

Studies on Dengue and Dengue Hemorrhagic Fever in Rajasthan, India – Vinod Joshi, Bennet Angel, Rashmi Chauhan, Himmat Singh, Anil Purohit and Manju Singh

Commencement: **February, 2003**

Duration: **Five Years**

Status: **Completed**

Objectives (Research)

1. To undertake situation analysis with respect to entomological, virological, epidemiological and serological aspects of dengue/DHF in study areas. Establishment of inter-relation among pupal density of *Aedes* species, naturally infected adult mosquitoes and cases of dengue in a given setting, to develop entomological indicators of disease: Development of predictors and determinates of dengue in Rajasthan.
2. To study quantum of transovarial transmission of virus taking place in nature among generations of susceptible *Aedes* mosquitoes. Study of its epidemiological significance in retention of disease during inter epidemic periods.
3. To study mechanism of DHF in study areas in context to Halstead's hypothesis and role of cytotoxic factor and/or genomic changes: Determination of regional risk factors of DHF.

Objectives (Capacity Building)

1. Creation of a databank to provide knowledge of occurrence and distribution of *Aedes* species in representative paradigms (study areas) of Rajasthan. Development of an updating mechanism of above data base in existing computer soft wares to know status of entomological and virological parameters at a given time for a given setting. Computer simulations of expected dengue prone areas, validation of the simulated results and their ultimate utilization for developing early warning system.
2. Establishment of a Regional Dengue/DHF Reference Centre in the host institute. The proposed laboratory will have its own generated data in the demonstrable form, to guide in developing a suitable control programme. In addition, necessary reference facilities will be initiated in the host institute to help health implementing authorities in developing expertise of identifying vector species and their region specific habitats.

Progress of the Work

A. Research Activities

Comprehensive survey in 20 villages and 5 towns representing five physiographic regions of Rajasthan was undertaken. Investigations were made thrice a year i.e. summer, rainy and winter seasons with respect to availability of dengue vectors, container type they breed in, their natural infectivity by dengue virus and current human infections in the sampled houses. These investigations have been conducted twice as first study and first follow up with the minimum gap of 10 days between two points of study. In all, 6418 human dwellings for

presence of adult dengue vectors, 37,525 human population and 62,747 domestic water containers were studied.

Larvae of *Aedes aegypti* collected from the human dwellings were reared into adult mosquitoes in the laboratory. About 1,073 reared adults were examined using IFAT to estimate quantum of transovarial transmission of dengue virus in nature. Tree hole soil samples of the peri-urban foci were regularly examined for breeding of mosquitoes followed by detection of virus circulating in them. During the time of a reported dengue outbreak in 2006, 9 houses were selected to study correlation of vector, infected vector population and susceptible human population leading to a particular transmission level of dengue in a house.

Inferences

- **Surveillance:** Of the five physiographic regions studied, socio-economic criteria of the existing population emerged as the basis of sampling for entomological and virological surveillance in desert and semi-desert areas of Rajasthan when viewed from the aforesaid investigation aspects.
- **Determinants of dengue:** Mosquito infection carried forward through vertical transmission of virus preceded human infections in the study areas. This observation could be very useful in developing an early warning system against dengue.
- **Risk factors of DHF:** Occurrence of virus in mosquitoes emerging from the tree hole soil samples collected from peri-urban foci also preceded the human infections in study areas. The viral genome carried through this extrinsic route represent unchallenged virus, which if happens to be different than strain already circulating in endemic foci, could be causal for the DHF. The studies are being further pursued to confirm the observations.
- **Correlation of mosquito infections, susceptible human hosts and human infections:** Mosquito infectivity along with presence of susceptible humans (without earlier exposure to dengue) in a particular setting emerged as the major determinants of transmission of disease in a house or area (horizontal route). Further studies on in-house transmission of dengue in selected disease endemic families, showed that 50% of mosquito infectivity with availability of susceptible human resulted into high transmission of dengue.

B. Capacity Strengthening Activities (Research and Training)

The project helped in generation & development of human resource, recognition of the group for guiding Ph.D. students, providing services as reference Centre to local hospitals for dengue vectors and virus and extending consultancy to State Government in tackling post-flood emergencies. The specific capacity strengthening achievements are enumerated below:

- Ph. D. programmes for four students & training to more than 50 M. Sc. students of bio-technology & microbiology on different aspects of dengue.

- Award of TDR, WHO sponsored international training courses in Bangkok, Thailand and Lusane, Switzerland for two students.
- Organization of two training programmes for medical officers and technical staff & entomologists.

Impact of TDR grant on Institute's work plan and Disease Control Programme

Research on dengue has been identified and supported as an important research activity in the Centre. Laboratory of Virology and Molecular Biology was upgraded to serve regional needs. Mass & electronic media having highlighted the problem of dengue in the state, public awareness & participation is expected have its impact on the disease control programme. To tackle the problem of dengue in the state, the Centre is in position to help the state health department.

Details of Research Activities

To accomplish the stated research objectives, three major research questions were addressed.

Research question 1: Through study of dengue as a system consisting of *Aedes* vectors, dengue virus and affected human population, in association with regional ecological conditions of a given setting, can we develop predictors and determinants of dengue infection for different settings of Rajasthan so as to workout a surveillance design?

The following studies were undertaken understand to answer the above question.

A. Vector Bionomics

Five study areas representing different socio-economic conditions of Rajasthan were selected for the study. Area-I represented **Desert Region** (thin vegetation, scarcity of natural water resources, low socio-economic group), Area-II represented **Hilly Region** (relatively thick vegetation, surrounded by hills and lakes, tribal group with low socio-economic profile), Area-III represented **Foot Hills Region** (semi-arid condition, due to urbanization and sufficient water, mixed socio-cultural set up), Area-IV represented **Forest & River Region** (ample water available throughout monsoon season, large industries, mixed socio-cultural set up) and Area-V represented **Saline River Region** (arid-ecology, monsoonal saline river, low to middle socio-economic status).

A total of 6418 human dwellings of the study areas were investigated. *Aedes aegypti* was found to be only species available in urban areas of all the study settings, whereas in peri-urban foci *Ae. albopictus* and *Ae. vittatus* were also collected.

- **Area wise seasonal abundance of adult vectors:** A total collection of 1713 adult mosquitoes was made in the 5 study areas. The percentage of houses positive for

presence of adult *Aedes* mosquitoes were recorded as Adult House Index (AHI). Data in Table 1 indicates that among urban settings of all study areas during all the seasons Area-I which represented desert region had highest number of houses positive for the presence of *Aedes aegypti*.

- **Area wise seasonal abundance of larval vectors:** A total of 62,747 containers were examined for larval breeding. Percentage of containers found positive for larval breeding were recorded as Breeding Index (BI). Maximum BI in summer season was seen in Area-I followed by Area-III and Area-V representing a directly proportional association between number of containers, corresponding BI and AHI. Water storage containers utilized by the inhabitants in all the areas were categorized as cement tanks, metallic, clay, plastic containers, underground tanks, coolers and miscellaneous containers. Of these containers found positive for larval breeding, cement tanks showed maximum breeding.

Table 1. Adult and larval vector survey in study areas

Ecological area	Summer				Rains				Winter-Spring			
	Adult survey		Larval survey		Adult survey		Larval survey		Adult survey		Larval survey	
	Houses Searched	AHI	Containers examined	BI	Houses searched	AHI	Containers examined	BI	Houses searched	AHI	Containers examined	BI
Area I												
Urban	100	24.0	1763	37	100	20.0	395	5	100	25	428	12
Rural	288	0.0	5731	60	388	0.0	1335	2.5	594	0	1942	0.16
Area II												
Urban	100	13.0	151	3	100	6.0	882	16	102	7.8	425	0.98
Rural	200	10.0	3535	9	300	10.3	2833	63	294	5.7	1172	3.74
Area III												
Urban	100	15.0	1907	15	100	3.0	831	14	120	23.3	564	48.3
Rural	200	12.5	5538	94	400	14.5	2453	23	684	7.3	3965	25.7
Area IV												
Urban	100	3.0	1446	5	100	5.0	464	16	103	11.6	436	5.82
Rural	200	18.5	3789	44	37	89.1	1956	85	226	10.1	988	25.2
Area V												
Urban	100	6.0	2728	5	100	1.0	1264	4	187	17.6	1101	43.3
Rural	200	9.0	7220	19	400	5.5	3179	9.7	395	6.8	2326	6.83
Total												
Urban	500*	12.2	7995**	13	500*	7.0	3836**	11	612*	17.0	2954**	22.0
Rural	1088*	8.5	25813**	45.2	1525*	9.3	11756**	74.1	2193*	6.0	10393**	12.3
	*Houses examined for adult survey:6418 surveyed houses:37,525 **Containers examined for larval survey: 62,747 Human population of											

B. Virological investigations

Mosquito Infections

A total of 1133 individual mosquitoes were tested for IFAT of which 27 (2.38%) showed natural infection of dengue virus. While rural settings showed 2.7% mosquitoes infected, urban settings showed only 1.7% mosquito infectivity. Natural infection of dengue virus among *Aedes aegypti* was confined to urban settings of Area-I 2(2.24%) in winter-spring and rural settings of Area-II, 1(3.22%) in winter-spring & Area III, 2(2.5%) in summers and 5(6.75%) in winter-spring. However, in Areas-IV both urban (10.25% in winter-spring) as well as rural settings (1.38% in summers and 6.8% in rains) showed infection among mosquitoes. Similarly in Area-V both urban (2.66%) and rural settings (11.11%) showed infectivity in winter-spring season. Two important points emerged from the above observations. That winter-spring was the most preferred season of mosquito infectivity in all the study areas. Secondly, in Area IV mosquito infectivity was observed during all the three seasons.

Human infections

A maximum 22 cases were observed during summer season followed by 14 cases in rainy season. No case of dengue was observed during winter-spring season. Presence of disease during summer was maximum in the Area I (12 cases) followed by Area-II (7 cases), Area-III (2 cases) and least in Area-V (1 case). No case of dengue fever was observed during summer season in Area-IV. During rainy season whereas no case of dengue was observed among sampled houses of Area-I and Area-II, maximum number of cases during this season were encountered in Area-IV (7 cases) followed by 6 cases in Area-V and least number of cases (1 case) in area III. During winter-spring season none of the areas had any suspected or laboratory diagnosed case of dengue.

Interpretation of observations with reference to research question

Surveillance: More number of adult and larval vectors in study area I, III and V (arid and semi-arid areas) in all the seasons in urban settings were associated with more number of domestic containers maintained in these settings. Least attempts are made to empty them so as to cope with the existing irregular and uncertain water supply and hence in these areas, the water storage habits of inhabitants which depend on their socio-economic status appeared to be the indicator of vector abundance. This criteria can be basis of stratification for sampling for dengue vector surveillance. Whereas for non desert areas such as area II & V, ecological criteria of availability of favourable environmental temperature and relative humidity which are itself supportive for vector survival appeared applicable in urban settings. For rural areas of all the settings (desert and non-desert), a uniform criteria of socio-economy emerged as stratification criteria for surveillance.

Key Containers: Study of key containers has revealed Cement tanks as the most important habitat of mosquito breeding as well as virus presence within mosquitoes. A carefully designed study of key containers targeting cement tanks as the primary sites for mosquito control may be helpful.

Determinants and Predictors of dengue: Mosquito infections emerged maximum during February-March (winter-spring season) in the desert and semi-arid areas, whereas, human infections were reported during April-June (summer season). The data suggest that residual

or reserved mosquito population available during February-March, represent maximum of mosquito infections and hence etiologically this period may serve as the inter phase of virus cycle when mosquito infections could transit to human disease during subsequent summer season. These observations highlight mosquito infections as the possible predictor of human infections in the study areas.

Table 2. Seasonal occurrence of mosquito and human infections

Setting	City/ Village screened	Seasonal observations on mosquito & human infections											
		February-March				April-June				July-January			
		Mosquito		Human		Mosquito		Human		Mosquito		Human	
		Ex*.	% +ve	Case	Sero +ve	Ex.	% +ve	Case	Sero +ve	Ex.	% +ve	Ex.	Sero +ve
Urban	5	260	3.1	0	0.0	114	0.0	43	16.3	73	0	26	15.4
Rural	20	182	5.5	0	0.0	186	1.6	4	2	318	1.9	10	0.0
Total	25	442	4.1	0	0.0	300	1.0	47	14.9	391	1.5	36	11.1

*Ex= Examined

Correlation between vectors, infected vectors, susceptible human hosts and human infections: Study of correlation of vectors, infected vectors, susceptible human population and diseased human, in 9 selected houses showed that 50% or more of natural infectivity of mosquitoes in a house in presence of susceptible subjects leads to maximum secondary transmission of dengue, irrespective of the number of primary dengue cases in a house. The observations suggest that percentage of mosquito infections and availability of susceptible humans in a house are the major determinants of infection.

Research question 2: Since dengue appears as a seasonal morbidity in community, during inter-epidemic periods, where virus remains in nature?

To answer the above question, seasonality of the mosquito and human infections was studied in all the five study settings across the year (Table 2). In addition, monthly investigations in selected sites of Jodhpur town were also made during the period of 2006-07 (Table 3).

The observations in Table 2 clearly indicate that during Winter-Spring (February-March) maximum infected mosquitoes have been observed whereas, human infections occurred during subsequent summer and rainy seasons. Study reveals that transovarial transmission of dengue virus as maintained by infected mosquitoes during February-March, retain the virus during inter epidemic period of disease. Investigations on virus isolations from urban and peri-urban foci during 2006-07 indicate that areas outside city (peri-urban) also maintain virus activities in mosquitoes (Table 3). This observation also highlights a possible maintenance mechanism of virus during inter epidemic periods.

Table 3. Details of virus detection from *Aedes* mosquitoes from urban and peri-urban settings of Jodhpur

Month	Urban Settings					Peri-urban Settings								
	Ae. aegypti			Ae. albo pict us	Ae. vitta tus	Ae. Aegypti			Ae. albopictus			Ae. vittatus		
	Ex	+ve	%			Ex	+ve	%	Ex	+ve	%	Ex	+ve	%
April	x	X	x	x	x	X	x	x	44	4	9.0	x	x	x
May	11	2	18.0	x	x	X	x	x	0	0	0.0	x	x	x
June	X	X	x	x	x	X	x	x	9	0	0.0	x	x	x
July	12	+	+	x	x	1	0	0.0	18	+	+	4	0	0.0
August	3	3	100	x	x	23	2	8.6	27	0	0.0	47	0	0.0
September	4	3	74.0	x	x	X	x	x	6	2	33.3	x	x	x
October	29	11	37.9	x	x	X	x	x	x	X	x	x	x	x
November	X	X	x	x	x	X	x	x	x	X	x	x	x	x

Research question 3. What are the risk factors of DHF in Rajasthan in context of Halstead's hypothesis, in context of concept of development of cytotoxic factor and/or in context of genomic constitution of affected population?

Halstead's theory about DHF as result of infection of two dengue strains with a time gap was taken as the basis of understanding cause of DHF. However, we further investigated as to what is the source of second dengue strain to an already infected and immune patient? We hypothesized that an infected person carrying different dengue strain than one to which a population was previously exposed, may not be able to provide strain with enough virulence due to action of interferon within human system.

The studies are being made to isolate the viruses from mosquitoes, especially from tree hole breeders. Virus typing of mosquito inoculates showed that two vector populations in an area carry two different strains. It is believed that mosquito carried virus could be source of introducing a new strain into a patient of simple DF.

A comprehensive plan for prevention of dengue is being prepared.

Development and demonstration of a surveillance design for control of dengue vectors in Jodhpur, using GIS – Vinod Joshi, Himmat Singh, Keerti Sharma, Bennet Angel, Anil Purohit and P. K. Dam

Commencement: **October, 2006**

Duration: **Two Years**

Status: **Ongoing**

Objectives

1. Development of a surveillance design for dengue vectors as applicable for an arid town, Jodhpur, Rajasthan.
2. Demonstration of monitoring and control of dengue vectors using area specific design and involving local health agency and community participation.
3. Detection of virus maintaining foci in nature as crucial etiological niche contributing to maintenance and transmission of disease in a setting.

Progress of Work

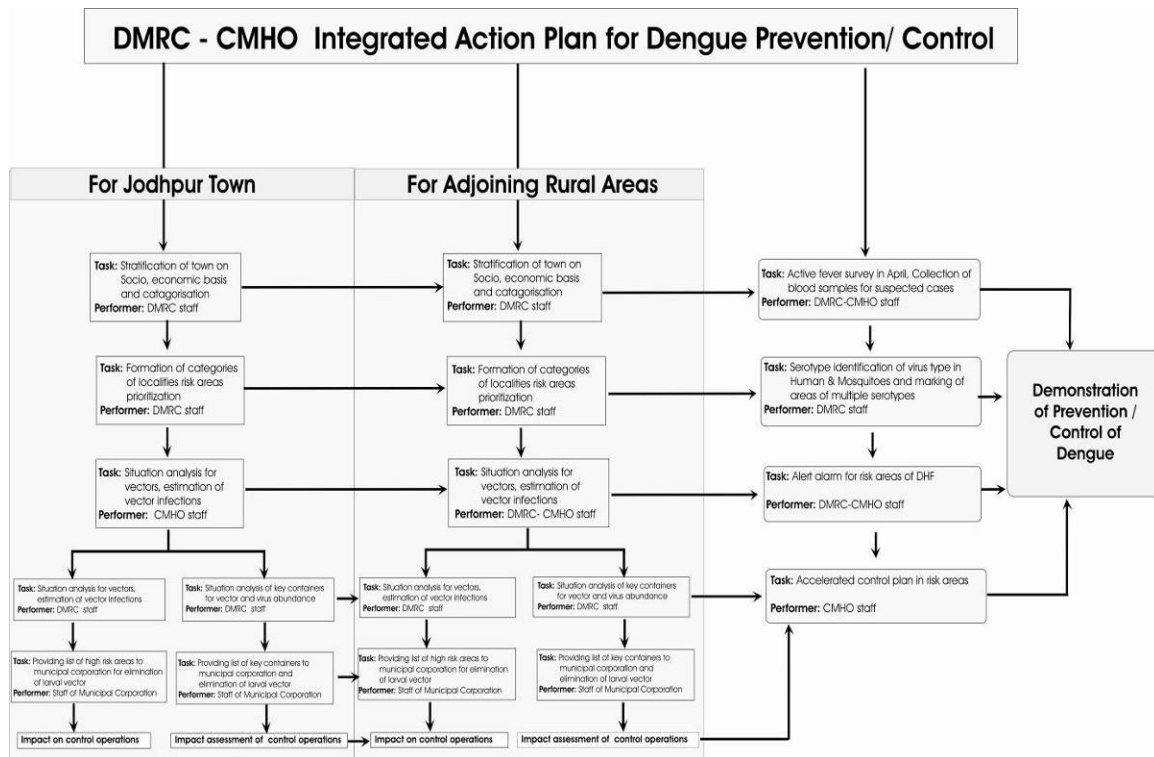
Associations of entomological observations with socio-economic attributes of study settings such as location at inside city and characteristics of agglomerations of human dwellings showed more AHI (Adult House Index) compared to areas of locations in outskirts and having spread housing pattern. However, area V even being located in outskirt, represented similar pattern of housing as of inside city houses). Similarly breeding of mosquitoes were also more pronounced among houses of inside city locations as compared to those in the areas of outside, except for Areas V which even being situated outside city showed BI of 92. The observations showed that poor to middle socio-economic status, agglomeration of houses and presence of peri-domestic water containers were the attributes which supported breeding and adult stages of *Ae. aegypti*, whereas Area IV and VI without these attributes showed relatively less presence of larval and adult *Ae. aegypti*. The present studies support the socio-economic criteria to be the appropriate basis of stratification for dengue surveillance.

Virological observations made on field collected adult mosquitoes showed high percentage of infectivity. Infected mosquitoes were observed maximum (65.0%) in Area V followed by Area I (58.3%) and the least in Area II (25.0%). In area IV no mosquito infectivity was recorded. The results of IFAT showed that DEN-3 was the most common virus type circulating in mosquito samples of all the study areas. In Area I, DEN-2 strain was also detected.

Clinically suspected cases of dengue were recorded maximum in Area I (39 cases) followed by Area II (19 cases) and least cases were in Area III, IV and V. The maximum confirmed cases of dengue were in Area I. The inside city contributed maximum 67(62%) out of 108 cases.

Dengue Action Plan developed for Jodhpur town

A dengue prevention plan has been developed and discussed with the Chief Medical & Health Officer, Jodhpur, for prevention/control of dengue and DHF in Jodhpur town. The stratification criteria developed by DMRC and the observations made on existing vectors and virus foci, as detected by the research team of DMRC, are likely to be intervened by appropriate larval elimination measures by employing manpower available with the CMHO, Jodhpur. The plan developed has been sketched below:



Preparation and demonstration of an Action Plan for prevention and control of dengue in Jodhpur in collaboration of local health authorities during forthcoming rainy season.2008-09 is being planned.

Development of molecular and genetic markers of virus transmission competence of dengue vector species in Rajasthan- Vinod Joshi, Bennet Angel and Rashmi Chauhan

Commencement: April, 2005

Duration: Three Years

Status: Ongoing

Objectives

1. Determination of mid gut protein responsible for dengue virus transmission (horizontal and vertical) among mosquito vector species in different ecotypes of Rajasthan.
2. Location of gene controlling the implicated protein and study of frequency of its appearance through gene flow maps.
3. Extrapolation of observations in GIS across different ecotypes of Rajasthan to develop molecular markers of transmission risk of dengue in Rajasthan.

Rationale

Dengue fever associated with Dengue Hemorrhagic Fever (DHF) is an emerging public health problem in many parts of India including north western state, Rajasthan. At present, presence of species such as *Aedes aegypti* and *Aedes albopictus* and their abundance in a particular area are being used as transmission risk factors. However, owing to wide biological variations among mosquitoes in different settings, vector biological indices do not appear to be accurate and dependable markers of risk of transmission of disease in an endemic setting. Through available biotechnological methods, proposed project envisages to develop molecular markers of transmission potential of dengue vectors species viz; *Aedes aegypti* and *Ae. albopictus* in different ecotypes of Rajasthan. The protein responsible for imparting virus transmission/refractory competence to available mosquito species will be implicated and areas wherever such proteins are reported in the state, will be marked as transmission risk zones using Geographical Information System (GIS). In addition, the gene controlling appearance of these proteins in wild caught mosquitoes will also be studied for frequency of its occurrence across generations of mosquitoes to predict seasonality of dengue onset in different ecotypes of Rajasthan. The study ultimately intends to develop molecular epidemiology of DF & DHF in Rajasthan.

Progress of the work

The present study is aimed to study molecular diversity of mid gut and ovarian proteins of *Aedes aegypti*, *Aedes albopictus* and *Aedes vittatus* mosquitoes with reference to their competence to transmit and maintain dengue viruses in a particular area. The species have been collected during three seasons namely rainy, winter and summer seasons. So far, the adult and larval *Aedes* mosquitoes have been collected from rural and urban settings of areas viz. Jodhpur, Kota, Jaipur, Udaipur and Bharatpur. Unfed adult mosquitoes were fed on fowls in the

laboratory and fed specimens along with blood fed specimens collected from the field were caged for egg laying. Larvae/pupae collected from the field were reared in laboratory to adult forms. F₁ generation of field caught and laboratory reared adults were dissected in normal saline and the mid guts of individual mosquitoes were taken out and processed for further studies employing SDS-PAGE. On other hand, head portion of each individual mosquito was processed for the examination of presence of dengue antigen using IFAT. The virus detected in laboratory reared mosquitoes which did not feed on any blood meal, was treated as vertically transmitted virus. To confirm the results of IFAT, mosquito remnants of samples showing positive IFAT were pooled to prepare viral suspension and suspension was injected intracerebrally into mice. Mice developing sickness after 4-6 days were sacrificed and their brain was centrifuged at 18,000 rpm. The supernatant was again subjected to IFAT to confirm the present of virus.

