told, that they had utilized the health services once (14.1%), twice (4.6%) or more often (5.2%) respectively. About fifty five per cent (54.9%) respondents sought advice from sources other than health facilities initially; of those nearly sixty three per cent (62.3%) have given drug to their patients. The mean duration was 65.3 hours between the time periods from person suffered from fever and attended a health facility. Respondents at last utilized health facility due to non-response of the other sources of treatment of febrile person. They preferred to utilize nearest health facility whenever a member of the family was very serious. Majority of the respondents traveled >5 km for the nearest health facility and more than ninety per cent (91.2%) of which used hired/owned transport to reach the nearest health facility. Jeep/Tractor/Camel Cart were the main transport used by the respondents. Nearly three fourth respondents were living in Dhanies (Dhani is hamlet away from the main village and situated mostly in farms) and out of these dhanies, 87.5% were spread over at the distance in 1-10 sq. km from each other and connected with kuchcha roads with the main villages.

Available options for treatment:

Regarding availability, preferred, actual practice related to treatment of malaria and use of traditional medicine based on the knowledge and experiences of respondents or elderly people of family or experienced and practicing person within their community, consulting health workers at Sub-Centre/Primary Health Centre, use of herbs and self treatment were available options for selection of health care for the febrile person. The net outcome of in depth discussion with the respondents, it was noted that, it was not necessary to follow the same pattern in all the cases. It was found that some ill people think about consulting health workers such as Doctor/MPW/ANM at the health facilities or at health workers home or if the patient couldn't move they ask the health worker to visit him at home. During adverse weather such as extremes of summer (May and June when temperature is about 50°C), one of the patient's relatives visits the health worker at home and describes the patient symptoms and accordingly the drug is given to this relative for the patient. In some cases if the patient could not recover, they changed the health personal.

Practices to treat febrile persons in desert:

It was the common practice among both study area to treat febrile case of their own. The justifications were given by the respondents for health practices with full confident and beliefs that they were able to get rid off from suffering of fever within or before the time period of reaching health facility, non availability of public transport from the dhanies of febrile person to the health facilities, it was costly for them to use the transport on the individual hire basis, some respondents expressed non availability of transport facility in and around their dhanies and very few respondents told that health personals were not available at health facility at the time as per urgency of the febrile person due to off time of the health staff at working place. In some cases respondents were not sure about the febrile person suffered from malaria and they consulted the elderly people in the community, if they agreed that the sickness of the person was malaria they administered antimalarial drugs. They used chloroquine, aspirin and paracetamol to treat the febrile person. These medicines were purchased from the nearest medical shops. The antimalarial dosages were given based on the experience of the respondents and conditions of the febrile person and as guided by medical shopkeepers.

Reasons for selection of different treatment options:

The health seeking behaviour of the febrile persons was based on the level of educational status of the head of the households. There was significant association between education of head of the household and consulting health workers within 24 hours of the onset of fever ($p < 0.05$). Further more in detailed investigations average delay period was reported nearly 10 hours for consulting health workers in case both the febrile person and head of the household. In most of cases it was based on severity of the person illness. If the febrile person was suffering with high fever, repeated vomiting, unable to stand or walk, stopped eating, loss of consciousness, yellowish sclera, severe diarrhoea, and deteriorating conditions of the febrile person compelled to take he/she to the health facility. In this situation they felt helpless themselves and wanted to consult health workers without delay. But at the same time if it happens during the night they wait till morning. Severity of illness and situational compulsion did not show significant association with the education of febrile person's head of the households or himself/herself or both.

Treatment of the disease:

Majority (55.6%) of the respondents treated malaria at household level in both the study villages. About sixty one per cent (60.9%) respondents preferred to apply traditional treatment based on knowledge and experience of the person acquired from elders. This traditional treatment was prescribed by relatives (54.8%) followed by traditional healers (29.1%), self medication (10.0%) and friends (6.1%) respectively. During the treatment of malaria, if, health condition of the patient did not improve in expected time and prescribed doses of traditional medicine, they applied modern medicines also either simultaneously or after withdrawal of the traditional medicines. Modern medicines were used to cure malaria on the basis of the symptoms described by the patients. Modern medicines namely analgesics and antipyretics such as aspirin and paracetamol along with antimalarials such as chloroquine and amodiaquine were used to cure the malaria. Traditional medicine mentioned by the respondents consisted of herbal teas from the leaves and bark of *Acacia (Acacia nilotica)*, leaves of neem (*Azadirachta indica*), guava (*Psidium guava*), tulsi (*Ocimum sativum*), aloe (*Aloe barbadensis*) and papaya (*Carica papaya*). Few of them in non-command villages summarised treatment options as follows: "When we have 'heetav' (fever with shivering) or 'ekantratav' (fever on alternate day) naming as malaria, we use leaves juices of *Azadirachta indica* or leaves of *Acacia sp.* to make herbal tea or enema. Sometime they buy aspirin (*paracetamol*) and *nivaquine (chloroquine)* to make additional treatment." According to respondents of command villages, during treatment of

malaria they avoid fried and oily food items for better results. There seemed to be no conclusive pattern relating the perceived causes and the chosen treatment. As shown in Table 2, regardless of whether parasites or mystical reasons were put forth as the main causes of malaria, more than sixty per cent (60.9%) respondents (n = 329 (60.9%)) exclusively used traditional treatments, whereas traditional treatments were combined with modern methods by the interviewees 158 (29.3%).

There was a similar pattern for the relationship of mentioned symptoms and the use of traditional medicine. Although people were aware of malaria-related symptoms and their association with mosquitoes, folk perceptions prevailed (Table 2). The ideal treatment of malaria for many people included both plant-based and modern allopathic treatments. An interesting observation was made in non-command villages; 56 (20.7%) of the 270 respondents (20.7%) stated to put a patient into a pit and cover his body upto neck with sand-dune to bring down raised body temperature to the normal body temperature. At the onset of symptoms, malaria was treated at home by the 18.1% more among the respondents of the non-command villages as compared to the respondents of the command villages. Care from traditional healers or professional health care providers were only sought if treatment at home fails in both the types of the villages (Table 2).

Prevention of the disease:

The findings of the study reveal that there was no association between perceived causes of malaria and the practice of prevention in both the types of the villages. The majority (76.8%) of respondents stated that they were using preventive measures to control the mosquito nuisance rather than control of malaria (NCVs: 27.1%, CVs: 49.7%). Though the respondents were sure that mosquitoes are transmitting the disease (NCVs: 36.3%, CVs: 57.8%) (Table 2). The schedule caste and schedule tribe (SC/ST) of non-command villages were using insecticide sprays (27.3%), bed nets (12.7%) and fumigation with burning coils (3.3%) to prevent the mosquito bites which may be called as modern preventive methods. This practice was higher among the SC/ST as compare to other backward caste (OBC) (21.8%, 9.2% and 2.1%, respectively). Combined respondents, SC/ST & OBC, (38.2%) from CVs and NCVs stated in response to what are the reasons for using bed nets as preventive measures by low proportion of respondents to prevent mosquito bites, they told that due to high cost of bed nets which was not affordable by them and they also mentioned that suffocation and uneasiness inside the bed nets compelled them for not using it as the preventive measures in hot environment of the desert part of Rajasthan. On the contrary modern prevention methods, about one fourth (26.3%) respondents also used herbal teas and enema to prevent malaria. The large majority (81.6%) of informants cited measures such as burning cow dung, hanging onion on the top of the entry and exit of the houses, the use of odorous herbal plants in the houses. Conversely, amongst those who believed that malaria is acquired because of their behaviour, helpful preventive measures include keeping the environment clean, removing vegetation and stagnant water in close proximity to their houses, as well as adequate disposal of waste. A few respondents (12.3%) also mentioned using mustered oil on the exposed parts of the body while working and resting hours in the field during the night hours. It is evident from the study that 57.4% person in CVs were aware of malaria parasite whereas only 34.4% in NCVs which was found to be significant ($X^2 = 15.5 > 0.01$). Similarly association of change in environmental condition was also significantly higher in command area villages. This shows that people living in command areas were more aware about the change in health condition.

The higher variation was observed in many factors in the villages of command areas like disease transmission knowledge 57.8% in CVs & 36.3% in NCVs this was found to be significant ($X^2 = 13.2 > 0.01$). Preferred treatment of sick person the CVs group of village preferred traditional practice 71.1% & NCVs village only 50.2% ($X^2 = 9.1 > 0.01$), whereas modern approach was lagging behind in CVs

village on 21.9 preferred hospitals and medicines whereas in NCVs village , it was around 36.7% ($X^2 = 10 > 0.01$). CVs village also preferred 62.2% removal of vegetation from nearby residences whereas NCVs only 40.7 ($x^2 = 12.1 > 0.01$) was significantly low other than smoking by burning bushes both the study group showed little difference in behaviour.

Socio-economic stratification, malaria related social indicators and malarial transmission:

Table 3 depicts the knowledge, belief and practices about malaria among study villages according to the social class of the respondents. Knowledge about symptoms of malaria such as fever with shivering was stated by social class I (72.7%) followed by II (52.6%), III (34.8%), IV (26.2%) and V (18.9%). Similar trend was observed regarding the perceived cause of malaria as the malarial parasite among the richest people by 69.1% and 16.8% among the poorest. About half (47.5%) of the poorest people preferred injections as compared to pills and other modern treatment (18.1%) to cure malaria with the one reason that injections are giving quick relief and early cure from the disease and the other reason was to go back to their work as earliest as possible with minimum loss of wages. Uses of bed nets as the preventive measures to prevent mosquito bites was 18.8% amongst the poorest as compare to richest 45.1%. Affordability was found to be the main cause of less use of bed nets by the poor people. Further, more they told high cost was the main reason for avoiding modern medicines and preferred to use traditional treatment to cure malaria. But at the same time few of them use the modern medicines simultaneously to minimise the period of the traditional treatment. Removal of vegetations (38.6%) and stagnant water bodies (27.7%) and bushes fire (31.6%) were used by the poorest people against the preventive measures to the mosquito bites. Table 4 depicts the transmission of malaria according to the social class for 6 years. There was positive correlation between socio-economic class and episodes of malaria, as much as economy of household increases malaria episodes decreases vs. economy of households decreases malaria episodes increases.

Table 3. Knowledge, belief and practices about malaria among households heads

Variable	Social Class					Total n=540
	I (U) n=55	II (UM) n=97	III (LM) n=115	IV (UL) n=130	V (L) n=143	
Fever with shivering	40 (72.7)	51 (52.6)	40 (34.8)	34 (26.2)	27 (18.9)	192 (35.6)
Loss of appetite	5 (9.1)	7 (7.2)	26 (22.6)	31 (23.8)	38 (26.7)	107 (19.8)
Headache and giddiness	1 (1.8)	8 (8.2)	20 (17.4)	25 (19.2)	32 (22.7)	86 (15.9)
Yellow eye	4 (7.3)	10 (10.3)	15 (13.4)	19 (14.6)	23 (16.8)	71 (13.1)
Multiple symptoms	2 (3.6)	12 (12.7)	8 (6.2)	16 (12.3)	15 (10.8)	53 (9.8)
Vomiting	3 (5.6)	9 (9.7)	6 (5.2)	5 (3.8)	8 (5.1)	31 (5.7)
Malaria parasite	38 (69.1)	25 (25.7)	20 (17.2)	18 (13.8)	23 (16.8)	124 (22.9)
Changing environment	8 (14.5)	21 (21.6)	36 (31.3)	47 (36.6)	58 (40.5)	170 (31.8)
Multiple causes	3 (5.6)	20 (20.6)	33 (28.2)	42 (32.3)	37 (25.8)	135 (25.0)
Personal hygiene	2 (3.6)	17 (17.5)	16 (13.1)	14 (10.7)	13 (9.1)	62 (11.8)
Impure water & edible items	3 (5.5)	10 (10.3)	6 (5.2)	2 (1.5)	7 (4.9)	28 (5.2)
Don't know	1 (1.8)	4 (4.1)	4 (3.5)	7 (5.4)	5 (3.5)	21 (3.9)
Pill	33 (60.0)	30 (30.1)	28 (24.4)	25 (19.2)	26 (18.8)	142 (26.2)
Injection	15 (27.8)	34 (35.5)	44 (38.6)	51 (39.2)	68 (47.5)	212 (39.5)
Perfusion	2 (3.6)	6 (6.8)	13 (11.3)	20 (15.8)	23 (16.8)	64 (11.8)
Drinking solution	5 (9.1)	27 (27.8)	30 (26.8)	34 (26.5)	26 (18.8)	122 (22.6)

Insecticide spray	20 (36.6)	43 (44.3)	50 (43.7)	67 (51.5)	84 (58.7)	264 (48.8)
Bed net	25 (45.1)	31 (31.2)	37 (32.7)	33 (25.8)	27 (18.8)	153 (28.3)
Fumigating coil	10 (18.8)	23 (23.7)	28 (24.4)	30 (23.7)	32 (22.7)	123 (22.7)
Herbal tea	23 (41.8)	48 (49.8)	41 (35.6)	72 (55.8)	79 (55.4)	263 (48.8)
Enema	27 (49.1)	21 (21.6)	52 (45.2)	41 (31.5)	46 (32.6)	187 (34.6)
Does not know	5 (9.1)	28 (28.8)	22 (19.3)	17 (13.7)	18 (12.8)	90 (16.6)
High cost	15 (27.7)	39 (40.2)	61 (53.4)	70 (53.8)	82 (57.4)	267 (49.4)
Treatment inefficient	27 (49.9)	35 (36.8)	44 (38.6)	40 (30.7)	46 (32.6)	192 (35.5)
Unfriendly staff	13 (23.6)	23 (23.7)	10 (8.2)	20 (15.8)	15 (10.8)	81 (15.0)
Lengthy healing process	29 (52.7)	50 (51.5)	55 (47.8)	43 (33.7)	30 (20.1)	207 (38.3)
High cost	6 (10.9)	15 (15.6)	28 (24.4)	55 (42.3)	72 (50.4)	176 (32.1)
Treatment inefficient	16 (29.1)	23 (23.7)	17 (14.8)	20 (15.8)	16 (11.8)	92 (17.3)
Does not know	4 (7.7)	9 (9.7)	15 (13.4)	12 (9.2)	25 (17.8)	65 (12.3)
Removal of vegetation	5 (9.1)	29 (29.7)	45 (39.3)	46 (35.8)	55 (38.6)	180 (33.3)
Removal of stagnant water	30 (54.5)	37 (38.1)	34 (29.6)	43 (33.7)	39 (27.7)	189 (35.0)
Insecticide spray	12 (21.8)	9 (9.7)	7 (6.8)	6 (4.6)	4 (2.1)	27 (5.0)
Bush fire	8(14.5)	22 (22.9)	29 (25.2)	35 (26.1)	45 (31.6)	14(2.6)

Figures in parentheses are percentages

U= Upper, UM = Upper Middle, LM = Lower Middle, UL = Upper Lower, L = Lower

Table 4. Malaria episode in the households year wise with relation to socio-economic class

Years	Social Class					Total n=540
	I (U) n=55	II (UM) n=97	III (LM) n=115	IV (UL) n=130	V (L) n=143	
	Malaria cases					
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
2005	4 (6.5)	6 (9.7)	9 (14.5)	10 (16.1)	33 (53.2)	62 (16.1)
2006	2 (3.1)	5 (7.7)	13 (20.0)	16 (24.6)	29 (44.6)	65 (16.9)
2007	2 (3.0)	7 (10.6)	8 (12.1)	14 (21.2)	35 (53.0)	66 (17.2)
2008	3 (4.8)	9 (14.3)	11 (17.5)	17 (27.0)	23 (36.5)	63 (16.4)
2009	1 (1.6)	5 (8.2)	10 (16.4)	20 (32.8)	25 (41.0)	61 (15.9)
2010	4	8 (11.9)	18 (26.9)	18 (26.9)	19 (28.4)	67 (17.4)
Total	16 (4.2)	40 (10.4)	69 (18.0)	95 (24.7)	164 (42.7)	384 (100.0)
API	4.8	6.8	9.8	11.8	18.8	11.7

Figures in parentheses are percentages

U= Upper, UM = Upper Middle, LM = Lower Middle, UL = Upper Lower, L = Lower

IMPORTANT LEADS/OUTCOMES FROM THE STUDY

The results of the study may be used by planners, malaria control programme implementers and researchers.

COMMUNICABLE DISEASES

1.9 A study of the suitable interventional methods for early detection of new PTB cases and bringing them for diagnosis and treatment under DOTS

– S. P. Yadav, Sc. 'E', A .K. Dixit, Sc. 'E' and R. K. Kalundha, T.O.

Commencement: November, 2007

Duration: Three Years

Status: Ongoing

OBJECTIVES

1. To study of the suitable interventional methods for early detection of new PTB cases and bringing them for diagnosis and treatment under DOTS.
2. To study cost effectiveness and acceptability of such strategy in the community.

RATIONALE

A major issue in TB control and its eradication is delay in diagnosis and commencement of treatment. An undetected and untreated patient has the potential to infect and transmit TB to many individuals daily and results in enhance infectivity. In order to control TB, it is mandatory to eradicate its source and decrease the chances of transmission from one individual to another. It is, therefore, important to diagnose and treat the infected individual as early as possible. Although cough and fever were common symptoms at onset, these symptoms alone did not always prompt patients to seek medical treatment early. Symptoms in the early stages of TB are not very specific and may be attributed to self-limiting illnesses, such as viral infections, and only when symptoms become worse or persist the person will consult a health service. Symptoms misinterpretation has been associated with patient delay in other studies internationally, where they are attributed to external causes such as overwork or exposure to cold. This delay in health-seeking behaviour is likely to have increased the risk of morbidity, mortality, and transmission of TB to contacts. Personal and community knowledge of TB and interpretation of health beliefs influences attitudes and health-seeking behaviour significantly. Self-treatment, involving a variety of home remedies and traditional and modern drugs, is the first step in the health-seeking behaviour process. This observation is consistent with previous studies, and is linked with the perception of the seriousness of the symptoms and the label the patient attaches to his/her condition. Persons with untreated sputum smear positive TB can infect 10 to 14 others in a year. There is a need for interventions that encourage symptomatic individuals to seek medical help at the earliest.

OBSERVATIONS AND INFERENCES

Table 1. Impact of intervention on reporting for diagnosis and treatment

Month	Study Group (n=400)		Control Group (n=400)	
	No.	%	No.	%
1	31	7.8	10	2.5
2	74	18.5	23	5.8
3	165	41.3	57	15.0
4+	57	14.3	64	15.3
Total	327	81.8	154	38.5

Symptoms and Previous History:

The frequency of symptoms in patients recorded was 97% cough, 89% fever and 25% haemoptysis. Bacillus Chalmette Guerin (BCG) scar was observed in only 8 patients. Among 98 (63+35) smears positive patients, 43 patients had a history of contact with TB patients. Thirteen had TB in their immediate family members such as father, mother, sister and/or brother, 10 in close relatives like uncle, aunty and cousin and 9 in friends, neighbours or colleagues.

Table 2. Status of sputum

Sputum Status	Study Group		Control Group	
	Number	%	Number	%
+ ve	63	19.3	35	22.7
- ve	264	80.7	119	77.3
Total	327	100.0	154	100.0

Table 3. Type of PTB cases

Type of cases	Study Group		Control Group	
	N	%	N	%
Cat. I	49	77.8	13	37.1
Cat. III	6	9.5	10	28.5
Relap. Case	5	7.9	7	20.0
Reocc. Case	3	4.8	5	14.3
Total	63	100.0	35	100.0

SUITABILITY AND COST EFFECTIVENESS

Present study reveals that intervention enhanced the case reporting and also proved that use of cured PTB volunteers for the advocacy is acceptable to the community. By using cured PTB volunteers for the identification of the symptomatic cases is found appropriate method and giving health education and advice for the early diagnosis and treatment under the DOTS programme is very useful. Their uses decrease the suffering of the person very significantly and as well as decrease the new cases in the community by stopping the infection early by bringing symptomatic cases under the DOTS programme. Socio-economic losses of the family and ultimately to the nation will be decreased simultaneously. Motivation cost calculated and found that total cost per person for the screening and motivation in the community was Rs. 36/= by this intervention method which is nothing as compare to the cost of the treatment of the PTB cases. In the study villages, Rashtriya Gauranti Rojgar Yojana was in existence

and volunteers were gladly accepted to work in the same rate by giving Rs. 100/= as honorarium to the each volunteer per working day for this work and further, these volunteers were ready to work in the same rate in future also.

IMPORTANT LEADS/OUTCOMES FROM THE STUDY

After completion of the project result may be helpful for the control of the PTB in DOTS programme. The method may be useful for early detection and motivation of new PTB cases and bringing them for diagnosis and treatment under DOTS and it may be also cost effectiveness and acceptable strategy in the community. SAC 2010 suggested modifying and continuing the study till next meeting.

COMMUNICABLE DISEASES

1.10 A study of treatment seeking behaviour for malaria and its management in children in desert part of Rajasthan, India

- S. P. Yadav, Sc. 'E', A. K. Dixit, Sc. 'E' and R. .K Kalundha, T.O.

Commencement: November, 2009

Duration: Three Years

Status: Ongoing

OBJECTIVES

1. To identify different community belief and practices on the basis of which fever could be recognized and classified
2. To explore factors involved in selection of different treatment options in great Indian Thar Desert.
3. To compare with other studies in different parts of the country as well as world.

OBSERVATIONS

During the report period the study was conducted in the villages of Ramgargh PHC with highest API among the 18 PHCs of the Jaisalmer district which has highest API among 12 desert districts of Rajasthan. All the 65 villages in Ramgarh PHCs were classified and divided into two groups namely Command and Non-command villages. Command villages (CVs) were defined here as villages where the water was available for the irrigation and drinking purposes since last 20 years or more through IGNP and Non-command villages (NCVs) were defined as where water is yet to reach. Using systematic random sampling, 9 villages from each category of villages were selected namely Seowa, Raghwa, Raimala, Sultana, Nagga, Bada, Mokal, Nehdai and Lanera from the CVs and Habur, Kakab, Hamira, Tibansar, Chandane ki Dhani, Markh ka Ganv, Mohammad Khan ki Dhani, Ranau and Tanot from the NCVs. 30 households were selected randomly from the each selected village for this study. A total of 540 (270CVs+270NCVs) households were surveyed from both the groups of the villages, however, Data from 405 households was completed which has been given in Table 1.

There were 405 respondents. The mean age for the sample was 30.3 years. Majority of the respondents were above 21 years of age. More than half (53.8%) were literate. Majority (86.9%) of the respondents were earning their livelihood by doing agriculture or its related work. The distribution showed that about three fourth (76.3%) of the study population was belonging to the low socio-economic status. The major proportion 378 (93.3%) of the respondents sought treatment. Thirteen respondents did not take any action and 14 did self medication. Nearly one third (34.7%) went to the government health facility such as Primary Health Centre (PHC), Sub Centre, ANM or MPW and 25.7% treated malaria by home-remedies. More than half (53.4%) of the respondents approached person first time for their treatment who was less qualified and they were given reason to approach such kind of person due

to low cost of treatment, confidence, availability and the attitude of the person. The mean distance from the first health care provider was 5.8 kilometres. More women than men visited Ramgargh CHC situated at a distance of more than 60 kilometres as they had severe illness. Forty seven percent of respondents walked to their providers, whereas others took jeep, camel cart, bicycle, public transport, tractor and other means of transport. About sixty per cent (59.5%) of the respondents utilized prompt and effective treatment at the PHC within an average of 72 h between onset of the symptoms and the diagnosis and the treatment of the disease.

Children less than five years of age had least prompt and least effective treatment as compare to the more than five years of age. The highest proportion of those receiving treatment belonged to general caste and scheduled caste, the least from the scheduled tribes group. A higher proportion of those with schooling had received treatment as compared to those who had never been to school. More respondents who availed care from a provider less than 5 Km received prompt and effective treatment. Respondents under five years belonging to scheduled tribe community and visiting a provider more than five kilometres were two times more likely to have delayed and/ or ineffective treatment than their counterparts. There was association between gender and appropriate treatment-seeking behaviour. Most of the respondents were delaying in early diagnosis and treatment due to negligence inspite of free of cost diagnosis and treatment. They would carry on with their daily routine and delay treatment till they were unable to function any longer. In the case of children, since elder children took care of most of the younger children, their inability to recognize the malaria symptoms led to delayed care for most of the children. Women were also regular victims of inappropriate care as they tend to neglect the health due to household work and sometimes, because there was no one to escort them to the health centre. Most of the respondents 315 (77.8%) stated that on first day they waited for the symptoms to subside attributing these to common cold, then they did not get time from their daily routine to go to the health centres, gradually 4 or 5 days passed away. Most common victims of negligence were ladies which they attributed to their household chores, sometimes they did not had anybody to accompany to the PHC. Further in depth investigations found that most people did not take the drugs as prescribed by the treating doctors. Though four chloroquine tablets were provided as one time dose (for presumptive treatment), patients took one or two at a time till they got symptomatic relief and preserved the remaining tablets to be kept for future use. Though the tablets gave temporary relief for a few days, the fever often came back. Since most of the people were poor, they could not stay back at home when sick and lose their daily wages. Few of them reported that non compliance of treatment was based on the previous experiences of side effects of the prescribed drugs. They complained of dizziness, vomiting, loss of appetite, bitter taste of chloroquine and some were unhappy over too many tablets. For an adult the usual dosage (radical treatment) is ten tablets of chloroquine and six tablets of primaquine, which was needed to be taken over a period of three days. Sometimes, they did not have anything to eat as they remain at home due to sickness. Anti-malarial drugs, especially chloroquine gives acute side effects if taken empty stomach.

If there was no cure after presumptive treatment, they will go to less qualified person who applied various measures like injecting analgesics, antibiotics and even sedatives. These people had some advantages such as their availability where there was no doctor and flexibility for the people to pay the fees in instalments or in kind. At times, people consume government supplied chloroquine while availing treatment from the less qualified providers simultaneously. Though they got cured due to chloroquine, they attribute their cure to the less qualified persons' treatment. While patients fail to get cured due to non-compliance or incomplete treatment, they attribute it to the lack of efficacy of drugs provided by the government programmes. The less qualified practitioners reinforce their lack of faith in government drugs through misinformation. Most of them didn't take the medicine as prescribed by the doctors at government health centres. They discontinue from the regimen as symptoms were subsided. If they got fever again within a short span of time, they attributed it to the ineffectiveness

of the medicines given by the government doctors. They believed that free drugs supplied by the government were not able to cure people. They were considering “Hui” (injection) is more effective as compare to tablets, which causes nausea, loss of appetite, vomiting and head reeling etc.

IMPORTANT LEADS/OUTCOMES FROM THE STUDY

Results of the study may be useful to the planners, control programme implementers, researchers and the administrators who are associated with malaria control programmes.

Table 1. Socio- demographic characteristics of the study subjects

Characteristics	Number	Percentage
Age (Yrs)		
<21	43	10.6
21-30	177	43.7
31-40	159	39.3
>40	26	6.4
Education		
Illiterate	187	46.2
Literate	218	53.8
Occupation		
Agriculture & its related work	352	86.9
Mining	10	2.5
Service	2	0.4
Business	1	0.2
Labour	26	6.4
Others	14	3.5
Religion		
Hindus	288	71.1
Non-Hindus	117	28.9
Caste among Hindus		
G C	143	49.7
OBC	96	33.3
SC/ST	49	17.0

GC= General Caste OBC= Other Backward Caste SC/ST= Schedule Caste/Schedule Tribe

COMMUNICABLE DISEASES

1.11 Risk assessment of JE virus emergence in two paddy growing districts of Rajasthan state (Sri Ganganagar and Hanumangarh)

– P. C. Kanojia, Sc. 'E', N. L. Aseri and M. L. Mathur Sc. 'F'.

Commencement: August, 2010 **Duration:** One & Half Year **Status:** Ongoing

OBJECTIVE

1. To assess potential emergence and public health risk of JE virus in Sri Ganganagar and Hanumangarh district by carrying out mosquito, vertebrate hosts and human surveillance.

PROGRESS OF THE WORK

JE virus infection in humans:

As many as 32 human sera were collected from different localities of Sri Ganganagar and Hanumangarh district during the year 2010 in order to establish JE virus activity in human population. Out of 32, one sample was obtained from encephalitis patient admitted at MGM hospital, Hanumangarh and rest thirty one were collected from the close relatives (contacts) of encephalitis cases reported in the recent past. These samples (n=31) were tested with a view to determine the presence of IgM antibodies against JE virus using MAC- ELISA test kit obtained from NIV, Pune. Out of thirty one, 13 samples (all from contacts) showed presence of IgM antibodies.

Detection of JE virus in vertebrate host:

Pigs play important role in JE epidemiology, therefore, pigs sera (N=24) were collected from different localities belonging to Sri Ganganagar and Hanumangarh district during the year 2010. These sera samples will be processed for the presence of HI & N antibodies against JE virus. However, in our previous serological study, we collected 10 pig sera and tested for the presence of JE specific neutralizing antibodies. Out of 10 sera, 9 were found positive for neutralizing antibodies and their titers ranging from 1:80 to 1:1280.

Prevalence of JE vectors:

In order to determine the prevalence of JE vectors in Sri Ganganagar and Hanumangarh district, entomological studies were carried out during the year 2010. Adult mosquitoes were collected during dawn and dusk hours from different villages of Sri Ganganagar and Hanumangarh district employing different methods, including using UV light traps. A total of 2570 mosquitoes were collected comprising 6 species, including 4 JE vectors viz., *Culex tritaeniorhynchus*, *Cx. bitaeniorhynchus*, *An. peditaeniatatus* and *An. subpictus*. Among the species collected, *Cx. tritaeniorhynchus* was found to

be predominant species. In addition to this, mosquito larvae were also collected from paddy fields wherein *Cx. tritaeniorhynchus* contributed maximum.

From above mosquito collections, as many as 64 mosquito pools were prepared (*Cx. tritaeniorhynchus*=58, *Cx. bitaeniorhynchus*=1, *An. peditaeniatus*=1, *An. pallidus*=1 and *An. subpictus*=3). These pools will be processed for detecting JE virus antigen using IFA and molecular techniques.

INFERENCES

Prevalence of IgM and neutralizing antibodies against JE virus in humans and in pigs respectively indicate that JE virus is circulating in Sri Ganganagar and Hanumangarh district. Predominance of *Cx. tritaeniorhynchus* completes the chain responsible for transmission of the JE virus in nature.

