FIELD PROJECT REPORTS

BY

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MAE – FETP Scholar, 2007-2008

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF APPLIED EPIDEMIOLOGY (M.A.E.)

OF

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY, THIRUVANANTHAPURAM – 695011, INDIA

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(INDIAN COUNCIL OF MEDICAL RESEARCH),
R-127, Tamilnadu Housing Board Phase I and II, Chennai, 600 077

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This is to certify that all the field projects submitted in this Bound Volume are original work, done by Dr. P.K.Anand during the first two field postings of six months each under the guidance of faculty of National Institute of Epidemiology (ICMR), Chennai and the local supervisor specially nominated for this purpose. This is in partial fulfillment of the requirements for the degree of Master of Applied Epidemiology and has not been submitted earlier, in part or whole, for any other (Publication or degree) purpose.

Director

National Institute of Epidemiology

Dated: 30.1.17

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Date : 31 /12/2008 Dr. P.K.Anand

Place: Chennai

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SECTION 1:

FIRST FIELD POSTING

SITUATIONAL ANALYSIS OF DISTRICT JODHPUR, RAJASTHAN, INDIA, 2007

P.K.Anand, R.Ramakrishnan

Introduction

Before joining the MAE-FETP course I was working as Research Officer in Desert Medicine Research Centre, Jodhpur, Rajasthan, India. My job functions included working in institutional research projects funded either extramurally or intramurally, to associate in planning, presentation, execution, reporting and publishing of research projects of Desert Medicine Research Centre. I was also entrusted with writing of research proposal individually, particularly of public health importance of Desert. Presentation of papers & abstracts, prepared out of completed projects was one of the important activities of my duty. Health situational analysis of district Jodhpur was the first field assignment given under field Epidemiology training programme. Situational analysis has the important role to describe the district in terms of health and its related characteristics. The study provides insight about the organization of health system, its capabilities, responsibilities and limitations at local level.

Objectives

The objectives of the present study were

1. to describe geography, population, economic resources of the district Jodhpur, Rajasthan
2. to understand and collect information about the organization of health system
3. to understand major public health priorities of area
4. to present status related with millennium development goals
5. to present status about the laboratories for laboratory surveillance.

Methodology

During study of situational analysis of Jodhpur, information on health system was collected from Health department, statistical department, local administration, and other offices. Print and electronic literature and reports were also consulted.

We described geographical, demographic, socio-economic characteristics, important health related millennium development goals indicators (such as prevalence and death rate associated with tuberculosis, infant mortality rate, maternal mortality ratio per 100,000 live birth, measles immunization among children under one, under-five mortality rate per 1000 children, percent of children under age 0-3 months on exclusively breast fed, percentage of children 12-59 month of age who received one dose of vitamin A in the past six months, couple protection rate), organizational set up of the health system and laboratory setup in state and district, major public health priorities with flow chart in context of the district Jodhpur, Rajasthan, India.

Data Sources

Offices of Joint Director (Health Services) Jodhpur Zone, Jodhpur, Chief Medical and Health Officer, Jodhpur, Reproductive and Child health officer, Jodhpur, Deputy Director ICDS, Jodhpur, District statistical officer, Jodhpur consulted for respective data. S.N. Medical college Jodhpur and associated hospitals, different laboratories and hospitals along with libraries of esteemed institutes were also visited. We discussed about the status of millennium development goals, public health priorities and health infrastructure existing in district. Different health care facilities such as medical college, district hospitals, sub-divisional hospitals, satellite hospitals, dispensaries, laboratories, block primary health centers, community health centers, primary health centers, sub centers visited to discuss about the existing public health priorities, concerned persons interviewed about the health system, prevention and control programmes for public health priorities, and reporting and surveillance formats.

getting information about the location, climate, geography, public health priorities and programmes and Millennium Development goals.

Data collection

Data on the geography, climate, population, organization setup of health care delivery system and laboratory facilities available in district, public health priorities and their prevention and control programme, and millennium development goals searched and collected through interview, official publications, books and Internet.