SDS Poly Acrylamide Gel Electrophoresis (PAGE) for membrane proteins of ovarian tissues and their relation with mosquito infections:

Before pooling all the remnants of IFAT positive mosquitoes, the ovaries of individual mosquito were dissected out. To ensure assay of membrane proteins, tissues were teased in cell lysis buffer and centrifuged at 18,000 rpm for 20 minutes. Supernatant was taken and sediment was again centrifuged. Supernatant obtained was digested in Sample Digestion Buffer (composed of 0.5M Tris HCl pH 6.8, Glycerol, Deionised water, Sodium Dodecyl Sulfate, bromophenol blue and β -mercaptoethanol). The digested tissues were then heated and loaded for electrophoretic assay in wells provided in the SDS-PolyAcrylamide Gel (12% resolving gel, silver stain protocol). Broad range protein standards (molecular weight of 200 kDa-30kDa) were used as reference proteins

As given in table 1, in urban areas of Jodhpur district, out of 37 specimens of ovaries of *Aedes aegypti* assayed for SDS-PAGE, 22 samples showed some protein bands. Of these 22 samples, 17 samples (77%) showed presence of 200 kDa protein. Of these 17 samples, only three samples (17%) showed salivary glands positive for dengue virus, whereas 83% of these samples were free from any natural infection of dengue. On other hand, in five samples not showing presence of 200 kDa protein, 3 (60%) showed presence of dengue virus. In case of *Ae. albopictus*, 32 samples showing some bands, 29 (90%) showed presence of 200 kDa protein. Of these 29 samples only 1 (3.4%) showed presence of dengue virus, whereas 96% mosquitoes showing 200 kDa protein were virus free. In the case of *Ae. vittatus*, 58 mosquitoes samples showing 200 kDa only 1 (1.7%) samples was positive for dengue virus. In rural areas of Jodhpur district, of 22 *Ae. vittatus* mosquitoes showing 200 kDa protein, none showed presence of virus, whereas out of 10 samples showing absence of 200 kDa, 2 (20%) of them were virus positive.

In urban areas of Kota district, of the 14 samples of *Ae. aegypti* showing 200 kDa, none showed presence of virus and same was true in the case of 5 samples of *Ae. vittatus*. In rural areas of this district, of 38 samples of *Ae. aegypti* showing 200 kDa, none of the mosquitoes were virus positive and 11 *Ae. vittatus* showing 200 kDa, none of them showed virus. In urban areas of Jaipur district, while none of *Ae. aegypti* showed protein bands in ovaries, in rural areas, 4 (44%) out of 9 showing 200 kDa were virus positive, while 6 (24%) out of 25 mosquitoes not showing 200 kDa were positive. In case of *Ae. vittatus* of rural areas of

Jaipur district, 1 (12.5%) out of 8 mosquitoes showing 200 kDa was virus positive whereas, 9 (36%) out of 25 mosquitoes not showing 200 kDa were virus positive.

Pooled data suggest that in urban areas of all the three districts, 3 (3.4%) out of 31 *Ae. aegypti*, 1 (1.5%) out of 29 *Ae. albopictus* and only 1 (1.5%) out of 63 *Ae. vittatus* showing 200 kDa in their ovaries were positive for presence of dengue virus. On other hand, 6 (24%) out of 20 mosquitoes not showing 200 kDa were positive for dengue virus. Similarly, in rural areas, only 4 (18.7%) out of 47 *Ae. aegypti*, and 1 (3.2%) out of 31 *Ae. vittatus* with 200 kDa showed presence of virus. On other hand, 6 (24%) out of 25 *Ae. aegypti* and 11 (31.4%) out of 35 *Ae. vittatus* not having 200 kDa were virus positive (Table 1).

Observations suggest that when ovarian proteins of 200 kDa molecular weight is present, less number of mosquitoes showed transovarial transmission of dengue virus whereas absence of this protein in ovaries was associated with the presence of virus in the samples. However, to confirm the observations made on field collected samples, we need to make laboratory studies and also isolate the virus in IFAT +ve mosquitoes by PCR assays.

Work remains to be done

Sequencing of aminoacids and cause and effect relationship need to be established. It is envisaged to undertake in-vitro studies to confirm presence or absence of 200kDa in cell lines for the study internalization of dengue virus employing IFAT.

Table 1. Association of ovarian membrane proteins with transovarial transmission of dengue viruses

Area	Species	Urban								Rural							
		Total number assayed	Bands expressed	No. with 200k Da	IFA Test positive	% of association	No. without 200 kDa protein	IFA Test positive	% association	Total no. assayed	Bands expressed	No. with 200k Da	IFA Test positive	% of association	No. without 200 kDa protein	IFA Test positive	% association
Jodhpur	<i>Ae.aeg.</i>	37	22	17	3	17.6	5	3	60	6	-	-	-	-	-	-	-
	<i>Ae.vitt.</i>	61	59	58	1	1.7	1	0	0	32	22	12	-	0	10	2	20
	<i>Ae.albo.</i>	39	32	29	1	3.4	3	0	0	-	-	-	-	-	-	-	-
Kota	<i>Ae.aeg.</i>	35	14	14	-	0	-	1	0	44	38	38	-	0	-	-	-
	<i>Ae.vitt.</i>	19	5	5	-	0	-	-	0	16	11	11	-	0	-	-	-
	<i>Ae.albo.</i>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Jaipur	<i>Ae.aeg.</i>	15	11	-	-	0	11	-	0	58	34	9	4	44.4	25	6	24
	<i>Ae.vitt.</i>	11	-	-	-	0	-	2	0	59	33	8	1	12.5	25	9	36
	<i>Ae.albo.</i>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total	<i>Ae.aeg.</i>	87	47	31	3	9.6	16	4	25	108	72	47	4	8.51	25	6	24
	<i>Ae.vitt.</i>	91	64	63	1	1.5	1	2	0	107	66	31	1	3.2	35	11	31.4
	<i>Ae.albo.</i>	39	32	29	1	3.4	3	-	0	-	-	-	-	-	-	-	-

Molecular characterization of extrinsic peri-urban dengue viruses contributing to cause DHF: A new concept for mechanism of DHF - *Vinod Joshi, Bennet Angel and Rashmi Chauhan*

Commencement: **December, 2005**

Duration: **Three Years**

Status: **Ongoing**

Objectives

1. To confirm occurrence of Zoonotic cycle (ZC) of Dengue virus among tree hole breeding mosquitoes and inhabiting monkey populations. Study of its occurrence and epidemiological significance in desert settings of Rajasthan.
2. Study of role of Zoonotic cycle in maintaining and/or amplifying endemic cycle of dengue fever.
3. Study of possible role of Zoonotic cycle as factor causing Dengue Hemorrhagic Fever.
4. To undertake experimental studies to confirm monkey- mosquito cycle of dengue in laboratory models of monkeys.

Rationale

DHF is the stage believed to be the result of failure of immune response of a human host towards a new dengue serotype when responding host is already immune against another dengue strain to which it was exposed previously (Halstead, 2002). At present it is being believed that active dengue cases infected of a strain different than previous strain, are the sources of introducing second strain to cause DHF in an area.

Dengue viruses are the members of flaviviruses which are highly antigenic. Owing to this, net viremia available in human blood is around 10^5 /ml of blood only. With this stock of virus which is a challenged stock by immune system of humans, an infected human may not be able to provide sufficient unchallenged dengue antigen to a previously exposed case of DF to cause DHF. We believe that to cause DHF humans may be a dead end as they are in the case of arbo-virus Japanese encephalitis. It is perhaps for this reason that in Delhi appearance of DEN-2 in 1996 and now appearance of DEN-4 in 2006 have not led to an epidemic of DHF. In Africa also with a gap of 10 years two strains of dengue infected the population, no DHF could be reported. We believe that for providing viraemically strong virus stock, a mosquito passaged virus in peri-urban foci, can only cause DHF. We thus need to type and sequence the virus of DHF patients and match sequences with available peri-urban viruses within mosquitoes to prove this hypothesis.

In support of above hypothesis it is mentioned here that dengue viruses were primarily the viruses of mosquitoes before they adapted to lower primates. We believe that crude and undisturbed ecological niches of peri-urban or sylvatic foci of dengue maintained within mosquitoes of zoos/parks or within larval mosquito pools breeding in permanent and protected reservoirs in city setup do not get weakened titre for less feeding opportunity available with the tree hole breeders to feed upon challenging systems of humans. If strains contained by mosquitoes of peri-urban foci happen to be different than urban strain, mixing of two strains may straight be causal for the DHF. In such case, proposed research will pave a very effective prevention strategy against DHF. To pursue this contention, present studies have been pursued.

Progress of the work

Study areas

Present understanding of etiology of Dengue Hemorrhagic Fever (DHF) is based on cross reactivity of two dengue strains appearing in a common host with a gap of few months/years of infectivity from each other. Keeping this in view, it is presumed that endemic dengue has a uniform infectivity by one DEN strain and that zoonotic or sylvatic foci of virus between tree hole breeding *Aedes albopictus* and monkeys or through vertically transmitted virus within generations of *Aedes albopictus*, introduce another DEN strain to endemic population. To study above concept we have undertaken typing of mosquito viruses from 4 endemic areas of Rajasthan as shown in the Table 1. Mosquito contained dengue strains from urban, rural and peri-urban foci of Jodhpur have been typed from December 2006 to February, 2008 (Table 2).

Observations on distribution of various virus types in endemic settings of Rajasthan.

- Among urban setting of desert area, all the four dengue types viz; DEN-1, 2, 3 and 4 were detected. Maximum presence (37.1 %) of DEN -2 and DEN-3 (31.4 %) were observed, while DEN-1 and DEN-4 were relatively less prevalent (14.2 and 11.4 % respectively). In peri-urban setting of desert area DEN-3 was observed whereas, among rural settings DEN-2 was detected.
- In semi-arid area, urban settings showed presence of DEN-3, whereas among rural settings of this area, rural-1 showed all the four DEN types present, rural-2 showed DEN-1 and DEN-3, rural-4 showed DEN-3 and DEN-4 and rural-3 showed no mosquito infections.
- In forest & river area, among urban settings, three DEN types, 1,2 and 4 were observed, whereas, DEN-3 was not observed from these settings. Among rural settings of this area, in rural-1, only DEN-2 was present, in rural-2, DEN-1 and DEN-4 were present.

- The data show that while in desert and semi-arid areas, all the four DEN types were observed in urban settings, whereas in forest & river area, DEN-3 was not observed from any of the settings screened. In non-arid area no mosquito infection was observed. Pooled data suggest that in urban settings 34.1 % and rural settings 36.3 % mosquitoes, maximum presence of DEN-2 was observed followed by DEN-3.

Inferences on distribution of various mosquito types in endemic settings of Rajasthan

- In desert and semi-arid areas of Rajasthan, where people show tendency storage of domestic water, present observations on occurrence of all four dengue strains, would ensure presence of different DEN types and thus present observations may have important bearing on the possibility of emergence of DHF in the area. It was interesting to observe that in both desert as well semi-arid areas, among urban settings, all the four dengue types were observed in the field collected mosquitoes but in forest and river area DEN-3 was not detected in any of the mosquito samples. These observations highlight specificity of areas for maintaining particular DEN types.
- In the present study, the mosquito infections detected through IFAT and their subsequent confirmation in cell culture medium, mouse brain as the possible screening tool to estimate risk of DHF in an area. The approach of virus typing in field collected mosquitoes could yield a powerful surveillance indicator to investigate current scenario of virus types available and develop predictors of the prospective risk of occurrence of DHF.
- The antigenic information on the virus types contained by extrinsic sources may be helpful in designing the surveillance of dengue.

Work remains to be done

We are pursuing typing of virus among tree hole breeding *Aedes albopictus*. Subsequently we propose to sequence the genome of viral strain causing DHF in human and match it with genome of *Aedes albopictus* contained virus.

Table 1. Distribution of dengue types in *Aedes aegypti* of four endemic areas of Rajasthan

Area	Rural/Urban	Total tested	Total positive	% +ve	+ve DE N-1	% +ve	+ve DE N-2	% +ve	+ve DE N-3	% +ve	+ve DE N-4	% +ve
Desert Area	Urban setting	162	35	21.6	5	14.2	13	37.1	11	31.4	6	11.4
	Peri-urban setting	11	1	9.0	0	0.0	0	0.0	1	100.0	0	0.0
	Rural setting	16	4	25.0	0	0.0	4	100.0	0	0.0	0	0.0
Semi-arid Area	Urban setting	31	1	3.2	0	0.0	0	0.0	1	100.0	0	0.0
	Rural setting -1	62	15	24.1	4	26.6	5	33.3	3	20.0	3	20.0
	Rural setting-II	32	4	12.5	2	50.0	0	0.0	2	50.0	0	0.0
	Rural setting-III	4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Rural setting-IV	26	3	11.5	0	0.0	0	0.0	2	66.6	1	33.3
Forest & River Area	Urban setting	70	5	7.1	3	60.0	1	20.0	0	0.0	1	20.0
	Rural setting-I	27	3	11.1	0	0.0	3	100.0	0	0.0	0	0.0
	Rural setting-II	36	4	11.1	1	25.0	0	0.0	0	0.0	3	75.0
Non-arid Area	Urban setting	21	0	0.0	0	0.0	0	0.0	0	0.0	00	0.0
Total	Urban	284	41	14.4	11	26.8	14	34.1	12	29.2	7	17.0
	Peri-urban	11	1	9.0	0	0.0	0	0.0	1	100.0	0	0.0
	Rural	203	33	16.2	7	21.2	12	36.3	7	21.2	7	21.2
Pooled	Setting	498	75	15.0	18	24.0	26	34.6	20	26.6	14	18.6

Table 2. Virus typing in urban, peri-urban and rural settings of Jodhpur

Month		Urban			Peri-urban			Rural			Total		
		Ae.	Ae.	Ae.	Ae.	Ae.	Ae.	Ae.	Ae.	Ae.	Ae.	Ae.	Ae.
Jan.	Total	106	X	-	-	-	-	25	X	-	131	-	-
	Positive	25	X	-	-	-	-	13	X	-	38	-	-
	% positive	23.5	X	-	-	-	-	52.0	X	-	29.0	-	-
Feb.	Total	92	X	-	13	2	-	72	X	-	177	2	-
	Positive	21	X	-	0	0	-	26	X	-	47	0	-
	% positive	22.8	X	-	0	0	-	36.1	X	-	26.5	0	-
Mar.	Total	-	X	-	3	3	-	-	X	-	3	3	-
	Positive	-	X	-	0	0	-	-	X	-	0	0	-
	% positive	-	X	-	0	0	-	-	X	-	0	0	-
Apr.	Total	50	X	-	4	20	3	27	X	58	81	20	61
	Positive	5	X	-	0	1	0	3	X	0	8	1	0
	% positive	10	X	-	0	5.0	0	11.1	X	0	9.87	5.0	0
May	Total	64	X	-	8	2	11	64	X	18	136	2	11
	Positive	11	X	-	0	0	0	10	X	0	21	0	0
	% positive	17.1	X	-	0	0	0	15.6	X	0	15.4	0	0
June	Total	8	X	-	-	-	5	-	X	6	8	-	11
	Positive	1	X	-	-	-	0	-	X	0	1	-	0
	% positive	12.5	X	-	-	-	0	-	X	0	12.5	-	0
July	Total	-	X	-	-	-	6	-	X	-	-	-	6
	Positive	-	X	-	-	-	0	-	X	-	-	-	0
	% positive	-	X	-	-	-	0	-	X	-	-	-	0
Aug.	Total	51	X	22	4	48	-	-	X	9	55	48	31
	Positive	16	X	0	0	3	-	-	X	0	16	3	0
	% positive	31.3	X	0	0	6.25	-	-	X	0	29.0	6.25	0
Sept.	Total	38	X	-	2	17	25	2	X	20	42	17	45
	Positive	12	X	-	0	1	1	0	X	2	12	1	3
	% positive	31.5	X	-	0	5.88	4.0	0	X	10.0	28.5	5.88	6.66
Oct.	Total	84	X	22	-	48	30	16	X	-	100	48	52
	Positive	13	X	2	-	9	3	3	X	-	16	9	5
	% positive	15.4	X	9.09	-	18.75	10.0	18.7	X	-	16.0	18.7	9.61
Nov.	Total	23	X	46	-	47	-	11	X	-	34	47	46
	Positive	8	X	10	-	13	-	0	X	-	8	13	10
	% positive	34.7	X	21.7	-	27.6	-	0	X	-	23.5	27.6	21.7
Dec.	Total	-	X	-	-	45	-	36	X	-	36	45	-
	Positive	-	X	-	-	21	-	11	X	-	11	21	-
	% positive	-	X	-	-	46.6	-	30.5	X	-	30.5	46.6	-
Total	Total	508	X	90	34	227	80	253	X	111			
	Positive	111	X	12	0	48	4	66	X	2			
	% positive	21.8	X	13.3	0	21.1	13.3	26.0	X	1.80			

- The data show that while in desert and semi-arid areas, all the four DEN types were observed in urban settings, whereas in forest & river area, DEN-3 was not observed from any of the settings screened. In non-arid area no mosquito infection was observed. Pooled data suggest that in urban settings 34.1 % and rural settings 36.3 % mosquitoes, maximum presence of DEN-2 was observed followed by DEN-3.

Inferences on distribution of various mosquito types in endemic settings of Rajasthan

- In desert and semi-arid areas of Rajasthan, where people show tendency storage of domestic water, present observations on occurrence of all four dengue strains, would ensure presence of different DEN types and thus present observations may have important bearing on the possibility of emergence of DHF in the area. It was interesting to observe that in both desert as well semi-arid areas, among urban settings, all the four dengue types were observed in the field collected mosquitoes but in forest and river area DEN-3 was not detected in any of the mosquito samples. These observations highlight specificity of areas for maintaining particular DEN types.
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Work remains to be done

We are pursuing typing of virus among tree hole breeding *Aedes albopictus*. Subsequently we propose to sequence the genome of viral strain causing DHF in human and match it with genome of *Aedes albopictus* contained virus.

Study of rapid culture of *Mycobacterium tuberculosis* from sputum samples- Murli L. Mathur and Aruna Solanki*

Commencement: **May, 2007**

Duration: **Two years**

Status: **On going**

Objectives

1. To shorten the duration of time required for rapid culture of *Mycobacterium tuberculosis* from sputum samples, so that it can be used for rapid drug susceptibility testing.

Rationale

Culture of *Mycobacterium tuberculosis* from clinical material is the "GOLD STANDARD" for diagnosis of tuberculosis (TB) which normally requires 3-8 weeks time. It is therefore not commonly used as a method for diagnosis of TB. Considering the emerging problem of drug resistance in TB, there is need to shorten the duration of time required for culture of *Mycobacterium tuberculosis* from sputum samples, so that it can be used for rapid drug susceptibility testing aimed at early diagnosis of Treatment Failure and MDR TB at secondary or tertiary health facilities in Revised National Tuberculosis Control Program.

Egg-based media incorporating malachite green are recommended as "gold standard" for isolation, culture, and drug susceptibility study of *Mycobacterium tuberculosis* (MTB) on which growth of mycobacteria tends to be slightly better and therefore most laboratories in developing countries use Lowenstein–Jensen medium for culture of MTB. Many commercial broth systems for Mycobacterial growth detection are also available. Automated culture systems such as BACTEC 460 (Becton Dickinson Microbiology Systems, Sparks, MD), Mycobacterial Growth Indicator Tube (MGIT) systems, ESP (Extra Sensing Power) Myco-ESPculture System II (Trek Diagnostic Systems, Inc., Westlake, OH), and BacT/ALERT MB Susceptibility Kit (Organon Teknika, Durham, NC) use radiometric or colorimetric systems. However all these are expensive and also take more than one-two weeks to produce results, therefore these are not widely used in developing countries.

A rapid and low-cost method for the sensitivity study of *Mycobacterium tuberculosis* is also available. It is known as Microplate alamar blue assay (MABA), which used Alamar blue as the dye. Recently a new dye known as tetrazolium bromide [3-(4,5-dimethylthiazol-2-yl)-2,5diphenyl-tetrazolium bromide] has been used. Tetrazolium microplate assay (TEMA) that uses tetrazolium bromide [3-(4,5-dimethylthiazol-2-yl)-2,5diphenyl-tetrazolium bromide] is an alternatively, less expensive, and easier-to-read method for antibiotic susceptibility determination. The TEMAs has proven to be a reliable method for the determination of MDR strains of *Mycobacterium tuberculosis*.

**Head, Dept. of Microbiology, Dr. S. N. Medical College, Jodhpur.*

The procedure is faster than other tetrazolium-based methods, because it uses ethanol instead of a lysis buffer, thus eliminating one step and shortening the total testing time by 1 day. At the same time, the method replaces Alamar Blue with an inexpensive tetrazolium indicator, thus reducing the cost compared to that of the previously developed MABA. Growth of MTB and drug susceptibility determination in 7H9 Middlebrook broth directly from sputum samples has been documented in 7-13 days using MODS according to recent reports. TEMA is a “laboratory freeware,” not commercial product or kit. Any laboratory that is adequately biologically secured and equipped with an incubator, bio-safety cabinet, ELISA plate reader, autoclave, and a centrifuge, can safely perform this technique. All ingredients are available from major laboratory suppliers.

In present study efforts are being made to shorten the duration of time required for documenting growth of *Mycobacterium tuberculosis* (MTB) from sputum samples, in TEMA, MODS as well as in LJ medium by supplementing the culture media using various permutations and combinations of nutrients so that it can be used for rapid drug susceptibility testing.

Progress of work

Tetrazolium Microplate Assay (TEMA): Sputum samples of patients of tuberculosis were obtained from laboratory of District Tuberculosis Clinic and K. N. Chest Hospital. Sputum was processed with Modified Petroff's Method. It was centrifuged at 5000 rpm for 15 minutes and supernatant was discarded. The pellet was resuspended in distilled water and was divided into two tubes, which was again centrifuged and pellets were obtained in two tubes. After discarding supernatant, pellet of one tube was resuspended in supplemented 7H9 Middlebrook broth and pellet of other tube was suspended in unsupplemented 7H9 Middlebrook broth (Control). Polymyxin-B, trimethoprim, nalidixic acid and nystatin were also added to the broth. Wells of sterile 96 well microplate with lid were loaded with 200 microlitres of this inoculum in supplemented and control broth. The plate was sealed with parafilm and incubated at 37° C. This day was taken as day 0. All work was carried out in biosafety cabinet class II. After three days the microplate was taken out from incubator and seal was opened in biosafety cabinet. Fifty microlitres of Tetrazolium Tween 80 mixture (1.5 ml of tetrazolium at a dilution of 1 mg/ml in absolute ethanol and 1.5 ml of 10% tween 80) was added to the first well of experimental row as well as control row and microplate was again sealed and kept in incubator at 37° C. If pink to red colour appeared in this well in 24 hours it was recorded, otherwise microplate was again opened in biosafety cabinet and tetrazolium was added to second wells of experimental as well as control row. The process was continued till colour appeared in control well. Number of days taken in appearance of visible pink to red colour in the well was recorded. Smear was prepared from contents of the well showing colour and it was stained with ZN stain and examined microscopically for presence of acid fast bacilli. Appearance of AFBs in the slide was taken as evidence of growth of *Mycobacterium tuberculosis*. Experiment was repeated with five types of supplements of 7H9 Middlebrook broth. Number of days taken in appearance of red colour was compared between supplemented broth and control (Table 1). Different supplements could reduce the time by 17 to 35%.