COMMUNICABLE DISEASES

1.12 Field efficacy trials of extracted latex of *Calotropis procera* for its public use as bio-larvicide against dengue vectors

- Manju Singhi, Sc. 'C', Vinod Joshi, Sc. 'F', Anil Purohit, R.A. and Sushmita Chattopadhyay

Commencement: January, 2011 **Duration:** One Year **Status:** On going

OBJECTIVES

1. To undertake field efficacy testing trials of extracted latex of *Calotropis procera* for control of dengue vector breeding in Jodhpur city.
2. To optimize the product dose of extracted latex per liter of water volume in breeding habitats of *Aedes* mosquitoes.
3. Finalization of its dose for handing over the results into public health actions by Vector Borne Disease Control Programme.

PROGRESS OF THE WORK

Selection of the areas:

The Jodhpur town has been divided into two areas as per the municipality city ward map as outside and inside city. Further as per the surveillance design developed by us we have further divided areas into high and low socio economic strata which determines the water storing habits and this effects the storing habits which determines the larval breeding. The areas selected for testing field efficacy of extracted latex are as follows-

1. High socio-economic areas of inside city (HSIC)
2. High socio-economic areas of outside city (HSOC)
3. Low socio-economic area of inside city (LSIC)
4. Low socio-economic area of outside city (LSOC)

Dose optimization:

Latex has been collected manually from *Calotropis procera* from the DMRC campus and extracted by methanol and acetonitrile as per the developed protocol. Larval collection has been made from each of the selected setting of the area and suspended into the different concentrations with control. For each concentration five replicates have been taken for studying dose optimization (Table 1-8). After 24 hours of exposure, mortality was recorded and follow up study have been made. Result findings

have shown 100 % mortality in all the treated larvae of all the areas as compare to control (Fig. 1-2). The final effective lethal dose 100 ppm has been selected for testing efficacy in all the + ve breeding containers of the selected areas of the town.

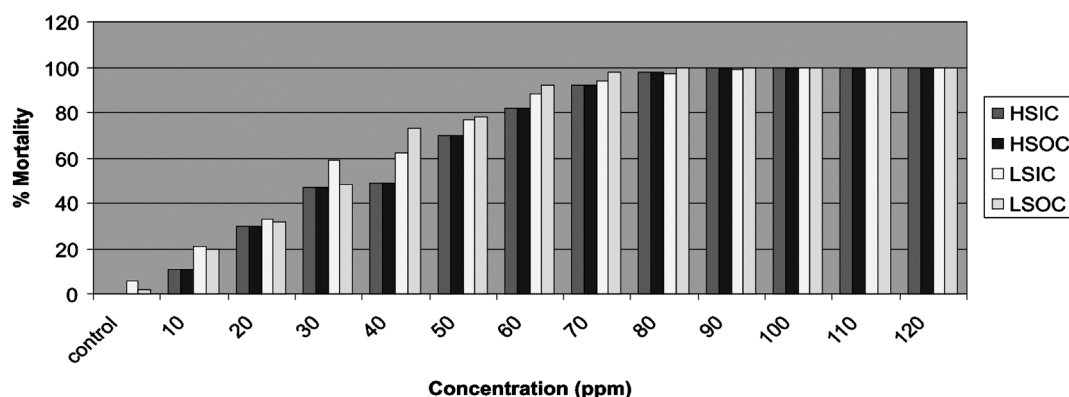


Fig. 1. Dose optimization (Methanol extracted latex)

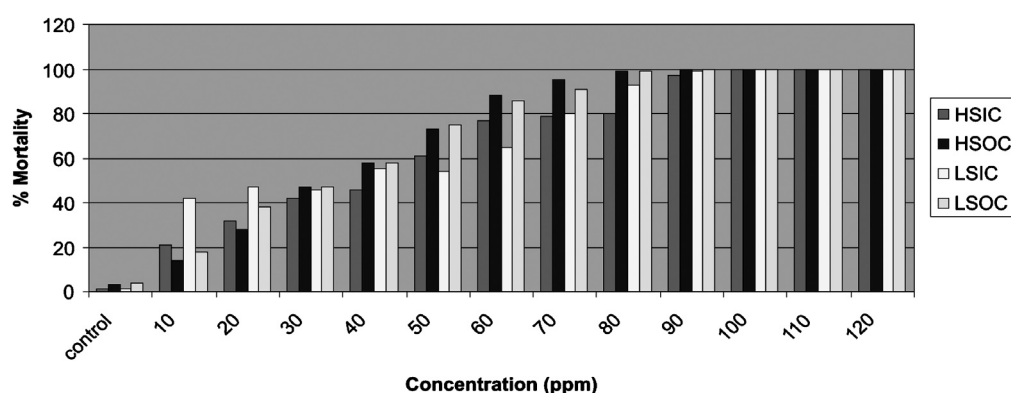


Fig. 2. Dose optimization (Acetonitrile extracted latex)

Table 1. Dose optimization of methanol extracted latex of *Calotropis procera* against *Aedes* larvae in HSIC** area

Treatment Dosage (ppm)	Live Larvae(3rd instar) and pupae(p)/container										Total larvae exposed	Total live larvae	% Mortality
	Tt* 1	P	Tt 2	P	Tt 3	P	Tt 4	P	Tt 5	P			
Control	20	0	20	0	20	0	20	0	20	0	100	100	0
10	18	1	18	0	19	0	17	0	17	0	100	89	11
20	14	0	15	0	14	0	13	0	14	0	100	70	30
30	11	0	10	0	12	1	10	0	10	0	100	53	47
40	9	0	10	1	12	0	10	0	10	0	100	51	49
50	8	0	9	0	8	0	7	0	7	0	100	30	70
60	4	0	5	0	2	0	4	0	3	0	100	18	82
70	1	0	2	1	1	0	2	0	2	0	100	8	92
80	0	0	0	0	1	0	1	0	0	0	100	2	98
90	0	0	0	0	0	0	0	0	0	0	100	0	100
100	0	0	0	0	0	0	0	0	0	0	100	0	100
110	0	0	0	0	0	0	0	0	0	0	100	0	100
120	0	0	0	0	0	0	0	0	0	0	100	0	100

* Tt- Test trial, **HSIC- High socio economic inside city

Table 2. Dose optimization of methanol extracted latex of *Calotropis procera* against *Aedes* larvae in HSOC area**

Live Larvae (3rd instar) and pupae(p)/container													
Treatment Dosage (ppm)	Tt* 1	P	Tt 2	P	Tt 3	P	Tt 4	P	Tt 5	P	Total Larvae exposed	Total live larvae	% Mortality
Control	20	0	19	1	20	0	20	0	20	0	100	99	1
10	12	0	16	0	18	0	16	0	15	0	100	75	25
20	12	0	10	0	14	0	12	0	13	0	100	61	39
30	8	0	8	0	11	0	10	0	9	0	100	46	54
40	6	0	7	0	8	0	8	0	6	0	100	35	65
50	4	0	4	0	5	0	5	0	5	0	100	23	77
60	2	0	1	0	3	0	4	0	3	0	100	13	87
70	0	0	0	0	1	0	2	0	1	0	100	4	96
80	2	0	0	0	0	0	1	0	0	0	100	3	97
90	0	0	0	0	0	0	0	0	0	0	100	0	100
100	0	0	0	0	0	0	0	0	0	0	100	0	100
110	0	0	0	0	0	0	0	0	0	0	100	0	100
120	0	0	0	0	0	0	0	0	0	0	100	0	100

* Tt- Test trial, **HSOC- High socio economic outside city

Table 3. Dose optimization of methanol extracted latex of *Calotropis procera* against *Aedes* larvae in LSOC area**

Live Larvae(3rd instar) and pupae(p)/container													
Treatment Dosage (ppm)	Tt* 1	P	Tt 2	P	Tt 3	P	Tt 4	P	Tt5	P	Total Larvae exposed	Total live larvae	% Mortality
Control	20	0	20	0	18	1	20	0	20	0	100	98	2
10	15	0	16	0	14	0	17	0	18	0	100	80	20
20	14	0	13	0	12	0	14	0	15	0	100	68	32
30	9	0	10	0	10	0	11	0	12	0	100	52	48
40	4	0	8	0	5	0	6	0	7	0	100	27	73
50	2	0	6	0	4	0	4	0	6	0	100	22	78
60	0	0	2	0	2	0	1	0	3	0	100	8	92
70	0	0	1	0	0	0	0	0	1	0	100	2	98
80	0	0	0	0	0	0	0	0	0	0	100	0	100
90	0	0	0	0	0	0	0	0	0	0	100	0	100
100	0	0	0	0	0	0	0	0	0	0	100	0	100
110	0	0	0	0	0	0	0	0	0	0	100	0	100
120	0	0	0	0	0	0	0	0	0	0	100	0	100

* Tt- Test trial, **LSOC- Low socio economic outside city

Table 4. Dose optimization of methanol extracted latex of *Calotropis procera* against *Aedes* larvae in LSIC area**

Live Larvae (3rd instar) and pupae(p)/container													
Treatment Dosage (ppm)	Tt* 1	P	Tt 2	P	Tt 3	P	Tt 4	P	Tt 5	P	Total Larvae exposed	Total live larvae	% Mortality
Control	20	0	15	2	19	0	20	0	20	0	100	94	6
10	18	0	13	0	15	0	17	0	16	0	100	79	21
20	15	0	10	0	12	0	15	0	15	0	100	67	33
30	14	0	8	0	8	0	10	0	11	0	100	41	59
40	11	0	6	0	6	0	8	0	7	0	100	38	62
50	9	0	3	0	3	0	2	0	6	0	100	23	77
60	8	0	2	0	0	0	0	0	2	0	100	12	88
70	5	0	1	0	0	0	0	0	0	0	100	6	94
80	3	0	0	0	0	0	0	0	0	0	100	3	97
90	1	0	0	0	0	0	0	0	0	0	100	1	99
100	0	0	0	0	0	0	0	0	0	0	100	0	100
110	0	0	0	0	0	0	0	0	0	0	100	0	100
120	0	0	0	0	0	0	0	0	0	0	100	0	100

*Tt- Test trial, **LSIC- Low socio economic inside city

Table 5. Dose optimization of Acetonitrile extracted latex of *Calotropis procera* against *Aedes* larvae in HSIC area**

Live Larvae(3rd instar) and pupae(p)/container													
Treatment Dosage (ppm)	Tt* 1	P	Tt 2	P	Tt 3	P	Tt 4	P	Tt 5	P	Total Larvae exposed	Total live larvae	% Mortality
Control	19	0	20	0	20	0	20	0	20	0	100	99	1
10	10	0	17	1	17	0	18	0	17	0	100	79	21
20	6	0	16	0	15	0	16	0	15	0	100	68	32
30	4	0	15	0	14	0	12	0	13	0	100	58	42
40	1	0	12	0	10	0	11	0	10	0	100	54	46
50	0	0	10	0	9	0	10	0	10	0	100	39	61
60	0	0	10	0	7	0	8	0	8	0	100	33	77
70	0	0	6	0	5	0	5	0	6	0	100	21	79
80	0	0	2	0	3	0	3	0	2	0	100	10	80
90	0	0	0	0	1	0	2	0	0	0	100	3	97
100	0	0	0	0	0	0	0	0	0	0	100	0	100
110	0	0	0	0	0	0	0	0	0	0	100	0	100
120	0	0	0	0	0	0	0	0	0	0	100	0	100

* Tt- Test trial, **HSIC- High socio economic inside city

Table 6. Dose optimization of acetonitrile extracted latex of *Calotropis procera* against *Aedes* mosquitoes in HSOC area**

Live Larvae (3rd instar) and pupae(p)/container													
Treatment Dosage (ppm)	Tt* 1	P	Tt 2	P	Tt 3	P	Tt 4	P	Tt 5	P	Total Larvae exposed	Total live larvae	% Mortality
Control	20	0	18	2	19	1	20	0	20	0	100	97	3
10	18	0	16	0	17	0	18	0	17	0	100	86	14
20	14	0	12	0	16	0	16	0	14	0	100	72	28
30	10	0	8	0	12	0	13	0	10	0	100	53	47
40	8	0	6	0	10	0	9	0	9	0	100	42	58
50	6	0	4	0	6	0	6	0	5	0	100	27	73
60	2	0	1	0	3	0	4	0	2	0	100	12	88
70	1	0	0	0	1	0	2	0	1	0	100	5	95
80	0	0	0	0	0	0	0	0	0	0	100	1	99
90	0	0	0	0	0	0	0	0	0	0	100	0	100
100	0	0	0	0	0	0	0	0	0	0	100	0	100
110	0	0	0	0	0	0	0	0	0	0	100	0	100
120	0	0	0	0	0	0	0	0	0	0	100	0	100

* Tt- Test trial, **HSOC- High socio economic outside city

Table 7. Dose optimization of acetonitrile extracted latex of *Calotropis procera* against *Aedes* mosquitoes in LSOC area**

Live Larvae (3rd instar) and pupae(p)/container													
Treatment Dosage (ppm)	Tt* 1	P	Tt 2	P	Tt 3	P	Tt 4	P	Tt 5	P	Total Larvae exposed	Total live larvae	% Mortality
Control	20	0	19	1	18	2	19	1	20	0	100	96	4
10	17	0	16	0	15	0	16	0	18	0	100	82	18
20	13	0	14	1	10	0	13	0	12	0	100	62	38
30	12	0	10	0	10	0	11	0	10	0	100	53	47
40	8	0	8	0	8	0	10	0	8	0	100	42	58
50	4	0	4	0	3	0	8	0	6	0	100	25	75
60	0	0	2	0	3	0	5	0	4	0	100	14	86
70	0	0	0	0	2	0	4	0	3	0	100	9	91
80	0	0	0	0	0	0	1	0	0	0	100	1	99
90	0	0	0	0	0	0	0	0	0	0	100	0	100
100	0	0	0	0	0	0	0	0	0	0	100	0	100
110	0	0	0	0	0	0	0	0	0	0	100	0	100
120	0	0	0	0	0	0	0	0	0	0	100	0	100

* Tt- Test trial, **LSOC- Low socio economic outside city

Table 8. Dose optimization of Acetonitrile extracted latex of *Calotropis procera* against *Aedes* mosquitoes in LSIC area**

Live Larvae (3rd instar) and pupae(p)/container													
Treatment Dosage (ppm)	Tt* 1	P	Tt 2	P	Tt 3	P	Tt 4	P	Tt 5	P	Total Larvae exposed	Total live larvae	% Mortality
Control	20	0	20	0	20	0	20	0	19	1	100	99	1
10	18	0	19	0	17	0	16	0	18	0	100	58	42
20	18	0	18	0	16	0	15	0	16	0	100	53	47
30	17	0	16	0	15	0	11	0	15	0	100	54	46
40	16	0	14	0	14	0	9	0	12	0	100	45	55
50	10	0	11	0	10	0	7	0	8	0	100	46	54
60	8	0	8	0	8	0	5	0	6	0	100	35	65
70	6	0	5	0	6	0	1	0	2	0	100	20	80
80	2	0	1	0	3	0	0	0	1	0	100	7	93
90	0	0	0	0	1	0	0	0	0	0	100	1	99
100	0	0	0	0	0	0	0	0	0	0	100	0	100
110	0	0	0	0	0	0	0	0	0	0	100	0	100
120	0	0	0	0	0	0	0	0	0	0	100	0	100

* Tt- Test trial, **LSIC- Low socio economic inside city

Screening of breeding containers for *Aedes* Larvae

A field study has been conducted in winter season for testing efficacy of extracted latex in all the socio-economic areas of Jodhpur town as per the developed surveillance design. All the houses of the selected areas have been surveyed for breeding of the *Aedes* mosquitoes. Common breeding containers in low socio economic areas were observed are uncovered cement tanks, clay pots, plastic containers, under ground tanks whereas in high socio-economic areas cement tanks, underground tanks, clay pots and coolers. During reported period total 200 houses were surveyed for breeding containers in all the defined 4 areas of Jodhpur town. Total of 775 containers were observed for the breeding. Out of 775 containers 38 containers were found + ve for *Aedes* breeding. In high socio economic status areas total of 12 containers while in low socio -economic areas 26 containers were found + ve for *Aedes* breeding.

Application of bio - larvicide and observed efficacy

All the +ve containers were treated by optimized dose of extracted latex as per the volume of water in the container (Table 9-12). Observations were made after 24 hours and then 2 nd follow up were under taken. Results have shown 100 % mortality in all the treated containers. The optimized dose found equally effective in all types of containers in winter season and in all the selected areas.

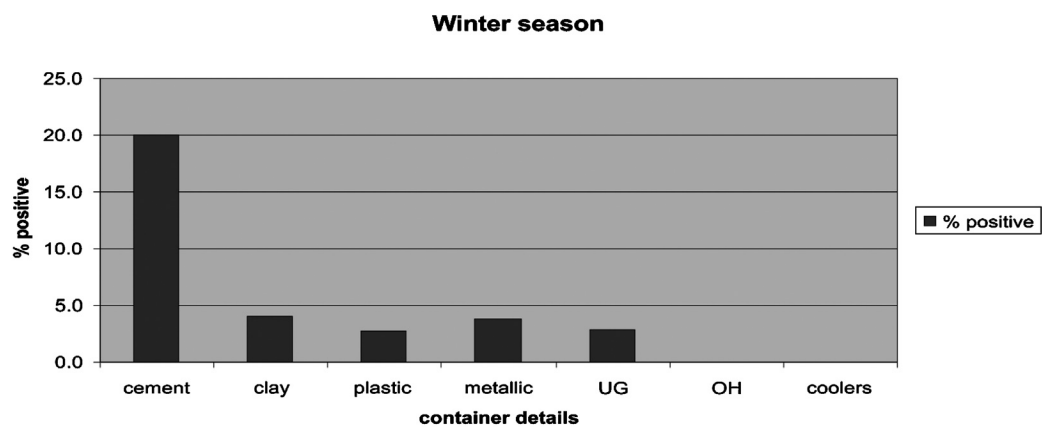


Fig. 3 Details of +ve breeding containers

Table 9. Details of breeding containers treated for testing efficacy in winter season in area HSOC
** Season: Winter; Households covered: 50

Area	Extract used	Concentration used	Container details*				Study type
			Type	No. exam-ined	No. posi-tive	No. treated	
HSOC	Acetonitrile & methanol	100 ppm	Cement	20	6	6	First study
			UG	50	0	0	
			OH	50	0	0	
			Metallic	0	0	0	
			Clay	4	2	0	
			Coolers	0	0	0	
			Plastic	25	0	0	
			Others	0	0	0	
			Cement	6	0	-	First follow up (after 24 hrs)
			UG	0	-	-	
			OH	0	-	-	
			Metallic	0	-	-	
			Clay	2	0	-	
			Coolers	0	-	-	
			Plastic	0	-	-	
			Others	0	-	-	

* Both domestic and peri-domestic containers; HSOC** - High socioeconomic outside city

Table 10. Details of breeding containers treated for testing efficacy in winter season in area HSIC Season: Winter; Households Covered: 50**

Area	Extract used	Concentration used	Container details*				Study type
			Type	No. examined	No. positive	No. treated	
HSIC	Acetonitrile & Methanol	100 ppm	Cement	45	4	4	First study
			UG	39	0	0	
			OH	45	0	0	
			Metallic	10	0	0	
			Clay	25	0	0	
			Coolers	0	0	0	
			Plastic	45	0	0	
			Others	0	0	0	
			Cement	4	0	-	First follow up (after 24 hrs)
			UG	0	-	-	
			OH	0	-	-	
			Metallic	0	-	-	
			Clay	0	-	-	
			Coolers	0	-	-	
			Plastic	0	-	-	
			Others	0	-	-	

* Both domestic and peri-domestic containers; HSIC** - High socio economic Inside city

Table 11. Details of breeding containers treated for testing efficacy in winter season in areas LSOC Season: Winter; Households Covered: 50**

Area	Extract used	Concentration used	Container details *				Study type
			Type	No. examined	No. positive	No. treated	
LSOC	Acetonitrile & Methanol	100 ppm	Cement	35	7	7	First study
			UG	10	3	0	
			OH	29	0	0	
			Metallic	32	2	2	
			Clay	46	1	1	
			Coolers	0	0	0	
			Plastic	60	6	6	
			Others	0	0	0	
			Cement	7	0	-	First follow up (after 24 hrs)
			UG	0	0	-	
			OH	0	-	-	
			Metallic	2	0	-	
			Clay	1	0	-	
			Coolers	0	-	-	
			Plastic	6	0	-	
			Others	0	-	-	

* Both domestic and peri-domestic containers; LSOC** Low socio economic out side city

Table 12. Details of breeding containers treated for testing efficacy in winter season in area LSIC Season: Winter; Households covered: 50**

Area	Extract used	Concentration used	Container details *				Study type
			Type	No. examined	No. positive	No. treated	
LSIC	Acetonitrile & Methanol	100 ppm	Cement	35	10	10	First study
			UG	8	0	0	
			OH	17	0	0	
			Metallic	10	0	0	
			Clay	50	2	2	
			Coolers	0	0	0	
			Plastic	85	0	0	
			Others	0	0	0	
			Cement	10	0	-	First follow up (after 24 hrs)
			UG	0	-	-	
			OH	0	-	-	
			Metallic	0	-	-	
			Clay	2	0	-	
			Coolers	0	-	-	
			Plastic	0	-	-	
			Others	0	-	-	

* Both domestic and peri-domestic containers; LSIC** Low socio economic inside city

FINDINGS

1. Dose optimization studies have shown that 100 ppm concentration of extracted latex is effective after 24 hours of exposure resulting into 100 % mortality against dengue vectors.
2. Common breeding containers in low socio-economic areas were found to be uncovered cement tanks, underground tanks, matkas, clay pots and plastic containers while in high socio-economic areas clay pots and cement tanks were observed.
3. 100 ppm concentration of extracted latex was equally effective in all type of containers in all the selected areas in the winter season.

COMMUNICABLE DISEASES

1.13 Polymorphisms in duffy blood group genes of *Plasmodium vivax* malaria patients and control population

- S. S. Mohanty, Sc. 'C', Karam. V. Singh, Sc. 'F', R. Fotedar, Sc. 'C' and J. Lakshminarayana, Sc. 'E'

Commencement: September, 2010 **Duration:** Two Years **Status:** Ongoing

OBJECTIVES

1. The four phenotypic variants of Duffy blood group [Fy:(a+b+), Fy(a+b-), Fy(a-b+) and Fy(a-b-)] will be calculated within the *Plasmodium vivax* malaria patients and control population.
2. Duffy blood group genotyping in *Plasmodium vivax* malaria patients and control population from the endemic areas of Rajasthan will be done.

PROGRESS OF WORK

The current study was undertaken to know the distribution of Duffy blood group antigen in the desert population of Rajasthan and its correlation with malaria infectivity. The study was carried out in Jodhpur district and the study population was divided in to tribal (Bhil) and non-tribal group. Both males and females were included in the study between the ages 1 to 60 years. All the subjects were taken from different families and were not related. Fever cases reported to the Mahatma Gandhi Hospital of S. N. Medical College and Fidusar Primary Health Centre were screened for malaria positive. Those found to be positive were included in the study. The blood samples of the healthy individuals were collected by door to door household surveillance. The healthy volunteers were asked about past malaria history and those who had earlier malaria infection were not taken in the study.

Blood samples were taken by finger prick or from vacutainer collected for clinical studies of the hospitalized patients. The whole blood samples of 200µL were kept in EDTA containing tubes for Duffy blood group testing. Duffy antigen identification was carried out within 24 hours of blood sample collection using the indirect antiglobulin technique. Commercially available antisera anti-Fya, anti-Fyb and anti-human globulin (M/s DiaMed GmbH, 1785 Cressier s/Morat, Switzerland) were used according to manufacturer's instructions.

For the diagnosis of malaria a thick and thin film was prepared on the same slide from the peripheral blood. Thin film of the slides was fixed with methanol before staining. The blood slides were stained with Jaswant Singh Bhattacharjee (JSB) stain and microscopically examined under an oil-immersion lens. A thick smear was regarded as negative on initial review if no parasites were seen in 100 high power fields. The diagnosis of malaria was done simultaneously for all the participants including the

healthy participants during the Duffy blood grouping. The malaria positive patients were promptly treated with antimalarial therapy in accordance with National drug policy. The frequencies of both the alleles were calculated from the observed phenotypes and data were analyzed by one way analysis of variance (ANOVA) to find significant differences using M. S. Excel software.

A total of 96 subjects were enrolled in the study and blood samples of all the subjects were screened for the presence of malaria parasite and analysed for the determination of the phenotypic variants of Duffy antigen. Among the study population, 78 were found to be control population and 18 were *Plasmodium vivax* malaria patients. The results of all the samples are shown in table I. When the Duffy phenotype of the *Plasmodium vivax* malaria patients (n=18) and healthy population (n=78) were compared, a higher percentage of population with Duffy phenotype Fy(a+b+) were recorded in the malaria patients (83.33%) than the healthy population (58.37%) and inverse to the above was recorded in case of Duffy phenotype Fy(a+b-) and Fy(a-b+) (Table I). Among all the population, Duffy phenotype Fy(a+b+) were significantly ($F=37.51$, $df=2, 9$; $P=0.00001$) higher than the Duffy phenotype Fy(a+b-) and Fy(a-b+). The Duffy phenotype Fy(a-b-) was not reported during this investigation in the study population.

Among the study subjects, 54 belonged to the tribal group and 42 to non-tribal group. When the Duffy phenotypes of the tribal population were compared, percentage of population with Duffy phenotype Fy(a+b-), Fy(a-b+) and Fy(a+b+) were 18.51, 11.11 and 70.37 respectively (Table I). However, non-tribal population with Duffy phenotype Fy(a+b+) were 15.6% lower than the tribal population and reverse order was recorded in case of Fy(a-b+). Furthermore, the percentage of both tribal and non-tribal population with Duffy phenotype Fy(a+b+) were significantly ($F=16.31$; $df=2, 3$; $P=0.02$) higher than the population with Duffy phenotype Fy(a+b-) and Fy(a-b+). The percentage of non-tribal population with Duffy phenotype Fy(a-b+) was 2.3-fold higher than the tribal population (Table I). Moreover, a higher percentage of non-tribal population were recorded with Duffy phenotype Fy(a-b+) than the Fy(a+b-) and reverse was recorded in case of tribal population.

OUTCOME OF THE PRESENT STUDY

The data suggests that the Duffy phenotype Fy(a+b+) was dominant in the population of the North-Western part of India were susceptible for *Plasmodium vivax* malaria infection. The Duffy phenotype Fy(a+b+) was also dominant in the tribal population than the non-tribal population and tribal population were more susceptible than the non-tribal.

Table I. Duffy phenotypes and gene frequencies of the various populations of the desert part of India

Name of the Category	Number tested (n)	Duffy phenotypes in %			Gene frequencies	
		Fy (a+b-)	Fy (a-b+)	Fy (a+b+)	FYA	FYB
<i>Plasmodium vivax</i> malaria patients	18	5.55 (n=1)	11.11 (n=2)	83.33 (n=15)	0.47	0.53
Healthy population	78	21.79 (n=17)	19.23 (n=15)	58.97 (n=46)	0.51	0.49
Tribal Population	54	18.51 (n=10)	11.11 (n=6)	70.37 (n=38)	0.54	0.46
Non-tribal population	42	19.04 (n=8)	26.19 (n=11)	54.76 (n=23)	0.46	0.54

COMMUNICABLE DISEASES

1.14 Study on the age determination of field collected mosquitoes by quantitative reverse transcriptase-PCR (qRT-PCR)

- S. S. Mohanty, Sc. 'C' Karan V. Singh, Sc. 'F' and S. K. Bansal, Sc. 'F'

Commencement: September, 2010 **Duration:** Two Years **Status:** Ongoing

OBJECTIVES

1. Candidate age depending expression genes will be identified from data generated in female *Drosophilla melanogaster* and *An. gambiae*. Orthologue genes of *Drosophilla melanogaster* will be identified in *An. gambiae*.
2. Specific primer will be designed for the age depending genes of *An. gambiae* and will be standardized for the determination of age of known *Anopheles stephensi* and *An. culicifacies*.
3. The quantitative assay of pteridine and glucose-6-phosphate dehydrogenase will be standardized for the age of known mosquitoes and will be used for the confirmation of the results of qRT-PCR.
4. Technique will be validated with the field collected mosquitoes.

PROGRESS OF WORK

The larvae, pupae and adults of laboratory reared and semi field conditions of *Anopheles stephensi* were used in the present study. About 100 pupae of *An. stephensi* were kept in an enamel bowl and the bowl was placed inside a cage. The pupae were left in the cages for the development to the adults, and those not emerged to adults on day-3 were discarded. Adults were given 10% sugar as food after emergence. Blood feed was not given to the experimental female mosquitoes. Ten mosquitoes were collected by the aspirator from the cages and were put in a test tube. The mosquitoes in the test tube were kept in side the freezer for 5 minutes for anesthesia. Each anesthetized mosquitoes of a batch were put separately in microfuge tube. 200 µL of 5mM glycine (pH-8) buffer was dispensed on each mosquito. Mosquitoes were grinded in a 1.5ml microcentrifuge vial by a pestle fit for the microfuge. The substrates and cofactors of glucose-6-phosphate dehydrogenase assay were added to the spectrophotometer cuvettes maintained at 30°C in a dry bath. The first solution (2.7ml) added to the cuvettes was 0.55M TrisHCl buffer at pH7.8 containing 0.0033M MgCl₂. Thereafter, 100 µl of 0.006M concentration of cofactors nicotinamide adenine dinucleotide phosphate (NADP) was added to the above solution in the cuvette, followed by 100µl of substrate of 0.1M glucose-6-phospahte. Finally 100 µl tissue of the mosquito was poured in the cuevete and readings were taken at 340nm for ten minutes at an interval of 1 minute. The glucose-6-phosphate dehydrogenase assay of the larvae and

field collected pupae was estimated immediately after collection from field. Protein concentration of the mosquito tissue was estimated by the Bio-Rad protein assay kit in accordance to the manufacturer's instructions.

Laboratory reared *Anopheles stephensi*

The g6pd activity of the newly emerged male and female mosquitoes was significantly (ANOVA, $df=3, 36$, $F=112.06$, $P<0.00001$) higher than the pupae and larvae. When the g6pd activity was compared between the three developing stages, the activity was found to be increased from larva to pupa and maximum activity was recorded in the newly emerged adults (Fig. 1). The g6pd activity of the newly emerged females on day-0 was 6.5 and 3.2-fold higher than the larvae and pupae respectively. Similarly the g6pd activity of the newly emerged male was 20.5- and 9.9-fold higher than the larvae and pupae respectively. Moreover, the g6pd activity of the adult male and female mosquitoes was decreased with increasing age and lowest activity was recorded in the 30 days old mosquitoes (Fig. 1). The g6pd activity of the 30 days old male and female mosquitoes was 84 and 81% lower than the newly emerged ones. The g6pd activity of the male mosquitoes was more than 2-times higher than the female mosquitoes. A significant difference in g6pd activity was recorded between the pupae and the newly emerged adult (ANOVA, $df=2, 27$; $F=94.28$, $P<0.0001$)

Semi field conditions *Anopheles stephensi*

The g6pd activity of the newly emerged females on day-0 was 8.4 and 4.7-fold higher than the larvae and pupae respectively. Similarly the g6pd activity of the newly emerged males was 18.6- and 10.3-fold higher than the larvae and pupae respectively. The g6pd activity of newly emerged male and female was significantly (ANOVA; $df=3, 36$; $F=545.04$; $P<0.00001$) higher than the larvae and pupae. The activity of g6pd was increased with developmental stage, however a rapid increase (ANOVA $df=2, 27$; $F=455.07$, $P=0.0001$) was recorded between the pupae and newly emerged adult (Fig 2). The activity of g6pd was decreased with increasing age of male and female mosquitoes (Fig 2). The g6pd activity of the male mosquitoes was higher than the female mosquitoes. Among the adult mosquitoes, 75% lower g6pd activity was recorded in the 30 days old mosquitoes than the newly emerged male and female mosquitoes.

When the g6pd activity was compared between the semi field conditions and laboratory reared female mosquitoes, higher g6pd activity was recorded in the females of semi field conditions than the laboratory reared females. However, the difference in g6pd activity between the laboratory reared and semi field conditions female mosquitoes was not significant. The g6pd activity of the laboratory reared male mosquitoes were significantly (t test, $P=0.0036$) higher than semi field conditions male mosquitoes. The g6pd activity of the semi field conditions male on day-25 and day-30 was higher than the laboratory reared male mosquitoes.

OUTCOME OF THE PRESENT STUDY

The results of the experiments indicate that the enzyme g6pd can also be used for the prediction of the age of male and female *An. stephensi* both in the laboratory and field condition.

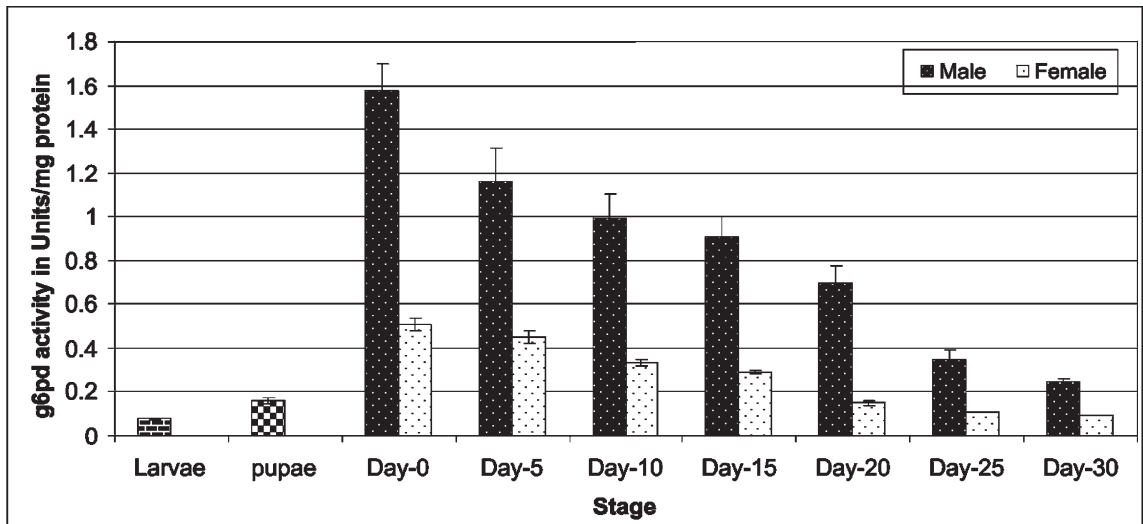


Fig. 1. Glucose-6-phosphate dehydrogenase activity in Units/mg protein of laboratory reared male and female *An. stephensi*

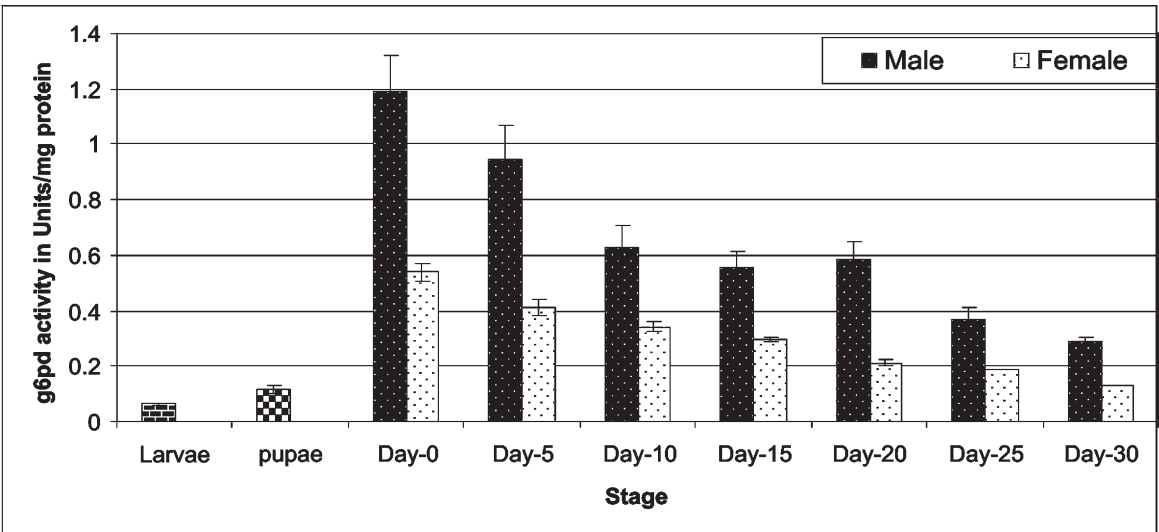


Fig. 2. Glucose-6-phosphate dehydrogenase activity in Units/mg of semi field conditions male and female *An. stephensi*

COMMUNICABLE DISEASES

1.15 Development of a real-time IT based intelligent health informatics management system in Desert with special reference to malaria

- Manjeet Singh Chalgia, T.O. and A. K. Dixit, Sc. 'E'

Commencement: April, 2009 **Duration:** Two Years **Status:** Concluded,
Collaborator: Joint Director, Health & Medical Services, Zone Jodhpur

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 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

Since the commencement of this study, Block Pokaran in Jaisalmer district was selected as study area on the basis of preponderance of malaria. Under Block Pokaran there are two CHCs : Pokaran & Sankra and six PHCs : Bhaniyana, Ramdeora, Loharki, Lathi, Jalora & Phalsoond and 181 villages. Four PHCs Loharki, Lathi, Jalora & Phalsoond were not having Lab Technicians. The blood smear slides collected at these PHCs were being sent to other PHCs for examination. It was noticed that the malaria information is moving from Sub Centre to PHC/CHC, PHC/CHC to Block, Block to District, District to Zone and Zone to State. This project was started with the aim to computerize the flow of information using Information and Communication technologies. The Real Time Health Informatics Management System (RT-HIMS) was developed by using trial version of Interactive Voice Response Server (IVRS) Software, Database server, GIS System and Web Server. Questionnaires in human voice were recorded in IVRS module of RT-HIMS to interact with health workers. Trainings were organized for lab technicians of study area to explain and demonstrate the method of interacting with RT-HIMS through telephone. From 1st December 2009, the trained Lab Technicians of PHCs of Block Pokaran started providing their lab reports to RT-HIMS server through their mobile phones. The RT-HIMS worked successfully as desired.

The work accomplished during reported period included the following steps:

1. Development of Questionnaire Developer Software for IVRS
2. Development of IVRS Software

3. Development of Software developed for sending SMS
4. Development of Web pages for providing Analytical and Graphical reports
5. System functioning validation & Data Validation
6. Results and Discussion
7. Limitations of Study

1. Development of Questionnaire Developer Software for IVRS

This software module is developed, using Visual Basic 6.0 and MS Access database, for preparing a hierarchy of questions for IVRS. The structure of the questionnaire database is described in Table 1. The runtime screenshot of the Questionnaire developer software is given in Figure 1.

Table 1. Structure of the questionnaire database

Field Name	Description
Mcode	Unique Message Code (Primary Key)
Name	Short Name for the Message
Description	Brief Description for the Message
Wavfile	Name of audio file carrying question/message in human voice
Varname	Variable Name to store the callers response
Msg_type	Message Type (predefined options are info or menu or data)
Time_out_msg	Action to be taken if caller delays in responding
Log_yes_no	Either to make entry in log book
b1,b2,...b9,b0	Action to be taken if caller presses 1,2,...,9 or 0
b_hash	Action to be taken if caller presses #
b_star	Action to be taken if caller presses *

Fig. 1. Runtime screenshot of Questionnaire developer software

The software was developed such that each record in the database may represent a question with unique message code. Record contained the link to pre-recorded audio files in human voice. The messages were classified into 'info' (information), 'menu' and 'data'. The messages type 'info' was kept for such messages which informs something but do not expect any data or input from caller, such as, 'welcome note', 'thanks note' and 'time out message'. The messages type 'menu' was kept for messages which read a menu message and waits for the caller to make selection. The messages type 'data' was kept for such messages which reads a question and waits for the numeric data. The fields 'b0' to 'b9', b_hash and b_star were created to specify pre-defined action to be taken if caller presses any key from its mobile keypad.

2. Development of IVRS Software

The IVRS program module, one of the main components of this project, has been developed using VB6 to interact with callers as per the set questionnaire. TAPI 3.0 (Telephony Application Programming Interface) is programmed to catch the telephonic events. Based on open source coding for TAPI programming available at Microsoft Corporation websites viz. www.tapi.info and [ftp://ftp.microsoft.com/telephony](http://ftp.microsoft.com/telephony), IVRS Software is programmed according to the requirement of the study.

The software is designed such that when IVRS software starts, it brings the computer into listening mode and waits for the TAPI event. When INCOMING ring event occurs, it identifies the caller ID, logs the event, accepts the call, plays the first message from the questionnaire pre-recorded in human voice and starts waiting again for the caller's response. When caller responses by pressing any telephonic key during IVRS questionnaire session, a Dual Tone Multi Frequency (DTMF) event occurs, IVRS identifies the telephonic key pressed by the caller, logs the event and takes the next action as per the pre-defined questionnaire. If the action points to another message, IVRS jumps to the specified message. If a caller delays in responding, IVRS plays out the time out message and if line gets disconnected, the IVRS identifies the event, logs the event and terminates the questionnaire session (Figure.3). IVRS Server is programmed to create and maintain three log files. The CALL LOG file keeps the record of the calls received by the IVRS. The INTERACTION LOG file keeps the record all the events identified by the IVRS, the incoming call detail, the sequence of messages played by the IVRS, all responses made by the caller and the action taken by the IVRS. The FINAL LOG file records only the answers responded by the caller in comma delimited format (Figure. 4). The developed log books are placed in a web folder, which enabled to view these files remotely through internet.

3. Software developed for sending SMS

The software module for sending SMS was developed using VB6 using "Microsoft Communication Control 6.0" component. This software module was developed by using the open source codings available at <http://www.scampers.org/steve/sms/samples.htm> and <http://www.developershome.com/sms>. This software periodically retrieves SMS text and mobile number from *smsrep* database, encodes the SMS into PDU format and sends the SMS through the USB GSM Modem (Figure. 5).

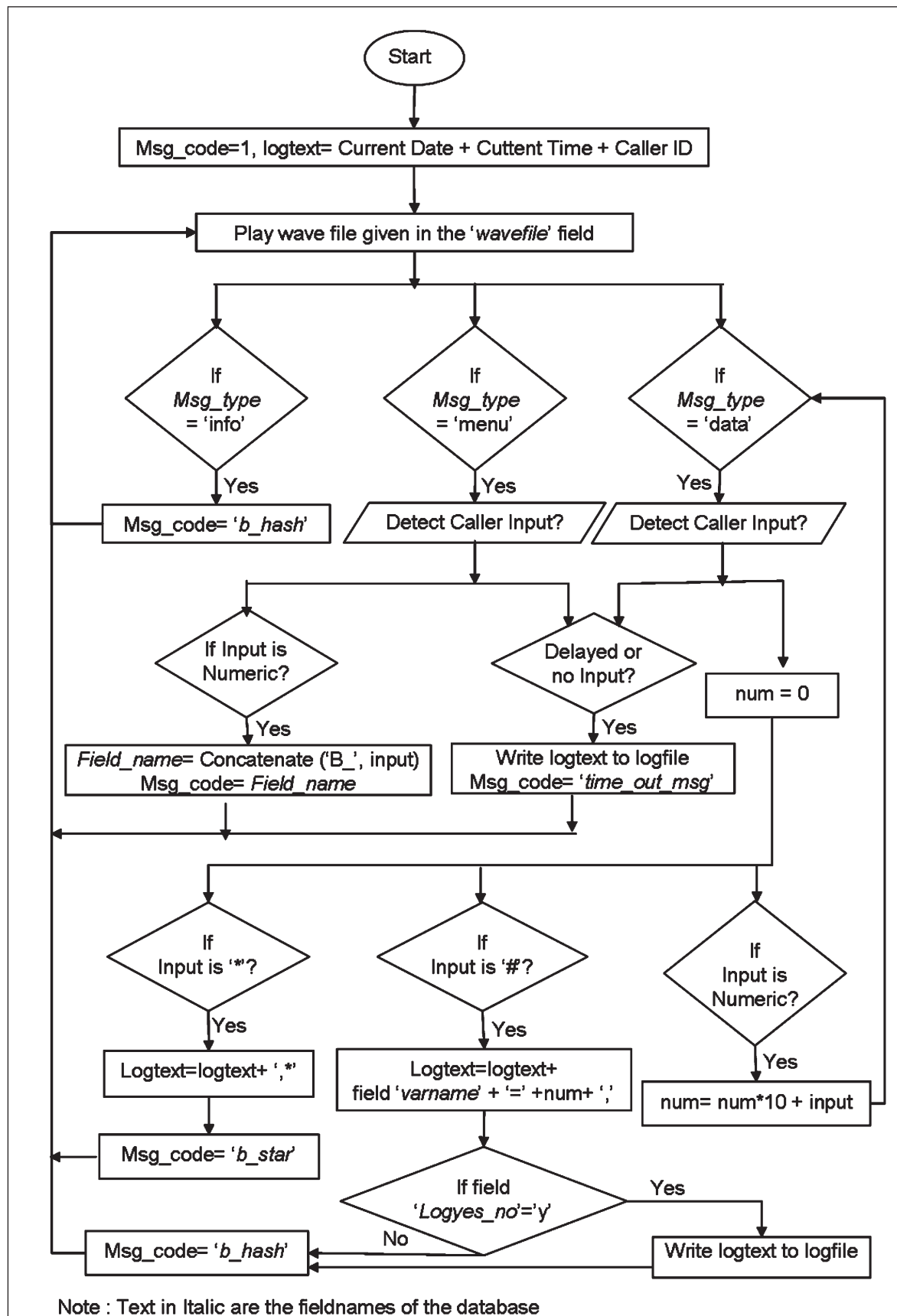


Fig. 2. IVRS Software: Flow diagram of questionnaire handling module

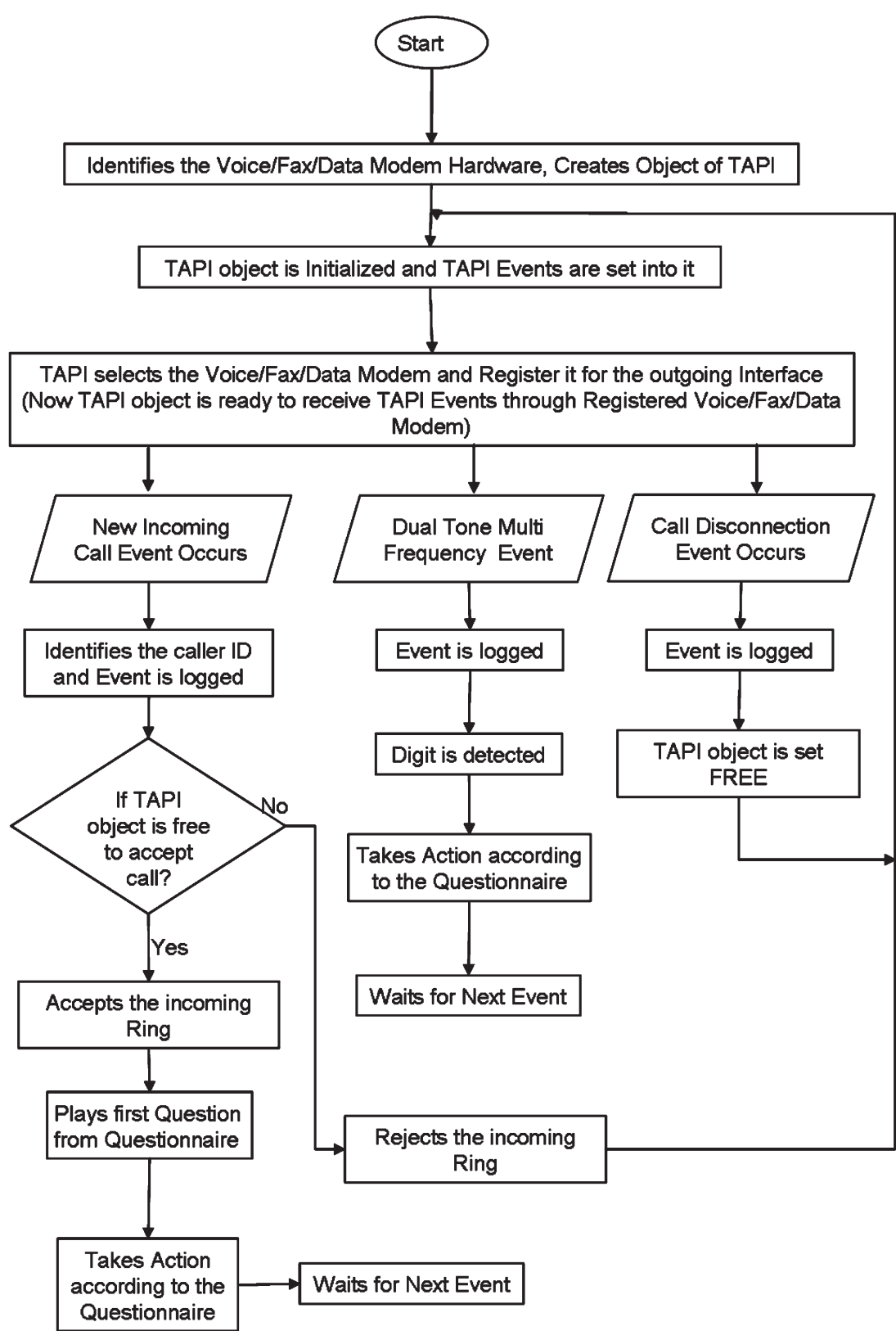


Fig. 3. IVRS Software: Flow diagram of Event handling module

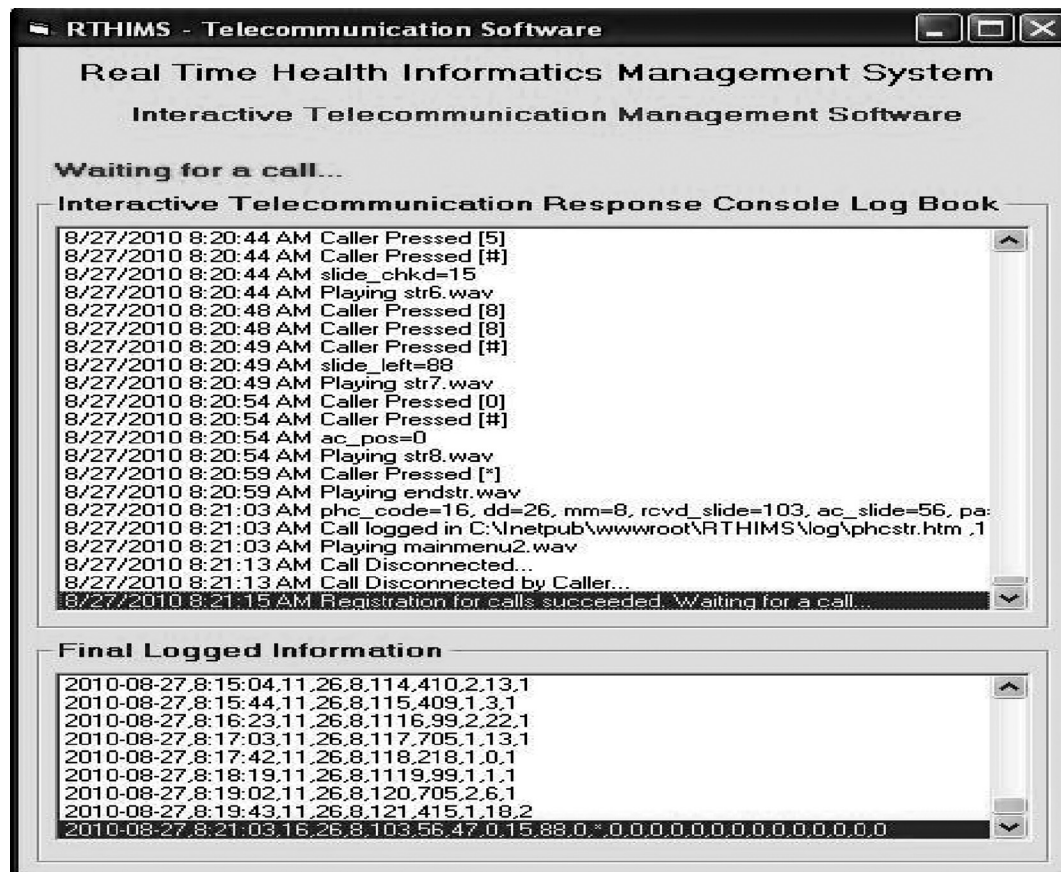


Fig. 4. Runtime screenshot of IVRS Software

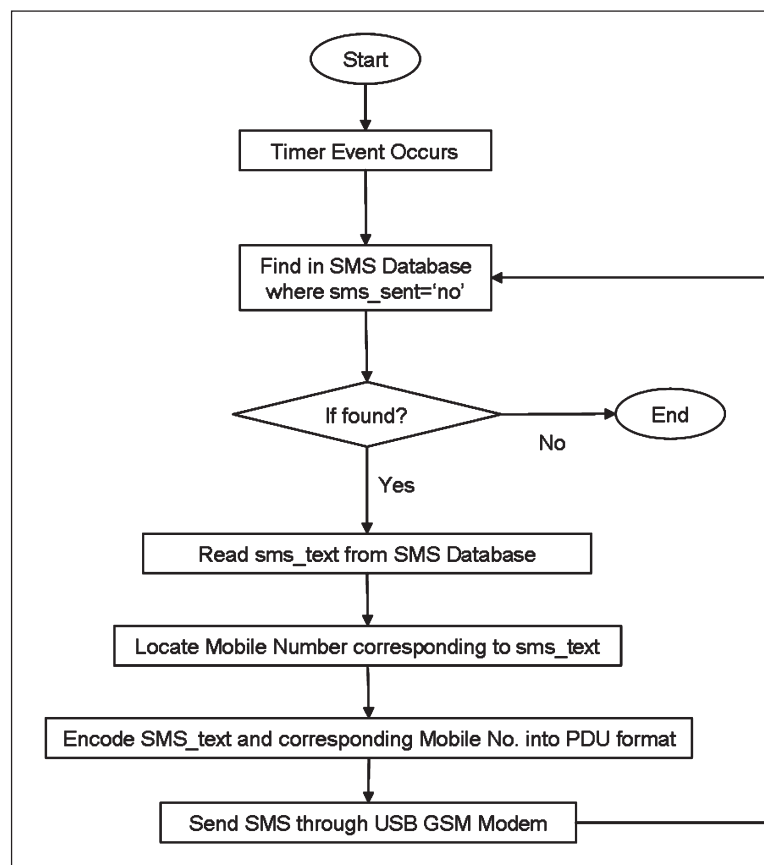


Fig. 5. Flow Diagram of Program module prepared for sending SMS

The revised architecture and data flow diagram is given in Figure 6 and Figure 7.

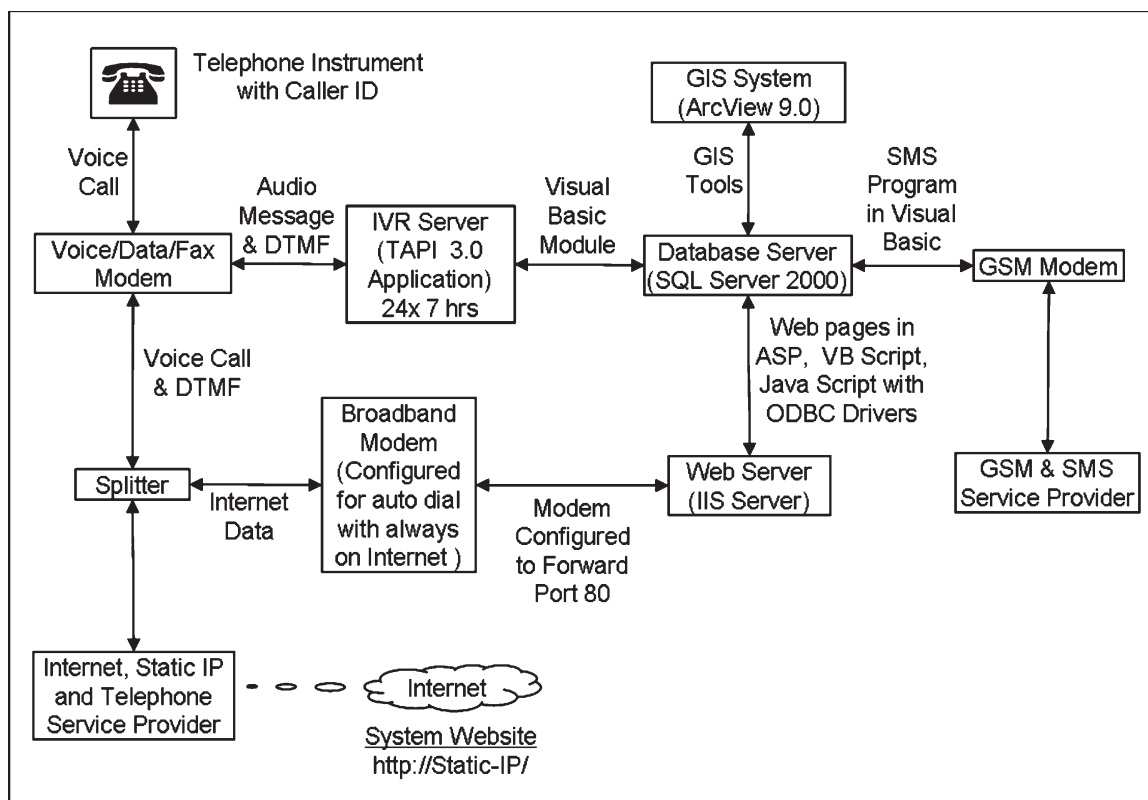


Fig. 6. Revised architecture of RT-HIMS

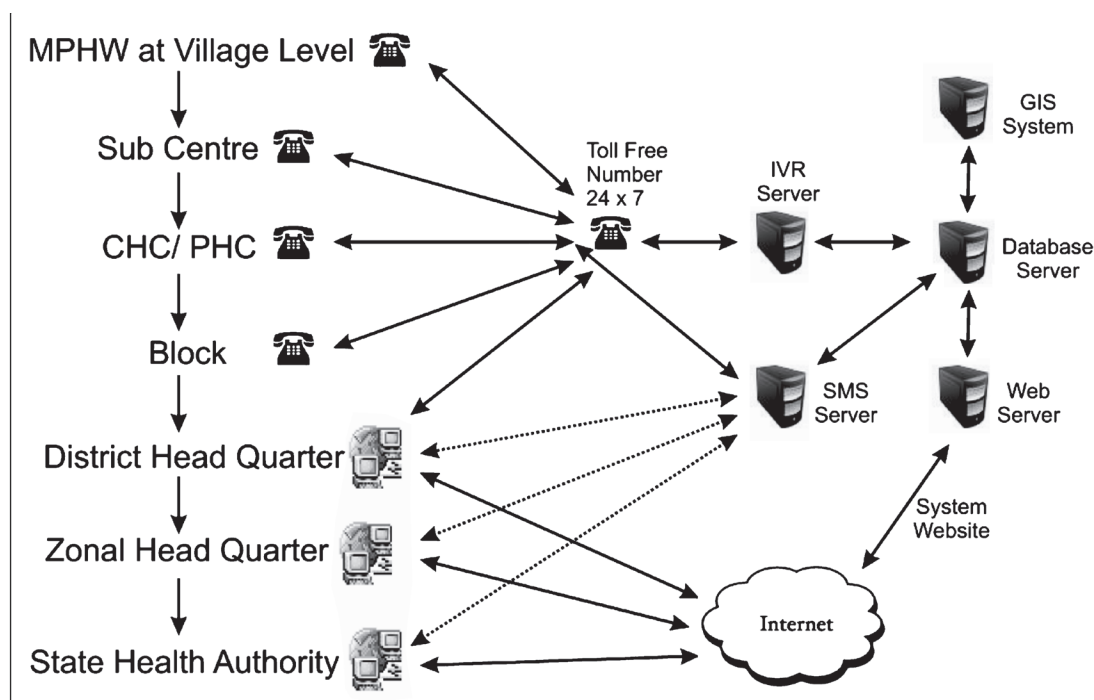


Fig. 7. Revised data flow diagram of RT-HIMS

4. Development of Web pages for providing Analytical and Graphical reports

The RT-HIMS web site has been developed using Active Server Pages, Java Script and other scripting languages. The IVRS data stored in SQL Server database is linked with the web pages. The online web

pages were created with customized interface, which enabled to view the malaria information for desired period and desired health centre. The system website provided analytical and graphical reports to identify the trend of malaria incidence, focus on pockets of disease and assess the affect of intervention.

(a) Analytical Reports

- *PHCwise Lab Report*: The PHC wise malaria report provided the details of the selected variable for the selected period of time and selected PHC. This report helped to study the trend of malaria cases and to identify the affect of intervention.
- *Villagewise Positive Case Distribution*: The Village wise malaria distribution report provided the village wise malaria cases in descending order for the selected period of time, selected PHC and selected malaria species. This report helped to identify the endemic area. The Village names in this report have further links to a more detailed report for that village. This detailed report contained the gender wise and age wise distribution of total cases occurred in that Village.
- *Gender wise and Agewise Disease Distribution*: The gender wise distribution report provided the gender wise and age wise distribution of malaria cases for the selected period of time, selected PHC and selected malaria species.