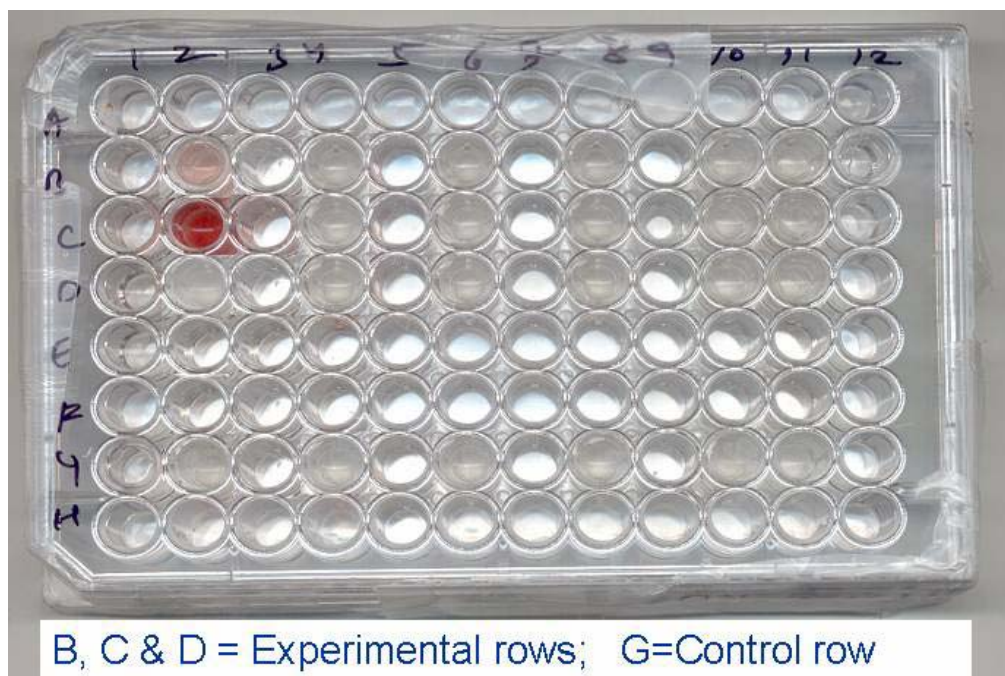


Figure 1. TEMA Plate showing colour in one experimental well.

Table 1. No. of days required for appearance of red colour in supplemented and unsupplemented 7H9 Middlebrook broth in TEMA.

Supplement No.	No. of samples	Mean No. of days on supplemente d Medium	Mean No. of days on Un-supplemented Medium	Mean no. of days saved	
				No.	%
1-A	5	6.8	8.2	1.4	17.1%
2-S	5	5.6	8.4	2.8	33.3%
3-AS	9	4.4	6.3	1.9	29.8%
4-T	2	5.5	6.5	1.0	15.4%
5-V	3	6.3	9.7	3.3	34.5%

Standardisation of TEMA for Drug susceptibility study: Two conc. of Isoniazid (INH 0.1 and 0.4 micgm/ml) , three of Rifampicin (RIF 0.5, 1.0 and 2.0 micgm/ml) and two of Streptomycin (SM 2 and 6 micgm/ml) in 7H9 Middlebrook broth were used for drug susceptibility study of MTB in TEMA. In this experiment only supplemented broth was used. The process as described earlier was followed till red colour appeared in wells without antituberculous drug. Appearance of colour in well containing antituberculous drug was taken as evidence of resistance to that drug. Results are shown in Table 2.

Table 2. Results of Drug sensitivity of MTB directly from sputum samples using supplemented 7H9 Middlebrook broth in TEMA

Sputum Sample No.	No. of days taken in getting the result	Results of drug susceptibility		
		INH	SM	RIF
1.	4	R	R	R
2	5	R	S	S
3	7	R	S	S
4	4	R	S	S
5	6	R	S	S
6	6	R	S	S
7	3	R	R	S

Supplementation of LJ Medium: In one experiment sputum samples were inoculated on enriched LJ medium as well as control slants. The time taken in appearance of macroscopic colonies could be reduced from 17% to 38% in two enrichments assessed. The study will be continued to assess the enriched LJ medium using more sputum samples to draw valid conclusions.

Important Leads and Outcome

Results of preliminary work carried out indicate that the status of growth of MTB and its drug susceptibility might be available within 4-7 days directly from sputum samples of patients. This needs to be confirmed. The expenses involve around Rs. 100/- per sputum sample examined.

Mapping of insecticide resistance in vectors of malaria in Rajasthan - Karam V. Singh and S. K. Bansal

Date of commencement: **October, 2005**

Duration: **Three Years**

Status: **Ongoing**

Objectives

1. To determine the current status of insecticide susceptibility/ resistance among malaria vectors against conventional and newer compounds in different parts of Rajasthan, and
2. To determine the biochemical mechanisms involved in the development of resistance.

Rationale

Several years of intensive use of organic insecticides to control disease vectors has led to the precipitation of insecticide resistance among them. Resistance management has evolved as a favoured approach to prevent, delay or reduce the impact of insecticide resistance. To develop this new strategy a thorough knowledge of the current status of resistance-developed and the mechanism involved are essential. Factors that induce resistance are numerous and the mechanism adopted by a particular vector species depends on the prevailing pressure and mode of action of insecticide in use. The information collected on the current status of resistance and the mechanism(s) involved would help in formulating probable means for the management of insecticide resistance and state insecticide policy as well.

Progress of the work

During the report period, the studies have been carried-out in seven districts namely Barmer, Jaisalmer, Jodhpur, Pali, Sirohi, Kota and Udaipur. The districts namely Jodhpur, Pali, Sirohi and Kota have the insecticide spray history of DDT, whereas, in Barmer, Jaisalmer and Udaipur districts the synthetic pyrethroids have also been introduced. In Jodhpur district detailed studies have been carried out in Ramdeo colony, which has spray history of DDT and has not been sprayed since last 6 years, to study the impact of gap/withdrawal of insecticide spray on the insecticide resistance status of vector species. Besides resistance status of vector species the studies on the impact of spray gap on the susceptibility of *An. culicifacies*, impact of spray on the susceptibility of different insecticides on *An. stephensi* in different spray backgrounds and observations on knock down effect of different insecticides have been carried out.

During the studies two vector species viz. *An. culicifacies* and *An. stephensi* were tested. Four insecticides i.e. DDT, Malathion, Propoxur and Deltamethrin (Synthetic Pyrethroid) were

used to determine the susceptibility status of these vector species against the candidate insecticides in different situations.

For determining the susceptibility status of vector species dawn collection was made in selected villages using suction tube method. The collected individuals were identified species-wise, abdominal conditions recorded and transported to Centre's insectary in Burraud cages. Tests were conducted as per standard WHO method for determining the insecticide susceptibility of adult mosquitoes. The individuals of each species were exposed to the diagnostic doses of DDT (4.0%), Malathion (5.0%), Propoxur (0.1%) and Deltamethrin (0.05%) for 1.0 hour and the observations were made after 24 hours. The WHO criteria was followed for considering the vector species susceptible (mortality >98 %), resistant (mortality <80 %) and intermediate resistant (mortality 80 – 98 %). Abbott's formula was applied wherever required to correct the observed mortality.

Table 1 depicts the results of the susceptibility tests carried out with *An. stephensi* against candidate insecticides. The results revealed that in all the districts, the species has developed resistance against DDT and malathion, whereas, against deltamethrin, which is a synthetic pyrethroid, the species was found totally susceptible.

Table 1. Insecticide Susceptibility status of *Anopheles stephensi* in different districts.

S. No.	Candidate Insecticides (Diagnostic doses)	Exposure Time (Hrs.)	Percent Mortality (%) and Susceptibility Status		
			Barmer	Jaisalmer	Jodhpur
1.	DDT	1.0	52.8 R*	42.5 R	57.9 R
2.	Malathion	1.0	73.3 R	62.3 R	78.8 R
3.	Deltamethrin	1.0	100.0 S	100.0 S	100.0 S

***R** – Resistant, **S** – Susceptible.

The susceptibility status of *An. culicifacies* was determined against candidate insecticides in five districts (Table 2). The results revealed that in all the districts, the species has developed resistance against DDT, except district Jodhpur where it was found intermediate resistant. Against deltamethrin, which is a synthetic pyrethroid, the species was found totally susceptible. Against Malathion and Propoxur the species exhibited either intermediate or total resistance.

Table 2. Insecticide Susceptibility status of *Anopheles culicifacies* in different Districts

Candidate Insecticides (Diagnostic doses)	Exposure Time (hrs.)	Percent Mortality and Susceptibility Status				
		Jodhpur	Pali	Sirohi	Udaipur	Kota
DDT (4.0%)	1.0	82.5 IR*	68.8 R	66.9 R	61.7 R	60.0 R
Malathion (5.0%)	1.0	85.7 IR	80.0 IR	94.5 IR	80.0 IR	78.0 R
Propoxur (0.1%)	1.0	85.0 IR	75.0 R	-	75.0 R	82.0 IR
Deltamethrin (0.05%)	1.0	100.0 S	100.0 S	100.0 S	100.0 S	100.0 S

***R** – Resistant, **IR** – Intermediate Resistant, **S** – Susceptible.

The impact of insecticide spray gap of DDT was studied in a village of Jodhpur district which had last DDT spray in 2001 and the vector species prevalent in the village was *An. culicifacies*. The results revealed that the susceptibility status of the vector species against DDT increases as the gap from the last spray increases (Table 3). The susceptibility status of *An. culicifacies* was also tested against other insecticides, Malathion, Propoxur and Deltamethrin, but no marked difference/trend was observed.

Table 3. Impact of insecticide (DDT) spray gap on the susceptibility of *An. culicifacies*

Insecticides Tested	Percent Mortalities in different backgrounds of DDT Spray		
	After 4 yrs	After 5 yrs	After 6yrs
DDT	53.3	78.7	82.5
Malathion	80.0	90.0	85.7
Propoxur	-	86.6	85.0
Deltamethrin	100.0	100.0	100.0

Impact of spray of different insecticides on the susceptibility status of *An. stephensi* in different spray backgrounds was studied and it was observed that DDT spray affected the susceptibility of only DDT not of other insecticides, however, synthetic pyrethroids, unlike DDT, affected the susceptibility of Malathion also, which indicates that both the insecticides might have some common mechanism of insecticide action (Table 4).

Table 4. Impact of spray of different insecticides on the susceptibility status of *An. stephensi* in different spray backgrounds

Insecticides Tested	Percent mortalities in different spray backgrounds (%)			
	DDT Spray		Synthetic Pyrethroid Spray	
	Regular Spray	2 yr. Gap	Regular Spray	2 yr. Gap
DDT	55.8	60.0	25.0	52.8
Malathion	77.5	80.0	54.5	73.3
Deltamethrin	100.0	100.0	100.0	100.0

Table 5. Showing observations on knock down effect of different insecticides

Insecticides Tested	Percent knock down at different time intervals (%)				
	15 minutes	30 minutes	45 minutes	60 minutes	% Mortality (After 24 hrs.)
DDT	0.0	31.1	62.2	79.9	57.1
Malathion	0.0	08.3	30.9	39.2	69.9
Deltamethrin	70.0	100.0	-	-	100.0

During the experiments the knock down effect of different candidate insecticides was observed (Table 5). However, the percent mortality, except Deltamethrin, was observed different than the percent knock down in each insecticide, which indicates that due to knock down phenomenon some of the individuals are exposed partially and do not get sufficient dose causing mortality and may develop low degree of resistance. In the field also we observed in village Roopawaton ka Bera in Jodhpur district that after few days of DDT

spray, the percent mortality *An. culicifacies* in the sprayed area was observed 46.0%, which may be attributed to either partial exposure to DDT, behaviour of the species or the quality of the spray.

Work remained to be carried-out

The studies will be conducted in the remaining areas and the biochemical mechanisms involved in the development of insecticide resistance in the study areas will be determined.

Evaluation of efficacy of different ovitraps for the surveillance and control of dengue vector, *Aedes aegypti* in Jodhpur city - Karam V. Singh and S. K. Bansal

Commencement: **October, 2007**

Duration: **Three Years**

Status: **New Project**

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.

Rationale

Traditional indices *viz.*, House, Container and Breteau index used in *Aedes* surveillance programme, are increasingly being seen as inadequate to measure risk of transmission or effectiveness of control operations. However, ovitraps are being considered useful in providing data on spatial and temporal distribution of *Ae. aegypti* and monitoring the impact of various types of control measures. Ovitrap data have been reported more sensitive than traditional indices in detecting low populations. They also reduce accessibility of vectors to breeding sites and remove eggs *en masse*. They are inexpensive, possible to install them in larger areas relatively quickly and amenable to use by people without special training. By considering these qualities of ovitraps it is proposed to evaluate them for their use in vector surveillance and control of *Ae. aegypti* with a view to establish an alternate method in arid situations.

Progress of the work

During the report period the laboratory evaluations have been conducted to determine the efficacy of two larvicides *viz.*, Abate (temephos) and *Bti* (*Bacillus thuringiensis* var *israelensis*) against *Aedes aegypti*. The experiments were carried out following standard WHO method. The LC₅₀ and LC₉₀ values, along with their fiducial limits and Chi-square have been calculated in view to find out the appropriate dose of these larvicides to be applied in the field experiments (Table 1). The results revealed that *Ae. aegypti* in the study area is susceptible to both Abate and *Bti*.

Table 1. Log Probit analysis of the mortality data of larvae of *Aedes aegypti* against different larvicides

Name of Larvicide	Regression Equation	Chi-Square	LC ₅₀ (fiducial limits)	LC ₉₀ (fiducial limits)
Abate	Y= 1.426+1.39x	40.35	0.0037 (0.0026-0.0052)	0.032 (0.022-0.465)
Bti	Y= -3.397+3.72x	7.81	0.0097 (0.0082-0.0116)	0.0217 (0.0136-0.0348)

To enhance the efficacy of the ovitraps some oviposition attractant compounds like hay/grass infusions, usually of indigenous nature are added which enhance significantly the number of eggs collection thereby increasing the trap efficacy. For this in the laboratory conditions, we screened grass infusions of 3 different grasses i.e. Doob (*Cynodon dactylus*), Madagascar dropseed (*Sporobolus coromandelianus*) and Australian grass (Table 2). . The result obtained from comparative study showed that traps containing *Cynodon dactylus* were found to have significantly higher number of eggs than the Australian, Madagascar dropseed and Control ($p < 0.01$).

Table 2. Comparative efficacy of grass infusions of different species with respect to ovipositional attraction against *Aedes aegypti* species

S. No.	Grass Species	No. of Eggs laid
1.	<i>Cynodon dactylus</i> (Doob grass)	769
2.	<i>Cynodon</i> sp. (Australian grass)	199
3.	<i>Sporobolus coromandelianus</i> (Madagaskar droopseed)	082
4.	Control	152

Table 3. Data on different concentrations of *Cynodon dactylus* infusion against ovipositional attractiveness of *Aedes aegypti*

S. No.	Concentrations (%)	No. of Eggs laid
1.	25%	283
2.	50%	356
3.	75%	121

Doob grass was further evaluated to know the efficacies of its different concentrations with respect to the oviposition attraction (Table 3). The experiment revealed that 50% infusion was most effective in comparison to other concentrations used and the difference in the number of eggs laid in each concentration was found statistically significant ($p < 0.01$). Doob grass, being a fast growing, tough and highly drought tolerant grass, commonly found in arid conditions, can be used in ovitraps for the surveillance and control of *Aedes aegypti* in arid areas.

The evaluation of Abate for its residual toxicity in the prevailing environmental conditions was done and it was observed that the larvicide was effective up to five weeks i.e. causing 100 per cent mortality.

For the field evaluation of different ovitraps Pratap nagar locality of Jodhpur city, which has been selected on the basis of preliminary survey of the *Ae. aegypti* population and in this locality, three groups of 30 houses each would be considered first as control and remaining two as experimental for evaluation of lethal and non-lethal ovitraps.

Work remained to be carried-out

The studies will be conducted to evaluate the efficacy of different types of ovitraps for the surveillance as an alternate method, and control of *Ae. aegypti*, the vector of dengue/DHF and chikunguniya.

Determination of larvicidal potential of active principle(s) of *Solanum xanthocarpum* against important mosquito vectors - S. K. Bansal and Karam V. Singh

Commencement: September, 2005

Duration: Three Years

Status: Ongoing

Objectives

1. Preparation of different solvent extracts from roots, leaves and fruits of *S. xanthocarpum* and isolation of their active constituents.
2. To identify different constituents of the extract and comparison of their larvicidal/repellent properties.

Rationale

Vector control through alternative means is an essential and effective tool for controlling transmission of vector-borne diseases especially in areas where vector have become resistant to the insecticides. Moreover, increasing awareness of the environmental hazards of these synthetic insecticides and development of resistance has forced the scientists to look for other alternatives of vector control. Hence, biologically active plant materials with complex chemical substances of different composition found in various parts of the plants with selective anti-larval and anti-adult properties are being paid attention to replace the synthetic one's. In the process a number of plant species with insecticidal properties have been considered including *Solanum xanthocarpum*, the Indian nightshade commonly known as 'baigan kateli'. It is found throughout the country but more abundantly in the arid areas and used widely for a variety of ailments in public health. Extracts prepared from different parts of this plant species will be screened for their larvicidal potential against larvae of different mosquito vectors present in this area.

Progress of the Work

Susceptibility tests were carried out with larvae of different mosquito vectors viz. *Anopheles culicifacies*, *Anopheles stephensi*, *Aedes aegypti* and *Culex quinquefasciatus*. For this purpose adults and larvae of all the mosquito species were collected from different areas of Jodhpur city and reared in the laboratory for further generations under controlled conditions of temperature ($28\pm 2^\circ\text{C}$) and humidity ($75\pm 5\%$). *S. xanthocarpum* has been selected for undertaking the proposed study. The different parts of this plant differ in their active constituents when extracted in different solvents. Samples of roots, leaves, fruits and seeds of this plant were chopped and shade dried between $30-40^\circ\text{C}$ 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

and 48 hrs and corrected by using Abbott's formula. Average of four observations was taken and data subjected to log probit regression analysis.

For HPLC and Infra Red spectroscopic studies, cleaned and dried seeds were powdered and a known amount was extracted with petroleum ether (40-60°C) as a solvent. The solvent was evaporated and the oil so obtained was subjected to saponification using KOH and ethanol as solvent for the preparation of mixtures of fatty acids. The fatty acids were subjected to esterification using diethyl ether. The upper organic layer was removed and methyl ester was obtained after drying on sodium sulphate (Fig.1). This sample was subjected to HPLC and Infra Red spectroscopic studies in Sophisticated Analytical Instrument Facility at CDRI, Lucknow (Figs. 2 & 3). The results so obtained have been given in Table 2 & 3.

Observations on the results of the larval susceptibility to methanol extracts of whole fruits without seeds, whole fruits and seeds for fresh, six and twelve months old samples are given in Table 1. With all the mosquito species mortality was dose dependent i.e. mortality increased with increase in concentration. 24 & 48hr LC₅₀ and LC₉₀ values along with their fiducial limits, regression equation and chi-square were calculated. The 24hr LC₅₀ values as observed for *An. culicifacies*, *An. stephensi*, *Ae. aegypti* and *Cx. quinquefasciatus* for fruit without seeds were 47.4, 79.6, 103.3; 52.3, 131.4, 146.3; 108.0, 273.4, 316.9 and 141.1, 384.9, 393.0 mg/l for fresh, 6 and 12 months old samples respectively. Similarly 24hr LC₅₀ values observed for the above mosquito species for whole fruits were 51.6, 91.7, 120.1; 52.2, 186.9, 224.3; 118.3, 290.9, 336.5 and 157.1, 450.6, 500.3 mg/l for fresh, 6 and 12 months old samples respectively. The 24hr LC₅₀ values observed for the seeds for the above mosquito species and samples were 66.9, 131.7, 195.7; 73.7, 195.6, 251.2; 123.8, 377.6, 426.2 and 154.9, 520.0, 656.7 mg/l respectively (Table 1). Comparative susceptibility observed on the basis of 24 & 48hr LC₅₀ values showed that larvae of anophelines are much more susceptible than larvae of *Ae. aegypti* and *Cx. quinquefasciatus*. 48hr LC₅₀ values were also found to be much less as compared to the 24hr LC₅₀ values showing that efficacy was much more pronounced after 48hrs as compared to 24hrs. Experiments done after six and twelve months on different samples showed that efficacy was decreased 2-4 times as compared to the fresh samples.

The uncorrected weights obtained by HPLC were observed at different component peaks. The saturated acids which corresponds to 16:0, 18:0 and 20:0 peaks were Palmitic acids, Stearic acids and Aracidic acids respectively while Oleic, Linoleic and Linolenic acid corresponds to peak at 18:1, 18:2 and 18:3 respectively (Table 2). Linoleic (32.96%) and Linolenic (4.32%) acid collectively constitute the Poly Unsaturated Fatty Acids (PUFA) which are 37.28%. Total saturated fatty acids (30.16%) are represented by Palmitic acid (8.58%), Stearic acid (18.44%) and Aracidic acid (3.14%) while total unsaturated fatty acids (66.02%) by Oleic (28.74%), Linoleic (32.96%) and Linolenic acid (4.32%) (Table 3). All these components are part of the edible oils, except, the hydroxy group (3.72%) as revealed by Infra Red peak at 3466mm (OH st. bond) along with 2924, 2853 (C-H St bond) and at 1743 mm COOH group. This group may probably contain the component responsible for larvicidal/repellant property present in *S. xanthocarpum*.

Conclusions

Efficacy of methanol extracts was more pronounced after 48 hr. as compared to 24 hr. which decreased 2-3 times after six months or one year of storage.

Larvae of *An. culicifacies* were found more susceptible than larvae of *An. stephensi*, *Ae. aegypti* and *Cx. quinquefasciatus* for all the different parts of the fruit.

Anophelines were found more susceptible than the culicines for all the different parts of fruit extract tested after 6 as well as 12 months.

Extracts from whole fruits and fruits without seeds were found more effective than seeds even after one year of storage. Active principle may be present only in the fruits and seeds. Further experiments as to which active ingredients are responsible for the larvicidal potential are in progress.

Hydroxy acids group as revealed by Infra Red peak at 3466 cm^{-1} (OH stretched Bond) seems to possess the larvicidal component, which requires further elution by chromatography and NMR studies.