(b) Graphical Reports

- *PHCwise Lab Report Graph*: The date wise graphical report provided the date wise bar graph of desired one or two attributes related to occurrence of malaria cases for the selected period of time and selected PHC.
- *Villagewise Positive Case Graph*: The Village wise malaria graphical report provided the village wise bar graph of malaria cases in descending order for the selected period of time, selected PHC and selected malaria species. The GIS facilitated to identify geographically the endemic area, pockets of disease and the population at risk .

5. System functioning validation & Data Validation

The functioning of the RT-HIMS system was validated by examining “INTERACTIVE LOG FILE”. Any abnormal functioning of the system or mistake made by the caller during interaction with the system was checked through this log file. In case of abnormal function of the system, the system was corrected by appropriate action. In case of caller’s mistake, the respective caller is re-trained telephonically.

Received data was made available online on the system website through dynamic web pages, which empowered the data user to validate the data remotely through internet. Check points were made in the questionnaire by which the data was validated for appropriateness of reports. For example, the sum *Active Slide Collection + Passive Slide Collection + Mass Slide Collection* was matches with the *Total Slide Collection* asked in the questionnaire which partially confirmed the validity of the data. But, if *Total Slides Checked + Total Slides Left for Testing* also match with the *Total Slide Collection*, then it fully confirmed the validity of the data received. Similarly data is validated by inspecting data logically. All data received through IVRS was programmed to store initially in an unchecked database. After validation only it was moved to checked database.

6. Results and Discussion

The developed RT-HIMS is in operation for more than a year. Lab technicians started providing lab report to the system through their mobile phone in December, 2009. Initially the lab technicians made

more mistakes in sending reports. Such mistakes were identified through INTERACTION LOG BOOK of RT-HIMS system. The respective callers were made aware telephonically about the mistakes made by them. Soon the lab technicians got familiar with the RT-HIMS system and the quality of the data got improved. The total calls received during the period from Jan to July, 2010 were analyzed and it was found that 92% of total calls were correct. Similar was the case with the Multi Purpose Health Workers, who started reporting to the system in May, 2010.

SMS server acknowledged the callers regularly. Confidentiality of the data was maintained by authorizing the users. The data was inspected and validated by authorized users. It was expected from lab technicians to report daily to the system. However, the system received 98% reporting from 4 PHCs and 76% reporting from 1 PHC. The reason was administrative.

Before installation of the RT-HIMS system, the malaria information moved manually from grass root level to the top level of health functionary's hierarchy. It was also observed that the manual movement of reports was delayed by a week or more and that due to merging of data at each level, the focus of the disease incidence was lost.

After installation of RT-HIMS system, the manual system of data collection was also continued and RT-HIMS system also generated the disease database. Disease information was collected from the grass root level health functionaries in real-time through IVRS. RT-HIMS stored malaria data collected through IVRS immediately in the Microsoft SQL server database, which was capable of querying, sorting, relating and data analysis. The System website retrieved disease data from database server and generated online real time disease reports. The availability of online reports reduced the delay in reporting at the level of health functionary hierarchy. The online customized tabular, graphical and GIS reports helped the decision makers to plan the intervention program more efficiently.

The RT-HIMS provides malaria information on daily basis and up to village level, which helps in early detection and monitoring of the malaria occurrence and to focus on the population at risk. These features of RT-HIMS make it different from all previous studies. While analyzing RT-HIMS online tabular reports it was observed that malaria suddenly rose on 30th August, 2010 and increased day by day. The RT-HIMS village wise distribution report was further analyzed for 30th & 31st August, 2010, to study the focus of malaria. It was noticed that total 90 cases of malaria were occurred during the period. The study area was having 181 villages but the villages which contributed to 60% (56 cases) of the total cases of malaria were Gomat (10 cases), Pokaran (10), Unjala (10), Mandva (6) and Lewan (4), Maurani (4), Kelawa (4), Jaimla (3) and 4 cases were diagnosed from the persons who were non-resident of study area. Thus the focus converged on these 8 villages. The situation was immediately brought into the notice of the Zonal health authority who in turn took immediate relevant control measures and brought the situation under control. The RT-HIMS reports were monitored continuously and observed that malaria increased on daily basis to its peak on 16th September, 2010 and then stepped down by 5th October, 2010. In this manner the RT-HIMS system helped health department to detect malaria occurrence in its early stage, to focus on the root of the problem and to monitor the impact of intervention actions. The bar diagram of datewise occurrence of malaria cases from 10th Aug to 25th Oct, 2010 is shown in Figure 8. Monthwise malaria occurrence in Block Pokaran in 2010 is given in Table-2.

Malaria information collected through the developed system was presented on GIS maps, which helped to identify the spatial relationship between disease occurrence and disease distribution. The GIS map representing distribution of Pv and Mix cases of malaria in study area from 10th Aug to 25th Oct, 2010 is shown in the Figure 9.

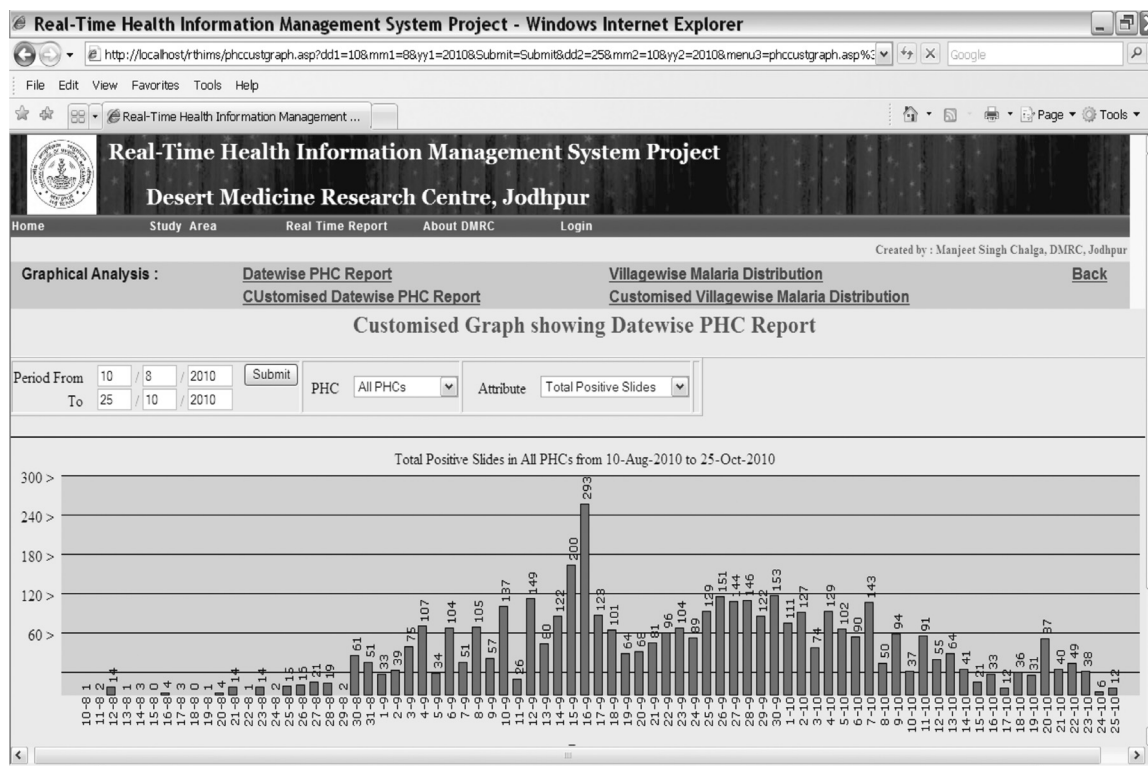


Fig. 8. Web Page showing Bar diagram of datewise occurrence of malaria cases from 10th Aug to 25th Oct, 2010

Table 2. Malaria Data of Block Pokaran in 2010

	BSE	Total Positive	Pv	Pf	Mix
Jan-10	3083	24	24	0	0
Feb-10	3076	7	7	0	0
Mar-10	3097	13	13	0	0
Apr-10	2274	33	33	0	0
May-10	1839	5	5	0	0
Jun-10	2591	3	3	0	0
Jul-10	3676	9	9	0	0
Aug-10	8745	250	240	8	2
Sep-10	24055	3179	2945	159	75
Oct-10	12710	1574	1549	17	8
Nov-10	3285	185	174	3	8
Dec-10	1483	54	47	6	1
Total	69914	5336	5049	193	94

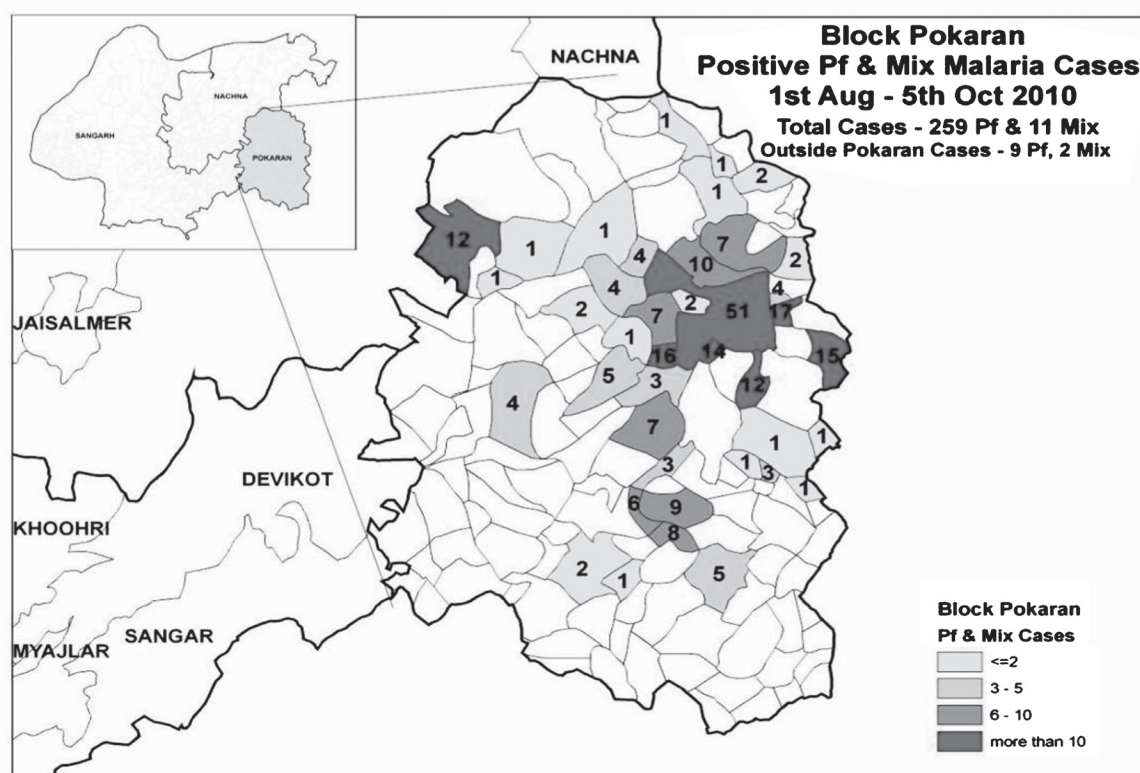


Fig. 9. GIS Map showing occurrence of malaria cases (Pv & Mix) in study area

Conclusion

The system is found to be faster, cost effective, more advantageous and an adjunct to the existing health information system. The main advantage of the system is that it empowers the grass root health workers to report through their mobile phones. Health workers can use their personal phone or public phones for reporting as the system telephone is kept toll free. System is very fast and it uploads the received report immediately on the database. It is cost effective as it doesn't involve the expenditure of computerization and human resource at root level. It doesn't have the limitation of distance. System questionnaire is flexible as any number of variables or health units or diseases can be added or removed at minimal or no extra cost. The questionnaire can be developed in the desired regional language. Online tabular and graphical reports facilitate data users to detect the trend of disease occurrence in real-time, to focus on the spatial distribution of disease, to understand its epidemiological base and to assess the effect of intervention. Moreover the system can operate on itself for 24 x 7 hrs.

7. Limitations of Study

- In this study data providers are the State health workers and data users are State health authorities. Thus active participation of State health workers and authorities play the key role in the success of the project.
- It was more suitable to collect numeric data through IVRS, thus alphabetic information were given numeric codes such as gender of patient, village name, health centre name etc. Alphabetic information, which cannot be given codes were not collected such as Patient's name, address etc. In such cases, it was observed that these patients were given a unique Malaria Patient Case number by the health department. Thus, this Malaria Patient Case

number was collected through IVRS, which made a link between malaria information in IVRS database to the patient information in health records.

- In this study single telephone line was used to connect IVRS through voice modem which limited the IVRS to communicate only with one caller at a time. However, this problem can be solved by adding more telephone lines or connecting PRI ISDN telephone line to the RT-HIMS system through telephony board. PRI ISDN telephone line is capable to manage 30 callers in parallel at the same time on a single telephone line.

Remaining Work to be done

- Implementation of RTHIMS Server for wider area
- Installation of telephony board and more telephone lines to enable root level reporting (Sub Centre-ANMs report)
- Adding more Analytical Reports
- Adding dynamic GIS Reports

NON-COMMUNICABLE DISEASES

2.1 Prevalence of diabetes mellitus and impaired glucose tolerance in the raika and other communities with similar life style in Rajasthan

- Bela Shah, Director-in-Charge and K. R. Haldiya, Sc. 'F'

Commencement: August, 2008 **Date of completion:** December, 2011 **Status:** Ongoing

OBJECTIVES

1. To estimate the prevalence of diabetes mellitus and impaired glucose tolerance in Raika community of Rajasthan
2. To compare prevalence of diabetes mellitus and impaired glucose tolerance in Raika community and other communities with similar life style
3. To find the association of diabetes and impaired glucose tolerance with camel milk consumption, if any.

PROGRESS OF THE WORK

The study was carried out in rural villages of Jodhpur and Barmer district of Rajasthan having Raika population. A house to house survey was carried out in selected areas. A total of 827 households were covered and 1858 individuals were interviewed and examined. The preliminary analysis of data was carried out on 526 households (HH) and 1041 individuals. The average family size of selected HH was 5.1 ± 2.1 members (Range 1-17 members) while the average available eligible members were 2.6 ± 1.3 members (Range 1-12 Members). The major source of water was tap water (50.6%) followed by tanker (39.4%). 99.6% HH did not have any toilet facility. Only 49.6% of HH has electric supply. 79.8% HH have 1-2 rooms. Only 44.3% HH have separate kitchen and wood was source of fuel for cooking in 97.7% HH. 34.1 % HH did not have agriculture land. The majority of households have goats (96.2%) followed by sheep (54.3%), camels (23.0%), cows (14.1%) and buffalos (5.1%). The pucca houses were 55.7%. Only 12.2% HH used camel milk. Only two household gave family history of diabetes.

The average age of the selected individual was $39.1 \pm 17.2\%$ years. The percentage of elderly population above 60 years of age was 12.1%.

Among surveyed individuals, 16.3% individuals were smokers followed by tobacco chewers (12.2%) and alcohol consumers (0.9%).

Almost all selected individuals were vegetarian and their staple diet was wheat and Bajra. Most of them eat fruits occasionally. Soyabean oil was used for cooking vegetables and pure ghee used for rotis.

The major occupation of the surveyed male individuals was labour (35.1%) followed by animal keeping (33.7%) and agriculture (14.0%) while in females it was housework (47.5%), labour (20.9%), agriculture (14.9%) and animal keeping (8.7%).

Among surveyed individuals, 656 (63.1%) gave history of drinking camel milk. Among them, only 131 (20.0%) drank camel milk during last 12 months. The majority of them drank milk occasionally (80.6%) while 5.5% daily. The quantity of milk drank at a time was >500 ml. (58.7%) followed by 300-500 ml. (28.3%) and 50-300 ml (13.0%). The majority of them were consuming unboiled as well as boiled milk (85.1%). The duration of drinking camel milk up to 4 years was 45.7%, followed by 5-14 years (25.7%) and 15 years and above (28.6%).

The other type of milk consumed was goat milk (97.9%) followed by cow milk (12.9%) and buffalo milk (3.4%)

The majority of individuals told that their nature of work was heavy and physical (44.5%) followed by standing (28.7%), walking (13.7%) and sedentary (13.1%). The physical activity at work was heavy (42.3%) followed by moderate (50.3%) and light/ very light (7.4%). More than 70% of individuals told they do activity related to work at home. The level of activity during past 5 years at work was heavy (44.8%) while at home it was 92.8% and overall it was 94.0%.

A total of 6 diabetics were detected during the survey. Out of which 4 were males and 2 females. Their age was between 41-70 years. Among them, one was smoker and two were tobacco chewers. Four diabetics were drinking camel milk and all were males.

WORK TO BE CARRIED OUT

Field survey of remaining Raika individuals and similar life individuals of other community will be carried out.

NON-COMMUNICABLE DISEASES

2.2 Meta Analysis of non-communicable diseases (diabetes mellitus and hypertension) and their mapping in western Rajasthan, India

- J. Lakshminarayana, Sc. 'E', Madhu B. Singh, Sc. 'E' and K. R. Haldiya, Sc. 'F'

Commencement: August, 2009 **Duration:** Two Years **Status:** Completed

OBJECTIVES

1. Meta Analysis of available published or unpublished information of non communicable diseases namely Diabetes Mellitus and Hypertension
2. To study regional/ecological variations of these non communicable diseases in Rajasthan by systematic reviews and
3. To map out the districts for Diabetes Mellitus and Hypertension in the western region.

PROGRESS OF THE WORK

The data for meta analysis was collected for Un-Published data by Visiting Medical college libraries in Rajasthan on diabetes mellitus and hypertension. A total of 45 studies on case control studies were collected, of these only 10 studies met the criteria for meta analysis of Diabetes mellitus and 10 studies for hypertension. The duration was considered to be for a period of 10 years. In India many studies have been carried out on diabetes and hypertension. All the published literature has been collected earlier by using different search engines as reported last year. The odds ratios and weights Effect size were calculated and reported. The un-published reports have been analysed and reported. The mapping of the data is in progress and will be reported next year.

RESULTS

The analysis of the un-published data revealed that the intervention and the cohorts were non-homogeneous ($P < 0.01$ and $P < 0.01$, respectively); however, the life style intervention cohort was homogeneous for Diabetes ($Q = 25.83$, d.f.= 9, and for hypertension ($Q=27.05$, D.f.= 9) $P=0.36$). The overall ES for interventions was 0.06 (95% confidence interval [CI] =(0.03–0.08); there were no significant differences among the life style interventions which had an overall ES of 0.10 (95% CI =0.05–0.16). The overall ES of the studies on diabetes mellitus is 0.08 (95% CI = 0.04–0.14), while stratifying the combined studies the largest impact is (ES = 0.38). Meta Analysis of combined studies of diabetes mellitus and hypertension improved the heterogeneity among the studies and gave valid Conclusions. The mapping of districts will be done from the data collected by using GIS.

CONCLUSIONS

The Interventions had low effect sizes which show that there is an improvement in diabetes cases similarly among the hypertensive patients. The combined studies improved the sample size and gave effect size statistically significant compared to normal's which showed a drastic improvement in patient of both diabetes mellitus and hypertension.

Table 1. Calculation of estimates of different studies & Odds Ratios on diabetes mellitus

Study Ref.	a	b	c	d	Sample Size(n)	Var.	Wt.	O.R.	Wt. X O.R.	Q
1	5	14	33	22	74	0.16	6.25	0.24	1.5	2.52
2	7	6	11	13	37	0.56	1.78	1.38	2.46	1.23
3	8	12	25	30	75	0.25	4.0	0.80	3.20	1.69
4	14	41	42	22	119	0.69	16.67	0.18	3.00	4.33
5	35	39	34	32	140	0.14	7.14	0.85	6.07	3.46
6	46	23	97	115	281	0.13	7.69	2.37	18.22	4.25
7	20	16	28	25	89	0.20	5.00	1.12	5.60	1.68
8	5	17	35	24	81	0.14	7.14	0.20	1.43	2.24
9	23	32	26	28	109	0.13	7.69	0.77	5.92	2.26
10	32	27	36	31	127	0.13	7.69	1.02	7.84	1.98

(Q = 25.83, d.f. = 9)

Table 2. Calculation of estimates of different studies & Odds Ratios for Hypertension

Study Ref.	a	b	c	d	Sample Size(n)	Var.	Wt.	O.R.	Wt. X O.R.	Q
1	10	14	23	12	59	0.15	6.15	0.1	0.62	2.88
2	14	11	17	15	57	0.56	7.18	0.37	2.68	1.07
3	45	25	95	110	275	0.11	9.09	0.56	5.04	1.96
4	14	41	42	22	119	0.07	14.29	0.74	10.57	4.16
5	35	43	32	38	148	0.11	0.91	0.14	0.13	3.62
6	30	22	35	32	119	0.13	100.2	0.82	82.17	4.75
7	15	36	55	42	148	0.20	8.62	0.48	4.13	1.89
8	6	17	35	24	82	0.14	7.14	0.32	2.28	2.54
9	23	30	26	28	107	0.13	7.69	0.41	3.15	2.22
10	15	16	28	26	90	0.13	7.69	0.38	2.92	1.96

(Q=27.05, d.f. =9)

Table 3. Calculation of estimates for diabetes mellitus and hypertension

Studies	O.R	95% C I	test	P-value	Effect Size
Diabetes	1.06	0.69-1.82	T=2.14	P<0.05	0.08 (0.04-0.14)
Hypertension	1.02	0.42 – 2.56	T= 2.54	P<0.05	0.38(0.05-0.61)

IMPORTANT LEADS AND / OUTCOMES FROM THE STUDY

The study has provided information on diabetes mellitus and hypertension through Meta Analysis for the entire state of Rajasthan with variations in different ecological/geographic regions. The mapping for these deficiencies will be done for the state of Rajasthan with ecological variations among the districts. This will be useful to many researchers and health administrators for identifying the incidences

among diabetes mellitus and hypertension at district level and can be implemented in the state health programmes. By this approach DMRC can become nodal centre and member of Cochrane data bases for western desert region. This will be an innovative work and well documented scientific study on diabetes and hypertension. Strategies can be developed and state government can be informed for intervention programmes to be launched and for implementing the control programmes in the districts and state as a whole.

WORK REMAINING TO BE CARRIED OUT

The work is still going on and searching for un-published work in few medical colleges libraries will be carried out. Mapping of the district will be done and reported in the next report. The analysis and mapping will be done using REVMAN 5.0 and GIS ARC VIEW packages which are available at DMRC.

Appendix

Formulae for Calculation of various parameters are as follows:

- Estimate the variance of the ORs for each study
- Variance $n = i/(b_i * c_i)$ for $i=1,2,3,....$
- Calculate the weights for each study
- Weight = $1/Var$
- Calculate the product of the weights * ORs
- Product = ORs * W
- Calculate the sum of the weights
- Calculate the sum of the product of **Weights & ORs** and
- **$OR_h = \text{Sum of products wt/sum of the wt}$**
- Calculate $Q = \text{Sum } W(\text{Log ORs} - \text{Log OR}_h)^2$

Test the hypothesis by Chi-square tables with $(n-1)$ d. f.

NON-COMMUNICABLE DISEASES

2.3 Clinical presentation, treatment outcome and risk factors of coronary artery disease among patients admitted in tertiary care hospital in Jodhpur

- P. K. Anand, Sc. 'C', M. K. Chauhan and A. K. Dixit, Sc. 'E'

Commencement: January, 2011

Duration: Two Years

Status: Ongoing

OBJECTIVES

1. To study the clinical presentation and treatment outcome among patients of coronary artery diseases admitted to tertiary care hospital (Mahatma Gandhi Hospital) in Jodhpur during period 2000-2009
2. To estimate the hospital admission rates of these diseases during period 2000-2009
3. To identify the associated risk factors of coronary artery disease among admitted patients of coronary artery disease

PROGRESS OF THE WORK

Data extraction work was carried out by observing the Indoor Bed Head Tickets of patients of coronary artery disease (CAD) or Ischemic Heart disease (IHD) admitted in Mahatma Gandhi Hospital, Jodhpur, Rajasthan during 2000- 2009. IHD patients were classified according to International Classification of Disease IX as ICD IX code 413 for Angina and ICD IX code 410 for Myocardial infarction. We have collected data of 928 admitted patients. The data on age, gender, residence, tobacco use, diet, diagnosis, and clinical presentation, treatment outcome, past disease history and investigations report if available were recorded on Data extraction form. Collected data was entered in epi-info software of computer and analysed later. For ease of demonstrating the data of all patients we have made few grouping.

Frequency distribution of manually created groups of data on diagnosis, clinical presentation, treatment outcome and risk factors is presented in the following figures as given below: -

About 88% of these admitted patients were diagnosed as either new or followed up cases of IHD with or without any history of diabetes mellitus, hypertension and cardiac complications. Interestingly 0.65 % of these patients were diagnosed as IHD who have given history of tuberculosis. Although their percentage was very less, this phenomenon may demonstrate the third dimension of epidemiological transition. As developing countries are experiencing the epidemiological shifting from infectious diseases i.e. diseases of underdeveloped or poverty to non-infectious diseases i.e. diseases of developed or rich communities, the occurrence of tuberculosis and IHD in same patient seems to demonstrate the third dimension of epidemiological transition.

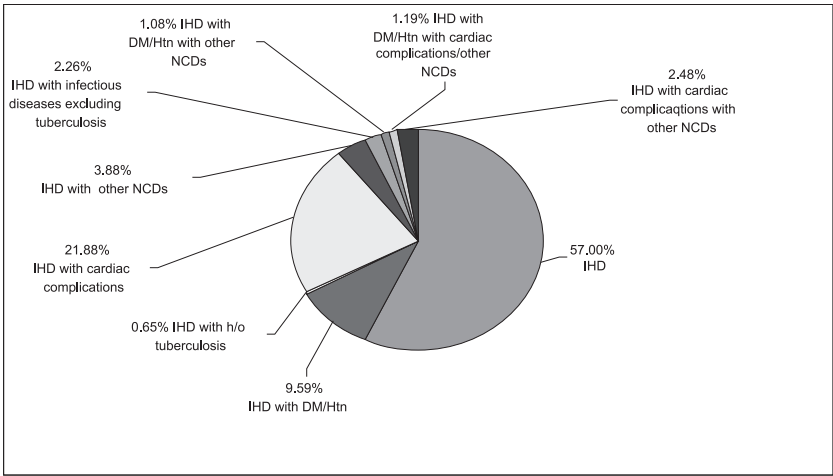
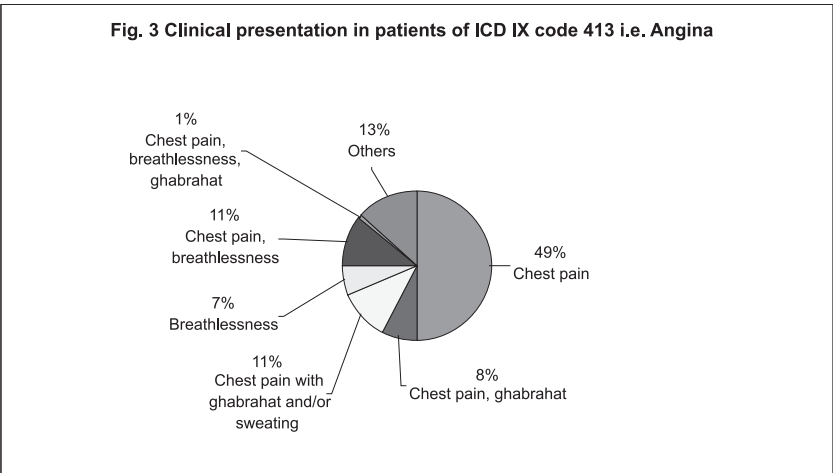
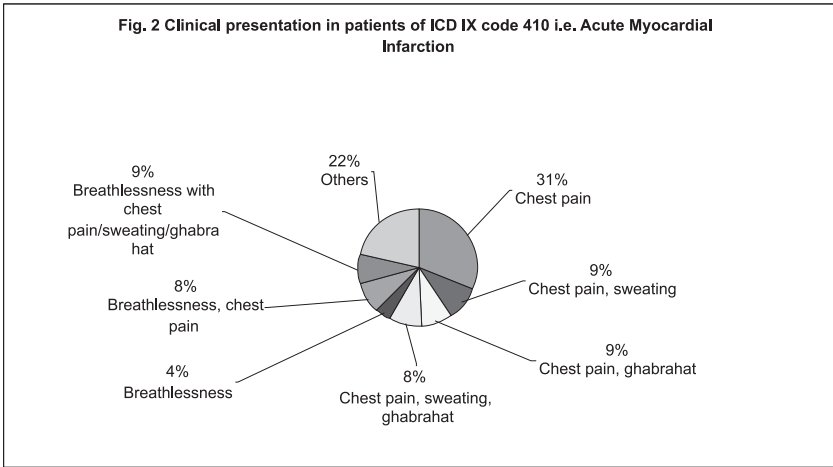


Fig. 1. Frequency distribution of diagnosis of IHD patients both ICD IX code 413 and 410 (n= 928)



As the figures number 2 and 3 explains, Chest pain occurs more frequently in patients of angina as compared to myocardial infarction patients. The frequency of patients reporting the other clinical symptoms was higher in myocardial infarction group as compared to angina group. However to look for statistical significant difference we need only the new cases without other clinical complications to compare between angina and myocardial infarction group. The analysis will be done later on when more data will be collected.

RESULTS

Table 1. Proportion of patients of IHD exposed to various risk factors

	Proportion of patients reporting the status of tobacco and drink use				
		Male		Female	
Drink	Information not available	243	44.5 %	112	61.5%
	NO	213	39.0	66	36.3
	Yes	84	15.4	4	2.2
	forgave	6	1.1	0	0
Smoking	Information not available	164	29.4	110	60.4
	NO	171	30.7	76	38.5
	Yes	197	35.4	2	1.1
	Forgave	25	4.5	0	0

As the table 1 demonstrate males were more exposed to risk factors, there is need to educate them for quitting such habits.

Table 2. Frequency of treatment outcomes in both groups of IHD

Treatment outcome	ICD IX code 413	ICD IX code 410
Death	2 (2.6%)	120 (14.2%)
Discharged	71 (93.4%)	700 (82.5%)
Left against medical advice	3 (3.9%)	28 (3.3%)

As evident that risk of dying was more in patients of ICD code 410.

IMPORTANT LEADS/OUTCOMES

The study will highlight the difference in clinical presentation and treatment outcome, risk factor exposures amongst different categories of Ischemic Heart Diseases.

NON-COMMUNICABLE DISEASES

2.4 Study of bio-cultural risk factor assessment for type 2 diabetes: Consortium for the family studies of genetics of type 2 diabetes in Indian populations (The Anthropological Survey of India)

- Bela Shah, Director-in-Charge and P. K. Dam, T.O.

Commencement: June, 2008 **Duration:** Three Years **Status:** Completed

Collaborative Centre: Anthropological Survey of India, Ministry of Culture, Government of India, 27, Jawaharlal Nehru Road, Kolkata

RATIONALE

A group of people with a similar genome are susceptible to certain diseases. Once biomarkers are identified, those will help to predict, the type of diseases, the group is susceptible to.

Overall Aims

1. To map the genetic variation among the three ethnically and linguistically diverse Indian population with special reference to T2DM.
2. To study population group specific biomarkers to establish the group's susceptibility to complex disorder like T2DM and MS.
3. Pharmacogenomics of drugs for T2DM to correlate genetic variation to drug efficacy.

OBJECTIVES

1. Conduct a complex extended family pedigree-based study among Mathur families of Jodhpur city to examine the genetic determination of susceptibility to T2DM and its related disease conditions.
2. Approximately 50 families with a minimum of 20 individuals per pedigree were decided to be included. Thus, the total target was 1,000 individuals. All first, second, and third degree relatives of probands aged 18 years or above to be covered in the study.

METHODOLOGY

Two lists of the probands 50 each were prepared through random sampling. First four probands were chosen from the first list after computer shuffling. Three generation's pedigree data was collected from the bilateral sides of the probands of each registered family.

Tracing the probands of the registered family, demographic data was collected following pre-tested demographic schedules.

Once the proband's family was covered, thereafter, demographic/pedigree/blood sugar determination data from the randomly selected households situated in the surroundings of the proband's family were collected, without knowing whether households covered through random selection were related to each other, or not. Once the total households were covered, thereafter, at the time of educating the probands as regards T2DM, this was observed that certain households are related to each others through kinship ties. Keeping in view the degree of kinship ties, finally the pedigree charts were constructed for four probands separately. Birth order of every sib was explicitly connoted & maintained in the pedigree. To find out the age distribution of primary, secondary and tertiary relatives of proband, age of every member in the family (i.e. households + kins) was asked and recorded. Once the age of certain family members were not known by the key informant during field data collection, later on telephonically the same were collected.

Attempt was made for complex extended family pedigree. (All 1st, 2nd, 3rd degree relatives). Name of respective clans/age were incorporated in pedigree sheet.

To determine the glycemic status, Fasting or after meal Blood Glucose was taken from all respondents (18 yrs. & above) (Non diabetic, Non pregnant adults: Fasting value-74-106 mg/dL; one to two hours after meal: less than 160 mg/dL). After every three field visits the glucometers were calibrated in regular interval for reliable blood glucose estimation.

Results of the study

Field survey was initiated at household level to collect demographic and pedigree data of primary kins of four probands. The blood sugar status determination of each of the members of the household (those who gave consent) were accomplished. Thereafter pedigree data was collected regarding secondary and tertiary kins of the probands tracing their paternal, maternal and affinal kins (i.e relations formed through spouse's family after marriage). Temporarily migrated cases were known T2DM cases, as disclosed by household members as well as family members of the relatives, and then confirmed through copies of prescriptions and pathological test reports, updated time to time. Percentage distribution of diabetics and non-diabetics at household level reveals higher distribution of cases in fourth probands (29.4%) followed by 2nd (22.2%), 1st (13.25%) and 3rd (13.25%). The overall occurrence of T2DM among the household members of four probands was observed as 16.4% (Table 1). Female cases outnumbered (14.7%) the males (10.9%) in the families of four probands (Table 2 & 3). Similar trend was observed in distribution of diabetics in paternal and maternal families as well; however in the families of wife of all 4 probands, a reverse trend was observed. Distribution of diabetics in the extended family pedigree of (paternal, maternal, and cognate families) four probands are presented in Table 4. Out of total 827 persons from four (4) proband's extended family pedigree data collection, 12.7 % (105 individuals) were diabetic and 87.3 % (722 individuals) were non-diabetic (Table 4). Distribution of diabetics and non-diabetics at household level of the four proband's families reveals 14.1% diabetics in paternal families and 14.7% diabetics in maternal families in respect of all four proband's (Table 5.). Further, absence of any illiterate persons in both paternal & maternal families of all four probands ensures that Mathurs are truly fascinated towards reading, writting, secretaries in administrative services and clerical jobs (Table 6.). Majority of the cases were observed in 50-59 yrs. Age group (40.9%). Followed by 40-49 yrs, age group (34.3%). However case were observed among lower age groups as well, that needs further attention. (eg. 5.7% at 30-39 yrs. Age group & 2.8% at 20-29 yrs. Age group). Cases were rarely reported for 80+ yrs. (1.9%) and 70-79 yrs. Age groups (2.8%) (Table 7). Analysis of four probands extended family pedigree reveals the frequency distribution of diabetics and non diabetics according

to degree of kinship (i.e. Primary, Secondary, and Tertiary kin). Majority (54.5%) of diabetics among primary kins, belonged to 40-49 years age group, whereas in secondary relatives, 26.6% each from 50-59 yrs. & 60-69 yrs. age group were diabetics. From Tertiary Kins, .51.4% from 50-59 yrs. & 30.9% in 40-49 yrs. age group were diabetics. All deceased T2DM cases were from Tertiary relatives of the probands. (Table 12-13). Distribution and origin of available 8 out of 84 sub clans originally reported for the Mathurs in Jodhpur city, who migrated from Mathura, U.P. and subsequently settled down at Jodhpur (Table 14). The occurrence of Bhiwani, Jhamaria, Narnolia, Merhatwal and Manakbhandari sub clans are commonly observed in the bilateral pedigrees of all 4 probands. However, the Charchouliya and Raizada sub clans are observed in the pedigrees of 1st proband only (Table 15).

Type of Relatives Based on Distance of Consanguinity

Primary relatives: Ego's parents and siblings in his family of orientation and his spouse & children in his family of procreation.

Secondary relatives: Primary relatives of Ego's Primary relatives. (Grandparents, Grandchildren, nieces, nephews, Mother's sister, Brother's son, Wife's mother, aunts, uncles)

Tertiary relatives: Primary relatives of Ego's Secondary relatives. (Fathers Sisters husband, Wife's Sisters Daughter, first cousins). Recurrence rate of T2DM is 4-5% in population (ages 20-70) and 10-15% in first degree relatives, being polygenic inheritance involving numerous genes. There are over 150 Mendelian disorders that includes certain common conditions as coronary artery disease, stroke, thrombosis, arrhythmia, cardiomyopathy and diabetes in adulthood. For many common diseases, having an affected close relative is the strongest predictor of an individual's lifetime risk for developing the disease. Present study revealed higher incidence in family (i.e. Primary relatives) followed by closer relatives. This indicates that families may share a common environment. Frequency of disease of spouses serves as a control for environmental factors & thereby spouses data also were collected. However, for data analysis purpose, among tertiary relatives, Fathers Sisters Husband were not included because husband and wife are not genetically related.

Hindu Marriage Norms

- ◆ Each individual should leave 4 clans for selecting spouse - father, mother, paternal and maternal grandmother.
- ◆ Offspring from primary and secondary relatives of EGO consanguineous marriage. (i.e. Presumed Biological Ties). Within the caste, not to proceed for matrimony between relations within the same clan (Bhasin and Walter, 2001. *Genetics of castes and Tribes of India*).
- ◆ No cross cousin marriage (children of opposite sex siblings).
- ◆ No parallel cousin marriage (children of same sex siblings).

Clan Exogamy

- ◆ Ethnology and social attributes - Important risk factors in diabetes.
- ◆ In addition to life style, food habits- a significant contributing factor can be 'surname endogamy' practice. Among Bhargavas – particularly prone to Diabetes, along with surname endogamy, clan endogamy is also practiced

Table 1. Percentage Distribution of Diabetics and Non- Diabetics from household members of four probands

Proband	Household	Respondents (>18)				
		Total No.	Diabetic	% Diabetic	Non Diabetic	% Non Diabetic
1	19	83	11	13.25	72	86.75
2	16	72	16	22.2	56	77.8
3	15	52	6	11.54	46	88.46
4	3	17	5	29.4	12	70.6
Total	53	224	38	16.9	186	83.0

Table 2. Distribution of T2DM Cases and Non-Diabetics in Bilateral Pedigrees of families of 4 Probands

Probands	Diabetic Male	Diabetic Female	Non-Diabetic Male	Non-Diabetic Female	Total Respondents
1	22	24	123	110	279
2	10	15	95	84	204
3	15	11	111	92	229
4	1	7	62	45	115
Total	48	57	391	331	827

Table 3. Frequency Distribution of Male and Female Diabetics in Bilateral Pedigrees of families of 4 probands

Proband	Total Male Respondents	Total Male Diabetic	%	Total female respondents	Total Female Diabetics	%	Total Respondents (Male +Female)
1	145	22	15.2	134	24	17.9	279
2	105	10	9.5	99	15	15.1	204
3	126	15	11.9	103	11	10.7	229
4	63	1	1.6	52	7	13.5	115
Total	439	48	10.9	388	57	14.7	827

Table 4. Distribution of diabetics in the extended family pedigree (paternal, maternal, cognate) of four probands

Proband	Paternal		Maternal		Wife		Total D	Total N.D	Total sample
	M	F	M	F	M	F			
1	5	9	8	9	9	6	46 (16.5%)	233	279
2	9	12	1	3	-	-	25 (12.2%)	179	204
3	3	3	12	8	-	-	26 (11.3%)	203	229
4	1	4	0	3	-	-	8 (6.9%)	107	115
Total	18	28	21	23	9	6	105 (12.7%)	722	827

Table 5. Distribution of diabetics and non-diabetics at household level of the four T2DM probands of Mathur families

Proband	Paternal Family				Maternal Family			
	Household Covered			Non-Diabetics	House-holds Covered	Persons covered at h/h		Non-Diabetics
1 st	9	33	6	27	7	32	6	26
2 nd	16	77	9	68	0	0	0	0
3 rd	2	14	3	11	1	3	1	2
4 th	6	25	3	22	9	26	2	24
Total	33	149	21	128	17	61	9	52

Table 6. Frequency distribution of T2DM cases in the families of 4 probands according to education

Proband	Paternal Family					Maternal Family				
	Literate	Illiterate	Data not available for previous generation members	Married	Unmarried	literate	Illiterate	Data not available for previous generation members	Married-d	Unmarried
1	33	0	11	29	4	32	0	24	29	3
2	77	0	14	55	22	0	0	0	0	0
3	14	0	14	12	2	3	0	1	2	1
4	25	0	13	24	1	26	0	12	24	2
Total	149	0	52	120	29	61	0	37	55	6

Table 7. Frequency distribution of age specific T2DM cases in the families of 4 probands

Age -Group	Total members in family	No. of diabetics in family	% of diabetics
< 20	182	0	0
20-29	92	3	2.8
30-39	79	6	5.7
40-49	119	36	34.3
50-59	116	43	41.0
60-69	65	8	7.6
70-79	43	3	2.8
80+	17	2	1.9
Expired	114	4	3.8
Total	827	105	12.7

Table 8. Distribution of Diabetics and Non diabetics according to degree of kinship in the families of the relatives of first proband (Mathur)

Degree of Kinship	Diabetics		No. of Non Diabetics		Total
	No.	%	No.	%	
Primary	7	31.8	15	68.2	22
Secondary	5	18.5	22	81.5	27
Tertiary	34	14.8	196	85.2	230
Total	46	16.5	233	83.5	279

Table 9. Distribution of Diabetics and Non diabetics according to degree of kinship in the families of the relatives of second proband (Mathur)

Degree of Kinship	Diabetics		No. of Non Diabetics		Total
	No.	%	No.	%	
Primary	5	33.3	10	66.7	15
Secondary	3	14.3	18	85.7	21
Tertiary	17	10.1	151	89.9	168
Total	25	12.2	179	87.7	204

Table 10. Distribution of Diabetics and Non diabetics according to degree of kinship in the families of the relatives of third proband (Mathur)

Degree of Kinship	Diabetics		No. of Non Diabetics		Total
	No.	%	No.	%	
Primary	7	36.8	12	63.1	19
Secondary	5	20.0	20	80.0	25
Tertiary	14	7.6	171	92.4	185
Total	26	11.3	203	88.6	229

Table 11. Distribution of Diabetics and Non diabetics according to degree of kinship in the families of the relatives of fourth proband (Mathur)

Degree of Kinship	Diabetics		No. of Non Diabetics		Total
	No.	%	No.	%	
Primary	3	42.8	4	57.1	7
Secondary	2	18.2	9	81.8	11
Tertiary	3	3.0	94	96.9	97
Total	8	6.9	107	93.0	115

Table 12. Distribution of Diabetics and Non diabetics according to degree of kinship in the families of the relatives of all the four probands (Mathur)

Degree of Kinship	Diabetics		No. of Non Diabetics		Total
	No.	%	No.	%	
Primary	22	34.9	41	65.1	63
Secondary	15	17.8	69	82.1	84
Tertiary	68	10.0	612	90.0	680
Total	105	12.7	722	87.3	827

Table 13. Age distribution of diabetics in Primary, secondary and tertiary relatives of four probands

Age group	Primary		Secondary		Tertiary		Total diabetics	
	No.	%age	No.	%age	No.	%age	No.	%age
<20	0	-	0	-	0	-	0	-
20-29	1	33.3	0	0	2	66.7	3	2.8
30-39	3	50.0	0	0	3	50.0	6	5.7
40-49	12	33.3	3	8.3	21	58.3	36	34.3
50-59	4	9.3	4	9.3	35	81.4	43	41.0
60-69	2	25.0	4	50.0	2	25.0	8	7.6
70-79	0	-	3	100.0	0	-	3	2.8
80+	0	-	1	50.0	1	50.0	2	1.9
Deceased	0	-	0	-	4	100.0	4	3.8
Total	22	20.9	15	14.3	68	64.8	105	100.0

Table 14. Systematic position of different Sub clans & their respective genesis in the Extended Family Pedigree Data among the Mathur families inhabiting Jodhpur city

'AI' / sub clan	Clan	Lineage	Veda	Deity (Goddess)	Family deity & their clans
Jhamaria	Kashyap	Mardhwani	Yaju	Jeevan Mata	Pareek Brahmins:- Vyas, Khatod, Mundaka
Bhiwani	Kashyap	Mardhwani	Rig	Vatwashan Mata	Dahima (Dadhich) Brahmins:- Vyas, khatod
Manakbhandari	Vatsya	Teitriya	Yaju	Mangal Vinayaki Mata	Dadhich Brahmin:-Acharya, Doga.
Narnouliya	Vatsya	Mardhwani	Atharva	Kakrashan Mata.	Dadhich Brahmin:- Acharya, Doba
Charchouliya	Shandilya	Teitriya	Atharva	Mana Bhaskar	Gujar Gaur Brahmin:- Tatiya.
Nepaliya (Munshi)	Vatsya	Mardhwani	Atharva	Peeplashan mata	Dadhich Brahmin:-Vyas, Khatod
Lawariya	Hoolas	Mardhwani	Yaju	Kulakhshamini	Pareek Brahmin:- Tiwari clan
Atroliya	Kashyap	Mardhwani	Rig	Batbasan Mata	Dadhich Brahmin:- Vyas, Khatod

Table 15. Distribution of different sub clans in the paternal and maternal families of four probands

Probands	Paternal Family		Maternal Family	
	Types of sub clans	Sub clans	Types of sub clans	Sub clans
1st	4	Bhiwani Jhamaria Narnolia Merhatwal	6	Bhiwani Jhamaria Manakbhandari Merhatwal Charcholia Raizada
2nd	4	Bhiwani Jhamaria Narnolia Manakbhandari	-	-
3rd	3	Bhiwani Jhamaria Manakbhandari	2	Bhiwani Bhanawaria
4th	5	Bhiwani Jhamaria Narnolia Manakbhandari	4	Bhiwani Jhamaria Narnolia Manakbhandari

NON-COMMUNICABLE DISEASES

2.5 Dermatoglyphic patterns in diabetes mellitus patients and non-diabetics: A preliminary study

- P. K. Dam, T.O. Vinod Joshi, Sc. 'F', Anil Purohit, R.A. and Himmat Singh, R.A.

Commencement: June, 2008 **Duration:** Three Years **Status:** Completed

OBJECTIVES

1. To identify patterns of dermal ridges on the fingertips and palms of diabetic and non-diabetics.
2. To focus the predictive strength of dermatoglyphics of diabetes.

PROGRESS OF WORK

Present study reveals association of dermatoglyphics (i.e. finger & palm print) and T2DM of 382 respondents (i.e. 248 Mathur, 134 Raika) and distribution of dermatoglyphics patterns among diabetics & non-diabetics. Among Mathurs 99 were diabetics (44 male & 55 female) & 149 non-diabetics (70 males & 79 females). Among Raika 8 were diabetics (6 male & 2 female) & 126 non-diabetics (68 male & 58 female). Among Mathurs, frequency of patterns are highly reduced in 3rd inter-digital area on palm of the left hands of the female diabetics (29.1%), as compared to the female non-diabetics (54.4%), confirming strong significant association (* $p < 0.05$). Statistical significant difference is observed (* $P < 0.05$, $\chi^2 = 54.7$ in male, * $P < 0.05$, $\chi^2 = 33.4$ in female) in 'dat' angles of left hands between diabetics & non-diabetics of Mathur families.

The result of dermatoglyphic data are presented in Table 1-8. Frequency of patterns are highly reduced in 3rd inter-digital area on palm of the left hands of the female diabetics (29.1%), as compared to the female non-diabetics (54.4%), confirming strong significant association (* $p < 0.05$). (Table 1). Consistent with this, reduced frequency of patterns (37.2%) among the male diabetics in their left 3rd inter-digitals, than the male non diabetics (50.0%) was observed, though these relations were not significant. Among Raikas, male cases are having higher occurrence of patterns in 2nd/3rd & 4th inter digital area than male controls in both left & right hands, except in right hand of 4th inter digital, where, controls outnumber the cases in terms of presence of patterns (Table.2). Statistical significant difference is observed in 'dat' angles of left hands between cases & controls of both the sexes (Table 3 & 4) of Mathur families. Chi square test reveals the significant difference in 'atd' angles between cases & controls in both of their right (Table. 5) and left (Table 6) hands respectively. Frequency distribution of degrees in 'dat' angles of 44 male cases & 70 male controls in their left hands reveals that a) occurrence of 56-58 degrees is highly reduced among the cases (13.6%) than the controls (47.1%). b) occurrence of 59-61 degrees is also lesser (13.6%) among the cases than the controls

(20.0%). c) occurrence of 50-52 degrees is high among the cases (11.4%) than the controls (4.3%) [Table 4]. Frequency distribution of degrees in 'atd' angles of 44 male cases & 70 male controls in their right hands reveal that a) occurrence of 34-36 degrees is highly reduced (2.8%) among controls than the cases (18.2%). b) Occurrence of 49-51 degrees is highly reduced (1.4%) among controls than the cases(11.4%) c) Occurrence of 40-42 degrees is highly reduced among cases (31.8%) than the controls (47.1%). d) Occurrence of 37-39 degrees is lesser (15.9%) among cases than the controls (24.3%)[Table. 5]. Frequency distribution of degrees in 'atd' angle of Mathur male cases (n=44) and controls (n=70) in their left hands reveals that a) occurrence of 34-36 degrees is less among controls (5.7%) than the cases (18.2%). b) occurrence of 43-45 degrees is less among controls (18.6%) as compared to cases (36.4%).c)occurrence of 46-48 degrees is less (4.3%) among controls than the cases (13.6%).d) occurrence of 40-42 degrees is less among cases (13.6%) as compared to controls (54.3%). (Table 6). Among Raikas, Percentage distribution of fingertip patterns on 10 hand digits (Table. 7) reveals that Plain Whorls are lesser among controls as compared to cases, both among males [cases: 41.7%, controls: 18.0] & females[cases: 30.0%, controls: 15.3%]; conversely, Ulnar Loops are higher in controls than the cases, both among males [controls: 47.3%, cases: 28.3%] and the females [controls:52.4%, cases: 15.0%]. Radial Loops are absent among cases (both male & female) and rarely present among controls.

Pattern Intensity Index (PII) is counted by dividing total number of triradius present on 10 fingertips by total number of respondents. Total number of triradius on 10 fingertips ranges from 0-20. For Arch, triradius is zero (0) i.e. $0=(0 \times 10)$; For Loop, it is Ten (10) i.e. $10=(1 \times 10)$. For Whorl, it is twenty (20) i.e. $20=(2 \times 10)$. Although the PII values between cases & controls did not show any statistically significant difference, but some directional indication has been observed between cases and controls. Respondents from two communities (Mathur and Raika) having variation in PII values in terms of cases & controls (Table.8).

UTILIZATION OF THE FINDINGS

The strong statistical association of various patterns and ridge counting in different palm areas & fingertips between T2DM cases and controls may be assessed in each mendelian population studied. Thereafter, the study findings may be tailored into 'user friendly', by screening out complex traits, so that it may be used for prediction, through a separate study by using the existing dermatoglyphic print outs.

Table 1. Frequency of palmar patterns in 2nd, 3rd and 4th interdigital area of 99 T2DM cases and 149 controls of Mathur families

Palm area	Sex	T2DM				Control			
		Left		Right		Left		Right	
		No.	%	No.	%	No.	%	No.	%
2nd interdigital	M	2	4.6	6	13.6	4	5.7	10	14.3
	F	2	3.6	2	3.6	4	5.1	6	7.6
3rd interdigital	M	16	37.2	22	50.0	35	50.0	42	60.0
	F	16	29.1*	43	54.4	43	54.4*	51	64.5
4th interdigital	M	27	62.8	26	59.1	51	72.8	48	68.6
	F	43	78.2	36	65.4	56	70.9	52	65.8

*P<0.05

Table 2. Frequency of presence of palmar patterns present in 2nd, 3rd and 4th interdigital area of Male T2DM cases and controls of Raika families

Palm area	Sex	T2DM				Control			
		Left		Right		Left		Right	
		No.	%	No.	%	No.	%	No.	%
2nd interdigital	M	1/6	16.7	3/7	42.2	2/29	6.9	5/27	18.5
3rd interdigital	M	5 /6	83.3	7/7	100	13/29	44.8	16/27	59.2
4th interdigital	M	6/6	100	1/7	14.3	19/29	65.5	14/27	51.8

Table 3. Frequency distribution of degrees in ‘dat’ angles of left hands female Case’s and Control’s of Mathur families

Degrees	Controls		Case	
	No.	%	No.	%
44-46	-	-	2	3.6
47-49	3	3.8	2	3.6
50-52	16	20.2	4	7.3
53-55	12	15.2	9	16.4
56-58	27	34.2	16	29.1
59-61	14	17.7	8	14.5
62-64	4	5.1	11	20.0
65-67	1	1.3	3	5.4
68-70	2	2.5	-	-
Total	79	100	55	99.9

*P<0.05, $\chi^2 = 33.43$ **Table 4. Frequency distribution of degrees in ‘dat’ angles of left hands of male Case’s and Control’s of Mathur families**

Degrees	Controls		Case	
	No.	%	No.	%
44-46	3	4.3	3	6.8
47-49	2	2.8	4	9.1
50-52	3	4.3	5	11.4
53-55	13	18.6	11	25.0
56-58	33	47.1	6	13.6
59-61	14	20.0	6	13.6
62-64	2	2.8	9	20.4
Total	70	99.9	44	99.9

*P<0.05, $\chi^2 = 54.7$

Table 5. Frequency distribution of degrees in ‘atd’ angles of right hands of male Case’s and Control’s of Mathur families

Degrees	Controls		Case	
	No.	%	No.	%
34-36	2	2.8	8	18.2
37-39	17	24.3	7	15.9
40-42	33	47.1	14	31.8
43-45	11	15.7	6	13.6
46-48	6	8.6	2	4.5
49-51	1	1.4	5	11.4
52-54	0	-	2	4.5
Total	70	100	44	100

*P<0.05, $\chi^2 = 55.7$

Table 6. Frequency distribution of degrees in ‘atd’ angles of left hands of male Case’s and Control’s of Mathur families

Degrees	Controls		Case	
	No.	%	No.	%
34-36	4	5.7	8	18.2
37-39	8	11.4	5	11.4
40-42	38	54.3	6	13.6
43-45	13	18.6	16	36.4
46-48	3	4.3	6	13.6
49-51	2	2.8	2	4.5
52-54	2	2.8	1	2.3
Total	70	99.9	44	100

*P<0.05, $\chi^2 = 36.19$

Table 7. Percentage distribution of fingertip patterns on 10 hand digits of male controls and cases, as well as female controls and cases of Raika community

PATTERNS	Male N.D. (68=N)		Male D (6=N)		Female N.D.(58=N)		Female D (2=N)	
	No	%	No	%	No	%	No	%
Double Loop whorls	43	6.5	2	3.3	35	6.1	-	-
Shell Whorls	15	2.2	-	-	31	5.4	-	-
Target Whorls	17	2.6	-	-	23	4.0	-	-
Central Pocket	47	7.1	11	18.3	35	6.1	1	5.0
Elongated Whorls	23	3.5	-	-	6	1.0	-	-
Plain Whorls	119	18.0	25	41.7	87	15.3	6	30.0
Accidental	18	2.7	1	1.7	2	0.3	-	-
Ulnar Loop	314	47.3	17	28.3	298	52.4	3	15.0
Radial Loop	5	0.7	-	-	5	0.9	-	-
Arch	25	3.8	2	3.3	23	4.0	10	50.0
Tented Arch	11	1.6	-	-	8	1.4	-	-
Imploding/Falling/Arch with Loop	27	4.0	2	3.3	16	3.0	-	-
Total readable prints	664	100	60	99.9	569	100	20	100

Table 8. Pattern Intensity Index among Female cases & controls, Male cases & controls of Mathur families and Female controls and cases vis-à-vis male controls and cases from Raika Community

STUDY GROUP	Number	Total Triradius in in 10 digits	Pattern Intensity Index
Female cases (Mathur)	55	748	13.6
Female controls (Mathur)	79	1086	13.7
Male Cases (Mathur)	44	607	13.8
Male controls (Mathur)	70	989	14.1
Female controls (Raika)	58	738	12.7
Female Cases (Raika)	2	16	8.0
Male controls (Raika)	68	874	12.8
Male Cases (Raika)	6	86	14.3

NUTRITION

3.1 Nutrition monitoring survey on NNMB pattern in Jodhpur district of Rajasthan

- Madhu B. Singh, Sc. 'E', J. Lakshminarayana, Sc. 'E' and Ranjana Fotedar, Sc. 'C'

Commencement: January, 2005 **Duration:** Long Term **Status:** Ongoing

OBJECTIVES

1. To develop continuous monitoring service to study the nutritional status, dietary habits, food availability and the effect of changing social and environmental factors on the health status of the population.
2. Aim at doing comparisons with other states data so as to assess the percentage of variation among the states.

PROGRESS OF THE WORK

Project activities included working on sampling plan in detail. Similar sampling design and protocol was adopted for the Nutrition Monitoring type of survey in Rajasthan, as it is being done in other states where NNMB is in operation. The sampling adopted here was two stage stratified random sampling method in which the villages in selected district formed the first stage units (FSU's) while in the village households (HH's) formed the second stage units. For the study purpose the district has been divided in to different strata in rural areas as per the tehsils with agro-economic regions and based on the population size of the village i.e. <2000 and ≥2000 populated villages. In the urban area three wards were selected.

From each stratum i.e. Tehsil, five villages were chosen randomly for the purpose of the survey in different direction one each from North, South, East, West and central part, to have proper representation of the tehsils in the district. Households in each village have been selected by adopting cluster sampling procedure for the purpose of the survey. A total of five clusters of four households each were selected from each village. Generally, the households in a village can be divided into natural "groups/areas" by geographical location such as streets/ mohallas/ areas. The SC/ST population often lives in a separate group/area in the villages. One cluster was selected from SC/ST group/area while the remaining 4 clusters were selected by systematic random sampling procedure, probability proportion to size of the group. In each cluster, by selecting a random start, 4 contiguous households were covered. For logistic reasons Jodhpur district was decided to be covered first and later on to expand horizontally in other districts of state in the similar pattern.

Fourth phase has been completed in which 30 villages were covered from six tehsils of Jodhpur district i.e. Jodhpur, Osian, Phalodi, Shergarh, Bilara and Bhopalgarh (five villages from each tehsil), covering 600 households. Fifth phase has been started in which 50 percent new villages and 50 percent old villages have been selected randomly in view to cover variation. A total of 28 villages were covered from six tehsils of Jodhpur district i.e. Jodhpur, Osian, Shergarh, Bilara and Bhopalgarh, and Phalodi covering 560 households. The entire selected household was examined for Socio-demographic and Socio-economic aspects. All the members in the household have been examined for nutritional deficiency signs, anthropometric measurements (Height, weight, arm circumference and FFT), Dietary intake (24 hours recall method) and examination of nutritional morbidities in preceding 15 days. Dietary intakes of the individuals information were recorded in alternate houses i.e. households from each village were covered.

Analysis of 600 households covering 3081 individuals of the fourth phase has been done. Table 1 showed age and sex wise distribution of population (1593 males and 1488 females). Analysis revealed that 94 percent of population was Hindus. Nuclear families were significantly more (83.6%) as compared to 4.7% joint families (Tables 2). Table 3 revealed that illiteracy is significantly high in females (62.9%) than males (35.5%). Higher education is very low in this area i.e. 1.4 percent.

Table 1. Age and sex wise distribution of population covered

Age group	Males	%	Females	%	Total	%
0-5	239	15.0	229	15.4	468	15.2
6-9	176	11.0	166	11.2	342	11.1
10-14	232	14.6	239	16.1	471	15.3
15-17	115	7.2	84	5.6	199	6.5
18- 29	318	20.0	306	20.5	624	20.2
30-39	209	13.1	195	13.1	404	13.1
40-49	143	9.0	124	8.3	267	8.7
50-59	94	5.9	83	5.6	177	5.7
>=60	67	4.21	62	4.2	129	4.2
Total	1593	100.0	1488	100.0	3081	100.0

Table 2. Distribution of households according to type of family

Type of family	N	%
1. Nuclear	502	83.6
2. Extended Nuclear	70	11.7
3. Joint	28	4.7
Pooled	600	100.0

Vs. P<0.01, 2 Vs 3 P>0.05, 1 Vs 3 P<0.01

Table 3. Distribution of population according to educational status

Educational status	Males	%	Female	%	Total	%
Illiterate	565	35.5	936	62.9	1501	48.7
Read & Write	17	1.1	14	0.9	31	1.0
1-4 Standard	275	17.3	223	15.1	498	16.2
5-8 Standard	380	23.8	209	14.0	589	19.1
9-12 Standard	266	16.7	66	4.4	332	10.8
College	44	2.8	0	0.0	44	1.4
N. A.	46	2.8	40	2.7	86	2.8
Pooled	1593	100.0	1488	100.0	3081	100.0

Main morbidities observed in population were acute respiratory infection (5.8 %) and fever (7.4%) followed by diarrhoea (0.4%). Both the morbidities i.e. acute respiratory infection and fever were significantly higher in females than males (Table 4). Regarding nutritional deficiency signs, it was observed that discoloration and sparseness of hair, a sign of protein calorie malnutrition was observed to be high i.e.10.2 percent which was significantly higher in females than males. Marasmus was observed only in females (0.1%). Angular stomatitis, cheliosis and glossitis were ranging from 0.7 to 5.2 percent. Vitamin A deficiency i.e. Night blindness was observed in females only (0.3%). Dental caries (17.6 %) and dental fluorosis (13.8 %) observed high in this area. Females suffered significantly more from dental caries and dental fluorosis than males (Table 5). No case of Koilonychia, a sign of anemia, was observed.