Table 1. Comparative 24 and 48hr LC₅₀ values of extracts from different parts of *S. xanthocarpum* to larvae of different mosquito vectors after different period of storage

Mosquito species	Fruit without seeds			Whole fruit			Seeds		
	24 (48) hr LC ₅₀			24 (48) hr LC ₅₀			24 (48) hr LC ₅₀		
	FF	6m	12m	FF	6m	12m	FF	6m	12m
<i>Anopheles culicifacies</i>	47.4	79.6 (60.0)	103.3 (62.3)	51.6	91.7 (66.5)	120.1 (83.3)	66.9	131.7 (79.3)	195.7 (112.4)
<i>Anopheles stephensi</i>	52.3	131.4 (67.3)	146.3 (80.4)	52.2	186.9 (87.9)	224.3 (152.5)	73.7	195.6 (95.6)	251.2 (172.4)
<i>Aedes aegypti</i>	108.0	273.4 (108.7)	316.9 (126.0)	118.3	290.9 (144.1)	336.5 (213.4)	123.8	377.6 (131.1)	426.2 (252.0)
<i>Culex quinquefasciatus</i>	141.1	384.9 (150.0)	393.0 (222.2)	157.1	450.6 (220.4)	500.3 (331.8)	154.9	520.0 (222.7)	656.7 (431.5)

FF- Fresh Fruits; 6m- Six months old; 12m-Twelve months old

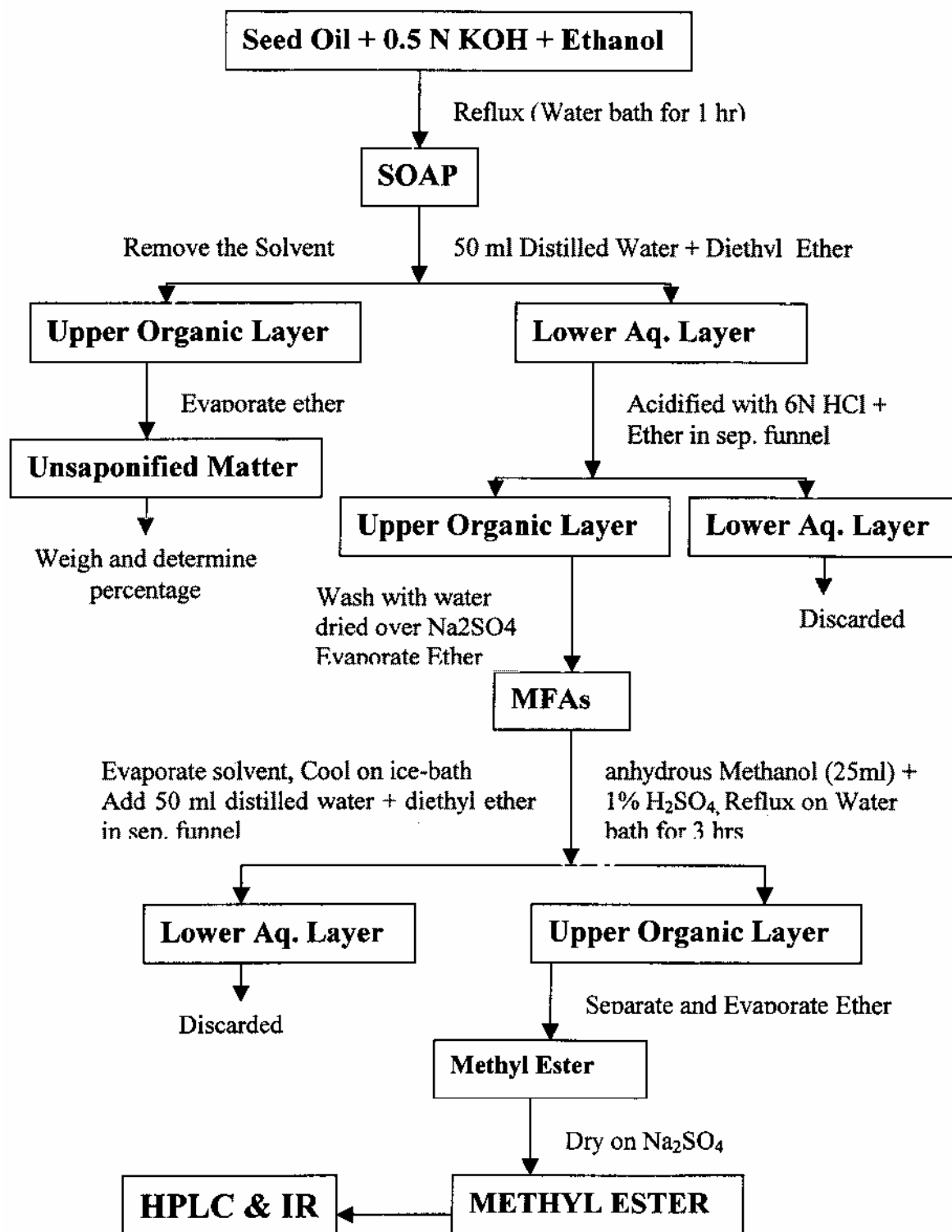


Fig. 1. Separation of MFAs from seed oil and preparation of Methyl Ester from Mixed Fatty Acids (MFAs) after hydrolysis

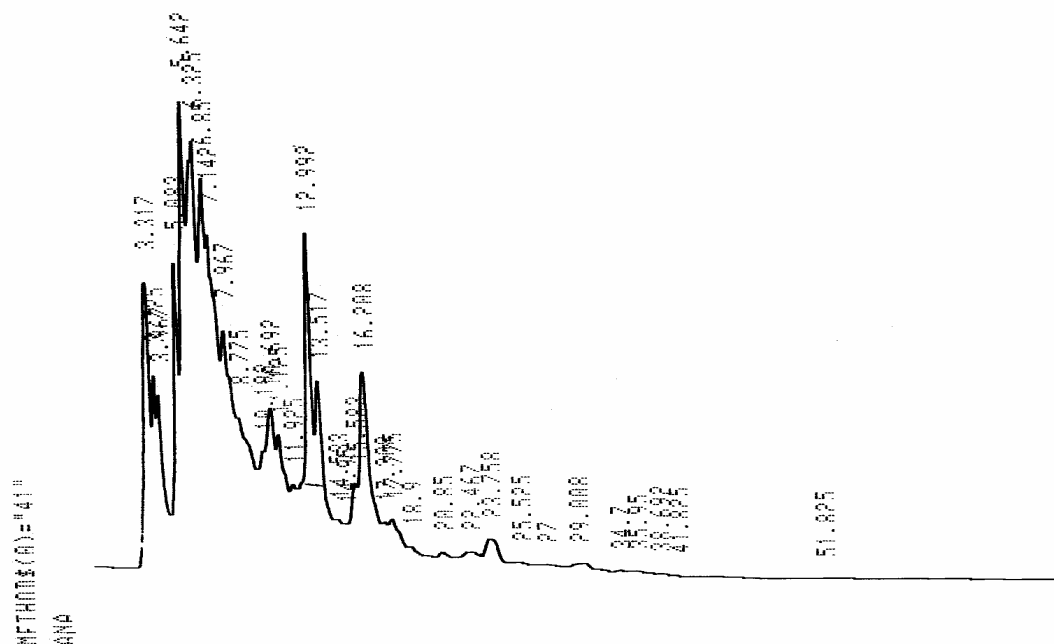


Fig. 2. HPLC analysis of extracts of seeds of *S. xanthocarpum*.

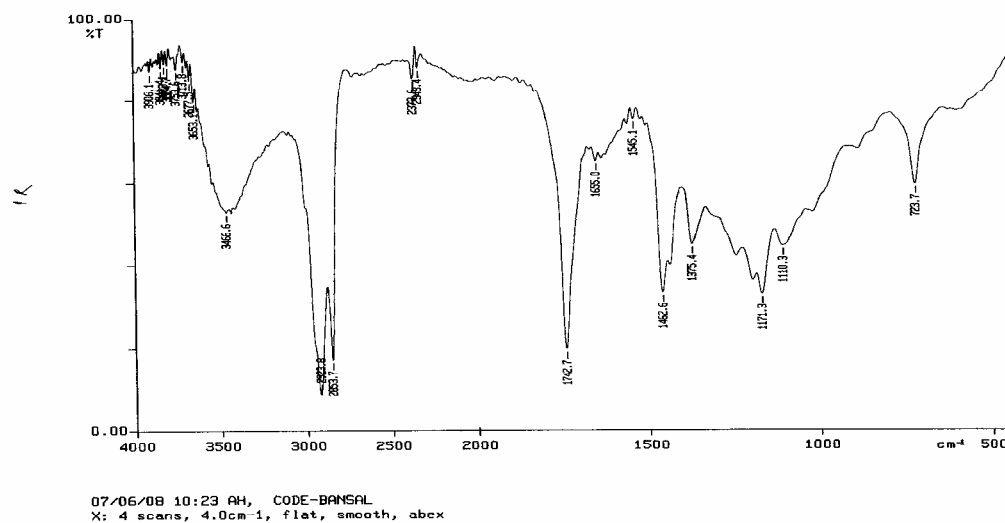


Fig.3. Infra Red (IR) Spectroscopic analysis of extracts of seeds of *S. xanthocarpum*.

Table 2. Methyl Ester composition (Uncorrected Wt.% by GLC) of oil from seed extract of *S. xanthocarpum*

Component Peak	Percent of Oil
16 : 0	08.58
18 : 0	18.44
18 : 1	28.74
18 : 2	32.96
18 : 3	04.32
20 : 0	03.14
Others (Hydroxy)	03.72
Total	99.90

Table 3. HPLC and IR spectroscopic analysis of the oil extracted from seeds of *S. xanthocarpum* after saponification and esterification

Total Saturated Acids	30.16%
Palmitic acid	08.58%
Stearic acid	18.44%
Aracidic acid	03.14%
Total Unsaturated Fatty Acids	66.02%
Oleic acid	28.74%
Linoleic acid	32.96%
Linolenic acid	04.32%
Polyunsaturated Fatty Acids (PUFA)	37.28%
Linoleic acid	32.96%
Linolenic acid	04.32%
Hydroxy Acid*	03.72%

*As revealed by IR peak at 3466 cm^{-1}

A study of association between socio-economic factors and transmission of malaria in desert- S.P. Yadav, A.K. Dixit and R.K. Kalundha

Commencement: **October, 2007**

Duration: **Two years**

Status: **Ongoing**

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.

Rationale

Malaria is one of the public health problems of desert part of Rajasthan. Some times the problem arises up to the extent, which takes the shape of epidemic and several lives are lost due to the disease. Entomological, parasitological, clinical and environmental related issues are looked into to bring down the morbidities and loss to human lives. Equally importantly, socio-economic aspects of malaria needs to be studied for better understanding and implementation of action plan to control desert malaria.

Progress of the work

The API of Jaisalmer district was the highest among the desert districts of Rajasthan. Ramgarh PHC was on top among the district PHCs. Base line data of all the 60 villages of Ramgarh PHC were collected for understanding the factors associated with magnitude of disease. To accomplish the above objectives, 342 households from 12 villages namely- Sanu, Seuwa, Tejpara, Bada, Naga, Sadhana, Raimala, Sultana, Mokhal, Lanala, Habur and Kakab have been covered. Thirty Households (LSEG 15 + HSEG 15) in each village were taken. Data pertaining to malaria cases during last 5 years (2002-06) was collected with respect to each household from the MPWs/ANMs. Pre-tested schedules were used for data collection which were prepared in English but communicated in *Hindi* or in local dialect- *Marwari*. Head of the Household or a member more than 18 years of age who was present at the time of survey was interviewed. Fever was used for the proxy of malaria. Some observations were made based on the accomplished work.

Observations and Inferences

Low Socio-Economic Group (LSEG) and High Socio-Economic Group (HSEG) both were comparable with socio-demographic characteristics such as age, sex, education, occupation, religion and castes (Table-1). LSEG has the API almost 2 for the 5 consecutive years from 2002-2006 which is alarming situation and nearly 3 times more than the HSEG (Table 2). Children are more affected (Table 3). These preliminary observations indicate statistically significant effect of malaria on low socio-economic group of the community. LSEG was less aware about causation of malaria and its signs and symptoms as compared to HSEG (Table 4

& 5). LSEG used less preventive measures to prevent the mosquito bite as compared to HSEG (Table 6). This has direct relation with the level of knowledge about the disease and its preventive measures and affordability.

Table1. Socio-demographic characteristics of respondents in two different groups

Characteristics		LSEG		HSEG	
		No.	%	No.	%
Age (Yrs)	<20	7	4.1	8	4.7
	20-29	61	35.7	59	34.5
	30-39	78	45.6	79	46.2
	40-49	15	8.8	16	9.4
	>50	10	5.8	9	5.2
Sex	Male	123	71.9	129	75.4
	Female	48	28.1	42	24.6
Education	Illiterate	88	51.5	84	49.1
	Literate	83	48.5	87	50.9
Religion	Hindus	125	73.1	126	73.7
	Other than Hindus	46	26.9	45	26.3
Caste	General Caste	66	52.8	72	57.6
	Other Backward Caste	41	32.8	36	28.8
	Schedule Caste/Schedule Tribe	18	14.4	17	13.6
Occupation	Agriculture/Animal keeping	132	77.2	140	81.9
	Other than Agriculture/Animal keeping	39	22.8	31	18.1

LSEG- Low Socio-Economic Group

HSEG- High Socio-Economic Group

Table 2. Incidence of malaria in two different socio-economic group from 2002-06

Study Parameters	2002		2003		2004		2005		2006	
	LSEG	HSEG	LSEG	HSEG	LSEG	HSEG	LSEG	HSEG	LSEG	HSEG
Population	1061	924	1087	950	1113	970	1139	995	1168	1016
ABER	7.0	7.5	7.0	8.1	7.2	8.0	7.4	8.3	6.9	7.9
(+) ve cases	20	6	22	8	18	5	24	9	18	5
Pf cases	12	1	13	2	10	1	11	3	6	1
API	1.9	0.6	2.0	0.8	1.6	0.5	2.1	0.9	1.5	0.5
Death	0	0	0	0	0	0	0	0	0	0

LSEG- Low Socio-Economic Group

HSEG- High Socio-Economic Group

ABER- Annual Blood slide Examination Rate

Pf- falciparum

API- Annual Parasite Index

Table 3. Distribution of malaria cases according to age in two different socio-economic groups

Age group (Yrs)	LSEG		HSEG		Total	
	No.	%	No.	%	No.	%
0-1	0	0	0	0	0	0
1-5	65	63.7	20	60.6	85	63.0
5-15	24	23.5	9	27.3	33	24.4
>15	13	12.8	4	12.1	17	12.6
Total	102	100.0	33	100.0	135	100.0

LSEG- Low Socio-Economic Group

HSEG- High Socio-Economic Group

Table 4. Level of knowledge about causation of malaria among respondents

Causation	LSEG		HSEG	
	No.	%	No.	%
Malaria parasite	30	17.5	102	59.6
Personal hygiene	47	27.5	19	11.1
Impure water and edible items	54	31.6	15	8.8
Changing environment	23	13.5	20	11.7
Multiple cause	11	6.4	12	7.0
Don't know	6	3.5	3	1.8
Total	171	100.0	171	100.0

LSEG- Low Socio-Economic Group

HSEG- High Socio-Economic Group

Table 5. Level of knowledge about signs and symptoms of malaria among respondents

signs and symptoms	LSEG		HSEG	
	No.	%	No.	%
High fever with chill or sweating on alternate day	60	35.1	114	66.7
Fever with giddiness, vomiting and reddish on the face	75	43.8	29	17.0
Multiple signs and symptoms	23	13.5	20	11.7
Others	13	7.6	8	4.6
Total	171	100.0	171	100.0

LSEG- Low Socio-Economic Group

HSEG- High Socio-Economic Group

Table 6. Distribution of respondents using different preventive measures

preventive measures	LSEG		HSEG	
	No.	%	No.	%
Mosquito net	17	9.9	42	24.6
Odomos cream	2	1.2	8	4.7
Oils	10	5.8	25	14.6
Tortoise coil	3	1.8	11	6.4
Good night vaporizer	1	0.6	9	5.3
Smoke of cow-dung	25	14.7	38	22.2
Smoke of foliage	30	17.5	33	19.3
Nothing	83	48.5	5	2.9
Total	171	100.0	171	100.0

LSEG- Low Socio-Economic Group

HSEG- High Socio-Economic Group

Important leads/outcomes from the study

The study will reveal the better understanding and implementation of action plan to control desert malaria along with the entomological, parasitological, clinical and environmental parameters.

Work remains to be done

More observations need to be obtained on desert malaria to substantiate the data and draw inferences. The following research question need to be replied which were arises during the preliminary observation of the present study:

1. Children less than one year age did not suffer with malaria. What was reason? Either mother milk was given immunity to protect from parasite or the social customary protection from the mosquito bite or inadequate data or any thing else prevented the transmission of malaria.
2. LSEG has almost 3 times more malaria as compare to HSEG. The question arises weather they were poor therefore, they suffered more with malaria or they suffer more with malaria therefore they become the poor.

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, A.K. Dixit and R.K. Kalundha

Commencement: **November, 2007**

Duration: **Three years**

Status: **Ongoing**

Objectives

1. To study 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

In earlier studies in substantial proportion (87.4%) of patients of Pulmonary Tuberculosis (PTB), delay in diagnosis and treatment of the disease was observed. Out of these nearly 91.2% delayed for more than a month. Lack of awareness was the major cause of delay in 76.2% of patients. Socio-Demographic characteristics suggest that patients belonging to illiterate, low income and SC/ST & OBC are more vulnerable groups in the population. As a result they transmit the disease in their families, friends, relatives, co-workers and so on at large in the community. Control of tuberculosis is a national priority of Government of India. Though, after diagnosis and treatment, they are not the cause of spread of the disease in the community, but the contact cases of these people become the source of infection of the disease. In such conditions, this study is proposed to study suitable interventional methods for generating awareness among the general population for involvement of symptomatic cases in self-reporting for early diagnosis and treatment under DOTS. Information Education and Communication (IEC) campaign regarding the Revised National Tuberculosis Control Programme (RNTCP) by the Government of India on awareness generation among the general population and improvement in self – reporting by symptomatic cases at the health facility is done through electronic media, print media, etc. Very few studies have been done on impact assessment in Delhi or in one or two urban places of other parts of India but not in desert ecosystem.

Progress of the work

Villages were selected to conduct the study. The rapport was built up with the Medical Officer and staff of the Chaumoo PHC for their support. Village and community leaders were also contacted and explained the purpose of the study to establish the confidence among villagers for seeking their cooperation and participation in the study. Before conducting the main study a pilot survey was done in 75 households for the pre-testing the schedules in Gudelai village of Chaumoo PHC in Jodhpur district. The schedules were designed for collecting information on family composition, respiratory symptoms, KAP, health seeking behaviour and so on of those who had chronic chest symptoms. The chronic symptomatic cases were interviewed separately. Three repeat visits were made to

contact those who were not available on first or second visit. Based on data collected some observations and inferences were made. The population of surveyed households was 312 in the age group 15-65 years. Forty-nine (15.7%) persons complained for chronic chest symptoms (Table 1). This seems high as compared to national average. Males (16.9%) had more chronic chest symptoms as compared to females (14.4%). The prevalence of symptoms varied according to the level of the education and type of occupation of the study subjects (table 2). Individual counseling was done for the motivation to report to nearest health facility under DOTS programme for diagnosis and treatment.

Table 1. Distribution of subjects according to chronic chest symptoms

Symptoms*	Number (N=312)	Percentage
Cough	41	13.1
Sputum	21	6.7
Breathlessness	17	5.4
Wheeze	5	1.6
Blood in sputum	3	1.0
Chest pain	4	1.3
Any or a combination above symptoms	49	15.7

* Multiple symptoms: hence numbers do not add to 49

Table 2. Prevalence of chronic chest symptoms among adults according to socio-emographic characteristics

socio-demographic characteristics		Number	Chest symptomatic	Prevalence %
Age	15-44	227	23	10.1
	45-65	85	26	30.6
Sex	Male	166	28	16.9
	Female	146	21	14.4
Education	Illiterate	133	24	18.2
	Up to primary	102	15	14.7
	Above primary	77	10	13.1
Occupation	Household work	98	14	14.3
	Student/Unemployed	43	5	11.6
	Service	42	6	14.3
	Business	32	5	15.6
	Labour	57	10	17.5
	Agriculture	40	9	22.5

Important leads/outcomes from the study

The results of the study may be useful for motivation of new PTB cases for bringing them for diagnosis and treatment under DOTS. It may also turn out to be also cost effective and acceptable strategy in the community.

Work remains to be done

Remaining data will be collected for the proposed sample size for drawing valid conclusions.

Studies on larvicidal ingredients of *Calotropis procera* and its possible role in blocking intracellular replication of dengue virus in mosquitoes- Manju Singhi and Vinod Joshi

Commencement – **August, 2007**

Duration –**Two years**

Status –**Ongoing**

Objectives

1. Study of possible impact of latex on intracellular structure and biochemical profile of *Ae. aegypti* treated with larvicidal compound and dengue virus.
2. Development of plant based antilarval and antiviral compound.

Rationale

There is no chemotherapy against dengue virus infections or a vaccine to protect vulnerable human population. Increasing insecticidal resistance among the mosquito population is another issue which adds to the complexity. Utility of latex of *Calotropis procera* as biocide against dengue vectors has been reported in series of experiments undertaken by us. It has also been reported that this biocide also acts as ovicidal agent and presence of particular concentration of it detract gravid mosquitoes from oviposition. Sub lethal concentrations which, neither act lethal nor refractory to oviposition, may be absorbed by the mid gut cells of exposed larvae. Adults emerging out of the treated larvae may have developed intracellular structural changes in midgut epithelium which may restrict virus replication in them.

Progress of work

4th instar larvae of *Aedes aegypti* collected from the field were exposed to sub-lethal concentration (0.005 %) of acetonitrile extract of latex of *Calotropis procera*. The larvae which were killed after exposure to sub-lethal doses showed bulging of anal papillae as compare to control (Fig.1). This structural distortion of papillae probably led to the death of larvae.

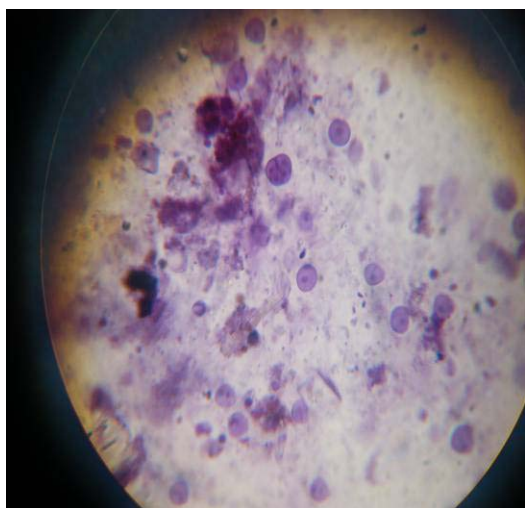


Photograph showing bulging of anal papillae in treated larva

Mid guts of the dead larvae were dissected and teased. The tissue dehydrated in alcohol was stained and fixed in the DPX. The larvae surviving after exposure to sub-lethal concentration, were allowed to rear into adults under laboratory conditions. Mid gut of adult mosquitoes reared from larvae exposed to the sub-lethal concentration were dissected out and tissues have been subjected to microtomy for studying internal structure

Study of effect of sub-lethal doses of acetonitrile extract of latex on mid gut cells of larvae

- Cells of mid gut of larvae killed due to the effect of latex showed changes in the cellular structures.
- Cells of exposed tissue showed lysed membrane as well as rare presence of cells in the dividing phase.
- The initial observations reveal interesting finding for further detailed studies by Electron Microscopy.



Untreated larva



Treated larva

Figure 2. Photographs showing effect of sub-lethal doses of acetonitrile extract of latex on cells of exposed and un-exposed mid guts (100x10).

Study of effect of latex on the adult mosquitoes developed from the larvae exposed to sub-lethal doses

The larvae surviving after exposure to sub-lethal doses of acetonitrile extract of latex were reared into adult mosquitoes at room temperature. The mid gut of adult mosquitoes were dissected out and further processed for microtomy (Figure 3). Detailed structural study of untreated mosquitoes to compare with treated group is in progress.

Epidemiology of Musculoskeletal Conditions in India - K.R. Haldiya, Murli L. Mathur
in collaboration with N. C. Mathur and Arvind Mathur**

Date of Commencement: **August, 2007** Duration: **Two Years** Status: **Ongoing**

Objective

The main objective of the project is to study the magnitude and impact assessment of selected musculoskeletal disorders in adults (aged over 18 years) in the community with a focus on osteoarthritis, rheumatoid arthritis and spinal disorders.

Progress of the work

This is the multi centric study of ICMR task force project. The five villages of Kaparda PHC and five urban wards from Jodhpur district have been selected randomly for this study. The list of selected villages and wards with their population is given in Table 1 & 2. A total of 10000 individuals of 18 years and above will be covered under this survey. The schedules were translated in Hindi from English then Hindi to English. The rapport with local personnel and health official has been done. The training of selected staff and reliability exercises were carried out. The regular fieldwork has been initiated.

Table 1. List of selected villages and their population

Village	Household	POPULATION
Rawar	536	3536
Holpur kalan	171	981
Kaparda	454	2657
Binawas	351	2167
Ramasani	330	2024

Table 2. List of selected wards and their population from Urban area of Jodhpur District

Ward No.	Household	Population
Pipar city 3	371	2211
Pipar city 23	186	1203
Jodhpur 4	7984	40590
Jodhpur 26	2099	13117
Jodhpur 49	4384	126083

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**Professor of Medicine, Dr. S.N. Medical College, Jodhpur

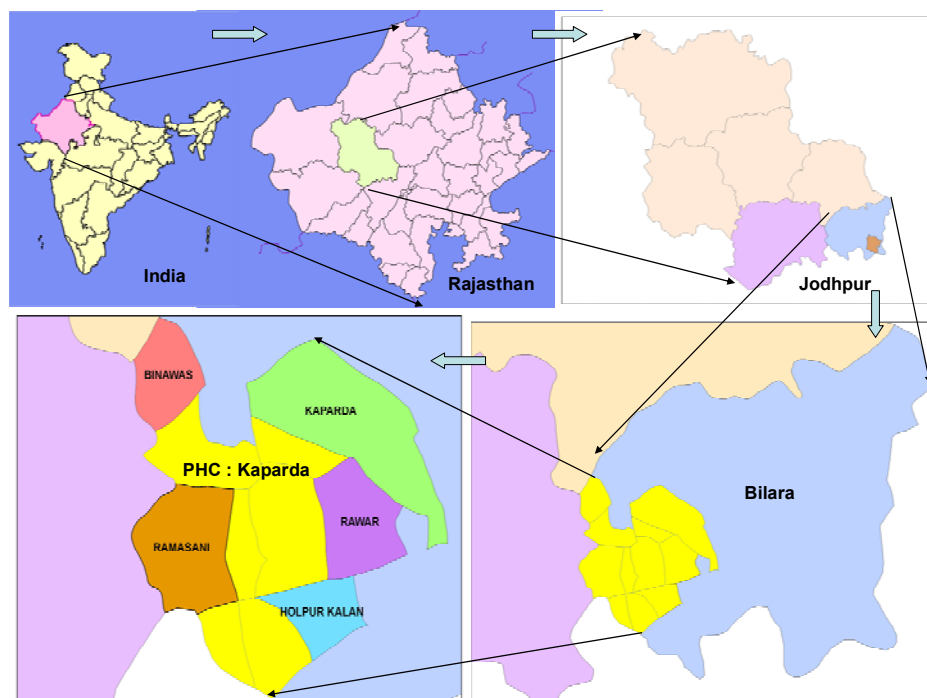


Figure 1. Map of selected area.