Table 4. Distribution of population according to Morbidity profile

Morbidity	Males N=1593	%	Females N=1488	%	Total N=3081	%
N.A.D.	1392	87.6	1154	77.5	2546	82.6
Fever	82	5.1	135	9.1	217	7.4
Diarrhoea	6	0.4	5	0.3	11	0.4
Dysentery	0	0	0	0.0	0	0.0
A. Res. Infec.	83	5.2	96	6.5	179	5.8
Measles	0	0	0	0.0	0	0.0
GIT	23	1.4	54	3.6	77	2.5

$\chi^2=1679$, $P<0.01$

Table 5. Distribution of population according to Nutritional deficiency signs

Deficiency Signs	Males N=1593	%	Females N=1488	%	Total N=3081	%
Hair Discolour	92	5.8	220	14.8*	312	10.1
Hair sparseness	1	0.1	1	0.1	2	0.1
Emaciation	0	0.0	0	0.0	0	0.0
Marasmus	0	0.0	1	0.1	1	0.03
Night Blindness	0	0.0	4	0.3	4	0.12
Angular Stomatitis	7	0.4	14	0.9	21	0.7
Chelosis	14	0.9	18	1.2	32	1.0
Glossitis	74	4.6	87	5.8	161	5.2
Koilonychia	0	0.0	0	0.0	0	0.0
Gums-spongy Bleeding	19	1.2	43	2.9	62	2.0
Dental Caries	186	11.7	356	23.9**	542	17.6
Dental Fluorosis	151	9.5	274	18.4**	425	13.8
Others	1	0.1	3	0.2	4	0.12

*P<0.05,**P<0.01

The weights of pre-school children were expressed as percent of NCHS standards and categorized into different nutritional grades, based on Gomez classification (Tables 6-7). The overall prevalence of under nutrition was very high i.e. 63.9 percent which was higher in ST community (70.9 %) in comparison to other communities. The overall prevalence of severe under nutrition was high i.e. 8.6 percent. Under nutrition was higher in extended nuclear families (72.2 %) and observed maximum in semi pucca houses (67.7 %).

Table 6. Distribution of 1-5 years children according to Gomez distribution and Type of family

Type of Family	N	Nutritional Grades*			
		Normal	Mild	Moderate	Severe
1. Nuclear	249	36.5	30.5	23.7	9.3
2. Extended	18	27.8	38.8	27.8	5.6
3. Joint	24	37.5	37.5	20.8	4.2
Pooled	291	36.1	31.6	23.7	8.6

 $\chi^2_4 = 3.742$ P<0.01 * NCHS Standards**Table 7. Distribution of 1-5 years children according to Gomez distribution and Community**

Community	N	Nutritional Grades*			
		Normal	Mild	Moderate	Severe
1. S.C	40	45.0	25.0	22.5	7.5
2. S.T	86	29.1	31.4	25.6	13.9
3. B.C	145	35.2	33.8	24.1	6.9
4. Others	20	55.0	30.0	15.0	0.0
Pooled	291	36.1	31.6	23.7	8.6

 $\chi^2_6 = 123.5$ P<0.05, * NCHS Standards

The extent of different types of malnutrition viz. stunting (Height for age) and under nutrition (Weight for age) were computed by adopting standard deviation classification using NCHS as well as WHO

standards. All the children with any of the above anthropometric measurement less than Median-2SD of NCHS values were considered as undernourished. Prevalence of under nutrition computed using Gomez classification and SD classification differ as the cut off values are different.

Underweight (Weight for age) in preschoolers was observed 49.8%, higher than NFHS III (44.0%). The proportion of severe underweight was high (26.4%) (Fig.1). Underweight was observed higher in females than males though statistically insignificant. Declining trend has been observed in stunting and underweight in comparison to Phase I, Phase II and Phase III study.

Stunting (Height for age) was 59.5 percent in preschoolers with the prevalence of severe stunting 35.4 %, which needs attention. It's higher than NNMB (49.3 %) and NFHS III (33.7 % - up to 3 years) where as lower than DMRC Phase I (71.6 %), DMRC Phase II (62.1 %) and higher than DMRC Phase III (57.1%) as shown in Fig. 2.

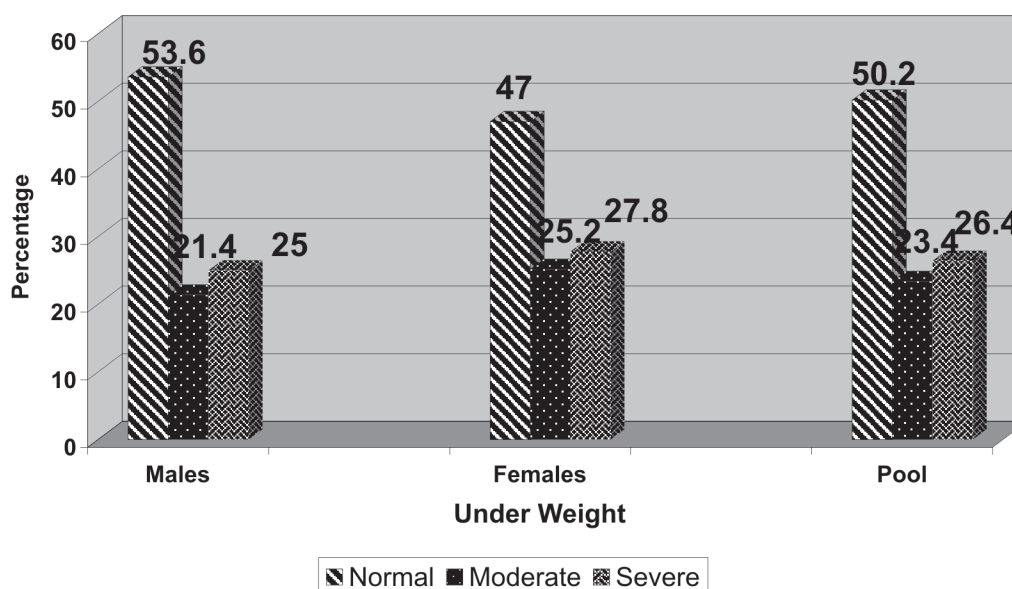


Fig. 1. Standard Division Classification for weight for age in preschoolers

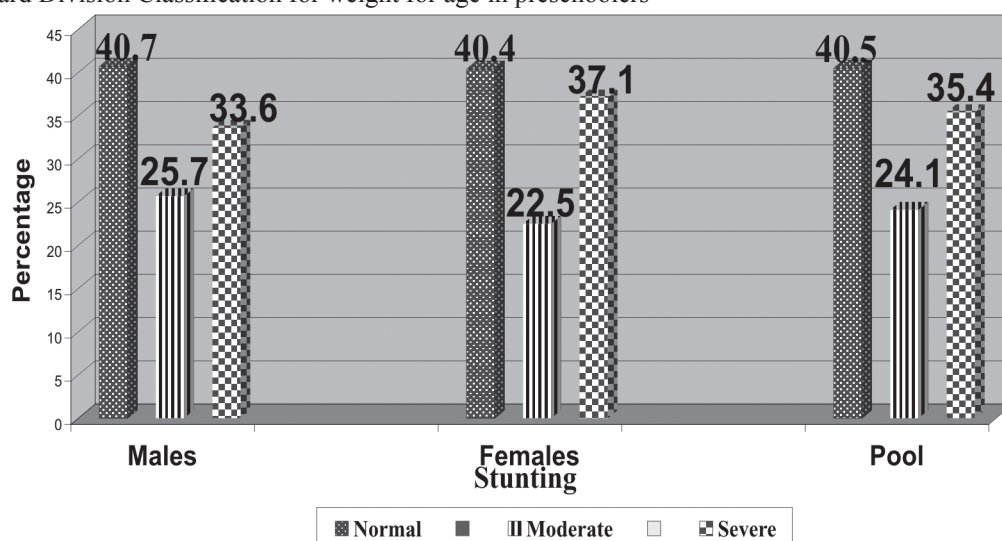


Fig. 2. Standard Division Classification for height for age in preschoolers

The distribution of adults according to BMI grades have been shown in Tables 8 to 10. At the aggregate level, 56.3 percent had normal BMI (18.5-25.0), while 33.3 percent had chronic energy deficiency

(Fig. 4). Severe chronic energy deficiency was higher in extended families (8.4 %) and maximum in mixed type houses (14.3 %) and ST community (18.6 %) though statistically insignificant.

Table 8. Distribution of adults (≥ 18 years) according to BMI classification

Gender	Obese II ≥ 30	Obese I 25-30	Normal 20-25	Low wt Normal 18.5-20	CED I 17-18.5	CED II 16-17	CED III <16
1. Male N=287	0.7	5.2	32.1	20.2	24.4	8.4	9.1
2. Female N=583	1.7	10.8	38.4	19.4	14.1	7.7	7.4
Pooled N=870	1.4	9.0	36.3	20.0	17.5	7.9	7.9

$\chi^2_{1,2} = 45.4$ $P < 0.01$

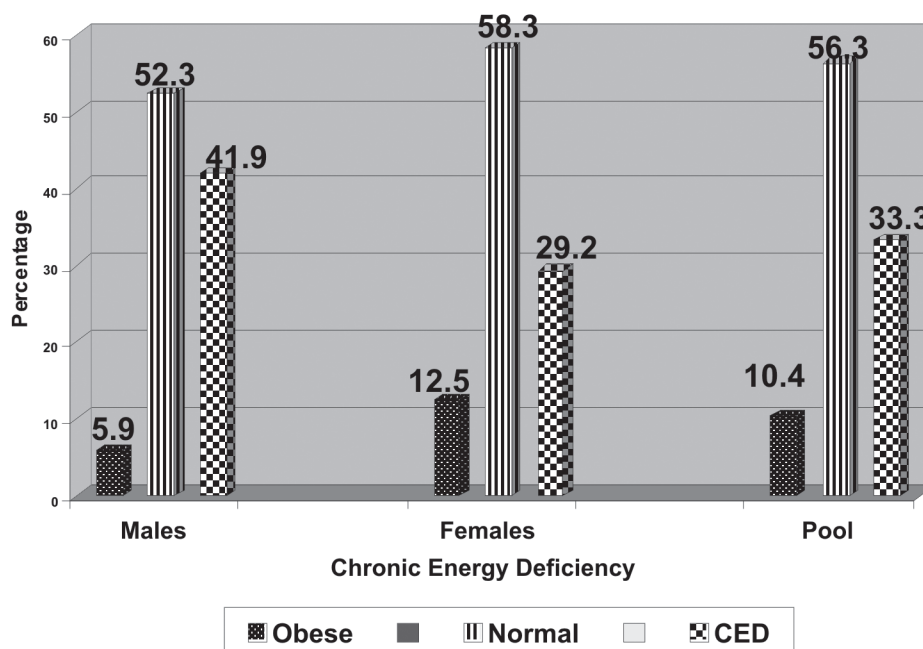


Fig. 3. Body Mass Index in adults

Table 9. Distribution of adults (≥ 18 years) according to BMI classification and Type of family

Type of Family	Obese II ≥ 30	Obese I 25-30	Normal 20-25	Low wt Normal 18.5-20	CED I 17-18.5	CED II 16-17	CED III <16
1.Nuclear N=679	0.9	7.7	35.8	20.2	19.1	8.4	8.0
2.Extended N=131	3.8	10.7	38.2	21.4	12.2	5.3	8.4
3. Joint N=60	1.7	20.0	38.3	15.0	10.0	8.3	6.7
Pooled N=870	1.4	9.0	36.3	20.0	17.5	7.9	7.9

$P > 0.05$

Table 10. Distribution of adults (≥ 18 years) according to BMI classification and type of house

Type of House	Obese II ≥ 30	Obese I 25-30	Normal 20-25	Low wt Normal 18.5-20	CED I 17-18.5	CED II 16-17	CED III <16
1.Pucca N=456	0.2	7.2	35.1	17.8	18.9	9.9	11.0
2.Kutch N=407	2.7	10.8	37.6	22.6	16.0	5.9	4.4
3. Mixed N=7	0.0	14.3	42.9	14.3	14.3	0.0	14.3
Pooled N=870	1.4	9.0	36.3	20.0	17.5	7.9	7.9

P>0.05

Dietary Factors: Dietary intake was collected on 788 adults (403 males and 385 females) and 677 children (340 males and 337 females). Consumption of food stuffs per day was observed marginally low in consumption of Cereals & Millets in males and females respectively where as 80 percent in DMRC phase I, 77.2 percent in Phase II and 79.6 percent in Phase III , very low consumption of Fats & Oils, Pulses & legumes & Consumption of Leafy Vegetables was extremely low. In dietary intake, average energy intakes (calories) was less than RDA in all age groups of children and adults whereas ranges from 59.0 to 99.2 % in DMRC phase I & phase II (53.5 to 85.9 %) and from 45.8 to 98.8 percent in Phase III.

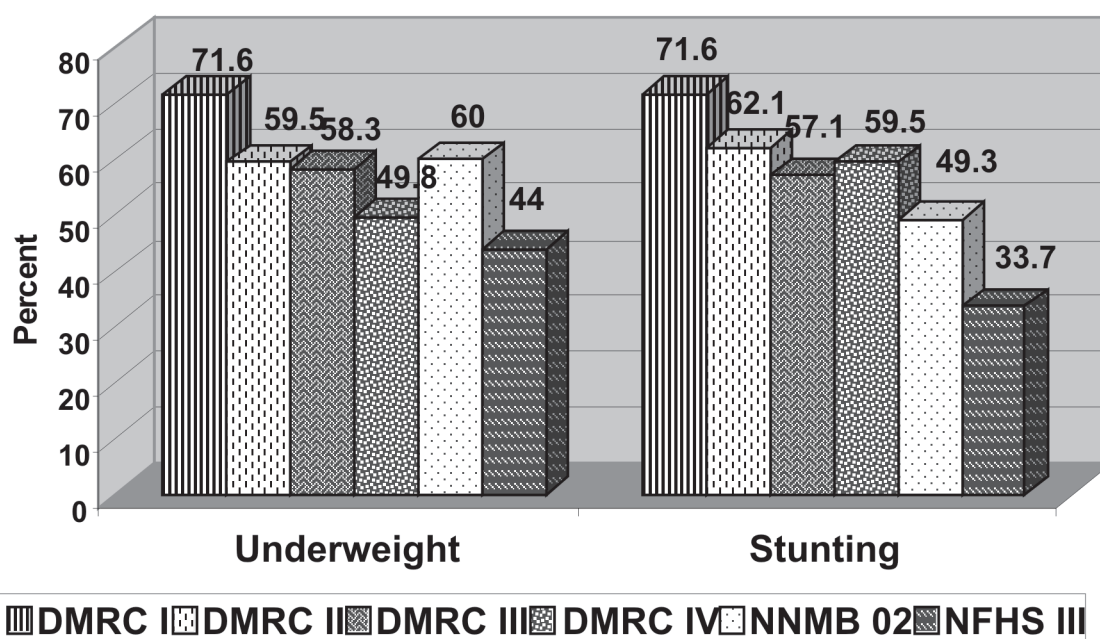


Fig. 4. Distribution of preschoolers according to SD classification

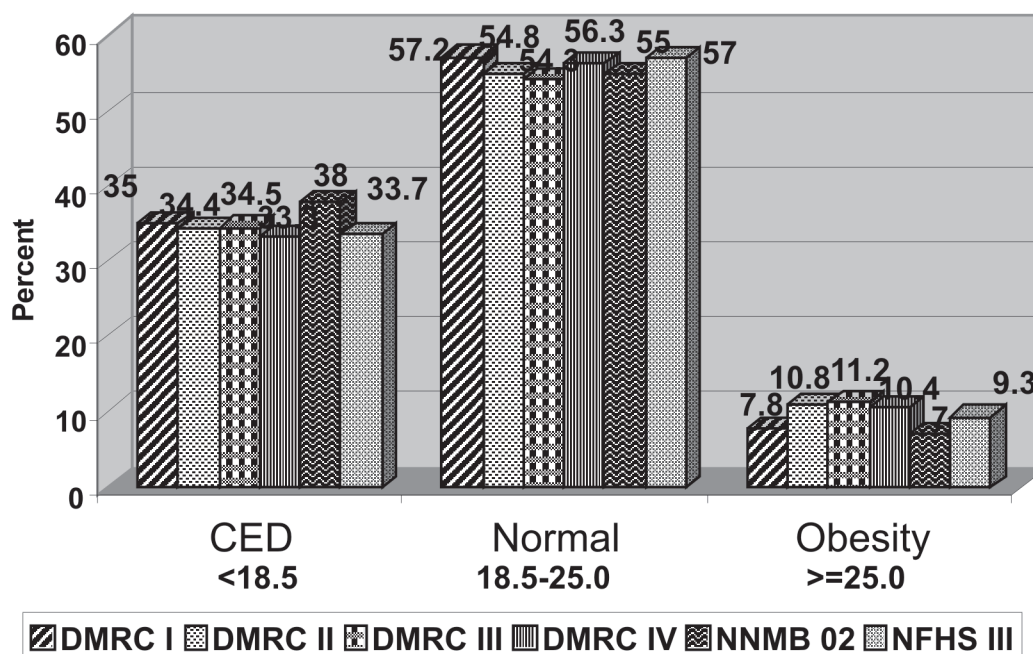


Fig. 5. Distribution of adults by BMI grades

Trends revealed that there is gradual decline in stunting and underweight in preschoolers on comparing between four phases i.e. DMRC Phase I, DMRC Phase II and DMRC Phase III and DMRC Phase IV studies, whereas, slight decline in chronic energy deficiency and incline in obesity in adults was observed (Fig. 4 & 5). Trends revealed that high illiteracy, poor economic conditions along with high deficiencies in their diet played important role for higher nutritional deficiencies, under nutrition and stunting especially more in children and chronic energy deficiency in adults of this region. After completion of fifth phase, sixth phase will be started in which 50 percent new villages and 50 percent old villages will be selected randomly in view to cover variations. Comparison of results of different Phases will be done in order to develop continuous monitoring service to study the nutritional status, dietary habits, food availability and the effect of changing social and environmental factors on the health status of the population and will continue year wise

IMPORTANT LEADS/ OUTCOMES

The results of the study carried out on representative segment of the population in desert areas as well as non-desert areas would provide information and useful guidelines for food policies and also to assess the impact of the nutritional programs currently in progress and for future planning in the state of Rajasthan.

NUTRITION

3.2 Assessment of iodine deficiency disorder, anemia and nutrition intervention in school age children of Jodhpur district of Rajasthan

-Bela Shah, Director-in-Charge, A. S. Bawa, Madhu B. Singh, Sc. 'E' and K. S. Premavalli

Commencement: July, 2008 **Duration:** Two Years **Status:** Ongoing

OBJECTIVE

1. To study the distribution and magnitude of the Iodine deficiency disorders and anemia in school age children of Jodhpur district.
2. Assessment of the extant of use of iodized salt by the community of Jodhpur district.
3. To study the effect of supplementation on micronutrient deficiency disorders

PROGRESS OF WORK

Project activities included working on sampling plan in detail. According to WHO /UNICEF/ICCIDD, for school based survey, 30 cluster sampling approach was adopted keeping in view the operational feasibility. Recently DGHS (2005) has given new guidelines for sampling according to which sample size is calculated on the basis of prevalence of IDD as 10%, level of confidence-95%, relative precision-20 % and design effect-2. Using formula $(Z\alpha)^2 Q/(L^2) P$, sample size worked out to be 1800 children from the district or $1800/30=60$ children per cluster for goiter and cretinism. Salt and urine samples along with blood on filter paper for haemoglobin estimation have been collected from 30 % of the children examined. At first step, listing of all the government and private schools with children 6-11 years of age from both rural and urban areas have been listed from district education office of Jodhpur. Secondly cumulative enrollment has been determined. Finally schools have been selected using PPS sampling technique as recommended by WHO. In the selected schools, children have been selected randomly using Tippets random number table. Equal proportion of boys and girls and proportionate distribution of children from 6-11 years have been covered in the selected school. Till now data have been collected from 31 schools covering 1917 school age children.

From each selected child, information for socio-demographic aspects has been collected. Each child interviewed/examined for the nutritional deficiency signs. Iodine deficiency disorders have been assessed by clinical examination of thyroid gland using the standard method as recommended by the joint WHO/UNICEF/ ICCIDD consultation. A casual urine sample has been collected for estimation of Urinary Iodine Excretion (UIE) levels to asses the Iodine nutriture status. Iodine have been determined by wet digestion method using standard laboratory technique. UIE level less than 10 mcg/dl have been considered as indicator of iodine deficient nutriture. 30 percent of children selected randomly were requested to bring their urine sample and sample of 20 gm salt consumed in their families in auto seal

LDPE pouches. Iodine content of salt sample was estimated using standard iodometric titration method. Salt samples having iodine content less than 15 ppm were classified as with inadequate iodine. Anemia was assessed by clinical signs (platinichia and koilonichia). Hemoglobin levels were estimated using Cyanmethaemoglobin technique and have been classified as per WHO classification.

In this project 311 school children of 6 to 11 years age groups belonging to 4 villages of Jodhpur tehsil of Jodhpur district were registered for supplementation. All registered children were examined for Anemia assessed by Hemoglobin levels (Cyanmethaemoglobin technique), and have been classified as per WHO classification, Iodine deficiency disorders (Urinary Iodine level, Iodine in salt) and nutritional deficiency signs along with psychological tests on learning attributes in terms of memory, intelligence, reasoning and attention before supplementation. All the Registered school children will be supplied with supplements daily for a period of 180 days. These supplements have been supplied by Defence Food Research Laboratory, Mysore.

Supplementation has been started and will continue up to May, 2011. These children will be re-examined after period of 180 days supplementation for all above mentioned parameters observing the impact of the supplements on reduction of micronutrient deficiency disorders in school children of Rajasthan. This will facilitate health functionaries in the reduction of micronutrient deficiencies existing in this area.

IMPORTANT LEADS/ OUTCOMES

The results of the study carried out on representative segment of the population in desert areas would provide information about the extent of Iodine deficiency disorders and anemia along with the extent of use of iodized salt by the community of Jodhpur district. This will reveal the impact of supplementation on reduction of micronutrient deficiency disorders on school children of Rajasthan. These results will be useful guidelines for food policies and also to assess the impact of the nutritional programs currently in progress and for future planning in the state of Rajasthan.

NUTRITION

3.3 Study of food and nutrient consumption pattern in women of child bearing age and 6-59 months of age children, with particular reference to Pearl millet consumption pattern and effects of storage, processing, & cooking practices on retention of iron, zinc, phytate and polyphenols in Nagaur, a desert district of Rajasthan

- Madhu B.Singh, Sc. 'E' and J. Lakshminarayana, Sc. 'E'

Commencement: August, 2010 **Duration:** One Year **Status:** Ongoing

Stakeholders: ICDS & State Agriculture Department of Nagaur district

Funding Agency: Harvest plus, Washington, Consultative Group on International Agricultural Research (CGIAR), coordinated by International Center for Tropical Agriculture (CIAT) & International Food Policy Research Institute (IFPRI)

OBJECTIVES

1. To assess the food and nutrient consumption distributions in a probabilistic sample of women of child-bearing age and under five children by means of 24 hour dietary intake recall in district Nagaur.
2. To assess the importance of pearl millet and other foods as sources of essential nutrients among women of child-bearing age and children less than 5 years of age in district Nagaur.
3. To study the seasonal patterns and time trends in pearl millet production and consumption in district Nagaur by means of desk review and qualitative research.
4. To assess the traditional processing and cooking methods and their effects on iron, zinc, phytate, and polyphenol retention among women of child-bearing age and children under 5 years of age through desk research, quantitative food technology and qualitative research in district Nagaur.

PROGRESS OF WORK

This project has been initiated and scientific meetings were conducted with Stakeholders i.e. Deputy Directors of ICDS Department & Agriculture Department of Nagaur district, and CDPOs of ICDS department located at various tehsils/ blocks of Nagaur district regarding their cooperation in this project after describing the scientific background of the project. Background data regarding the pearl millet production, consumption, and other relevant information regarding pearl millet have been collected from Nagaur district agriculture and ICDS department. 30 clusters Sampling was done and

rapport had been established with the local inhabitants. Meetings were organized at field level with local anganwadi workers/ sarpanch/ villagers of the selected clusters. In 'HarvestPlus Pearl Millet Multicentric Project Inception Workshop at Mumbai' standardized the approaches i.e. study design, data collection tools, data processing and analysis with expected tables and figures. PI along with field staff was trained in CS Dietary.

Different schedules/questionnaires were prepared and pre-tested in 30 households in the field in three villages. Final schedules were prepared after doing necessary corrections. A cross sectional study has been implemented for estimating the average intake distribution of food and nutrients among women of child bearing age (15- 45 years) and children 6 to 59 months of age with special emphasis on consumption of Pearl Millet and iron. Study has been carried out in Nagaur, a desert district of Rajasthan in India. Nagaur district has ten tehsils / blocks as per census 2001. Study was carried out in all ten tehsils / blocks of district Nagaur covering women in the child bearing age and under five children. According to WHO, 30 cluster sampling approach was adopted in dietary survey keeping in view the operational feasibility. Sampling unit was household level because in each house mother and child were available. Sample size was calculated on the basis of prevalence of iron deficiency in diet of women in desert area as reported in literature (Singh *et al.* 2009) as 20%, level of confidence of 95% relative precision of 20% and design effect of 2 Using formula $(Z\alpha)^2 Q/(L^2) P$, sample size worked out to be 768, adjusted for 20 percent non response. So sample size was 900 (rounded off) from the district or $900 / 30 = 30$ households per cluster and 3 house hold per cluster were repeated only for dietary intake. In Nagaur, geographically, a cluster consisted of village. These 30 clusters / villages were selected from 10 tehsils (Sub-districts) of Nagaur district by means of simple random sampling using census 2001. In each cluster / village, 30 household were selected on the basis of simple random sampling technique using a complete list of all households in each village.

Inclusion Criteria: Only those household were selected which had women of child bearing age (15-45 years) and children with age of 6 to 59 months.

Exclusion Criteria: If in one household women of child bearing age has two or more children with age of 6 to 59 months, then only one child available at household was considered for the study.

Random selection of the households: In selected villages a random walk method starting from a central place (usually a temple) in the village and proceeding in at least four different directions. A household was selected only if eligible women of child bearing (15-45 years) and a child 6-59 months of age are members of the family.

Sampling of raw and cooked food samples: Most popular varieties cultivated and consumed were considered for estimation of nutrient contents. A sub sample i.e. 10% of women of selected household were requested to provide raw varieties of pearl millet in LDPE pouches and brought to laboratory for estimation of Iron, Zinc, Phytate and polyphenols retention in the laboratory on payment basis.

At each household level information for demographic and socio-economic aspects were collected. At each household level, women, (15-45 years) was interviewed for the dietary pattern using 24 hour recall method (Data was collected by the standard technique as followed by NIN (ICMR), Hyderabad) along with Roseland Gibson/harvest manual for 24 hour recall. Dietary intake was collected for women of child bearing age and 6-59 months child at each HHs level for the day prior to the interview. HHs were shown dietary cups regarding portion sizes (actual foods and cooked items) and a small percentage of the HHs include direct weighing of portions to validate the measuring instruments provided to the field workers. Information for Food Frequency Questionnaire (FFQ) was also collected from women at each HHs level.

At each village level Focus Group Discussions (FGD) were conducted for collection of information regarding seasonal pattern and time trends in pearl millet production and consumption information, traditional processing and cooking methods etc. At each village level, focus group discussions were conducted from two type of key informant groups i.e. One group of 6 or more male persons key informants mainly key persons from village i.e. Panch, Sarpanch, teacher etc from the village to provide the above mentioned information. Second group consisted of 6 or more knowledgeable women key informants including Anganwari workers for providing the information regarding the preparations of different type of recipes from pearl millet, their consumption and preservation etc. They also demonstrated the method of preparation of different recipes mainly made up from the pearl millet which were commonly consumed by the villagers. Team learnt and standardized five commonly consumed recipes of pearl millet in the field in district Nagaur.

Pilot survey was carried out on 30 household's women of the selected area for pre-testing of different schedules before conducting the regular survey in district Nagaur. Field work was started for collection of data and a total of 600 households from 20 villages belonging to 10 tehsils of Nagaur district were covered till now and 60 household were duplicated for dietary intake information. Mother and under five child of selected households were examined for Socio-demographic and Socio- economic aspects, anthropometric measurements, dietary intake and examination of Nutritional Morbidities in last 15 days. Samples of most popular varieties of pearl millet cultivated and consumed in each village were collected in LDPE pouches and brought to the laboratory for estimation of iron, zinc, phytate, and polyphenol. From each village, information regarding the cooking methods of different food items prepared from pearl millet was recorded in each village from group of 6 elderly women (Key informants) by means of FFQ and the standardization of five recipes commonly consumed by the villagers was also recorded. Information regarding seasonal pattern and time trends in pearl millet production & consumption information, traditional processing and storage etc has been has been recorded from a group of 5 elderly male persons (Key informants) from each village by means of FGD. A total of 20 Focus Group Discussions were recorded. The project is ongoing.

A total of 5 raw varieties of Pearl Millet commonly consumed in Nagaur district i.e. 'Desi bajra', 'Pro Agro hybrid', 'MH-169', '118+154 Ghua Seed' and Pioneer' were collected. The most common recipes prepared from pearl millet in the study villages were *Sogra*, *Rab1* (Pearl millet Grains), *Rab2* (Pearl millet Flour), *Kadhi* and *Khitchri* (*Kheech*) which were standardized. Five samples each of raw varieties and five cooked recipes along with mixed flour of raw varieties of pearl millet were tested for Iron, Zinc, Phytate and polyphenols. The samples of raw varieties of pearl Millet collected from field were sent to laboratory of Baroda Pearl Millet Center (Department of Foods and Nutrition, A WHO collaborating Center for Health Promotion, Faculty of Family and Community Sciences, MS University of Baroda, Vadodara, Gujarat) for testing of iron, zinc, phytate, and polyphenol retention on payment basis. Pearl Millet Project staff also prepared the five standardized recipes of pearl millet in the Baroda laboratory and dried them and testing being done for above mentioned parameters. At Baroda laboratory, determination of Iron and Zinc was done by Atomic Absorption Spectrophotometer, by Diacid mixture of HNO & HCLO in 3:1 ratio (Ryan *et al.*, 2001) and Phytate from Raw Pearl Millet Samples using Official AOAC, Anion Exchange and Quantitative Determination of Total Phenol by Lowry, *et al.*, 1951. The project is ongoing.

Plans for data analysis: Dietary intake data were entered by trained data entry operators and project staff into CSDietary, whose training was given by HarvestPlus. The CSDietary program enabled conversion of portion size data to gram weight equivalents and calculates energy and nutrient intake data for each food and ingredient consumed using NIN standards. Intake data were then transferred to Stata 10 software for statistical analysis.

Data on Socio-demographic aspects and other data collected from FFQ and FGDs were computerized in FOX-PRO under the supervision of Dr. J. Lakshminarayana, biostatistician in this project and used Stata10 software for statistical analysis. Tables and figures have been generated according to data analysis plan for report elaboration.

IMPORTANT LEADS/ OUTCOMES

This project will help in assessing the nutrition & food technology associated with the assessment of pearl millet which is an important dietary source of iron and zinc for at risk populations in Indian states and districts where pearl millet is a primary staple food crop and iron deficiency anemia a nutritional deficiency of public health significance. Pearl millet is an important staple food in Rajasthan & commonly grown and consumed by millions of people. It is a significant source of dietary energy and nutritional security for poor farmers and consumers in several highly populated regions of India. This will facilitate health functionaries in reduction of micronutrient deficiencies in this area.

NUTRITION

3.4 Nutritional status along with morbidity and mortality of neonates in Jodhpur district of Rajasthan – A community based longitudinal study

- Ranjana Fotedar, Sc. 'C', Madhu B. Singh, Sc. 'E' and J. Lakshminarayana, Sc. 'E'

Commencement: September, 2007 **Duration:** Two Years **Status:** Ongoing

OBJECTIVES

1. To study profile of Health and Nutritional Status of neonates by means of anthropometry, and clinical examination for nutritional deficiency signs along with feeding practices and their follow up for 1 year age group.
2. To study the types of morbidity, mortality and their causes among neonates and infants.

PROGRESS OF THE WORK

In the beginning the present project proposal was revised as per the suggestions made by SAC thereafter the present project proposal was initiated. Study design and sampling design were formulated in detail for conducting the fieldwork. Schedules were structured for carrying out the field Survey. Preliminary field visits were made to study the area in order to observe the timings of the availability of the respondents and gathering information relevant to the project. In the month of August 2007, one Pre-testing survey was carried out and suitable modifications were incorporated in the schedules based on the experience of the pre-tested survey. The regular survey was initiated from September 2007.

Jodhpur district has been selected for feasibility reasons. So far new registrations of 300 newborns have been completed from 28 villages namely Jhalamand, Sangaria, Tanawada, Salawas, Nandwan, Saraecha, Sar, Mogar Kalla, Feach, Bacharna, Dhundada, Hanwant Nagar, Piparali, Dedas, Luni, Vishnu Nagar, Shikarpura, Chainpura Bhatan, Karnayali, Modi, Golia Magra, Madopur, Dudia, Nai Basti, Krishna Kheda, Sangasni Gao, Nimbla, Guda Bishnoi belonging to Salawas Community Health Centre of Luni Panchayat Samiti, Jodhpur district. ANM or Anganwadi workers were contacted at village level for reporting the new birth. All 300 newborns (0-7 days) of selected 28 villages have been registered in our study. Details of baby were obtained from mother, who was the respondent for filling up schedules. All neonates and infants were examined clinically for morbidities and nutritional deficiencies. Information regarding mortality of neonates and infants along with clinical examination (such as general infection respiratory tract infection especially pneumonia, diarrhoea and nutritional marasmus) were examined. Social-cultural / economic causes responsible for mortality were recorded from mother of each child registered in the study in pre-designed schedules.

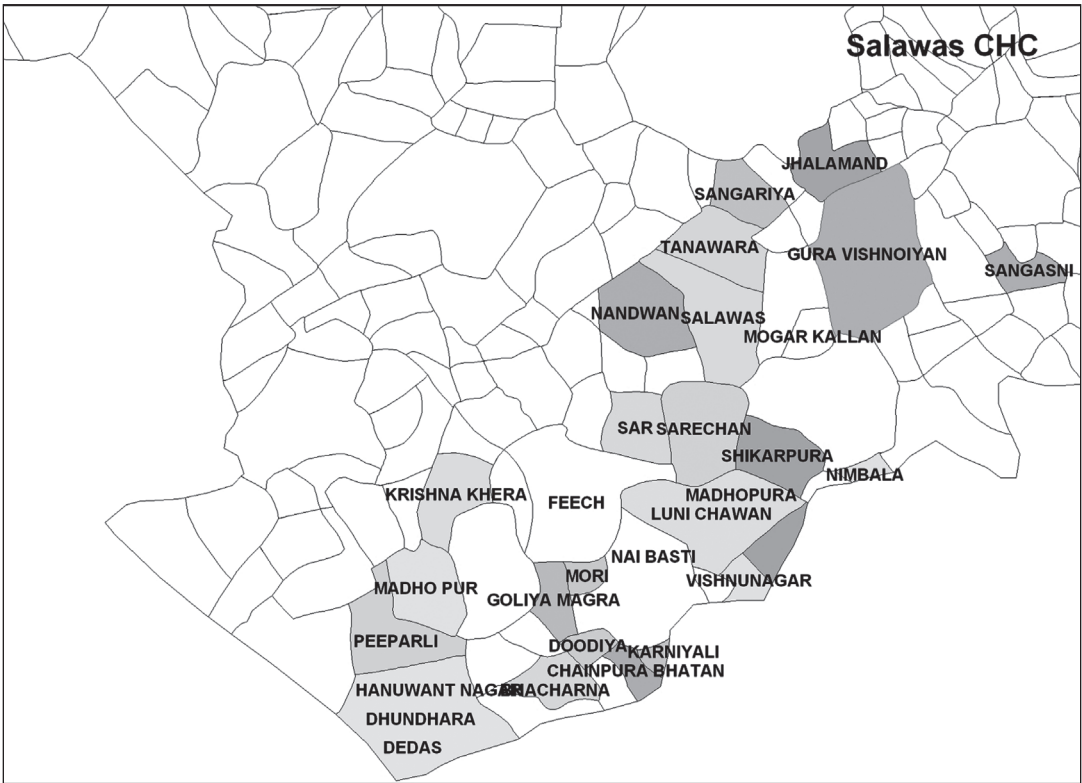


Fig. 1. Map of study villages

Table 1. List of villages in Salawas CHC from where the neonates (0-7days) have been covered

S. No.	Villages	S. No.	Villages
1	Tanavda	15	Shikarpura
2	Sangaria	16	Jhalamand
3	Salawas	17	Nimbla
4	Nandvan	18	Guda Bishnoi
5	Sarecha	19	Sangasani
6	Sar	20	Bacharna
7	Mogarkalla	21	Chainpura Bhatan
8	Feach	22	Karnayali
9	Dhundhara	23	Modi
10	Hanwant Nagar	24	Golia Magra
11	Piparli	25	Madopur
12	Dedas	26	Dudia
13	Luni	27	Nai Basti
14	Vishnu Nagar	28	Krishna Kheda

Registered newborns till July 2009 – 300 newborns have been registered from 28 villages belonging to Salawas Community Health Centre of Jodhpur District as shown in Fig. 1 and Table 1. All the newborns are clinically examined for morbidity, mortality and nutritional deficiency signs, anthropometry (height i.e. Recumbent length, weight, arm circumference, chest circumference, head circumference and fat fold triceps following standard techniques of WHO) and feeding practices. The feeding practices of newborn collected for nutritional assessment. Infant feeding practices comprising of both the breast-feeding as well as complementary feeding were also recorded. They have major role in determining the nutritional status of the child. The socio demographic/economic information

along with socio-cultural/ economic causes responsible for mortality were also recorded from mother of each child registered in the study. Each registered child was followed up every month for above-mentioned clinical examination. The registration of 300 neonates (0-7 days) has been completed in July 2009 and then they were followed-up to the age of 12 months (one year).

During this reported period, remaining 50 neonates registered earlier were followed up every month up to age 12 months and examined for all the parameters mentioned above. Field work has been completed. The data of 300 neonates and infants collected in this project through out the year has been started entering into the computer since Jan. 2011 by data entry operator / cum analyst and the complete analysis will be done very soon. Preliminary analysis shows that main morbidities observed at the time of birth were fever (3.7%) followed skin infection (Boils) and Umbilical Infection (2.7%) and Congenital abnormalities (1 %). Neonatal mortality was 13.3 per thousand and Infant mortality was 43.3 per thousand in the studied population. Detailed analysis will be done very soon.

WORK TO BE CARRIED OUT DURING 2010-2011

The field work of the project has been completed on 300 newborns registered from 28 villages belonging to Salawas CHC of Jodhpur district. The complete analysis of 300 newborns (0-7 days) will be done. After entering the data in the computer, the complete analysis and report writing of 300 newborns and infants will be done very soon during 2010-11.

EXPECTED OUTCOME

Results of the study will be helpful in formulation of simple interventional plans for neonates and infants for reduction of under nutrition, morbidities and mortality among neonates and infants and parents especially mother of newly born can reduce the health problem in the second phase of study.

The research out put of this project will also help in developing a package of Essential Newborn Care (E.N.C.) which will be useful to State Health Department Functionaries in the second phase of study.

NUTRITION

3.5 Nutritional status along with morbidity and mortality of under five children - a follow up study of earlier registered infants up to 5 years

- Ranjana Fotedar, Sc. 'C', Madhu B. Singh, Sc. 'E' and J. Lakshminarayana, Sc. 'E'

Commencement: June, 2010

Duration: Five Years

Status: Ongoing

OBJECTIVES

1. To study profile of Health and Nutritional Status of earlier registered infants followed up to 5 years of age group by means of anthropometry, and clinical examination for nutritional deficiency signs along with feeding practices and their follow up to 5 years of age group at the interval of 6 months.
2. To study the types of morbidity, mortality and their causes of earlier registered infants followed up to 5 years of age group.
3. To study the time trend analysis of growth and nutrition of earlier registered infants followed up to 5 years of age group.

RATIONALE

This period of childhood, especially the second year of life, is notoriously fraught with risk. The young child is “transitional” as regards diet, immunity to infections and psychological dependence. This is a period of rapid growth with high nutrient needs, particularly of protein for swiftly increasing muscle tissue. It is the time several meals a day are required and when foods should be easily masticable and digestible. It is at this time also that the non-immune child comes in contact with a succession, or more often accumulation, of bacterial, viral and parasitic infections. Lastly, it is often the occasion for the psychological trauma that occurs as a result of the sudden separation from the mother after a prolonged period of continuous intimate contact and permissive breast - feeding frequently caused by a further pregnancy.

Certain vitamin and mineral deficiency disease occur with varying frequency in under 5 children in different parts of the world, including, for example avitaminosis A, rickets and iron-deficiency anemia. The incidence varies greatly from place to place, depending upon the local dietary and social factors. Thus, rickets in sunnier parts of the world may be related to lack of exposure to available ultraviolet light due to overcrowding in urban dwellings, as in old style walled cities or in slums, or to a deliberate sheltering of young children from the sun for various cultural reasons, e.g. to prevent their acquiring a darker complexion or to escape the “evil eye”. However, the principal forms of malnutrition seen during this transitional period are those now termed “protein calorie malnutrition of early childhood”

including kwashiorkor. However, time trend analysis of growth and nutrition is still lacking from desert part of Rajasthan where conditions are very harsh, demanding a great amount of work to be done. So no data / information is available from this part of the country.

PROGRESS OF THE WORK

This is continuation of the earlier project study entitled ‘Nutritional status along with morbidity and mortality of Neonates in Jodhpur district. A follow up study’ and study will be continued on earlier registered 300 infants from 28 villages (Fig. 1 & Table1) from Luni Panchayat Samiti of Jodhpur District which were followed up to 5 year of age group at an interval of 6 months in the above mentioned project. The study will be continued on same 300 subjects as mentioned above.

Thus regular survey was initiated from June 2010. So far 190 infants have been completed at the interval of 6 months. They were examined clinically for morbidity, mortality and nutritional deficiency signs, anthropometry (height, weight, arm circumference, chest circumference, head circumference and fat fold triceps following standard techniques of WHO) and feeding practices.

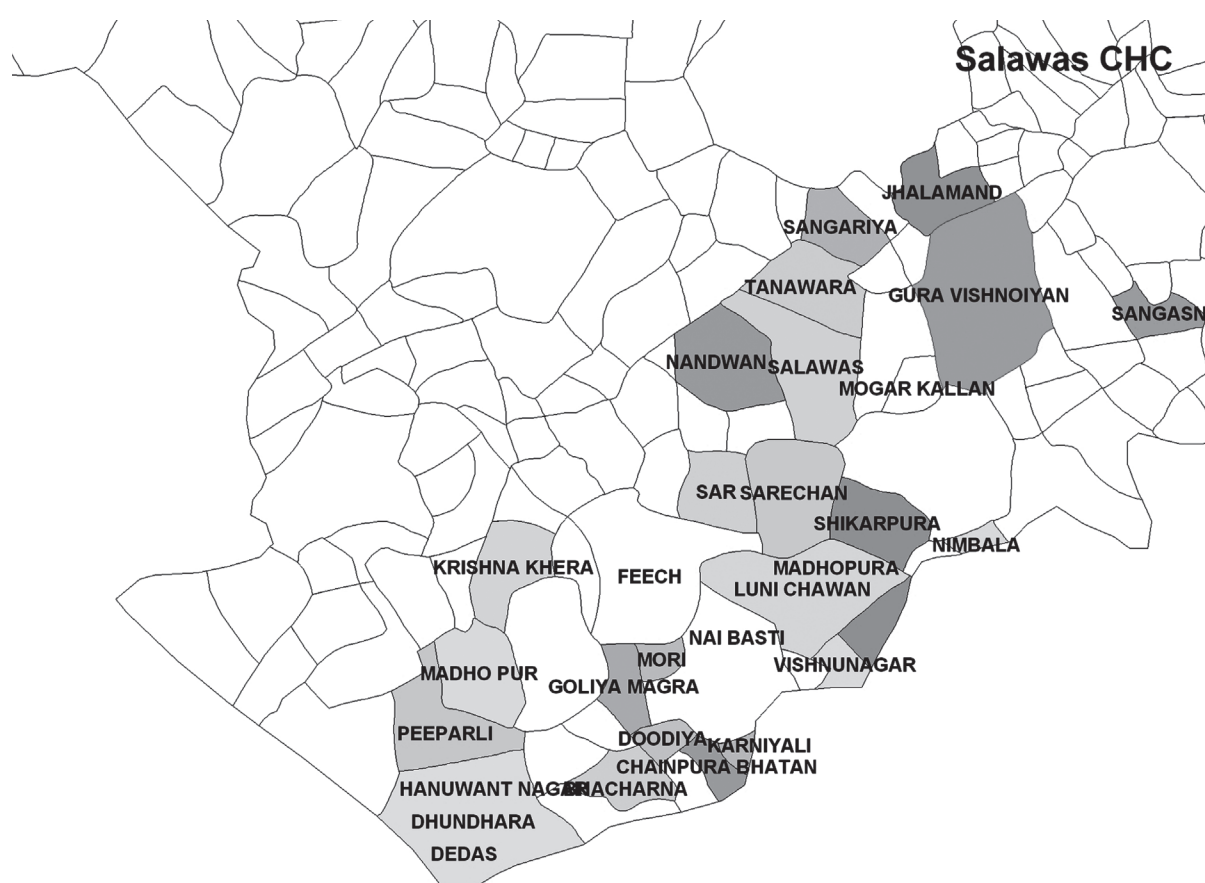


Fig. 1. Map of study villages

Table 1. List of Villages from Salawas CHC from where the earlier registered neonates were covered

S. No.	Villages	S. No.	Villages
1	Tanavda	15	Shikarpura
2	Sangaria	16	Jhalamand
3	Salawas	17	Nimbla
4	Nandvan	18	Guda Bishnoi
5	Sarecha	19	Sangasani
6	Sar	20	Bacharna
7	Mogarkalla	21	Chainpura Bhatan
8	Feach	22	Karnayali
9	Dhundhara	23	Modi
10	Hanwant Nagar	24	Golia Magra
11	Piparli	25	Madopur
12	Dedas	26	Dudia
13	Luni	27	Nai Basti
14	Vishnu Nagar	28	Krishna Kheda

WORK TO BE CARRIED OUT 2010-11

The project is on going and the survey would be carried out to cover remaining earlier registered infants followed up to 5 years of age group children belonging to 28 villages of Salawas CHC of Jodhpur District. Each earlier registered child infants will be followed up every six month for clinical examination of nutritional deficiencies, morbidities, mortality, anthropometry, feeding practices and socio-cultural causes for mortality.

EXPECTED OUTCOME

Results of the study will be helpful in formulation of simple interventional plan for under five children for reduction of under nutrition, morbidity and mortality among under five children and their parents especially mother of under five children and reduce the health problems in the second phase of study. The Research output of this project will also help in developing package for under 5 children, which will be useful to State Health Department Functionaries in the second phase of study.

OTHER HEALTH AREAS

4.1 A study of behavior of Mantel- Haenszel estimator under different sampling schemes to sample the controls in case-control studies for its improvement

- A. K. Dixit, Sc. 'E'

Commencement: April, 2009

Duration: Two Years

Status: Completed

AIM

To improve upon control of confounding in case-control studies

OBJECTIVES

1. To investigate the behavior of ORMH under different sampling plans of the controls in case-control studies so as to get an improved estimator over ORMH
2. To suggest for an improved estimator over ORMH to control for the confounding in case-control studies
3. To suggest for appropriate sampling scheme of sampling of controls in case-control studies given the specific situation

PROGRESS OF WORK

Work done in past:

This project of two years duration was approved by the SAC, 2009 and got started in April, 2009. It aimed to investigate the behavior of ORMH measure under different sampling schemes to sample the controls in stratified case-control studies in an attempt to provide feasibility in sampling of controls as per the given situation with an improvement in OR_{MH} estimation. The behavior of ORMH under different sampling schemes to sample the controls was judged employing two criteria, viz the percentage error brought about by the sample estimate under consideration in the estimation of population ORMH and the variance of the sample estimate. The schemes of sampling studied were systematic, cluster, inverse and stratified samplings, besides the so far used simple random sampling, which was also considered for comparison purpose. Methodology involved consideration of 60 populations for case-control studies, each of which categorized in to 4 categories as per a confounder and 20% of controls selected for each category by different sampling schemes considered and also by simple random sampling for the purpose of comparison. Cases were not sampled. Sample ORMH were obtained in each case. Sampled ORMH obtained under each sampling schemes and under random sampling were compared with population ORMH through the employed criteria. Under systematic sampling, there was over estimation in 78.3%; whereas under cluster, it was 43.3%. However, the magnitude of overestimation

was confined to lower limits of percentage error. As the variance comparison was concerned, systematic sampling showed better results than cluster sampling. Under stratified sampling, out of sixty cases, in fifty eight; there was under estimation (96.7%) and out of these cases of under estimation, forty six (79%) registered this characteristic with more than 25% of error magnitude. This clearly depicts high under estimation under stratified sampling. However decreased variance was noted in 80% of cases, in lines with characteristic of stratified sampling compared to simple random sampling. Under inverse sampling the over estimation was found in 37% of cases and out of which in 86% of cases the magnitude of error exceeded 25%. The increased variance under the inverse sampling compared to simple random sampling was noted in 60% of cases.

Work done during the year:

Cluster sampling of controls was further investigated as to know the effect of intra-cluster correlation, which happens to be important entity in deciding upon the estimation characteristics under this sampling. Lastly, attempts were made to derive the conditions under which there is going to be over or the under estimation of population ORMH under any sampling plan and then the efforts to improve upon under the situations were made by devising an algorithm to lower down the value of the sample estimate of ORMH, in case of over estimation and to enhance its value in case of the under estimation ; thus bringing an improvement in estimation of ORMH..

Two typical populations for the purpose were studied, which produced just the reverse results in the estimation of ORMH i.e. one which provided more the over estimation and the other which provided more the under estimation. The clustering of sample OR values within and between the categories of these populations were studied through

- Analysis of variance
- Intraclass Correlation
- Linear Trend across the categories

From each category of a population 30 samples of 10 clusters each with replacement were drawn. The 10 clusters in a sample then were clubbed together to produce an OR for the category pertaining to the sample. The 30 OR so obtained for each category of the two populations considered, were analyzed to reveal difference between the two populations resulting differently in type of estimation. The analysis of variance of OR values between and within the categories of populations is given in table 1. It is noted from this table that OR values differed significantly across the categories of the populations, resulting in difference in type of estimation obtained.

Table 1. Analysis of OR values between and within the categories of populations

Source of variation	df	SS	MS	F (Cal)	F (Tab)
Between Populations	1	5566.9	5566.9	20.67*	10.13
With in Populations	3	1855.4	618.5	2.29	9.27
Error	7	808.2	269.4		
Total	11	8230.5			

* p <.05

The Intraclass correlation coefficients for the OR values within the categories were then computed for the two populations, which are given in Table 2. This shows similar pattern of clustering of OR values with in the categories of the two populations.

Table 2. Intraclass correlation coefficients of OR values for the two populations

Population	Intraclass correlation coefficient
I	-.02
II	-.04

The OR values across the categories of the populations, when regressed showed clear differences with respect to the two populations to yield different estimation results. The number of instances, we obtained positive and negative regression for the OR values across the categories of the two populations are given in Table 3. It is evident from this table that population with preponderance of positive linear trend among the values of OR across the categories provided lesser percentage of over estimation than the population with preponderance of negative regression which provided more over estimation.

Table 3. Type of Linearity in OR values across the categories of the populations

Populations	No. of Samples drawn	Instances of +ve linear trend	Instances of -ve linear trend	% of Under Estimation	% of Over Estimation
I	30	26	4	57	43
II	30	0	30	30	70

The algorithm, developed to improve upon the estimation was based on the observation that under systematic sampling of controls there was over estimation of population ORMH, if

$$b_1 c_1 / b_2 c_2 > t_1 / t_2 \quad (1)$$

and, in case of under estimation, the negation of the above being true. This provides the condition of over/under estimation of population ORMH when the controls are picked up through systematic random sampling. In formula (1) above, b_1, b_2 are exposed controls sampled in the two categories of a population respectively; c_1, c_2 are the non-exposed controls being sampled in these categories. If, A_i ($i=1, 2$); similarly represents the exposed and B_i the non-exposed cases; C_i the exposed and D_i , the non-exposed controls in the two categories of the population, then $t_i = (A_i = B_i + b_i + d_i)$.

The algorithm, which successfully helped in improving the estimated value goes as below

Step I.

The formula for sample ORMH is first put in the form

$$[(A_1 d_1) / (t_1 / t_2) + A_2 d_2] / [(b_1 C_1) / (t_1 / t_2) + b_2 C_2] \quad (2)$$

Step II.

Replace (t_1 / t_2) in the above transformed formula (2) by

$$(t_1' / t_2') = (b_1 C_1 / b_2 C_2)^{1 / (t_1 / t_2)^2}$$

in case of over estimation,

And replace (t_1 / t_2) in the transformed formula (2) by

$$(t_1'' / t_2'') = (t_1 / t_2)^{1 / (b_1 C_1 / b_2 C_2)^2}$$

in case of under estimation.

This provided improved estimation in numerous examples we investigated.

POSSIBLE UTILIZATION OF THE STUDY

Through the study, we could achieve the objectives of our intention to investigate the behavior of ORMH under different sampling schemes to sample the controls in case-control studies, pin pointing

the cautions to be taken care of when other sampling than the simple random sampling is used as per the situational demand and also bringing an improvement in ORMH estimation in general. Thus all the three objectives of the project are met.

Though the sampling of controls in ORMH estimation is usually done by simple random sampling but when situation so demands other sampling schemes are required. The investigations help in control for confounding in case-control studies when the other samplings are required to be used. The condition to indicate over/under estimation and finally the algorithm developed to improve upon the estimation happen to be fruitful efforts in the direction of using ORMH under different sampling schemes of the controls as per the given situation.

OTHER HEALTH AREAS

4.2 A study of predictors of community access to primary health care in desert

- A. K. Dixit, Sc. 'E' and S. P. Yadav, Sc. 'E'

Commencement: April, 2009

Duration: Two Years

Status: Completed

AIM

To improve upon the access to primary health care in desert.

OBJECTIVES

1. Estimation of community access to Primary Health Care.
2. Determination of factors influencing the access in desert.
3. Investigation into mechanism these factors influence the access.

PROGRESS OF WORK

Work done in past:

This project of two years duration was approved by the SAC, 2009 and got started in April, 2009. The access to health care in India is noted to be poor. Not more than fifty percent of people ever reach to these services. In desert, the physical distances add to it. The individual image of curative potential of these services, apart from the felt need of the dwellers in the area play important role in improving the access. Project aimed to investigate the predictors of community access to primary health care in desert taking in to consideration both the components. To take a note of the first component in desert, 55 subcentres attached to two community health centres (CHCs) in typical desert district of Jaisalmer were visited to record information on their curative potential through pre tested questionnaires. The ANM posted at the subcentres were contacted and interviewed. The information included, (1) Availability of beds (2) Availability of minor surgical (3) Needed infrastructure (4) Needed equipments (5) Needed medicines (6) Out reach of ANM and also (7) Image of subcentre among its users. The validity of the information on availability of equipments and medicines at the time of survey was ensured through physical verification of these at the subcentre and the information about outreach of ANM in terms of her visits to household (H/H) was confirmed by the villagers.

Work done during the year:

The analysis of the gathered information from the subcentres was first analysed, which revealed the following

1. Average OPD cases per day at a sub centre: The subcentres were found to register on an average, four to five OPD cases per day.

2. Availability of beds: Availability of two beds was found in only 38.2% of subcentres, whereas in 45.4% of subcentres there was single bed.

3. Availability of minor surgical: Minor surgical to treat minor ailments requiring surgery were available at 30.9% of subcentres only.

4. Needed infrastructure: Larger OPD room to accommodate visiting outdoor patients was needed in 43.6% of subcentres, water connection in 39.1%, repair of sub centre building in 47.3% and conveyance to ease the approach to the sub centre in 41.8% of them.

5. Needed equipments: Certain required equipments were found present in less than 50% of the subcentres. They included, Glucometer (present at 9.1% of subcentres), Delivery Kit (27.3%), Vaccine carrier (36.4%), Slide boxes (20.0%), Sterilizer (25.5%), Foot steps for climbing to clinical examination table (41.8%), Baby tray (27.3%), Hb meter (42.8%) and Thermometer (16.4%).

6. Needed medicines: To cope with the day to day cases, the availability of basic medicines all the time at the sub centre is required. For this, timely supply of the medicines is necessary. For time gap in this regard, the availability of basic medicines was not found in more than 50% of subcentres; this included, Glucose (61.8%), Antibiotic syrup for children (54.5%), Tab Zinc sulphate (78.2%), Vit. A solution (58.2%), Ointment for wounds (63.6%) and Cotton/Bandage (67.3%).

7. Out reach of ANM: On an average, 13 H/H were found being visited by the ANM posted at the sub centre per day. This practice was observed in case of 65.4% of subcentres. As regard to revisit of an H/H by the ANM, 70.9% revisited an H/H in more than a week's time but within a fortnight.

As regard to factors affecting access to primary health care on part of the users apart from availability of infrastructure at these centres, data from 15 villages in the study area with 30 H/H in a village was collected.

The opinion of those who visited the subcentre in last three months was recorded asking them for their satisfaction level on different aspects of curative potential of subcentre. The distribution of image of the curative potential of the subcentres as rated by the users on four point scale was, Bad (rated by 5.3%), Fair (38.7%), Good (49.4%) and Very Good (6.6%).

UTILIZATION

We could estimate the access to primary health care in desert. We could also assess the potential of subcentres to attract its users, which indicates for more strengthening of these subcentres in terms of infrastructure, staff, equipments, and the prompt supply of medicines in order to prove their utility. With existing facilities at these centres, majority of their users rated its curative potential between fair to good only on four point scale. As regard to socio-economic, cultural and other factors affecting access to primary health care on part of the users the data collected from 15 villages in the study area at H/H level is being analyzed. The findings of the study will sound the planners to devise appropriate strategies to enhance access to primary care.

OTHER HEALTH AREAS

4.3 A Statistical study of the characteristics of epidemiological transition in Rajasthan

-A. K. Dixit, Sc. 'E'

Commencement: April, 2009

Duration : Two Years

Status: Completed

AIM

To reveal epidemiological transition in Rajasthan

OBJECTIVES

1. Study of the occurrence pattern of communicable and non-communicable diseases.
2. Study of the rate of epidemiological transition
3. Modeling of increase in the magnitude of non-communicable diseases as a function of decrease in communicable diseases
4. Investigating correlations of developmental factors with epidemiological transition

PROGRESS OF WORK

Work done in past:

This project of two years duration was approved by the SAC, 2009 and got started in April, 2009. It aimed to investigate the pattern of epidemiological transition in Rajasthan. Data obtained from Directorate of Health, Govt of Rajasthan, Jaipur was utilized. Risk of increase in non communicable diseases (NCD) compared to communicable diseases (CD), during the period of five years, as measured by Odd Ratio (OR) was 1.23. There was male dominance with respect to both. In case of NCD, the percentages have been 54% vs 46% and in case of CD it was, 57% vs 43% respectively. The risk of mortality associated with NCD has been 2.42 in case of males and 2.32 in case of females (OR values).

Work done during the year:

The joint occurrence of NCD and CD was studied through matrix algebraic methods, as directly correlating the occurrence of CD and NCD through measures, such as r-measure was judged inappropriate to study such interactions. The hypothesis has been that in nature, in a given year; a set of NCDs and a set of CDs are present, which may interact to give rise to a NCD or CD, e.g. a rise in a NCD may link itself with rise/fall in several CD/NCD. To analyze such situation, matrix approach

was used which derives its justification for in this approach; instead of considering single entity, a set of entities, called a vector is considered.