Possible outcome and Utilization

The study will find out magnitude of the problem in India and select priorities and develop strategies to prevent common musculoskeletal conditions.

Jaivigyan Mission Mode Project on Control of Rheumatic Fever and Rheumatic Heart Diseases in Jodhpur district- *Murli L. Mathur in collaboration with Sanjeev Sanghvi* and Aruna Solanki***

Commencement: **March, 2007**

Duration: **Two years**

Status: **On going.**

Objectives

1. To determine the prevalence of RF/RHD in school children of age 5 to 14 years
2. To determine the profile of Group A Beta Hemolytic streptococcal strains prevalent in school children age 5 to 14 years
3. To study the Blood Pressure distribution in school children age 5 to 14 years
4. To establish a registry of RF/RHD cases in selected area
5. To monitor secondary prophylaxis to RF/RHD in selected area
6. To sensitize community for primary prophylaxis by providing relevant health education in selected area

Rationale

Rheumatic fever is the most common cause of acquired heart disease in children and adults worldwide. Acute rheumatic fever is expressed as an inflammatory reaction that involves many organs, primarily the heart, the joints, and the central nervous system. The clinical manifestations of acute rheumatic fever follow a Group A Streptococcal (GAS) infection of the tonsillopharynx after a latent period of approximately 3 weeks. The major importance of acute rheumatic fever is its ability to cause fibrosis of heart valves, leading to crippling hemodynamics of chronic heart disease, heart failure and death. A recent meta-analysis of ten clinical trials concluded that antibiotics appear to be effective in reducing the incidence of acute rheumatic fever following an episode of suspected GAS pharyngitis. This effect may be achieved at relatively low cost if a single intramuscular penicillin injection is administered. Where primary prevention fails, a secondary prevention plan also relying on antibiotic therapy is recommended for preventing the progression of cardiovascular complications. Implementation of a wide scale, cost-effective public health strategy is required for adequate control of the devastating sequelae of group A streptococcal pharyngitis.

In the year 2007, Desert Medicine Research Centre, Jodhpur was identified as a satellite centre attached to the nodal centre at PGIMER Chandigarh for Rheumatic Fever and Rheumatic Heart Diseases (RF/RHD) registry under Task Force Project of Indian Council of Medical Research. This is a multicentric study, which was already continuing at many centers, including PGIMER, Chandigarh.

*Senior Cardiologist, Deptt. of Medicine, Dr. S. N. Medical College, Jodhpur,

**Head, Department of Microbiology, Dr. S. N. Medical College, Jodhpur.

Progress of work

Three adjacent tehsils namely Osian, Bhopalgarh and Bilara with lower socioeconomic development were selected to be included in the study area. The literacy rate in these tehsils is 43.8%, 45.0% and 54.3% respectively. Estimated population of these tehsils in year 2006 was 1019571 as shown in Table 1. The selected area has three community development blocks, two towns and 374 villages. It has 30 primary health centers (PHCs), four Block PHCs, two Community Health Centers and one referral hospital.

Table 1. Population of selected tehsils of Jodhpur district.

Tehsil	Population in Year 2001			Expected population in 2006	No. of revenue villages
	Male	Female	Total	Total	
Osian	183431	169434	352865	411088	159
Bilara	129734	121109	250843	292232	92
Bhopalgarh	139909	131551	271460	316251	123
Total	453074	422094	875168	1019571	374



Figure 1. Selected tehsils Osian, Bhopalgarh and Bilara in Jodhpur district.

Involvement of State Health Services: Director, Medical and Health Services, Rajasthan, Joint Director, Medical and Health Services Jodhpur Zone and Chief Medical Officer, Jodhpur district were informed and briefed about the project. Co-operation of Medical Officers was sought for the project through official channels.

Training Programmes and Workshops Organised:

- Project Staff was trained as per their role in project. The trainings were imparted in biosafety, microbiological work, anthropological measurements, clinical examination of throat, throat swab collection, transportation, inoculation on blood agar, diagnosis of streptococcal sore throat and diagnosis of rheumatic heart disease.
- Five workshops were organised for Medical Officers working in study area. All the participants were briefed about streptococcal sore throat, rheumatic fever, rheumatic heart disease, objectives and activities of the project. They requested to refer all suspects of rheumatic fever and rheumatic heart diseases from their area to Dr. Sanghvi, Senior Cardiologist, M. G. Hospital, Jodhpur.
- Three training programmes for health workers were organized, one at Osian, one at Bilara and other at Bhopalgarh. Forty-four workers were present at Osian and the same number at Bhopalgarh. The health workers were explained about symptoms based on which rheumatic fever or rheumatic heart diseases can be suspected. They were briefed about the project and were requested to refer all suspects to the Medical Officer, who in turn would refer the suspects to Cardiologist at M. G. Hospital after examination.

School health survey: List of all schools including private schools, in the selected area was obtained from Offices of Education Department at Jodhpur. These included all primary schools, middle schools, secondary schools and senior secondary schools in the area. Every fifth school from list of all schools in rural area was selected for this purpose.

The team visiting school consisted of one Medical Officer and two field investigators. On reaching school, the team introduced itself to the Headmaster and sought cooperation of class teachers for school health examination. Teachers and students are explained the signs and symptoms of RF/RHD and facilities provided under Jai Vigyan Mission Mode Project. The role of teachers within school as well as in their residential areas for detecting suspected RF-RHD cases was also explained. IEC-1 was distributed to children and teachers. All girls of school were selected for examination and all boys of a class randomly selected. The team was seated on two benches viz. BENCH 1 (Field Assistant), BENCH 2 (Medical Officer). On bench one, Field investigator with the cooperation of class teacher, entered the name, age, sex, address etc. of student in school health form and allocated ID No. Another field investigator measured height, weight, waist circumference and hip circumference and recorded the same. Body weight was measured (to the nearest of 0.5 Kg) with the participant in standing position on weighing scale, feet about 15 cm apart and equally distributing weight on both lower limbs with minimum out wear and no footwear. Height was measured with the subject in standing position and with the head positioned so that the top of the external auditory meatus level with the inferior margin of the bony orbit. Waist circumference was measured in centimeters (cm) at the level of umbilicus to the nearest 0.1 cm. Hip circumference was measured at the trochanteric level in cm to the nearest 0.1 cm. MO took history, examined student clinically and entered findings in school health form. For suspected RF-RHD cases, MO filled up the Referral Card and requested class teacher to call parents of the suspected case, who were then explained about disease of the child and were

requested to consult senior cardiologist at M. G. Hospital with the referral card. MO took three readings of BP measurement of all students in sitting position with a minimum gap of 2 minutes per reading. Mercury Sphygmomanometer was used for this purpose. Every third child and the child with sore throat were asked to sit in a separate row for collection of throat swab. At the end MO collected throat swab of the selected children for transferring the same for to the laboratory.

Observations

The team visited fifty of selected schools in this period. Of these 24 were from Osian tehsil, 12 from Bhopalgarh Tehsil and 14 from Bilara tehsil. In all 2439 students of 5-14 years from these schools were examined. Throat swabs were collected from 354 students.

Table 2. Age and sex distribution of students examined.

Age in years	Males	Females	TOTAL	
			No.	Percent
5	90	73	163	6.7
6	131	106	237	9.7
7	146	136	282	11.6
8	164	163	327	13.4
9	205	170	375	15.4
10	183	126	309	12.7
11	149	136	285	11.7
12	121	114	235	9.6
13	99	66	165	6.8
14	26	35	61	2.5
TOTAL	1314	1125	2439	100.0

Table 3. Mean Weight of students according to age and sex.

Age in years		Males		Females
	n	Mean Weight in Kg.	n	Mean Weight in Kg.
5	90	18.9±3.4	73	17.5±3.3
6	131	19.6±3.8	106	18.9±3.3
7	146	21.5±4.4	136	20.7±3.3
8	163	23.7±3.9	163	23.0±4.3
9	205	25.6±5.6	170	25.4±5.4
10	183	28.4±5.8	126	27.9±5.3
11	149	30.4±6.2	136	30.4±6.2
12	121	34.3±8.3	114	34.3±6.8
13	99	35.1±6.7	66	36.9±7.8
14	26	36.9±7.3	35	39.1±6.7

Table 4. Mean height of students according to age and sex.

Age in years		Males		Females
	N	Mean Height in Cms.	n	Mean Height in Cms.
5	90	114.7 ± 9.9	73	110.9±8.8
6	131	117.3±9.3	106	115.5±7.5
7	146	122.9±8.1	136	121.3±7.0
8	164	127.6±7.5	163	127.3±8.8
9	205	132.7±9.1	170	132.0±8.6
10	183	138.7±9.4	126	135.9±8.3
11	149	141.8±9.4	136	140.3±7.9
12	121	147.1±10.3	114	146.1±8.8
13	99	150.1±9.9	66	148.5±6.5
14	26	151.1±8.4	35	150.4±7.7

Table 5. Distribution of school children (5-14) according to Body Mass Index (BMI).

Percentile	BMI		
	Males	Females	Both Sexes
5th percentile	12.6	12.4	12.5
10th percentile	13.0	12.8	12.9
20th percentile	13.5	13.3	13.4
30th percentile	13.8	13.7	13.8
40th percentile	14.2	14.1	14.1
50th percentile	14.5	14.5	14.5
60th percentile	14.8	14.9	14.8
70th percentile	15.2	15.3	15.3
80th percentile	15.7	16.1	15.8
90th percentile	16.5	17.2	16.9
95th percentile	17.4	18.5	17.9

Table 6. Mean hip circumference of students according to age and sex.

Age in years		Males		Females
	N	Mean Hip Circ. in Cms.	N	Mean Hip Circ. in Cms.
5	90	58.7 ± 3.5	73	57.7 ± 3.9
6	131	59.6 ± 3.8	106	59.2 ± 3.6
7	146	60.5 ± 3.6	136	60.3 ± 3.7
8	164	62.8 ± 4.1	163	62.4 ± 4.9
9	205	64.8 ± 4.6	170	65.4 ± 5.6
10	183	66.5 ± 5.8	126	67.2 ± 5.6
11	149	68.1 ± 5.9	136	69.9 ± 6.7
12	121	71.1 ± 6.3	114	73.4 ± 6.9
13	99	72.6 ± 5.3	66	75.5 ± 6.5
14	26	74.0 ± 6.4	35	78.4 ± 5.9

Table 7. Mean waist circumference of students according to age and sex.

Age in years		Males		Females
	n	Mean Waist Circ. in Cms.	N	Mean Waist Circ. in Cms.
5	90	51.5 ± 3.3	73	49.7±3.6
6	131	51.5±3.9	106	50.8±3.8
7	146	51.8±3.6	136	71.4±4.7
8	164	53.2±3.8	163	51.8±4.1
9	205	54.3±4.4	170	52.9±4.4
10	183	55.8±4.6	126	55.0±5.8
11	149	57.1±5.8	136	56.8±5.9
12	121	60.2±6.1	114	59.4±6.3
13	99	61.5±5.1	66	60.4±6.6
14	26	63.0±5.9	35	61.1±5.9

Table 8. Mean waist hip ratio (WHR) of students according to age and sex.

Age in years		Males		Females
	n	Mean WHR	N	Mean WHR
5	90	0.88±0.03	73	0.86±0.04
6	131	0.86±0.04	106	0.86±0.04
7	146	0.86±0.04	136	0.84±0.04
8	164	0.85±0.04	163	0.83±0.04
9	205	0.84±0.04	170	0.81±0.04
10	183	0.84±0.05	126	0.82±0.04
11	149	0.84±0.05	136	0.81±0.05
12	121	0.85±0.05	114	0.81±0.05
13	99	0.85±0.05	66	0.80±0.05
14	26	0.85±0.05	35	0.78±0.05

Table 9. Distribution of school children (5-14) according to Waist-Hip Ratio (WHR)

Percentile	WHR	
	Males	Females
5th percentile	0.78	0.74
10 th percentile	0.79	0.76
20 th percentile	0.81	0.78
30 th percentile	0.83	0.80
40 th percentile	0.84	0.82
50 th percentile	0.85	0.83
60 th percentile	0.86	0.84
70 th percentile	0.87	0.85
80 th percentile	0.89	0.87
90 th percentile	0.90	0.89
95 th percentile	0.92	0.90

Table 10. Mean Systolic Blood Pressure of students according to age and sex.

Age in years		Males		Females
	n	Mean SBP in mm Hg	N	Mean SBP in mm Hg
5	90	112.0 ± 8.8	73	110.7±8.7
6	131	110.7±9.4	106	112.2±9.3
7	146	110.9±9.2	136	110.3±9.5
8	164	112.0±8.5	163	111.6±9.6
9	205	112.5±9.3	170	112.7±9.5
10	183	112.3±10.4	126	113.2±9.3
11	149	114.0±10.2	136	116.8±10.1
12	121	114.7±9.6	114	115.3±10.3
13	99	114.0±10.9	66	114.4±10.4
14	26	113.8±11.1	35	117.4±9.7

Table 11. Mean Diastolic Blood Pressure of students according to age and sex.

Age in years		Males		Females
	N	Mean DBP in mm Hg	n	Mean DBP in mm Hg
5	90	71.3 ± 4.5	73	70.5 ± 3.7
6	131	71.3 ± 4.8	106	71.2 ± 5.0
7	146	71.3 ± 5.5	136	71.4 ± 4.7
8	164	71.5 ± 5.5	163	71.3 ± 6.2
9	205	71.5 ± 5.8	170	72.4 ± 5.8
10	183	72.5 ± 6.5	126	72.5 ± 5.9
11	149	73.1 ± 6.2	136	74.8 ± 7.2
12	121	73.6 ± 6.3	114	73.3 ± 6.2
13	99	74.0 ± 6.6	66	73.9 ± 6.7
14	26	73.3 ± 6.2	35	73.1 ± 5.6

Throat swabs of 355 students was collected and transported to the laboratory where these were inoculated on blood agar. Of these 314, seventeen students had clinically sore throat. Throat swabs collected during July to September were processed same day as this was suited to school timings. From October, 2007 to December 2007 as the school time was changed the sample were collected and transferred to filter paper strips which could be processed within one week of sample collection. Any colony of Beta Hemolytic Streptococcus did not grow from throat swabs up to December 2007. From January 2008 blood agar plates were carried to schools, where they were directly inoculated from the throat swabs immediately after collection of throat swab. Then 3 or 4 sets of streaks were spread from the primary inoculum with a sterile wire loop to obtain well-spaced single colonies. The plates were then incubated overnight at 37°C in Candle jar.

After required time of incubation the plates were observed for morphological identification of the colonies and the appearance of hemolytic zone around the colonies of beta hemolytic streptococci (BHS). Gram's staining was done for microscopic examination of colonies. The observations were recorded in laboratory reporting forms. Morphological and microscopic observation of colonies appeared on blood agar plate showed variety of microorganism including yeast, alpha hemolytic bacteria, gram positive bacilli, gram negative cocci.

The growth of Beta-hemolytic streptococci was observed in plates prepared from nine throat swabs after December 2007. All these nine colonies were sent to PGI Chandigarh. These were of Gr. A/C/G betahemolytic streptococci. However, many other plates showed growth of alpha-hemolytic streptococci, yeast and fungi.

Registered RF/RHD cases

Among 89 registered cases proportion of females was 53.9%. According to severity of disease at time of registration, 64.6% were severe cases, 25.6% moderately severe and 9.8% mild.

Table 12. Patients registered in different categories:

Category		No. of patients
1A.	ARF with carditis	1
1B.	ARF without carditis	0
2A.	RHD with rheumatic activity	0
2B.	RHD without rheumatic activity	88
3A	Documented past RF without RHD	0
3B.	Not Documented past RF without RHD	0

Age group wise trend of registration

Table 13. Age and sex distribution of RF/RHD Cases.

Age Group	No. of RF/RHD Cases			
	Males	Females	Total	
			No.	%
0-4	0	0	0	0.0
5-9	0	0	0	0.0
10-14	4	5	9	10.1
15-19	5	2	7	7.9
20-24	4	6	10	11.2
25-29	2	3	5	5.6
30-34	8	9	17	19.1
35-39	3	6	9	10.1
40-44	8	7	15	16.7
45-49	3	4	7	7.9
50-54	1	2	3	3.4
55-59	1	2	3	3.4
60-64	2	1	3	3.4
65-69	0	0	0	0.0
70-74	0	0	0	0.0
75-79	0	0	0	0.0
80 & above	0	1	1	1.4
TOTAL	41	48	89	100.0

Month wise registration of RHD cases

Table 14. Month wise registration of RHD cases

S. No.	Month	No. of RF/RHD Cases registered
1.	May 2007	6
2.	June 2007	6
3.	July 2007	5
4.	August 2007	3
5.	September 2007	4
6.	October 2007	4
7.	November 2007	16
8.	December 2007	13
9.	January 2008	12
10.	February 2008	10
11.	March 2008	10
	Total	89

Specific Valve involvements

Table 15. Final diagnosis (ECHO diagnosis) of RF/RHD patients seen by cardiologist.

RHD:- Valve involved:-	Males	Females	Total
Mitral Alone	17	25	42
Mitral+Aortic	8	6	14
Mitral+Aortic+Tricuspid	5	8	13
Mitral+ Tricuspid	6	5	11
Aortic alone	1	0	1
RF	1	0	1
ECHO to be done	3	4	7
Total	41	48	89

Monitoring of Secondary Prophylaxis (SP):

Out of 89 registered cases of RF/RHD, seven have died, five are not advised by cardiologist to take SP as they are above age of 45 years or have other problem. Out of remaining 77 patients put on SP, information from fifty one (66.2 %) subjects, is available that all of them have taken last dose of due SP in Feb 08, none of them have stopped SP. One patient has migrated to Gujarat and cannot be followed. Remaining 32.5% could not be contacted and information about them is not available, whether they have taken last due dose of SP or not.

Important Leads and Outcome

Preliminary data indicate that prevalence of RF/RHD in school age group is around one per thousand in the selected area. The data about blood pressure, height, weight, BMI, waist circumference, hip circumference and WHR are expected to reveal more.

Dermatoglyphic Patterns in Diabetes Mellitus Patients and Non-Diabetics: A Preliminary Study: P.K. Dam, Vinod Joshi, Anil Purohit and Himmat Singh

Commencement: **June, 2006**

Duration: **Three years**

Status: **Ongoing**

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

Rationale

Many of the human health problems are accurately predicted as clinical symptoms through time-tested physical anthropological evidences. Loss of body weight in case of many acute infections like TB, pale yellow pigmentations in the eyes and nails in case of Hepatitis and presence of Bitot's spot in case of acute Vitamin A deficiency are few examples. Similarly, observation emerged from the preliminary study (DMRC Annual Report, 2006-07) carried out among a selected endogamous group inhabiting Jodhpur City, reveals that there is consisting association between fingerprint patterns (i.e. dermatoglyphics) and Type 2 Diabetes Mellitus (T2DM) respondents. This has also been revealed that T2DM respondents possess a particular kind of dermatoglyphic patterns which follow a definite inheritance pathway. Heritable variation in human phenotypic traits is due to variation in DNA sequence among the individuals.

Since the clinical symptoms of T2DM are less specific to the probands in the family and the corresponding efforts on the part of them to examine pre-chronic biochemical level of blood or urinary sugar are missing among majority of patients of developing country like India, there is an ardent need of an easy, cost effective and reliable marker such as dermatoglyphics to initiate preventive measures among prospective diabetics. Unusual dermatoglyphics have already been reported as disease marker for Diabetes Mellitus in other parts of the world (Verbov, 1973, Ziegler *et al.*, 1993, Shield *et al.*, 1995, Kahn *et al.*, 2001).

Dermatoglyphics matures at specific times in the foetus when critical growth in the brain is taking place. As adverse foetal exposures were to occur before 20th week of gestation, then this effect may be found in the fingerprints of the offspring.

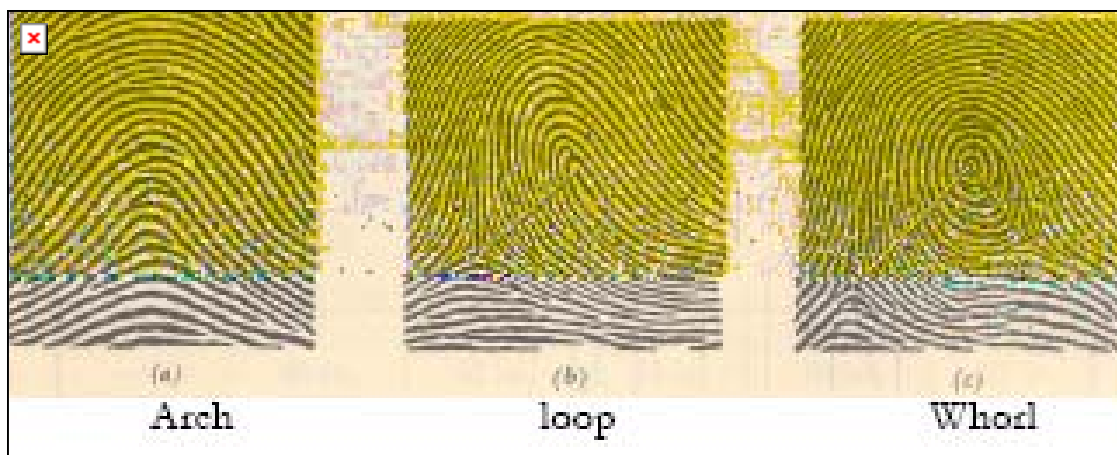
Dermatoglyphic features of 290 children and 180 adults with Diabetes Mellitus revealed a high TRC i.e. Total ridge count value that was more frequent in both girls and boys with Diabetes than in controls. (Barta *et al.*, 1997).

Present study would elucidate whether dermatoglyphics pattern can be used as one of the disease markers for the Diabetes. Results of a preliminary study undertaken to achieve above, are presented in the report. Further continuance of the present study would be helpful to formulate counseling messages based on dermatoglyphic pattern prevalent among

young generation and their possible simulation to determine the younger people's likelihood to develop diabetes in their later age. Counseling can be imparted through a separate study to the parents of younger generation.

Work undertaken & Methodology:

- Prints have been taken of respondents palms and fingertips of right and left hand separately with the help of standard Dermatoglyphic kits. Then individual prints have been scanned and stored in computer for their detailed character study of respective design and ridges. Arch, loop & Whorl are the three basic types of fingerprint patterns which are illustrated here to show, how ridge counts are made, viz



- Arch: No triradius, hence ridge-count is zero
- Loop (one triradius on the left where 3 ridges meet): To count ridges, a line has to be drawn from the point of the triradius to the centre of the loop. If the ridge count is 13, it means the number of ridges cut by the line is 13.
- Whorl (two triradii): The following ridge-counting protocol was used: ridge count = (ridges crossing the longer line only); therefore, the ridge-count values in these examples are A=0, B=13, and C=17 [Adapted from Holt, and penrose 1968]

Outcome of present study:

Present study delineates finger print patterns of 50 probands of T₂DM and 50 controls. Difference of ridge counts and palm patterns on right and left hands of male and female T₂DM and 50 matched controls are shown in Table 1. Following characteristics are revealed through palm and finger print analysis among the diabetics as compared to non-diabetic controls:

- Lower a-b ridge count (i.e. the number of ridges occurring in the second inter-digital area between the two A and B digital triradius).