For a set $I=(i_1, i_2, \dots, i_k)$ of occurrence per lac population of k CDs and similarly, a set $N=(n_1, n_2, \dots, n_k)$ of occurrence per lakh population of k NCDs; a matrix M_1 of order $k \times k$ ($k \times k$ entities) was considered such that its (i, j^{th}) ; $i=1, \dots, k$, entity provided the ratio (n_j / i_1) . As such, the first row of matrix M_1 provided row of increase in n_j , $j=1, 2, \dots, k$; given i_1 for a given year, while its other $(k-1)$ rows provided this increase given respectively the occurrences per lakh population of other CDs, $i_2, i_3, \dots, i_k$. M_1 thus happens to be a symmetric matrix of k rows and k columns which provides increase in NCDs given the CDs and takes in to account the totality of the both. For different years, similar matrices, M_2, M_3 , were obtained.

It was observed that trace of matrix M_1 increased in good linear fashion over the years ($r=.9$). This provided a clue of Mathematical Interaction pattern of CDs and NCDs. The matrix product, $I'MN$ was then studied over the years. This confirmed to linear increase ($r=.88$) but the slope b acquired low value ($b=.16$), indicative of slower growth of N .

The analysis also paved a methodological way to compare the growth of NCDs in totality, given the scenario of CDs in two regions or during two time periods.

The above method assumed equal number of NCDs and CDs which is not natural. Our efforts were then directed to explore matrix interaction of NCDs and CDs in a natural situation in which the numbers of NCDs differ from the number of CDs. In such cases, M matrix does not remain a square matrix and then the transpose of the matrix is not defined. It was highly encouraging to note that the entity

$$Y=I'N/D^2$$

where, D^2 is the sum of squares of differences of magnitude of NCDs and CDs, increased over the years very positively ($r=.995$). This observation provided the clue to study the above interaction in most practical situations, where number of NCD differ with the number of CD, and in which case the transpose of the matrix M is not defined. For a given year, Y was computed with respect to a considered CD and all NCDs and between all CDs save the one, of which decrease/increase was under consideration. . The totals of this interaction (Y) with NCD and CD were studied for prediction of rise/fall of the considered CD in the following year.

UTILIZATION

The investigation places the pace in increase in NCDs in views of given scenario of CDs i.e. it provides an insight in to epidemiological transition in the state. The matrix analysis of interaction of NCDs with CDs helped to account the interaction of these in totality, and yielding modeling of increase/decrease of a CD/NCD in the following year, which is worth an alarm for the health planners. The correlation of developmental scenario with increase in NCD will be revealed with further analysis.

OTHER HEALTH AREAS

4.4 Reduction in household disease burden through intervention of household level risk factors: A prospective study in desert

-A. K. Dixit, Sc. 'E' and P. K. Anand, Sc. 'C'

Commencement: December, 2009 **Duration:** Two Years **Status:** Concluded

AIM

To bring reduction in household disease burden through intervention in modifiable household level risk factors of disease burden

OBJECTIVES

1. To bring reduction in household disease burden through intervention in Modifiable household level risk factors of disease burden
2. To confirm and measure the reduction in household disease burden in time brought about by the intervention

PROGRESS OF WORK

Work done in past:

This project of two years duration was approved in principle by the SAC, 2008; revised and presented in review group, which allowed it. The study was as such was initiated in December, 2009. It aims to bring reduction in household disease burden through addressing modifiable household level risk factors of disease burden, identified in an earlier study. Living area (Area shared), Cattle keeping inside house and drinking water usage were identified as three easily modifiable factors to address household (H/H) level disease burden (DB) in that study.

Interactive role of these factors was studied, which revealed that; whereas, level pattern (1,1,2) viz living area at defined level 1, cattle keeping at level 1 and drinking water at level 2 accounts mostly for low H/H DB; the level pattern (2,1,2) accounts for high H/H DB. As such, among all H/H registering higher H/H DB (more than the median of the distribution of H/H DB) in that study; as per the suggestion of the review group, 72 H/H in intervention group and equal number of H/H in control group were selected. An intervention battery was prepared to be implemented to intervention group as to achieve median level of interaction (1, 1, 2) in this group. Out of selected 30 villages, 8 villages could be visited. In each village, the H/H selected for intervention as well as the H/H selected for control group were visited. These H/H happened to be among the H/H in the village surveyed 5 years ago in the

cross-sectional DB study in these villages. Contribution of the new entrants in the family towards that H/H DB along with the ones in past was recorded.

Work done during the year:

Survey of 72 H/H in intervention and equal number of H/H in the control group intended to be covered from 30 villages was completed. Through our preliminary observations it is noted that H/H level DB is increasing ($R^2=56\%$). An analysis on the shift in H/H DB% given in table 1, reveals that the numbers of H/H in high DB class have been doubled. This pertains to the situation that H/H DB in this class is not reduced but the burden is doubled in five years. Hypertensive cases are also found to go up by 10%.

Table 1. Distribution of H/H DB % before and after 5 years

Categories of H/H DB %	Number of H/H	
	Before 5 years	At Present
Low DB (<2%)	54 (58.1%)	48 (51.6%)
Medium DB(2-10%)	34 (36.6%)	33 (35.5%)
High DB(>10%)	5 (5.3%)	12 (12.9%)
Total	93	93

UTILIZATION

It was realized during the course of study that without the strict supervision of local health functionaries, effective intervention was hard to be implemented. However, with the collected data, through this a turned up follow up study now of H/H DB; changes in H/H DB in 5 years are reflected. It also helped in identifying the type of H/H needing prioritized attention which plays an important role in planning of strategies to reduce the DB in the community.

5. LIST OF PAPERS PUBLISHED/ACCEPTED / PATENT/CHAPTER IN BOOK DURING 2010-11

1. Anand, P. K. Book: Malaria associated factors in Thar Desert of Rajasthan, India. The personal, household and environment related factors. *Lambert Academic Publishing, Germany*, January 2011
2. Anand, P. K. and Ramakrishnan, R. Investigation of the outbreak of typhoid in a village of Thar Desert, Rajasthan, India. *Indian J. Med. Res.*, 2010, **131**: 799-803.
3. Anand, P. K. and Ramakrishnan, R. Malaria associated factors in Thar Desert of Rajasthan, India: A case-control study. *J. Rural Trop. Public Health*, 2010, **9**: 61-66.
4. Bansal, S. K., Singh, Karam V and Sherwani, M. R. K. Comparative larvicidal potential of different plant parts of *Withania somnifera* against vector mosquitoes in the semi-arid region of Rajasthan. *J. Environ. Biol.*, 2011, **32**:71-75.
5. Bansal, S. K., Singh, Karam V and Sherwani, M. R. K. Laboratory observations on the larvicidal efficacy of three plant species against mosquito vectors of malaria, dengue fever/dengue hemorrhagic fever (DF/DHF) and lymphatic filariasis in the semi-arid desert. *J. Environ. Biol.*, 2012, **33**: 617-621.
6. Dixit, A. K. A Geometrical application in Epidemiology: Deducing mathematical interaction between two components of a confounder in giving rise to confounding in case-control studies. *International Journal of Computing and Mathematical Applications*. 2010, **4**: 153-158.
7. Dixit, A. K. and Ansari, F. Behavior of ORMH under cluster sampling of controls in case-control studies: An empirical investigation. *Journal of Statistics Sciences*. 2010, **2**: 105-110.
8. Dixit, A. K. and Ansari, F. Behavior of ORMH under systematic sampling of controls in case-control studies: An empirical investigation. *International Journal of Mathematics and Applied Statistics*. 2010, **1**: 121-125.
9. Dixit, A. K., Kalundha, R. K. and Yadav, S. P. Assessment of subcentres: A case study in Rajasthan. *Oikoassay*. 2011 (Accepted)
10. Dixit, A. K. Differential diagnosis: Cases with equal posteriori likelihoods. *Journal of Clinical and Diagnostic Research*. 2011, **5**: 418.
11. Dixit, A. K. and Anand, P. K. A study of household disease burden and its associated factors in rural population of a desert district in India. *Southern African Journal of Epidemiology and Infection*. 2011, **26**: 165-168
12. Haladiya, K. R., Mathur, M. L. and Sachdev, R. Life-style related risk factors for cardiovascular disease in a desert population of India. *Curr. Sci*. 2010, **99**: 190-195.
13. Joshi, V., Angel, B., Purohit, A., Singh, H. *et al.*. Epidemic of Pandemic Influenza A (H1N1) 2009 in Western Rajasthan, India: Report of prevalence of test positive cases. *Indian Journal of Medical Research*. 2011 (Accepted).

14. Kanojia, P.C., Paingankar, M.S., Patil. A.A., Gokhale, M.D. and Deobagkar, D.N. Morphometric and allozyme variation in the mosquito *Culex tritaeniorhynchus* (Diptera: Culicidae) populations from India. *Journal of Insect Science* 2010, **10**: 1-15.
15. Kumbhat, S., Sharma, K., Gehlot, R., Solanki, A. and Joshi V. Surface plasmon resonance based immunosensor for serological diagnosis of dengue virus infection. *Journal of Pharmaceutical and Biomedical Analysis*. 2010, **52**: 255-259.
16. Lakshminarayana, J., Haldiya, K. R. and Singh, Madhu B. Associated risk of morbidities of Tobacco smoking among opium consumers in rural areas of Rajasthan. *J. Hum. Ecol.*, 2011, **33**: 35-39
17. Lakshminarayana, J., Misra K. N. Singh, Madhu B. and Kalundha, R. K. Opium consumption and its indirect effect on the fertility of women in desert villages of Rajasthan. *Annals of Arid Zone*. 2010 (Accepted)
18. Lakshminarayana, J. and Singh Madhu B. Estimating and adjusting for Publication bias in vitamin A (VAD) in Meta analysis. *International Journal of Environmental and Allied Sciences, Bikaner*, 2010, **23**: (Accepted)
19. Lakshminarayana, J., Singh, Madhu B., Dangi, Ritu and Soni, Shelly. Meta Analysis of Micronutrient Deficiency Disorders and their Mapping in Rajasthan, *International Journal of Environmental and Allied Sciences, Bikaner*, 2010, **23**: (In Press)
20. Lakshminarayana, J., Mishra Anusha, Singhvi Liyanka and Singh Madhu B. Opium use and socio cultural factors associated in consumption in rural areas of Desert Rajasthan, India. *International Journal of Environmental and allied Sciences, Bikaner*. 2010, **23**: (In Press)
21. Mathur, M. L., Gaur J., Sharma, R., Haldiya K. R. Antidiabetic properties of a spice plant *Nigella sativa*. *J Endocrin. Metab.* 2011, **1**:1-8.
22. Singh, Madhu B; Sharma, S. K., Nair Siri, Pandey, R. M. and Kapil, Umesh; Singh, C. Status of Iodine Content of Salt in four regions of India. *Indian Journal of Pediatrics*, DOI 10.1007/s12098-010-0338-0 Online First™, 31 December 2010.
23. Singh, Madhu B; Marwal, Robin; Lakshminarayana, J. Assessment of Iodine Deficiency Disorders in School age children in Jodhpur district of Rajasthan. *Journal Human Ecology*, 2010, **32**: 79-83.
24. Yadav, S. P., Anand, P. K. and Singh, H. Awareness and practices about silicosis among the sandstone quarry workers in desert ecology of Jodhpur; Rajasthan, India. *J. Hum. Ecol.*, 2011, **33**:191-196.
25. Yadav, S.P. A study of treatment seeking behaviour for malaria and its management in febrile children in rural part of desert, Rajasthan, India; *J. Vec Borne Dis.*, 2010, **47**: 235-242.
26. Yadav, S.P. Singh, H., and Ananad, P.K. Changing Scenario of malaria in the thar desert, India. *Proceedings: National Seminar on Impact of climate change on biodiversity and challenges in Thar desert organized by Desert Regional Centre(old name ZSI), Jodhpur on 9th July, 2010*, pp. 351-361.

6. WORKSHOPS/CONFERENCES/SYMPOSIA/ SCIENTIFIC MEETINGS ATTENDED BY SCIENTISTS FROM 2010-11

Dr. K. R. Haldiya, Scientist 'F'

1. Attended the West Zone Conference under ICMR centenary celebrations at National Institute of Virology, Pune from 2-4th February 2011 and presented a paper on '*Scientific work of DMRC*'.

Dr. Vinod Joshi, Scientist 'F'

1. Attended scientific advisory group meeting of Division of NCD on 23.12.10 and presented work of DMRC at National Institute of Pathology, New Delhi.

Dr. Karam V. Singh, Scientist 'F'

1. National Seminar on Impact of Climate Change on Bio- diversity and Challenges in Thar Desert, organized by ZSI – Desert Regional Centre, Jodhpur, on 9th July, 2010.
2. Interactive meeting on 'Climate Change Concerns: Opportunities, gaps and needs', organized by Arid Forest Research Institute, Jodhpur on 6th November, 2010, addressing climate change concerns *vis a vis* forests and forest products in India.
3. '*Rajbhasha Vaigyanik Sangoshthi*', organized by Defence Laboratory, Jodhpur on 10-11th March, 2011 and presented a paper entitled '*Paschimi Rajasthan mai malaria rogvahkon ke keetnashak grahansheelta sthiti par antarik avshisth spray ka prabhav*', by Singh, Karam V. and Bansal, S. K.

Dr. S. K. Bansal, Scientist 'F'

1. Attended National Seminar on Impact of Climate Change on Bio- diversity and Challenges in Thar Desert, organized by ZSI – Desert Regional Centre, Jodhpur, on 9th July, 2010.
2. 'Larvicidal activity of the extracts from different parts of the plant *Solanum xanthocarpum* against important mosquito vectors in the arid region' by- Bansal S. K., Singh Karam V. and Suresh Kumar. Abstracted in National Conference on Animal Science: Innovation and prospectives: Organized by Deptt. Zoology, JNV Univ. Jodhpur on 29th January, 2011.
3. Attended the West Zone Conference under ICMR centenary celebrations at National Institute of Virology, Pune from 2-4th February 2011 and presented a paper on '*Vector Biology and control in the desert*'.

Dr. S. P. Yadav, Scientist 'E'

1. Attended National Seminar on Impact of Climate Change on Bio- diversity and Challenges in Thar Desert, organized by ZSI – Desert Regional Centre, Jodhpur, on 9th July, 2010.

2. Attended 6th Indo-US workshop to develop a Social and Behavioural Research Agenda to Prevent the Spread of HIV/STD in India at NIHFW, New Delhi from 27-28 October, 2010 organized jointly by ICMR and NACO.
3. Attended the 28th Annual Conference of Indian Society for Medical Statistics at New Delhi organized by National Institute of Health and Family Welfare, New Delhi and National Institute of Medical Statistics (ICMR), New Delhi from 11-13 November, 2010 and presented a paper entitled '*A study of socio-cultural practices related with malaria and its control in Thar Desert*'.
4. Attended the Raj Bhasha Vaigyanik sangosthi at DRDO, Jodhpur from 10-11 March, 2011 and presented a paper entitled '*Jalwayu pariwartan evam vikash ke sath-sath Rajasthan pradesh ke maru kshtra me malaria kee wartman esthi ka adhyayan*'.

Dr. Madhu B. Singh, Scientist 'F'

1. Attended and delivered an invited lecture on '*Studies on the nutritional status of children in a drought-affected desert area of western Rajasthan, India*' in EPS Global International Forum on Aging from 29th & 30th July, 2010 in EPS Global International Forum on Aging, at Hangzhou, China.
2. Attended National Seminar on 'Impact of climate change of Biodiversity and challenges in Thar desert' on 9th July, 2010 organized by ZSI, Desert Regional Center, Jodhpur.

Dr. J. Lakshminarayana, Scientist 'E'

1. Attended and presented a paper Entitled '*Effect of tobacco use and smoking on human health, risk factors in desert district of Rajasthan: A Pilot study*'. J. Lakshminarayana, Madhu B. Singh and K.R. Haladiya. 28th Annual Conference of Indian Society for Medical Statistics(ISMS) held at NIHFW, New Delhi during 11-13th November, 2010,

Dr. Manju Singhi, Scientist 'C'

1. Attended the West Zone Conference under ICMR centenary celebrations at National Institute of Virology, Pune from 2-4th February 2011

Dr. S. S. Mohanty, Scientist 'C'

1. Presented a poster entitled '*Distribution of Duffy blood groups among the population of the desert region of India*' in the International Conference on Genomics, Genetics Diseases and Diagnostics & XXXVI Annual Conference of the Indian Society of Human Genetics, held at Manipal Life Sciences Centre, Manipal University, Manipal from 14th to 16th February 2011.
2. Attended the West Zone Scientist's conference held at National Institute of Virology, Pune from 3rd to 4th of February 2011 and made an oral presentation on '*Malaria in Desert*'.

Dr. P. K. Dam, Technical Officer 'A'

1. Participated in the Centenary Celebration of ICMR – 2010-2011, Technical Workshop (West zone, ICMR)) held at National Institute of Occupational Health, Ahmedabad on 11 & 12 January 2011 and Co-Chaired a session 'Technical Session -4' of the Workshop.

Dr. M. S. Chalga, Technical Officer 'A'

1. Participated in the Centenary Celebration of ICMR – 2010-2011, Technical Workshop (West zone, ICMR)) held at National Institute of Occupational Health, Ahmedabad on 11 & 12 January, 2011.

7. SCIENTIFIC ADVISORY COMMITTEE

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9. SCIENTISTS & STAFF

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Director-in-Charge

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1. Dr. K. R. Haldiya, Scientist - F
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3. Dr. M. L. Mathur, Scientist - F
4. Dr. Karam V. Singh, Scientist - F
5. Dr. S. K. Bansal, Scientist - F
6. Dr. Raman Sachdev, Scientist - E
7. Dr. S. P. Yadav, Scientist - E
8. Dr. Madhu B. Singh, Scientist - E
9. Dr. A. K. Dixit, Scientist - E
10. Dr. J. Lskshminarayana, Scientist - E
11. Dr. Phoolchand Kanojia, Scientist - E
12. Dr. Ranjana Fotedar, Scientist - C
13. Dr. Manju Singhi, Scientist - C
14. Dr. Praveen Kumar Anand, Scientist - C
15. Dr. S. S. Mohanty, Scientist - C

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3. Er. Manjeet Singh Chalga

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3. Sh. Pankaj Kumar

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2. Sh. Pooran Mal Meena

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5. Sh. Rohit Prasad Joshi
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1. Sh. Narender Bajaj

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2. Sh. M. C. Pargi
3. Smt. Chandra Kala
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3. Sh. Manohar Singh Seervi

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1. Sh. Jaideep Gaur

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2. Sh. Raghu Nath Singh
3. Sh. Mohd. Gaffar
4. Sh. Ishwar Khetani
5. Sh. Manohar Singh
6. Sh. Rana Ram
7. Sh. Naveen Kumar

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3. Sh. Lal Chand Bandra
4. Sh. Raghu Nath Singh Bisht
5. Sh. Babu Lal Bunker
6. Sh. Mahaveer Prasad
7. Sh. Satya Prakash
8. Sh. Mahesh Chand Sharma
9. Sh. Jodha Ram
10. Smt. Laxmi Kanta
11. Sh. Khushal Singh
12. Sh. Ram Lal, Peon
13. Sh. Ladhu Ram, Peon
14. Smt. Sua Devi, Sweeper
15. Smt. Shoni Devi

TRAINEE

1. Sh. Bhawar Manohar Singh

PROJECT STAFF

Dr. K. R. Haldiya

1. **Prevalence of Diabetes mellitus and impaired glucose tolerance in the Raika and other communities with similar life style in Rajasthan**
 1. Dr. Narvitam Lal, Research Scientist
 2. Sh. Surender Chodhary, Technician
 3. Sh. Sanjay Singh, Technician
 4. Sh. Saiyed Asfaq Ali, Field Incestigator
 5. Sh. Suresh Kumar, Driver

Dr. Vinod Joshi

2. Development of probe to detect dengue transmission or blocking proteins in mosquitoes as early warning tool for transmission risk of dengue in endemic areas

1. Dr. Anshul Sharma, Senior Research Fellow
2. Ms. Annet Angel, Junior Research Fellow

Dr. Karam V. Singh

3. Development of molecular markers for the identification of Biological forms of *Anopheles stephensi* prevalent in arid areas of Rajasthan

1. Mr. Robin Marwal, Junior Research Fellow
2. Ms. Anusha Mishra, Research Assistant

Dr. Madhu B. Singh

4. Utility/Validation of Spot Testing Kit in the Assessment of Iodine Content of Salt -A Multicentric study

1. Mr. Robin Marwal, R.A.

5. Assessment of Iodine Deficiency Disorder Anemia and Nutrition Intervention in School Age children of Jodhpur District of Rajasthan

1. Ms. Suman Shenchu, R.A.
2. Mr. Sundera Chodhary, Technician
3. Mr. Lalit Rangi, Technician

6. Study of food and nutrient consumption by women of child bearing age and 6-59 months of age, with particular reference to pearl millet consumption patterns and the effects of storage, processing, and cooking practices on the retention of Iron, Zinc, Phytate and Polyphenols in Nagaur, a desert district of Rajasthan

1. Ms. Priyanka Malaviya, Research Assistant
2. Dr. Neetu Parihar, Research Assistant
3. Sh. Sudhir Pratap Singh, Data Entry Operator
4. Sh. Yogesh Kr. Saini, Field Investigator
5. Sh. Rakesh Kr. Panwar, Field Investigator
6. Sh. Goverdhanram Patel, Field Attendant
7. Sh. Prashant, Field Attendant

10. केन्द्र में राजभाषा को प्रोत्साहन

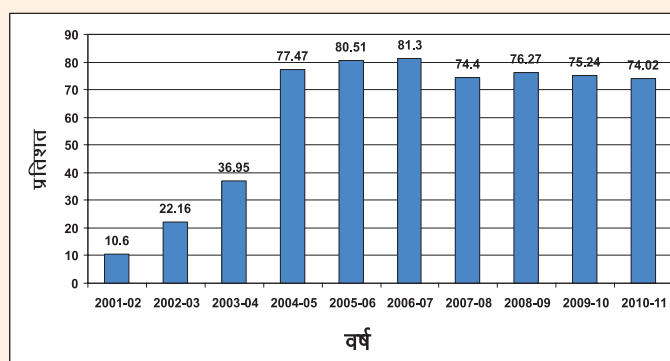
1. त्रैमासिक पत्रिका

किसी भी संस्था की गृह पत्रिका उसकी सतत् क्रियाशीलता, जागरुकता एवं उपलब्धियों की प्रतिबिम्ब होती है। केन्द्र में हो रहे विभिन्न कार्यकलापों तथा आयुर्विज्ञान के क्षेत्र में हो रहे अनुसंधान कार्यों को जन-साधारण तक पहुँचाने में त्रैमासिक द्विभाषी पत्रिका "चेतना" एक अहम् भूमिका निभा रही है। अब तक (वर्ष 2002 से) इस पत्रिका के 36 अंक प्रकाशित हो चुके हैं। प्रकाशित पत्रिकाओं की एक झलक :



2. हिन्दी में पत्राचार

राजभाषा के सभी नियमों के अनुपालन के प्रति यह केन्द्र सजग प्रयत्नशील है जिनमें से हिन्दी में पत्राचार एक मुख्य बिन्दु है। भारत सरकार के गृह मंत्रालय, राजभाषा विभाग द्वारा हिन्दी में पत्राचार संबंधी निर्धारित मानदण्डों को प्राप्त करने के लिए केन्द्र सदैव ही ध्यान देता रहा है। पिछले कुछ वर्षों में प्राप्त प्रतिशतता की झलक :



3. हिन्दी कार्यशाला

केन्द्र में राजभाषा के प्रयोग को बढ़ाने के लिए नियमित रूप से हिन्दी कार्यशालाओं का आयोजन किया जाता है। इन कार्यशालाओं में प्रशासन व लेखा अनुभाग के कर्मचारी भाग लेते हैं। इस वर्ष दिनांक 3 जून, 2010, 14 सितम्बर, 2010 तथा 23 मार्च, 2011 को हिन्दी कार्यशालाओं का आयोजन किया गया। दिनांक 3 जून, 2010 को आयोजित कार्यशाला में केन्द्र के तकनीकी अधिकारी अभियंता मंजीत सिंह चालगा ने कम्प्यूटर सॉफ्टवेयर युनिकोड का हिन्दी टंकण में प्रयोग बताया। युनिकोड सॉफ्टवेयर हिन्दी में टंकण न जानने

वाले व्यक्तियों के लिए सहायक सिद्ध होगा जिससे राजभाषा कार्यों में बढ़ोत्तरी होगी। दिनांक 14 सितम्बर, 2010 को हिन्दी सप्ताह के दौरान आयोजित हिन्दी कार्यशाला में केन्द्र के लेखा अधिकारी श्री अनूप सरिन ने पत्र व टिप्पणी लेखन पर जानकारी दी। दिनांक 23 मार्च, 2011 को आयोजित हिन्दी कार्यशाला में जय नारायण व्यास विश्वविद्यालय के हिन्दी विभाग के आचार्य डॉ कौशलनाथ उपाध्याय ने केन्द्र के कर्मचारियों को हिन्दी में कार्य करने के लिए प्रेरणात्मक व्याख्यान देते हुए कहा कि यदि हम हिन्दी में कार्य करने का प्रण ले लें तो यह कार्य बहुत ही सरल हो जाएगा।



3 जून, 2010



14 सितम्बर, 2010



23 मार्च, 2011

4. हिन्दी सप्ताह



हिन्दी में कार्य करने के उत्साह को अधिकाधिक बढ़ाने हेतु केन्द्र में गत वर्ष की भांति इस वर्ष भी दिनांक 13 से 17 सितम्बर, 2010 तक हिन्दी सप्ताह का आयोजन किया गया। सप्ताह के दौरान विभिन्न प्रतियोगिताओं यथा श्रुतिलेख प्रतियोगिता, हिन्दी टिप्पण व पत्र लेखन प्रतियोगिता, कार्यालय शब्दावली ज्ञान, निबन्ध लेखन प्रतियोगिता, वाद विवाद प्रतियोगिता, कविता पाठ प्रतियोगिता, गीत प्रतियोगिता, अनुवाद प्रतियोगिता, सुलेख प्रतियोगिता, चित्र अभिव्यक्ति प्रतियोगिता का आयोजन किया गया। दिनांक 28 फरवरी, 2011 को केन्द्र के वैज्ञानिक 'एफ' डॉ. कृपाराम हल्दिया ने हिन्दी सप्ताह के दौरान आयोजित विभिन्न प्रतियोगिताओं के विजेताओं व वर्ष 2009-10 के दौरान हिन्दी में सर्वाधिक कार्य करने वाले कर्मचारियों को विभिन्न पुरस्कारों से सम्मानित किया।

5. विशेष :

(i) महानिदेशक डॉ. विश्व मोहन कटोच द्वारा केन्द्र के नवनिर्मित परिसर का उद्घाटन

केन्द्र में दिनांक 21 मई, 2010 को स्वास्थ्य अनुसंधान विभाग के सचिव एवं भारतीय आयुर्विज्ञान अनुसंधान परिषद्, नई दिल्ली के महानिदेशक डॉ. विश्व मोहन कटोच ने केन्द्र के नवनिर्मित परिसर का उद्घाटन किया। इस अवसर पर उन्होंने देश के विभिन्न क्षेत्रों से आए गणमान्य व्यक्तियों एवं केन्द्र के स्टाफ को हिन्दी में संबोधित किया एवं उन्हें हिन्दी में कार्य करने के लिए प्रेरित किया।



(ii) गणतंत्र दिवस आयोजन

केन्द्र में दिनांक 26 जनवरी, 2011 को गणतंत्र दिवस मनाया गया। केन्द्र की निदेशक प्रभारी डॉ. बेला शाह ने झण्डारोहण कर उपस्थित जनों को हिन्दी में संबोधित करते हुए कहा कि वैज्ञानिक जो भी कार्य करें, उसका लाभ आम जनता को मिलना चाहिए।



(iii) हिन्दी कम्प्यूटर प्रशिक्षण

केन्द्र में दिनांक 10 फरवरी, 2010 से जोधपुर प्रौढ़ शिक्षण समिति द्वारा दो माह का हिन्दी कम्प्यूटर प्रशिक्षण दिया गया। इस कार्यक्रम में केन्द्र के प्रशासन व लेखा अनुभाग के पाँच कर्मचारियों को कम्प्यूटर पर हिन्दी में टंकण का प्रशिक्षण दिया गया।

6. राजभाषा सम्मेलनों में प्रतिभागिता

(क) केन्द्र के वैज्ञानिकों द्वारा वैज्ञानिक राजभाषा सम्मेलन में प्रतिभागिता



केन्द्र के वैज्ञानिक 'एफ' डॉ. कर्मवीर सिंह तथा वैज्ञानिक 'इ' डॉ. शेषपाल यादव ने रक्षा प्रयोगशाला में दिनांक 10-11 मार्च, 2011 को 'गैर-पारम्परिक ऊर्जा स्रोतों का रक्षा के क्षेत्र में योगदान' विषय पर आयोजित राजभाषा वैज्ञानिक संगोष्ठी में भाग लिया। डॉ. कर्मवीर सिंह ने "पश्चिमी राजस्थान में मलेरिया रोगवाहकों की कीटनाशक ग्रहणशीलता स्थिति पर आंतरिक अवशिष्ट स्त्रे का प्रभाव" और डॉ. यादव ने "जलवायु परिवर्तन एवं विकास के साथ-साथ राजस्थान प्रदेश के मरु-क्षेत्र में मलेरिया की वर्तमान स्थिति का अध्ययन" विषय पर अपनी प्रस्तुति दी।

(ख) राजभाषा सम्मेलन में प्रतिभागिता

राजभाषा विभाग, गृह मंत्रालय द्वारा दिनांक 21 जनवरी, 2011 को राष्ट्रीय समुद्र विज्ञान संस्थान, गोआ में 'मध्य एवं पश्चिम क्षेत्र का संयुक्त क्षेत्रीय राजभाषा सम्मेलन' आयोजित किया गया। इस सम्मेलन में केन्द्र की कनिष्ठ हिन्दी अनुवादक श्रीमती कंचन बाला ने भाग लिया। सम्मेलन में गोवा के राज्यपाल डॉ. एस. एस. सिद्धु, गोवा विश्वविद्यालय के कुलपति प्रोफेसर दिलीप देव बाकर तथा राजभाषा विभाग, गृह मंत्रालय की सचिव श्रीमती वीणा उपाध्याय उपस्थित थे। यद्यपि गोवा की भाषा कोंकणी है, जो हिन्दी से बेहद अलग प्रतीत होती है, परन्तु वहाँ के लोगों ने अपने हिन्दी प्रेम व हिन्दी को अपनाने की ललक दर्शाते हुए अनुरोध किया कि गोवा को अहिन्दी भाषी क्षेत्र 'ग' न मानकर उसे अर्द्ध-हिन्दी क्षेत्र 'ख' का दर्जा दिया जाए। उनके ऐसे विचार निश्चय ही अनुकरणीय हैं।



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