- Lower third finger ridge count.
- Lower frequency of occurring true pattern in 4th interdigital area.
- Lower frequency of occurring true pattern in Thenar area.

In places of manual fingerprint ridge extraction, a computer based program for rapid (between point of tri-radius to the center of loop / whorl) by image enhancement after due validation of the steps of a logarithm is developed (fingerprint normalization, local ridge orientation extraction, fingerprinting filtration, image threshold, image thinning, ridge extraction, false ridge removal).

Work remaining to be carried out

Association of the fingerprints with T2DM will be made for a sample of about 200 probands and 200 age & sex matched controls. Extended pedigrees collected from 50 probands are under process of analysis that would reveal the first, second and third degree relatives with T2DM.

Table 1. Percentage of presence of unusual patterns and ridge counts among men and women diabetic patients and matched controls

Cases/ Control	MEN								WOMEN							
	a-b ridge count on palm		3 rd finger ridge count		%presence of 4 th inter- digital pattern		% presence of pattern in Thenar area		a-b ridge count on palm		3 rd finger ridge count		% presence of 4 th interdigital pattern		% presence of pattern in Thenar area.	
	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L
Cases	37.61	38.72	15.60	17.94	63.42	55.62	8.30	8.35	39.42	40.34	14.12	13.92	79.81	62.34	20.92	25.24
Control	44.33	45.12	18.90	20.90	92.74	87.33	65.52	48.44	51.34	50.63	21.42	21.83	92.56	91.81	64.82	56.72

Nutrition Monitoring Survey on NNMB pattern in Jodhpur district of Rajasthan- *Madhu B. Singh, J. Lakshminarayana and Ranjana Fotedar*

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 for carrying out 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 into 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 the state in the similar pattern.

Second 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 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. 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.10 households from each village are covered.

Analysis of 499 households covering 3015 individuals of the second phase has been done so far. Table 1 showed age and sex wise distribution of population (1522 males and 1493 females). Analysis revealed that 93.8 percent of population was Hindus and 5.0 percent Muslims. Nuclear families were significantly more (67.5 %) as compare to 20.1% joint families (Tables 2). Table 3 revealed that illiteracy is significantly high in females (58.6 %) than males (32.7 %). Higher education is very low in this area.

Table 1. Age and sex wise distribution of population covered

Age group	Males	%	Females	%	Total	%
0-5	250	16.4	266	17.8	516	17.1
6-9	169	11.1	170	11.4	339	11.2
10-14	211	13.9	221	14.8	432	14.3
15-17	105	6.9	90	6.0	195	6.5
18-29	298	19.6	284	19.0	582	19.3
30-39	182	11.9	173	11.6	355	11.8
40-49	128	8.4	123	8.2	251	8.3
50-59	88	5.8	77	5.3	165	5.5
>=60	91	6.0	89	5.9	180	6.0
Total	1522	100.0	1493	100.0	3015	100.0

Table 2. Distribution of households according to type of family

Type of family	N	%
Nuclear	337	67.5
Extended Nuclear	62*	12.4
Joint	100*	20.1
Pooled	499	100.0

*P<0.01

Table 3. Distribution of population according to educational status

Educational status	Males	%	Female	%	Total	%
Illiterate	498	32.7	875*	58.6	1373	45.6
Read & Write	17	1.1	17	1.1	34	1.1
1-4 Standard	431	28.4	335*	22.4	766	25.5
5-8 Standard	247	16.2	125*	8.4	372	12.3
9-12 Standard	200	13.1	36*	2.4	236	7.8
College	54	3.6	13*	0.9	67	2.2
N. A.	75	4.9	92	6.2	167	5.5
Pooled	1522	100.0	1493	100.0	3015	100.0

* P<0.01

Main morbidities observed in population were acute respiratory infection (11.2 %) and fever (9.2 %) followed by diarrhea (1.7 %). Both the morbidities i.e. acute respiratory infection and fever were significantly higher in females than males (Table 4). Regarding nutritional deficiency signs, it is observed that discoloration and sparseness of hair, a sign of protein calorie malnutrition was observed to be high i.e. 7.5 percent which was significantly higher in females than males. Marasmus was observed only in females (0.1 %). Angular stomatitis, cheilosis and glossitis were ranging from 0.6 to 3.2 percent. Vitamin A deficiency (Night blindness) was 0.2 percent, higher in females than males. Dental caries (32.6 %) and dental fluorosis (24.2 %) observed high in this area. Females suffered significantly more from dental caries and dental fluorosis than males (Table 5). Koilonychia, a sign of anemia, was observed only in females (0.1 %).

Table 4. Distribution of population according to Morbidity

Morbidity	Males N=1522	%	Females N= 1493	%	Total N=3015	%
N.A.D.	1263	83.0	1112	74.5	2375	78.8
Fever	103	6.8	175*	11.7	278	9.2
Diarrhoea	20	1.3	30	2.0	50	1.7
Dysentery	3	0.2	7	0.5	10	0.3
A. Res. Infection	152	10.0	187**	12.5	339	11.2
Measles	0	0.0	1	0.1	1	0.0
GIT	50	3.3	62	4.1	112	3.7

*P<0.01 ** P<0.05

Table 5. Distribution of population according to Nutritional deficiency signs

Deficiency Signs	Males N=1522	%	Females N= 1493	%	Total N=3015	%
Hair Discolour	67	4.4	151*	10.1	218	7.2
Hair Sparseness	3	0.2	7	0.5	10	0.3
Emaciation	0	0.0	2	0.1	2	0.1
Marasmus	0	0.0	1	0.1	1	0.0
Night blindness	2	0.1	4	0.3	6	0.2
Angular Stomatitis	5	0.3	13*	0.9	18	0.6
Chelosis	45	3.0	50	3.3	95	3.2
Glossitis	21	1.4	31	2.1	52	1.7
Koilonychia	0	0.0	1	0.1	1	0.0
Gums-spongy Bleeding	10	0.7	34*	2.3	44	1.5
Dental Caries	375	24.6	607*	40.6	982	32.6
Dental Fluorosis	287	18.9	442*	29.6	729	24.2

* 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. 77.3 percent which was higher in ST community (88.2 %) in comparison to OBC communities (72.6 %). The overall prevalence of severe under nutrition was high i.e. 7.4 percent. Under nutrition was higher significantly in joint families (79.5 %) and observed maximum in kutcha houses (80.4 %) followed by pucca houses. Overall under nutrition was highest in low income group and decline with the rise in income. (Fig. 1)

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	227	22.5	41.4	29.9	6.2
2. Extended	42	28.6	33.3	28.6	9.5
3. Joint	83	20.5	37.3	32.6	9.6
Pooled	352	22.7	39.5	30.4	7.4

$\chi^2_{1,2} = 51.5$ P<0.01 $\chi^2_{1,3} = 62.4$ P<0.01 $\chi^2_{2,3} = 17.7$ P<0.01

* NCHS Standards

Fig. 1. Gomez Classification according to Per Capita Income (Rs.) in preschoolers

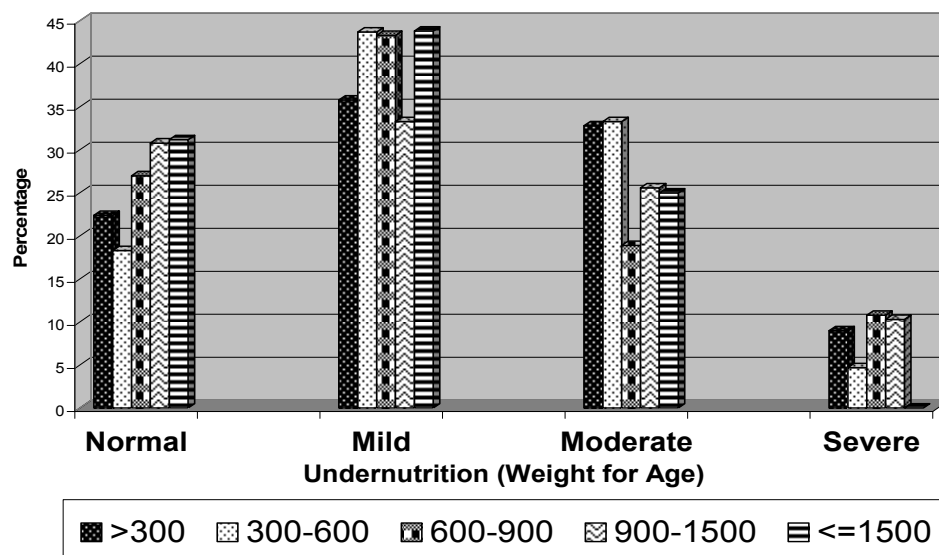


Table 7. Distribution of 1-5 years children according to Gomez distribution and type of house

Type of House	N	Nutritional Grades*			
		Normal	Mild	Moderate	Severe
1. Kutchia	46	19.6	34.8	43.5	2.1
2. Semi Pucca	212	23.6	40.1	28.3	8.0
3. Pucca	94	22.3	40.4	28.8	8.5
Pooled	352	22.7	39.5	30.4	7.4

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 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.

Stunting (Height for age) was 62.2 percent in preschoolers with the prevalence of severe stunting 40.3 %, which needs attention. It's higher than NNMB (57.7 %) and NFHS III (33.7 % - up to 3 years) Fig. 2.

Underweight (Weight for age) in preschoolers observed 59.9 %, higher than NFHS III (44.0 %). The proportion of severe underweight was high (28.9 %) Fig. 3. Both stunting and underweight were observed significantly higher in males than females though statistically insignificant. Declining trend has been observed in stunting and underweight in comparison to Phase one study.

Fig. 2. Standard Deviation Classification for Height for Age in preschoolers

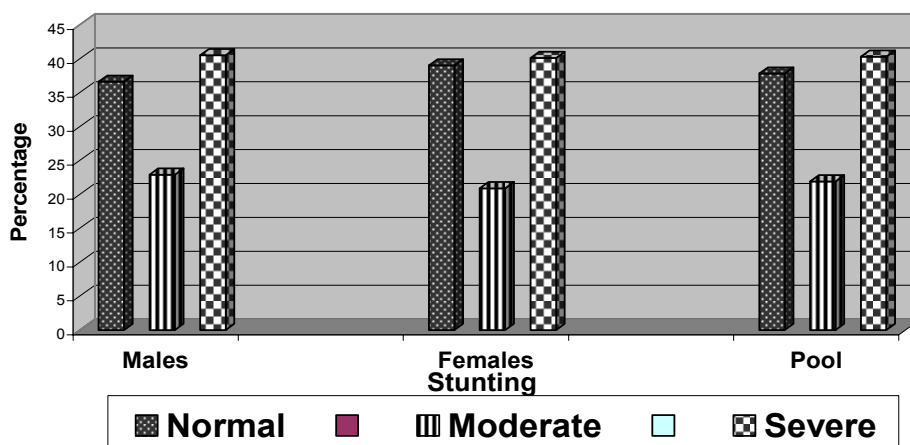
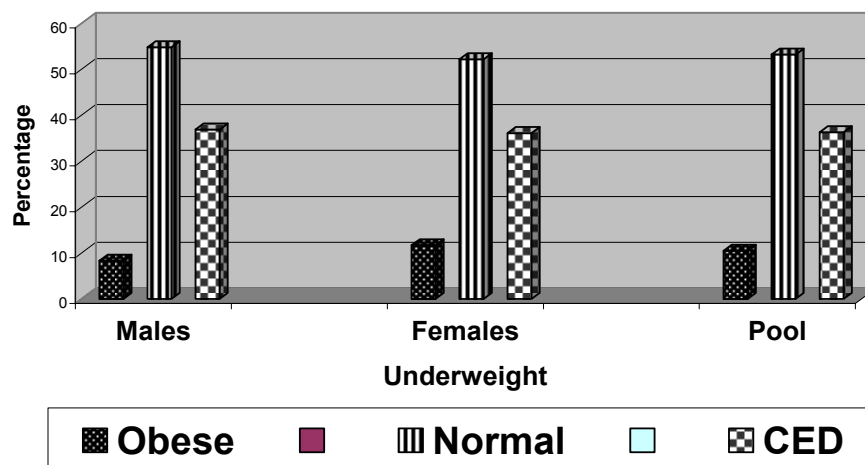


Fig. 3. Standard Deviation Classification for Weight for Age in Preschoolers



The distribution of adults according to BMI grades have been shown in Tables 8 to 10. At the aggregate level, 53.2 percent had normal BMI (18.5-25.0), while 36.3 percent had chronic energy deficiency (Fig. 4). Severe chronic energy deficiency was significantly higher in joint families (11.2 %) than nuclear families (6.8 %) and maximum in pucca houses (13.3 %). Chronic Energy deficiency declined with increase of per capita income i.e. 44.2 percent in low income (<Rs.300) and 34.5 percent in high income group ($\geq$ Rs.1500).

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

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. Male N=227	2.5	5.8	37.5	17.3	18.1	10.5	8.3
2. Female N=538	3.0	8.7	31.8	20.4	17.7	10.4	8.0
Pooled N=815	2.8	7.7	33.7	19.5	17.8	10.4	8.1

$$\chi^2_{1,2} = 111.5 \quad P < 0.01$$

Fig. 4. Body Mass Index in adults

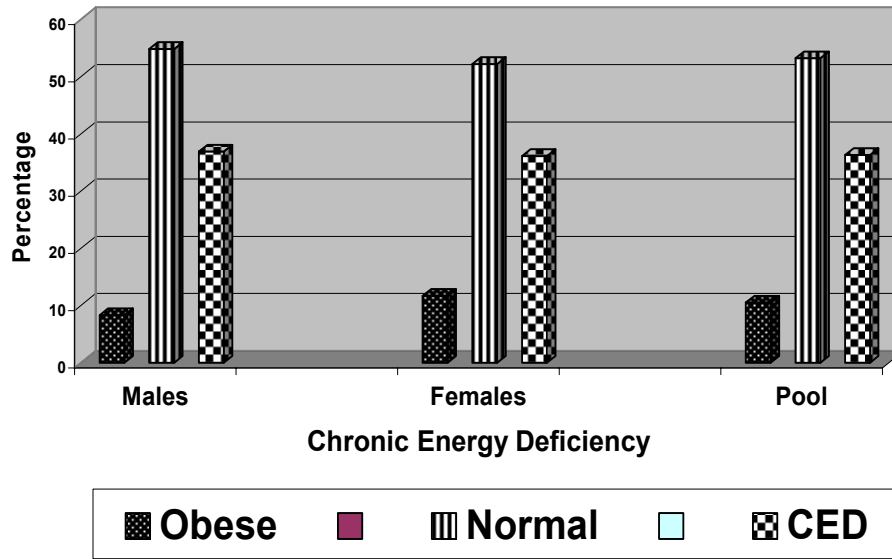


Table 9. Distribution of adults (≥ 18 years) according to BMI classification and Type of family

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=474	2.5	7.2	33.8	20.7	18.5	10.5	6.8
2. Extended N=117	2.6	8.5	29.9	19.6	18.9	12.8	7.7
3. Joint N=224	3.6	8.5	35.7	16.5	15.6	8.9	11.2
Pooled N=815	2.8	7.7	33.7	19.5	17.8	10.4	8.1

$$\chi^2_{1,2} = 226.0 \quad P < 0.01 \quad \chi^2_{1,3} = 183.2 \quad P < 0.01 \quad \chi^2_{2,3} = 54.0 \quad P < 0.01$$

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=75	1.3	4.0	24.1	22.7	21.3	13.3	13.3
2. Kutcha N=492	2.8	7.5	36.2	19.9	18.6	9.3	5.7
3. Mixed N=248	3.2	9.3	31.9	17.3	15.3	11.7	11.3
Pooled N=815	2.8	7.7	33.7	19.5	17.8	10.4	8.1

$$\chi^2_{1,2} = 48.3 \quad P < 0.01 \quad \chi^2_{1,3} = 130.6 \quad P < 0.01 \quad \chi^2_{2,3} = 208.4 \quad P < 0.01$$

Dietary analysis of 298 households covering 1632 individuals (814 males and 818 females) revealed that their diet is marginally low in consumption of Cereals & Millets i.e. deficit ranging from 6.6 to 31.0 % and maximum deficit in 4-6 years age group, very low consumption of Pulses & Legumes (deficit ranges from 23 to 64 % of RDA), Fats & Edible Oil (deficit ranges from 22.5 to 80 % of RDA), Green Leafy Vegetables (deficit ranges from 19 to 60 % of RDA). Consumption of Roots & Tubers meets the requirement in most of age groups.

Average energy intakes (calories) was less than RDA in all age groups i.e. 1-3, 4-5, 7-9, 10-12, 13-15, 16-17 years and adults ranging from 53 to 85 percent. Calorie deficit was observed more in girls and highest in 1-3 years group followed by 4-6 and 7-9 years groups. Deficiency in protein intakes was observed maximum in 13-15 (13 %) followed by 16-17 years age group. Dietary analysis of vitamins, iron and other nutrients is under process of analysis. Comparison of results of Phase one will be done with Phase II after analyzing the data of 600 household 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. Third phase will be started in which 50 percent new villages and 50 percent old villages will be selected randomly in view to cover variation.

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.

Meta Analysis of Micronutrient Deficiency Disorders and their Mapping in Western Rajasthan - J. Lakshminarayana, Madhu B. Singh and Ranjana Fotedar

Commencement: **September, 2007**

Duration: **Two Year**

Status: **Ongoing**

Objectives

1. Meta Analysis of available published or unpublished information of three important Micronutrient Deficiency Disorders namely Vitamin A, Iron Deficiency Anemia (IDA) and Iodine Deficiency Disorders.
2. To study regional/ecological variations of these three micronutrient Deficiency Disorders in Rajasthan by systematic reviews and
3. To map out the districts for three micronutrient deficiencies in the western region.

Progress of the work

The Data base has been created by searching relevant literature through Pub Med, MEDLARS, EMBASE, Cochrane on micronutrients and survey reports of NFHS-I and II & III, ICMR multi-centric studies, compendium on Micronutrients published by ICMR, NNMB technical report on Micronutrient Deficiency's, using FOX-PRO package for relevant published data. There are total of 124 studies on various Micronutrients Deficiency Disorders (MDD's) published from Rajasthan and other parts of India. Some of them are case control studies, prevalence and cohort studies. Systematic search was done for unpublished data like MD thesis from all the medical college libraries and reports from NGOs organizations covering data reported from Jaipur, Kota, Bharatpur, Ajmer, Udaipur, Jodhpur, Jaisalmer, Barmer and Bikaner districts which has been collected. The Literature related to all the intervention studies, prevalence, case control and cohort studies on MDD's in Rajasthan and reports published from DMRC has been collected for re-analysis and for creation of database for mapping out the ecological regions and studying the regional variations within Rajasthan. DMRC has done field based studies in population groups related to Vitamin A Iron Deficiency Anemia, but all are based on clinical signs and symptoms from different ecological zones. Intervention studies on MDD's are very few and these are to be given attention & priority among different vulnerable population groups in the communities. In India many intervention studies were taken up by ICMR institutes, NGO's and Govt. organizations. The collected data has been re-analysed using REVAMAN package.

The data for meta analysis was collected through literature search for the Vitamin A Deficiency (VAD). A total of 124 studies were collected by Systematic review of these 15 studies only met the criteria for meta analysis and the re-analysis has been carried out. For 15 publications on the effect of Vitamin A among school children The duration was considered to be for a period of 10 years. Binomial model has been used to estimate the results and rank correlation proposed by Begg and linear regression method proposed by Egger & Trim and

Fill method to evaluate publication bias. The publication bias was adjusted by using “Trim & Fill method. The analysis was done using REVMAN package.

The studies with at least 10 subjects per intervention group were included. 124 articles were evaluated, out of which only 20 met the criteria for the meta analysis. Multiple interventions of study samples were identified in 15 of the articles. Each intervention was counted as a separate study, yielding 25 cohorts totaling 1892 subjects. Of these subjects, 51% received interventions and 49% served as controls. Cohorts reported between 1992 and 1999 accounted for 53% of the sample; 56% of all cohorts were based in hospital and 26% involved micronutrient deficiencies. There are two type of interventions reported one is on Behavioral interventions accounted for 11 cohorts (885 subjects), and educational interventions for 8 cohorts (392 subjects), and combined interventions for 19 cohorts (645 subjects). Homogeneity of groupings and effect sizes (ESs) were calculated for each type of intervention. Overall, the data were not homogeneous, so conclusions could not be derived from the entire body of data.

The re-analysis of the data revealed that the educational intervention and combined intervention table8 and the cohorts were non-homogeneous ($P < 0.001$ and $P < 0.01$, respectively); however, the behavioral intervention cohort was homogeneous ($Q = 52.48$, d.f. = 35, $P=0.36$). The overall ES for behavioral interventions was 0.06 (95% confidence interval [CI] = 0.03–0.08); there were no significant differences among the behavioral & educational interventions which had an overall ES of 0.10 (95% CI = 0.05–0.16). The overall ES of the combined interventions was 0.08 (95% CI = 0.04–0.14). While stratifying the combined interventions the behavioral had the largest impact (ES = 0.38). Meta Analysis of studies of interventions improved the heterogeneity among the studies and gave valid conclusions

Table1. The calculation of Estimates of intervention studies and Odds Ratios of different studies on micronutrients

Study Ref.	a	b	C	d	Sample size (n)	Var.	weight	O.R.	Weight XOR	Q
1.	2	14	33	22	71	0.15	6.51	0.1	0.62	2.88
2.	1	3	22	19	43	0.80	1.25	0.17	0.22	0.43
3.	12	39	44	24	109	0.09	11.7	0.23	2.69	3.34
4.	7	6	11	13	37	0.56	7.18	0.37	2.68	1.07
5.	14	41	45	25	125	0.06	16.67	0.13	2.16	2.68
6.	8	12	25	30	75	0.25	4.00	0.22	0.88	3.52
7.	22	46	52	28	148	0.06	16.67	0.14	2.33	3.36
8.	33	27	36	31	127	0.13	7.69	0.38	2.92	1.96
9.	5	17	35	24	81	0.14	7.14	0.32	2.28	2.54
10.	23	32	26	28	109	0.13	7.69	0.41	3.15	2.22
11.	20	16	28	25	89	0.20	8.62	0.48	4.13	1.89
12	7	6	11	13	37	0.56	7.94	2.37	18.22	20.61
13	46	23	97	115	281	0.13	100.21	0.82	82.17	4.75
14.	35	39	34	32	140	0.11	0.91	0.14	0.13	3.62
15.	14	41	42	22	119	0.07	14.29	0.74	10.57	4.16

Table 2. Showing methods used for the calculation of publication bias among the studies

	Education Intervention	Behavioral intervention
Begg's method	Z= 2.04	P= 0.04
Egger's method	T= 2.14	P= 0.05
Trim and fill Method	OR= 1.16 95% CI (0.69 -1.82) (before adjusting)	OR= 0.98 95% CI (0.42 - 1.56) (after adjusting)
Effect Size (ES)	0.08	95% C.I.(0.05–0.16)
OVER ALL (ES)	(95% CI=0.04–0.14)	0.38

Appendix: Calculation of various parameters are as follows:

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

Work remaining to be carried out

The systematic secondary data collected has to be re analysed which has to be done by using *REVMAN* package, which is provided by CMC Vellore when attended the training programme on Cochrane data bases for protocol development for communicable diseases. The mapping of the zones with micronutrients deficiencies has to be done using ARC View package and view package and will be reported.

Important Leads/ Outcomes from the Study

The study will provide data of three micronutrient deficiency disorders (VAD, IDA, IDD) through Meta Analysis for the state of Rajasthan with variations in different ecological/geographic regions. This will be useful to many researchers on micronutrients and health administrators for identifying the incidences among the MDD's at district level and can implement nutritional programmes on micronutrients. With this approach DMRC will be a nodal centre and be a member of Cochrane data bases for western desert region. This will be an innovative work and well documented by scientific study on MDDs and the strategies can be developed and informed to state govt. for intervention programmes to be launched in the districts.

Nutritional status along with morbidity and mortality of Neonates in Jodhpur district - *Ranjana Fotedar, Madhu B. Singh and J. Lakshminarayana*

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

105 Neonates (0–7 days) have been covered from 20 villages belonging to Salawas Community Health Center of Jodhpur district and 89 newborns have been followed up at the interval of one month and will continue up to one year of age. All the new borns were clinically examined for morbidity, mortality, nutritional deficiency signs, anthropometry (height i.e. Recumbent length, weight, arm circumference, chest circumference, head circumference and fat fold at triceps following standard techniques of WHO) and feeding practices. The feeding practice of new born and socio-cultural / economic causes responsible for mortality are also recorded from mother of each child registered in the study. Each registered child has been followed up every month for above mentioned clinical examination. This process of registration will continue till the required number of 300 new borns (0 – 7 days) will be attained.

Preliminary analysis of 89 new borns has been done. Table 1 & 2 showed the age and sex wise distribution of new borns. Morbidities observed at the time of birth were fever (1.1 %) and stomach ache (1.1 %) as shown in Table 3.

Table 1. Distribution of New Borns examined & followed up

New Borns examined & followed up	No.
No of New Born examined at age of 0-7 days till January, 08	89
No of New Born followed up & examined at age of 1-2 months	15
No of New Born followed up & examined at age of 2-3 months	58
No of New Born followed up & examined at age of 3-4 months	38

Table 2. Distribution of New Born according to Sex

New Borns (0-7 days)	No	Percent
Male	37	41.5
Female	52	58.4
Total	89	100.0

Table 3. Distribution of New Born According to Morbidity Profile

Morbidity	New Borns (0-7 days) N=89	%
NAD	86	96.6
Fever	1	1.1
Vomiting	-	-
Diarrhoea	-	-
Stomach ache	1	1.1
Respiratory Infection	-	-
Congenital Abnormality Bi-lateral cleft lip & hard palate	1	1.1

Mortality observed in the studied children was 3.4 percent. Causes observed were fever and low birth weight as shown in Table 4. Preliminary analysis revealed that the percentage of low birth weight babies was 17.8 percent (Table 4).

Table 4. Distribution of New Born According to Mortality

New Born (N=89)	No. of Death		Cause of Death
	No.	Percent	
0-3 days	1	1.1	PUO
0-7 days	1	1.1	Low birth weight 1.3 Kg.
0-25 days	1	1.1	Unknown
Total	3	3.4	

Table 5. Distribution of New Born According to Weight for Age

New Born (0-7 days)	Nutritional Grades		
	Normal ≥2.5 Kg	Mild <2.5-2.0 Kg	Severe <2 Kg
No. Examined	75	11	3
Percentage	84.2	12.4	3.4

The project is ongoing and the survey would be carried out to cover remaining registration of 195 new borns (0-7 days) belonging to villages of Salawas CHC of Jodhpur district. Each registered child will be followed up every month for clinical examination of nutritional deficiencies, morbidities, mortality, anthropometry and feeding practices and socio-cultural causes for mortality.

EXPECTED OUTCOME

Results of the study will be helpful in formulation of interventional plan for neonates & infants for reduction of under nutrition, morbidity and mortality among neonates and infants. The research out put of this project will also help in developing package of essential new born care (E.N.C.) which will be useful to State Health Functionaries.

Evaluation of immunization coverage against vaccine preventable diseases in western Rajasthan - K.R. Haldiya and Murli L. Mathur

Commencement: **October, 2007**

Duration: **Six months**

Status: **Ongoing**

Objectives:

1. To determine the complete immunization coverage and reasons of non-vaccination against vaccine preventable diseases in western Rajasthan.
2. To study the influence of socio-demographic factors on the immunization coverage in order to establish strategies for improvement of immunization coverage in under-five children.

Progress of the Work.

A UNICEF financed cross sectional survey was undertaken in Jodhpur and Barmer districts of Rajasthan to determine immunization coverage of vaccine preventable diseases in 12-23 months old children. The villages were divided into two category on the basis of population having less than 1000 (category I) and 1000 or more (category II). The urban population of Barmer district was only 7.4% so no separate cluster selection of urban area was done and wards were included in category II. In each category, 30 clusters were selected from Jodhpur and Barmer separately while 30 wards were selected from urban area of Jodhpur district. A total of 150 clusters were selected for this study. The study population was parents of 12-23 months old children who were interviewed for immunization status of six vaccine preventable diseases and knowledge and reasons for not getting vaccination in selected children. House-to-House survey was carried out in each cluster till parents of seven children of 12-23 months selected for this study. The total number of households and children of 12-23 months covered was 4758 and 1068 respectively. The data were analyzed by using Epi Info programme 2003. The preliminary analysis of data shows that the complete immunization coverage was higher in Jodhpur district (36.1%) than Barmer (14.9%) with average of 27.7%. The coverage was highest in urban area (63.0%) followed by villages having more than 1000 population (21.8%) and lowest in villages having less than 1000 population (16.3%). The coverage was higher in children of educated mothers than father's education. The major reason of non-immunization was not having any knowledge about vaccine preventable diseases among parents of eligible children in the study. The final report is under preparation.

Table 1. Household Characteristics Survey

Characteristics of population	Rural		Urban N=	Grand Total N=
	Category I N=	Category II N=		
Number of Clusters	60	60	30	150
Household Surveyed	1952	1897	909	4758
Population in sampled households	12658	12414	5312	30384
12-23 months children	426	431	211	1068
Complete Immunization %	16.3	21.8	63.0	24.8

Possible Outcome and Utilization

The results of the study will help in explaining the reasons for non-vaccination of children in desert region and for preparing intervention programme by the health care facilitators to improve the vaccination coverage rates and achieve the targets of EPI.

Estimation of Burden of Disease by DALY Measure in Desert Region of Rajasthan–
Raman Sachdev, K.R. Haldiya and J. Lakshminarayana

Commencement: **July, 2007**

Duration: **One and a half Years**

Status: **Ongoing**

Objectives

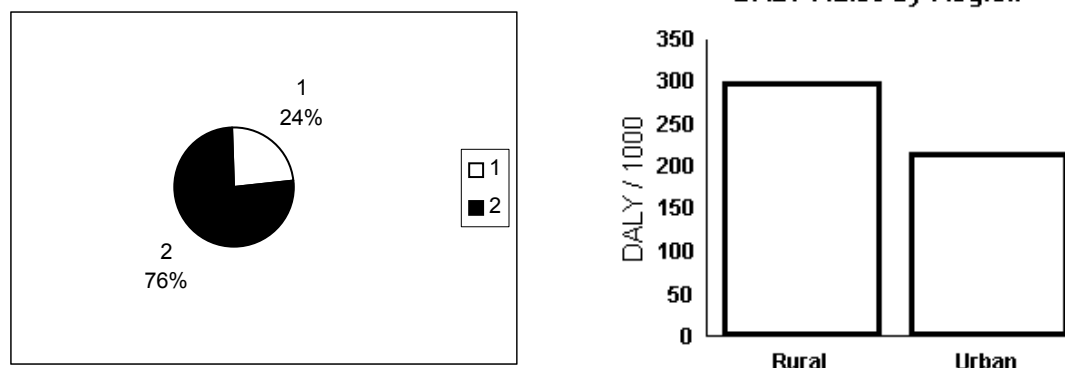
1. To quantify the burden of premature mortality (YLL) and disability (YLD) by age, sex and region for major causes or groups of causes with specific objective to carry out a comprehensive assessment of the burden of disease, injuries and important risk factors for the population of desert region in order to:
 - i Provide a baseline for assessing improvements in health and performance of health systems
 - ii Provide comprehensive data on health needs to support rational resource allocation and to address inequalities in health status across subpopulations.

Progress of the work

The secondary data were collected from different agencies viz., Directorate of Medical and Health Services, Govt. of Rajasthan, Jaipur, Director of Census Operations, Govt. of Rajasthan, Jaipur, Directorate of Economics and Statistics, Govt. of Rajasthan, Jaipur and Office of Registrar, Births & Deaths, Jodhpur. The data of four desert districts viz., Jodhpur, Pali, Jalore and Jaisalmer were analyzed in respect of the number of deaths by age, sex, cause of death and average age at death within respective age groups in the software BDAP Ver 1.18 developed by Institute of Health Systems (IHS), Hyderabad. The age at death approximated to identifying the midpoint of respective age intervals. YLL and YLD components were estimated in five age groups to reflect infancy and childhood, adolescence, adulthood, older adults and the elderly. The disability adjusted life year (DALY) estimates were carried out in five age groups (0-4, 5-14, 15-44, 45-59, and 60+ years). YLDs were computed from number of incident cases, and other descriptive epidemiology parameter estimates like age at death and duration. Role of local life table in burden of disease estimation was utilized to take stock of the demographic estimates that was required at different stages of disease burden.

Rural-Urban distribution of disease burden in desert of Rajasthan

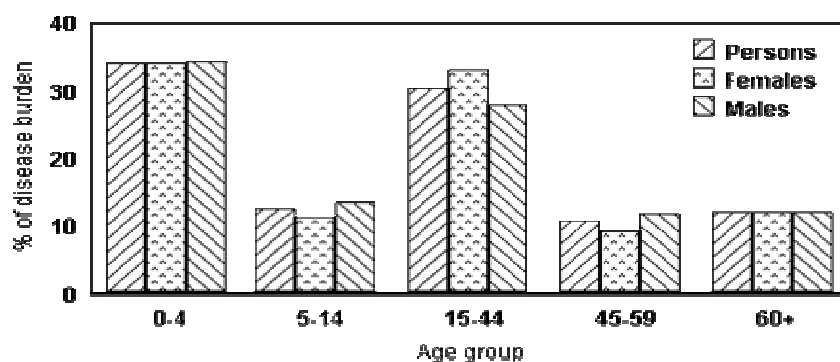
Total 18369287



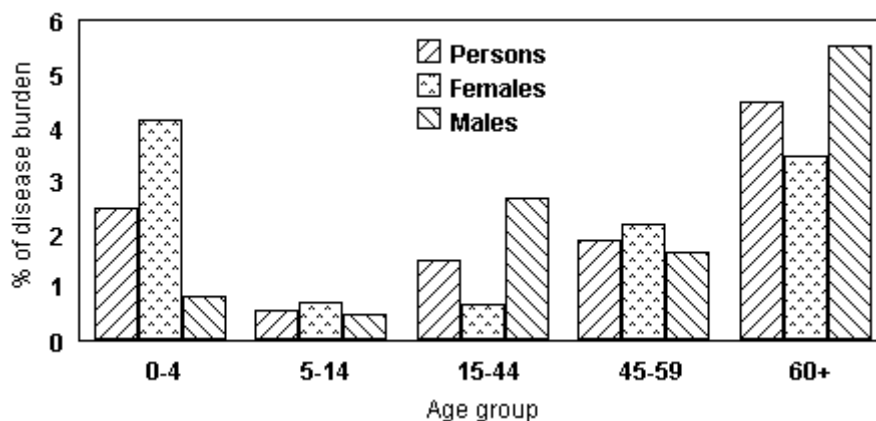
The above figure shows the rural-urban distribution of disease burden in the desert part of the state. About 76% of disease burden is estimated to be in the rural region. The rate of disease burden is also higher in the rural areas, where rate of loss is 300 DALYs / 1000 persons. In urban areas the rate of loss is 214 DALYs / 1000 persons.

Distribution of DALYs and YLL : YLD ratio by age sex groups

Age Distribution of DALYs lost in Rajasthan



YLL : YLD Ratio by age sex groups, Rajasthan



The figure about distribution of DALYs & YLL shows age-sex distribution of disease burden and the composition in terms of YLL : YLD ratios. A lot of disease burden is concentrated in infancy and early childhood. These are mostly due to premature mortality, as can be inferred from the high YLL to YLD ratio in this age group. Within the 0-4 year age group, girl infants and children are more vulnerable to death (YLL:YLD ratio = 4.14), whereas male infants and children live with disability (YLL to YLD ratio = 0.83). In adult age group of 15 to 44, the situation is reversed. Among those who suffer, females tend to live with disability and males are more vulnerable to death. Ten leading causes of burden in rural and urban areas of the state is given in Table 1. Six leading causes are common to both the areas. These are: (a) lower respiratory infections, (b) diarrhoea, (c) low birth weight, (d) ischaemic heart disease, (e) falls and (f) tuberculosis. Poor nutrition, lack of safe drinking water and sanitation are common risk factors for three of these, namely lower respiratory infection, diarrhoea, and low birth weight. Four of these (a, b, c, and f) are already included in various public health and disease control programs of the state. The results obtained here reinforce the desirability of strengthening of those programs.

Table 1. Leading causes of disease burden (DALY) in rural and urban areas of Rajasthan			
Rural: Cause	%	Urban: Cause	%
Lower Respiratory Infections	8.2	Falls	6.71
Diarrhoeal diseases	6.72	Low birth weight	6.12
Low birth weight	6.6	Lower Respiratory Infections	5.76
Ischaemic heart disease	6.07	Tuberculosis	5.12
Falls	5.23	Diarrhoeal diseases	4
Self-inflicted injury	4.02	Ischaemic heart disease	3.55
Tuberculosis	4.1	Fires	3.47
Cerebrovascular disease	2.34	Birth Asphyxia and birth trauma	3.21
Bacterial meningitis and meningococcaemia	2.17	Road accidents	2.74
Epilepsy	2.02	Unipolar major depression	2.71
Road accidents	2.03		
Residual cause groups with % burden higher than last cause included above:			
Other unintentional injuries	5.61	Other cardiac diseases	3.72
		Other unintentional injuries	3.68

Important Leads and Outcome

The exercises will use the disease burden information in one or more of the following ways: Rank ordering causes of disability, Magnitude of disease burden, Mortality-morbidity relationship and Age and sex distribution of disease burden. Lists of the main causes of ill health or its variants can be used to draw attention of policy planners to important health problems faced by the population in desert region of Rajasthan.

Household distribution of disease burden in community health management: A study in desert - A. K. Dixit and P. K. Anand.

Commencement: **October, 2005**

Duration: **Two Years**

Status: **Completed**

Objectives

1. Identification of the distribution of disease burden at household level
2. Identification of household level risk factors of disease burden
3. Locating the pockets of population needing prioritized health care attention

Rationale

A study was designed to read disease burden (DB) at household (H/H) level, which is basic unit in the community in which health of an individual is a function of all the other members of the H/H. The disease burden at H/H level is a newer concept used to account for overall burden of diseases (BOD) found at H/H. It sums BOD of all diseases identified among the members of the H/H at the time of visit of the H/H. The study aimed to look for physical, economical and social characteristics of the H/H and to correlate them with total disease burden (DB) at H/H in order to determine household level risk factors of disease burden. 898 H/H from 30 villages in Jodhpur district were surveyed following standard sampling procedures. . The associations of H/H characteristics with H/H level disease burden were measured in terms of Odds Ratio (OR), using median of the distribution of H/H level disease burden as cut off point to decide upon the H/H, carrying more disease burden.

Progress of the work done

With an ultimate aim of the project to find ways to reduce the H/H DB; it was necessary to analyze the interaction of study factors in giving rise to H/H DB. Using multiple linear regression, contribution of each factor towards enhancing H/H DB was first determined. The concentration then has been on each level of the factors. To apprehend the current scenario, in this respect; the modal values of the levels of factors were read. The correlations of change in levels of factors with change in DB were obtained together with the slope in regression module. DB classes were formed as per low, medium and high DB range and within each class, the change in levels of factors was studied. Based on multiple regression and OR values worked out earlier, the modifiable factors to address DB in the community were identified. These help in identification of H/H needing prioritized attention. The interaction between levels of factors in each defined class of DB was studied.

Observations

All the study factors when put under multiple regression model with DB as dependent variable, yielded $R^2 = 14.36\%$. This shows that apart from the study variables, DB at H/H level is influenced with other factors. However, the factors under study certainly account for around 15% variation in DB.

The individual contribution of each factor under study is given in table 1. Though the Education is at the top but 30% contribution is accounted by the factors living area, cattle keeping and drinking water usage. These are well modifiable attributes and they have also figured in identified risk factors in terms of odds ratio (OR) earlier.

Table 2 presents the current scenario of factor level i.e. the most prevalent factor levels, which has gives average DB/HH as 1.0439 in the study area.

Table 3 presents the correlation and the slope values of these variables in simple linear regression mode. Each entry in this table is negative i.e. with increasing DB, speaking in general; each factor should tend to its lowest level.

Table 4 gives average change in levels of each factor in three defined classes of DB, based on its distribution. These figures simply reflect that a general statement made earlier that to address H/H DB, each factor under study should brought to its lowest is not of much importance. In fact if it is increase in factor level of some variable e.g. type of house from 1.05 to 1.18 in class I to II; it is a decrease from 1.18 to 1.06 in class II to III. The pattern of such changes encouraged to study interacting patterns of the factors, which is read through tables 5 & 6, and entails much importance in addressing H/H DB easily.

Table 5 presents two classes of DB and the modal values of levels of three identified modifiable variables viz. living area, cattle keeping and drinking water use. It is quite interesting to note from this table that, whereas level pattern (2,1,2) is mostly responsible for average DB of 5.646, level pattern (1,1,2) is responsible for average DB of .084 i.e. a high reduction in DB if only level 2 of the factor, living area is brought to level 1.

Outcome

The study puts three easily modifiable factors to address DB at H/H level. These factors viz. the living area, the cattle keeping and the drinking water usage account for 30% contribution in explaining the variations in DB, as compared to the variation explained by all the factors taken together, which is noted from table 1. We note from table 2 that in maintaining average level DB, living area and cattle keeping are just one level up from their lowest, whereas drinking water use is of course two level up. Though the usual regression provided an impression, as seen from table 3 that in order to lower the DB, each factor should be brought to its lower level, however studying the interactions between the levels of the factors, we get much easier way to address H/H DB. Table 4 provides the clue that levels of factors may increase or decrease in their interactive role in giving rise to DB. For the three factors identified, the interaction studied between levels of a factor with the other are presented in tables 5 and 6. From table 5, it can be seen that there is high reduction in

average DB per H/H; when living area is brought one level lower, even with levels of the other two factors unchanged. This provides the easier way to address DB in the community. Table 6 ultimately identifies the H/H carrying bigger load of DB in terms of factor levels and attracts for a prospective study to be taken to look for actual reduction in DB in time through addressing the identified level pattern of the three factors at desired level.

Important Leads

The study of interactive pattern of factors influencing DB at H/H identifies the H/H which requires prioritized attention and envisages a study, prospective in nature, to see for the magnitude of actual reduction in DB along with the time, through addressing the identified interactive pattern to a desired level. The results once confirmed through the prospective study, would help in devising easier ways to address DB in community.

Table 1. Individual contribution of study factors in terms of R in multiple regression module

Factor	Contribution (%)	Over all R ² (%)
Education level	59	14.36
Cattle keeping	24	
Drinking Water	5	
Social status	3	
Provision of Elect.	5	
Type of house	2	
Living area	2	
Total	100	

Table 2. Modal values of factor levels describing average disease burden per H/H

Factor	Modal value	Frequency(H/H %)	Av. DB per H/H
Type of House	2	403 (44.87)	1.049
Living area	1	497 (55.34)	
Provision of Elect.	0	489 (54.45)	
Cattle keeping	1	586 (65.25)	
Education level	3	201 (22.38)	
Social status	0	706 (78.61)	
Drinking Water	2	632 (70.37)	
Sanitation	0	682 (75.94)	

Table 3. Correlation and regression of study factors with disease burden per H/H

Factor	Correlation (r)	Slope (m)
Type of House	-.021	-0.111
Living area	-.016	-0.119
Provision of Elect.	-.007	-0.117
Cattle keeping	-.036	-0.283
Education level	-.036	-0.101
Social status	-.035	-0.293
Drinking Water	-.025	-0.212
Sanitation	-.028	-0.322

Table 4. Change in average level of factors as per change in disease burden classes

Factor	Disease Burden Classes		
	I	II	III
	Average level of factors		
Type of house	1.05	1.18	1.06
Living Area	1.41	1.48	1.43
Electricity	.44	.52	0.51
Cattle keeping	.79	.82	0.72
Education	2.58	2.42	2.57
Social Status	.29	.30	0.25
Drinking Water	1.64	1.75	1.98
Sanitation	.24	.20	0.26

Table 5. Factor interaction pattern as per defined disease burden categories

Disease Burden Class	Factor Levels				
Factors	Living Area	Cattle	Drinking water usage	Frequency (H/H)	Av. DB/HH
Low	1	1	2	163	0.84
High	2	1	2	34	5.646

Table 6. Factor interaction patterns describing average disease burden per H/H

Factor Levels			
Living Area	Cattle	Drinking Water	Av. DB/HH
0	0	0	0
1	2	2	0
1	1	2	0.84
2	1	1	5.43
2	1	2	5.65
2	0	1	14.30

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Scientific Events Organized

1. 7th Joint Conference of ISMOCD & IAE

7th Joint Conference of ISMOCD & IAE was organized from 27th to 29th October, 2007 in view to discuss the implications of rapid changes in living conditions and life style due to increasing economic growth and associated developmental activities, which in turn may be responsible for significant rise in non-communicable diseases world wide, whereas, the dual burden of long standing communicable and upcoming non-communicable diseases in developing countries. The immediate objective of this conference was to identify the agenda for the investment in public health for the health security and quality of life, which would not only help in improvising the ongoing national health programmes but also define the directions of future community oriented eco-conscious interventional strategies.

2. Brain Storming Session on Desert Health

A brain storming session on desert health was organized from 28th to 29th September, 2007 with local participating institutes and other experts with the objectives to strengthen linkages between different institutes and agencies involved in health research in desert areas by coming together at a common platform, a broad-spectrum analysis of the desert health problems keeping in view the social, cultural and geographical aspects of the desert and to strengthen the scientific and technical know-how of various health issues collectively through interactions, networking and resource sharing. The group came out with certain recommendations on various issues of desert health and their redressal by researchers, public health specialists and administrators for undertaking individual and collaborative search projects for betterment of health.

As a follow up action a Workshop on 'Prioritizing the areas of Desert Health and strategies to implement' was also organized on 13th January 2008.

3. Workshop on Right to Information

Centre organized a workshop on 'Right to Information' on 21-22 April, 2007 with the faculty support from Institute Secretariat Training & Management, Govt. of India, New Delhi and the participants from different ICMR and local institutes and ICMR headquarter attended the workshop.

4. Training

Training for Medical Officers, Entomologists and Technicians of Jodhpur zone, Department of Health & Family Welfare, Govt. of Rajasthan was organized from 28-29th July and 4th-5th August, 2007. A 'Refresher Training Course for Laboratory Technicians', sponsored by State Health Society (NVBDCP), Government of Rajasthan, was organized in three batches from 24th March to 11th April, 2008.

^तेतु

3- fgUnh dk;!'kkyk



केन्द्र के कर्मचारियों में राजभाषा हिन्दी में और अधिक कार्य करने की अभिरुचि बढ़ाने के लिए समय-समय पर केन्द्र में हिन्दी कार्यशालाओं का आयोजन किया जाता है। इस वर्ष दिनांक 19 सितम्बर, 2007, 14 दिसम्बर, 2007 तथा 28 मार्च, 2008 को इन कार्यशालाओं का आयोजन किया गया। इन कार्यशालाओं में विषय-विशेषज्ञ हिन्दी के प्रयोग को सहज बनाने हेतु, अपने अनुभवों से लाभान्वित करते हैं। ये कार्यशालाएं राजभाषा के अनुप्रयोग में अत्यंत उपयोगी रही हैं।

4- fgUnh llrkg



हिन्दी सप्ताह का आयोजन राजभाषा हिन्दी में काम करने के लिए याद दिलाता है। इस वर्ष भी केन्द्र में दिनांक 14-21 सितम्बर, 2007 को हिन्दी सप्ताह पूरे उत्साह एवं हर्षोल्लास के साथ मनाया गया। इसमें केन्द्र के सभी अधिकारियों व कर्मचारियों ने मिल जुलकर भाग लिया। इस दौरान प्रतिदिन कई प्रतियोगिताओं का आयोजन किया गया जैसे श्रुतिलेख प्रतियोगिता, सुलेख प्रतियोगिता, हिन्दी टिप्पण प्रतियोगिता, पत्र लेखन प्रतियोगिता, निबंध प्रतियोगिता, कार्यालय शब्दावली ज्ञान प्रतियोगिता, शुद्ध हिन्दी वार्ता, वाद-विवाद प्रतियोगिता, कविता-पाठ प्रतियोगिता, प्रश्न-मंच प्रतियोगिता तथा अंताक्षरी प्रतियोगिता। जोधपुर नगर की नगर राजभाषा कार्यान्वयन समिति के अध्यक्ष एवं मण्डल रेल प्रबन्धक श्री सुनील कुमार सूद ने इन प्रतियोगिताओं के विजेताओं को स्मृति चिन्ह प्रदान कर पुरस्कृत किया। साथ ही राजभाषा विभाग, गृह मंत्रालय की प्रोत्साहन योजना के अनुसार सरकारी कामकाज में हिन्दी का अधिक प्रयोग करने वाले कर्मचारियों को भी नकद पुरस्कार से सम्मानित किया।

5- dUn: dh jk tHkk"kk dk; kUo; u lfe fr dh cBd:

नियमित रूप से केन्द्र के निदेशक की अध्यक्षता में केन्द्र की राजभाषा कार्यान्वयन समिति की बैठकों का आयोजन किया जाता है। इन बैठकों में राजभाषा हिन्दी में हो रहे कार्यों की समीक्षा व गृह मंत्रालय, राजभाषा विभाग, भारत सरकार द्वारा प्रतिवर्ष जारी वार्षिक कार्यक्रम व उसके अनुपालन आदि पर चर्चा की जाती है। इस समिति के सदस्य हैं :

1. डॉ. बेला शाह – अध्यक्ष
2. डॉ. शेषपाल यादव – सदस्य
3. डॉ. मधुबाला सिंह – सदस्य
4. डॉ. आशुतोष कुमार दीक्षित – सदस्य
5. श्री अनूप सरीन – सदस्य
6. श्री राजकुमार कालुंधा – सदस्य
7. श्री रोहित प्रसाद जोशी – सदस्य
8. कृ. कंचन बाला – सचिव

6- iLdky; e: miyC/k fgUnh iLrd:

गृह मंत्रालय, राजभाषा विभाग, भारत सरकार द्वारा जारी वार्षिक कार्यक्रम में हिन्दी पुस्तकों की खरीद के निर्धारित लक्ष्यों को ध्यान में रखते हुए केन्द्र में प्रतिवर्ष ज्ञान-विज्ञान, साहित्य से संबंधित हिन्दी की पुस्तकें खरीदी जा रही हैं। वर्ष 2005-06 में 14,009/- रूपए, वर्ष 2006-07 में 15,902/- रूपए तथा वर्ष 2007-08 में 17,412/-रूपए की हिन्दी पुस्तकें खरीदी गईं। केन्द्र के पुस्तकालय में उपलब्ध इन पुस्तकों का केन्द्र के सभी वर्ग के कर्मचारी लाभ उठा रहे हैं।

dUn: dh oc lkbV e: fgUnh dk i; kx

दिनांक 24 दिसम्बर, 2006 को केन्द्र की वेबसाइट (www.dmrjodhpur.org) का शुभारंभ हुआ। इस वेबसाइट में केन्द्र की वैज्ञानिक गतिविधियों के साथ-साथ केन्द्र में राजभाषा हिन्दी के अनुप्रयोग व उपलब्धियों की वार्षिक रिपोर्ट का भी समावेश किया गया है।

7- fgUnh e: mUke dk; l d fy, dUn: dk yxkrkj pkFkh ckj i jLdkj



केन्द्र में राजभाषा के उत्कृष्ट अनुपालन के लिए लगातार प्रयास किए जाते रहे हैं। हमारे इन्हीं प्रयासों को सराहते हुए जोधपुर नगर की नगर राजभाषा कार्यान्वयन समिति ने इस केन्द्र को लगातार चौथी बार पुरस्कृत किया है। इस वर्ष केन्द्र को दिनांक 20 नवम्बर, 2007 को प्रथम पुरस्कार के रूप में चल-वैजयंती व प्रमाण पत्र प्रदान किए गए। चाहे वह आयुर्विज्ञान अनुसंधान हो अथवा राजभाषा अनुपालन; केन्द्र ने अपने कार्यों में निरन्तर प्रगति करते हुए एक पहचान अर्जित की है जिसे बनाए रखने के लिए हम कृतसंकल्प हैं।

fo 'k'k

if'k{k.k dk; Øe e fgUhh dk i; kx



केन्द्र में प्रयोगशाला तकनीशियनों के लिए पुनश्चर्या प्रशिक्षण पाठ्यक्रम का आयोजन किया गया। यह कार्यक्रम बीकानेर के लिए दिनांक 24 से 28 मार्च, 2008 तक आयोजित किया गया जो कि स्टेट हैल्थ सोसाइटी (राष्ट्रीय वैक्टरजनित रोग नियंत्रण कार्यक्रम), राजस्थान सरकार द्वारा प्रायोजित था। प्रशिक्षण का संपूर्ण कार्यक्रम हिन्दी में किया गया एवं इसमें प्रयुक्त प्रश्नावलियों में हिन्दी का प्रयोग किया गया। साथ ही मलेरिया नियंत्रण में सूक्ष्मदर्शिकी की भूमिका, सूक्ष्मदर्शी एवं उसका रखरखाव, मलेरिया परजीवी का जीवनचक्र और उसकी आकृति, मानवीय रक्त में उपस्थित तत्व, रक्त आलेप की तैयारी, अभिरंजन एवं परीक्षण, प्रयोगशाला की जैव-सुरक्षा इत्यादि जैसे महत्व पूर्ण विषयों को भी व्यवहारिक प्रदर्शन देते हुए सरल हिन्दी भाषा में समझाया गया। कार्यक्रम के आयोजन में केन्द्र के वैज्ञानिक ई. डॉ. कर्मवीर सिंह व डॉ. शिव कुमार बंसल की मुख्य भूमिका रही।

vu | /kku ifj; k tukvk e fgUhh dk i; kx

केन्द्र में सभी प्रकार के फार्म हिन्दी या द्विभाषीय रूप में तो प्रयोग किए ही जा रहे हैं; साथ ही, केन्द्र में चल रही विभिन्न अनुसंधानिक परियोजनाओं में प्रयुक्त प्रश्नावलियाँ/पोस्टर आदि का प्रयोग भी हिन्दी में किया जा रहा है, यथा र्यूमेटिक बुखार तथा र्यूमेटिक हृदय रोग की रोकथाम हेतु भारतीय आयुर्विज्ञान अनुसंधान परिषद का जय विज्ञान मिशन मोड प्रोजेक्ट; भारतीय आयुर्विज्ञान अनुसंधान परिषद द्वारा अस्थिपेशीय स्थिति पर सर्वेक्षण; सूक्ष्मपोषक कमी विकार परियोजना के परिणामों के आधार पर राजस्थान के मरुस्थलीय क्षेत्र में पोषक पैकेज विकसित करने तथा गर्भवती एवं स्तनपान करानेवाली महिलाओं पर इसके प्रभाव का मूल्यांकन; विद्यालय आयु वर्ग के बच्चों में आयोडिन कमी; नवजात शिशुओं की अस्वस्थता, मरणशीलता व उनकी पोषण स्थिति; राजस्थान के राइका समुदाय पर अध्ययन; समन्वित रोग निगरानी परियोजना (आई.डी.एस.पी.) के घटक के रूप में मलेरिया निगरानी का विवरण एवं मूल्यांकन आदि।

Workshops/Conferences/Symposia/Scientific meetings attended by the scientists

Dr. K. R. Haldiya, Scientist F

- Attended brain-storming session on 'Desert Health' held on 28-29th September, 2007, at DMRC, Jodhpur.
- Attended 7th Joint Annual Conference ISMOCD & IAE held from October 27-29, 2007 at DMRC, Jodhpur and presented a paper on 'Study of life style related risk factors for cardiovascular disease in rural population of Indian desert'.
- Attended Workshop on 'Prioritizing the areas of Desert Health and strategies to implement' held on 13th January, 2008 at DMRC, Jodhpur.

Dr. Vinod Joshi, Scientist F

- Delivered two expert lectures on dengue in WHO sponsored training programme on dengue on 29-30th July, 2007 at DMRC, Jodhpur.
- Delivered expert lecture entitled "Surveillance, Monitoring and Manpower development of dengue" on 4th August, 2007, in WHO sponsored training on dengue at DMRC, Jodhpur.
- Attended brain-storming session on 'Desert Health' held on 28-29th September, 2007, at DMRC, Jodhpur.

Dr. M. L. Mathur, Scientist F

- Attended brain-storming session on 'Desert Health' held on 28-29th September, 2007, at DMRC, Jodhpur.
- Attended 7th Joint Annual Conference ISMOCD & IAE held from October 27-29, 2007 at DMRC, Jodhpur and presented a paper on 'Study of three medicinal plants on in-vitro growth of *Mycobacterium tuberculosis*, India'.
- Attended Workshop on 'Prioritizing the areas of Desert Health and strategies to implement' held on 13th January, 2008 at DMRC, Jodhpur.
- Attended International Microbicides 2008 Conference Organized by Indian Council of Medical Research from 24th to 27th February, 2008 at New Delhi.

Dr. Raman Sachdev, Scientist E

- Attended brain-storming session on 'Desert Health' held on 28-29th September, 2007, at DMRC, Jodhpur.
- Attended 7th Joint Annual Conference ISMOCD & IAE held from October 27-29, 2007 at DMRC, Jodhpur and presented a paper on 'Pulmonary lesions in radiographs of the residents of a fluoride endemic zone'.
- Attended Workshop on 'Prioritizing the areas of Desert Health and strategies to implement' held on 13th January, 2008 at DMRC, Jodhpur.

Dr. Karam V. Singh, Scientist E

- Attended National Conference on Parasitic Diseases 'Emerging parasitic diseases and their control in the new millennium' organized by Janardhana Foundation, from 13-15th April, 2007 at Bangalore and presented a paper on 'Larvicidal activity of an organic by- product against important mosquito vector species'.
- Attended brain-storming session on 'Desert Health' held on 28-29th September, 2007, at DMRC, Jodhpur.
- Attended 7th Joint Annual Conference ISMOCD & IAE held from October 27-29, 2007 at DMRC, Jodhpur and presented a paper on 'Vector biological studies of *Phlebotomus papatasi* in relation to climatological and socio-demographical factors in semi-arid areas of Rajasthan'.
- Attended Workshop on 'Prioritizing the areas of Desert Health and strategies to implement' held on 13th January, 2008 at DMRC, Jodhpur.
- Attended 'International Workshop on Insecticide Resistance', organized by National Institute of Malaria Research, on 14th February 2008 at Puri (Orissa).
- Attended IX International Symposium on Vectors and Vector borne diseases held from 15-17th February, 2008 at Puri, Orissa and presented a paper on 'Indoor residual spray and insecticide resistance among malaria vectors in Rajasthan: Current Scenario'.

Dr. S. K. Bansal, Scientist E

- Attended and presented a paper on 'Efficacy of different synthetic insecticidal compounds to larvae of three mosquito species in the arid region' In National Conference on Parasitic Diseases 'Emerging parasitic diseases and their control in the new millennium' organized by Janardhana Foundation, from 13-15th April, 2007 at Bangalore.

- Attended brain-storming session on 'Desert Health' held on 28-29th September, 2007, at DMRC, Jodhpur
- Attended and presented a paper on 'Evaluation of the larvicidal efficacy of *Solanum xanthocarpum* after different period of storage against important vector mosquitoes in the arid region' in 7th Joint Annual Conference ISMOCD & IAE held from October 27-29, 2007 at DMRC, Jodhpur.
- Attended 'Workshop on 'Prioritizing the areas of Desert Health and strategies to implement' held on 13th January, 2008 at DMRC, Jodhpur.
- Attended International Workshop on Insecticide Resistance', organized by National Institute of Malaria Research, on 14th February, 2008 at Puri (Orissa).
- Attended and presented a paper on 'Larvicidal activity of the extracts from different parts of the plant *Solanum xanthocarpum* against important mosquito vectors in the arid region' in the International Symposium on Vectors and Vector borne diseases held from 15-17th February, 2008 at Puri, Orissa.

Dr. S. P. Yadav, Scientist E

- Attended brain storming session on 'Desert Health' held on 28-29th September, 2007, at DMRC, Jodhpur.
- Attended and presented a paper on 'A study of self treatment of malaria in rural desert of Rajasthan, India' in 7th Joint Annual Conference ISMOCD & IAE held from October 27-29, 2007 at DMRC, Jodhpur.
- Attended Workshop on 'Prioritizing the areas of Desert Health and strategies to implement' held on 13th January 2008 at DMRC, Jodhpur.
- Attended an 'International Workshop on Insecticide Resistance', organized by National Institute of Malaria Research, on 14th February 2008 at Puri (Orissa).
- Attended and presented a paper on 'Human behaviour and malaria in desert' in the International Symposium on Vectors and Vector borne diseases held from 15-17th February, 2008 at Puri, Orissa.

Dr. Madhu B. Singh, Scientist E

- Attended and presented a paper on 'Dietary intake and its association with anemia among pregnant and lactating women of desert areas of western Rajasthan, India in 7th Joint Annual Conference ISMOCD & IAE held from October 27-29, 2007 at DMRC, Jodhpur.

- Attended and presented a paper on 'Iron Deficiency Anemia and Iodine Deficiency Disorder along with related factors among pregnant and lactating women of Jodhpur, desert district of Rajasthan '39th National Conference of NSI' from 15th to 17th November, 2007 at National Institute of Nutrition, Hyderabad.
- Attended /Taken Training for estimation of serum retinol for Vitamin A deficiency using HPLC Technique from Dr. Shakir Ali, Head, Department of Biochemistry, Faculty of Science from 3rd to 7th December, 2007 at Jamia Hamdard (Hamdard University), Delhi.
- Attended brainstorming session on 'Desert Health' held on 28-29th September, 2007, at DMRC, Jodhpur.
- Attended Workshop on 'Prioritizing the areas of Desert Health and strategies to implement' held on 13th January, 2008, at DMRC, Jodhpur.
- Attended the International Symposium on Vectors and Vector borne diseases held from 15-17th February 2008 at Puri, Orissa.
- Attended International Microbicides 2008 Conference Organized by Indian Council of Medical Research from 24th to 27th February 2008 at New Delhi.

Dr. A.K. Dixit, Scientist E

- Attended and presented a paper on 'A study of behavior of ORMH under systematic sampling' in 7th Joint Annual Conference ISMOCD & IAE held from October 27-29, 2007 at DMRC, Jodhpur.
- Attended brain storming session on 'Desert Health' held on 28-29th September, 2007 at DMRC, Jodhpur.
- Attended Workshop on 'Prioritizing the areas of Desert Health and strategies to implement' held on 13th January, 2008, at DMRC, Jodhpur.

Dr. J. Lakshminarayana, Scientist D

- Attended a training on 'protocol development for Cochrane database' from 26-28th June, 2007 held at CMC, Vellore, Chennai.
- Attended a WHO training programme for medical officer and technicians on Dengue and DHF held at Desert Medicine Research Centre during 28th & 29th July, 2007.

- Attended brainstorming session on 'Desert Health' held on 28-29th September, 2007, at DMRC, Jodhpur.
- Attended and presented a paper on 'A Systematic Review and Meta Analysis of Intervention Studies of Malaria' in 7th Joint Annual Conference ISMOCD & IAE held from October 27-29, 2007 at DMRC, Jodhpur.
- Attended, and presented a paper on 'Testing and adjusting for publication bias in meta analysis for Vitamin A studies' in ISMS Silver jubilee conference held at Manipal university, Dept. Biostatistics MAHE, Karnataka during 30th November-2nd December, 2007.
- Attended Workshop on 'Prioritizing the areas of Desert Health and strategies to implement' held on 13th January, 2008, at DMRC, Jodhpur.

Dr. R. Fotedar, Scientist C

- Attended and presented a paper on 'Morbidity pattern and Chronic Energy deficiency among the working women of Jodhpur city, India in 7th Joint Annual Conference ISMOCD & IAE held on October 27-29, 2007 at DMRC, Jodhpur.
- Attended Workshop on 'Prioritizing the areas of Desert Health and strategies to implement' held on 13th January, 2008, at DMRC, Jodhpur.

Dr. Manju Singhi, Scientist B

- Attended workshop on Conservation, Assessment and Management prioritization (CAMP) for medicinal plants of Rajasthan organized by Rajasthan Forest Department & Foundation for revitalization of local health traditions, Bangalore at Forestry Training Institute, Jaipur from 10-13th September, 2007.

Dr. P. K. Dam, Technical Officer

- Attended Global Health Forum at Beijing, Peoples Republic of China, from 29-10-2007 to 01-11-2007, and presented a paper entitled 'Equitable distribution of health care measures in India: The need for integration of social parameters with disease control measures'.

Scientists and Staff

Dr. Bela Shah, MD
Officer-in-Charge

A. SCIENTISTS

1. Dr. K. R. Haldiya, Scientist-F
2. Dr. Vinod Joshi, Scientist-F
3. Dr. M. L. Mathur, Scientist-F
4. Dr. Raman Sachdev, Scientist-E
5. Dr. Karam Vir Singh, Scientist-E
6. Dr. S. K. Bansal, Scientist-E
7. Dr. S. P. Yadav, Scientist-E
8. Dr. (Mrs.) Madhu B. Singh, Scientist-E
9. Dr. A. K. Dixit, Scientist-E
10. Dr. J. Lakshminarayan, Scientist-D
11. Dr. (Mrs.) Ranjana Fotedar, Scientist-C
12. Dr. (Mrs.) Manju Singhi, Scientist-B
13. Dr. P. K. Anand, Scientist-B

B. TECHNICAL STAFF

1. Dr. P. K. Dam, Technical Officer
2. Sh. Raj Kumar Kalunda, Technical Officer
3. Sh. Manjeet Singh, Technical Officer
4. Dr. Himmat Singh, Research Assistant
5. Sh. Anil Purohit, Research Assistant
6. Sh. Rajneesh Kumar, Lab. Technician
7. Sh. S. K. Dhawal, Lab. Technician
8. Sh. Ramesh Chandra, Lab. Technician
9. Sh. Pooranmal Meena, Lab. Technician
10. Sh. Colvin Sunil Singh, Lab. Technician
11. Sh. Rohit Prasad Joshi, Lab. Technician
12. Sh. Rajendra Chouhan, Lab. Assistant
13. Sh. Nivesh Bhardwaj, Lab. Assistant

C. MINISTERIAL STAFF

1. Sh. Subhash Chander Sharma, Administrative Officer
2. Sh. Anup Sarin, Accounts Officer
3. Sh. S. K. Lotan, Section Officer
4. Sh. Narender Bajaj, Section Officer
5. Smt. Neelam Devi, Assistant
6. Sh. Dharampal, Assistant
7. Sh. Rajendra Singh, Assistant
8. Sh. Shamshad Ali, U.D.C.
9. Smt. Chandra Kala, U.D.C.
10. Sh. Mahesh Chand Pargi, U.D.C.
11. Sh. Yesh Pal Singh, U.D.C.
12. Sh. Ram Niwas, L.D.C.
13. Sh. Nand Kishore, L.D.C.
14. Smt. Kanchan Bala, Junior Hindi Translator
15. Sh. Joginder Singh, Stenographer
16. Sh. Jaideep Gaur, Hindi Typist

D. SUPPORTING STAFF

1. Sh. Babu Lal, Driver
2. Sh. Mangu Singh, Driver
3. Sh. Raghunath Singh, Driver
4. Sh. Mohammed Gaffar, Driver
5. Sh. Ishwar Khetani, Driver
6. Sh. Manohar Singh, Driver
7. Sh. Rana Ram, Driver
8. Sh. Banwari Lal, Lab. Attendant
9. Sh. Shridhar Bohra, Lab, Attendant
10. Sh. Lal Chand Bandra, Lab. Attendant
11. Sh. Raghunath Bisht, Animal Attendant
12. Sh. Babu Lal Bunker, Animal Attendant

13. Sh. Mahaveer Prasad, Animal Attendant
14. Sh. Satya Prakash, Animal Attendant
15. Sh. Mahesh Chand Sharma, Attendant
16. Smt. Laxmikanta, Attendant
17. Sh. Khushal Singh, Attendant
18. Sh. Jodha Ram, Attendant
19. Sh. Ram Lal, Peon
20. Sh. Ladu Ram, Peon
21. Smt. Sohni Devi, Peon
22. Smt. Sua Devi, Sweeper

E. PROJECT STAFF

❖ Development of molecular and genetic markers of dengue vectors species in Rajasthan, India

1. Ms. Kirti Sharma, Senior Research Fellow
2. Ms. Bennet Angel, Junior Research Fellow
3. Sh. Achlesh Sharma, Lab. Cum Field Assistant

❖ Evaluation of Immunization Coverage against Vaccine Preventable Diseases in Western Rajasthan

1. Sh. Oma Ram Choudhary, Field Investigator
2. Ms. Vandana Purohit, Field Investigator
3. Ms. Sapna Sharma, Field Investigator
4. Ms. Namarta Singh, Field Investigator
5. Ms. Neetu Parihar, Field Investigator
6. Mrs. Manita Choudhary, Field Investigator
7. Sh. Kailash Chandra, Field Investigator
8. Sh. Pukhraj Thapar, Field Investigator
9. Sh. Ram Kishor, Field Investigator
10. Sh. Piyush Raj Joshi, Field Investigator
11. Sh. Mithun Khandelwal, Field Investigator
12. Sh. Mohd. Kasim, Field Investigator

❖ **Jai Vigyan Mission Mode Project on Control of Rheumatic Fever and Rheumatic Heart Diseases in Jodhpur District**

1. Dr. Ramesh Sharma, Medical Officer
2. Sh. Chandra Prakash Joshi, Field Investigator
3. Ms. Jyoti Gaur, Field Investigator
4. Ms. Priti Purohit, Computer Data Operator
5. Ms. Ruchika Sharma, Field Investigator

❖ **Epidemiology of Musculoskeletal conditions in India**

1. Ms. Hemlata Chouhan, Senior Research Fellow
2. Ms. Shewta Mathur, Senior Research Fellow
3. Ms. Sapna Sharma, Field Investigator
4. Ms. Namarta Singh, Field Investigator
5. Mrs. Manita Choudhary, Field Investigator
6. Sh. Piyush Raj Joshi, Field Investigator
7. Sh. Mohd. Kasim, Field Investigator
8. Sh. Oma Ram Choudhary, Field Investigator

DMRC Activities 2007-08: A Pictorial View



16th Scientific Advisory Committee Meeting of the Centre, April, 19-20, 2007



Workshops on Dengue organized on July 28-29 and on August 4-5, 2007



Independence Day Celebration 2007



Brain Storming Session on Desert Health - September 28-29, 2007



7th Joint Conference of Indian Society of Malaria and other Communicable Diseases (ISMOCD) & Indian Association of Epidemiologists (IAE)- October 27-29, 2007



Ethics Committee Meeting of the Centre – December 28, 2007



Workshop on “Prioritizing Areas of Desert Health and Strategies to Implement” organized on 13th January, 2008



Visit of Sh. Sanjeev Dutta, Finance Advisor, ICMR, to DMRC- 20th January, 2008



Scientific Advisory Group Meetings – January 22 & 24, 2008



Republic Day Celebration 2008



Visit of Padambhushan Prof. N. K. Ganguly, Former Director General, ICMR on 27th January 2008



17th Scientific Advisory Committee Meeting of the Centre- March 17-18, 2008



***Dr. R. C. Sharma, Officer-in-Charge, superannuated on January 31, 2008.
He blessed DMRC family on January 25, 2008***



Construction Work of Laboratories and Allied Buildings of DMRC- In Progress