Consultation also made with various reports published at state and district level by Desert Medicine Research Centre, Jodhpur, fact sheet Rajasthan, National Family Health Survey-3, World health statistics-basic indicators-India, Census-2001.The reports included (1) Annual reports of Desert Medicine Research Centre, Jodhpur (2) Census data, 2001 (3) Millennium development goals, India country profile, world bank and (4) The World Health Report, 2004 (5) Offices of health facilities and associated departments(5) Report on situational analysis of malaria in district Jodhpur, Rajasthan under RBM initiative-2001 (6) Series -9, Rajasthan, Census of India 2001(7) district Statistical layout 2001,district Jodhpur, Directorate of economics and statistics, Jaipur, Rajasthan.

Result

a. Location, climate, geography, population and economical resources

District Jodhpur lies in western part of Rajasthan and it is known as the gate way of great Indian Thar Desert. The district is bounded on the north by districts Bikaner and Jaisalmer, on the south by the districts Pali and Barmer, on the side of east by the districts Pali and Nagaur and on the west by the district Jaisalmer (Fig.1). Jodhpur district stretches between 26^0 0' and $27^0$37' north latitude and $72^0$55' and $73^0$52' east longitude. District resemble irregular rectangular, most of its area is arid with few small hillocks in Bilara and Osian Tehsil. Climate is characterized of extreme of temperature, uncertain rainfall and dryness. Temperature can reach 44.7^0C in summer daytime and 4.3^0C in winter night. District is prone for frequent draughts

Bhopalgarh, Phalodi, Luni and Osian) head quarter, 9 Panchayat samity (Bilara, Osian, Bhopalgarh, Mandore, Balesar, Luni, Phalodi, Bap and Shergarh), Three municipality (Phalodi, Pipar, and Bilara) and one Municipal corporation (Jodhpur). Total geographical area is 22850 Km^2 with population density of 94 persons/ Km^2. Jodhpur district has the literacy rate of 57.38%. Sex ratio is of 908 females /1000 males.

b. Major public health priorities

The major public health priorities in the district are Malaria, Tuberculosis and Maternal and child health problems. Other common health problems in area are Malnutrition, Micro-nutrient deficiency diseases, Dengue, Fluorosis, Silicosis, Hypertension and Urolithiasis.

c. Organization of the health system

District Rural Health Mission (DRHM) is responsible for implementation and management of all national health programmes at district level. DRHM is the District level unit of National Rural Health Mission. DRHM is constituted with Zila Parishad Pramukh as Chairperson, District Collector as Vice-chairperson and MPs, MLAs, Pradhans, and District level officers of state government as member of the mission.

DRHM is supported by District Rural Health Society (DRHS) under chairpersonship of District Collector and Chief Medical and Health Officer as Member Secretary and Deputy CMHOs, Addl. CMHO, CHC in-charge and other District level officer as member (Fig.2).

At the state level Director, Public health is responsible for managing the health status of people of Rajasthan. Joint Director, Health services, Jodhpur Zone takes care of health services in six desert districts including Jodhpur. Office of Joint Director provides help in entomological survey with insecticidal sensitivity testing for six desert districts with its entomologist. At district level Chief Medical Officer of Health is overall in charge and responsible for the health care delivery system.

Reproductive and Child Health Officer and Additional CMHO (Family Welfare) are helping hands to Chief Medical and Health officer in delivering the programme activities in district and reporting back to Chief Medical and Health officer about the status of respective programme (Fig.2).

In municipal corporation area senior health officer is responsible for birth and death registration, sanitation, and antiLarval spraying in the area. Office CMHO provides support in form of staff and corporation send the weekly entomological report back.

CMHO is assisted by reproductive and child health officer for reproductive and child health services at district level and the RCH activities are carried out through the existing health system under supervision of RCH officer. In rural Jodhpur health care services are delivered through the network of 9 Block PHCs, 12 Community Health Centres, 9 Family welfare centres and 79 Primary Health centres (Fig.3).

In urban area health care facilities are delivered by 5 Urban family welfare centres, 14 state hospitals, 2 satellite hospitals, 4 dispensaries, 4 urban primary hospital, 3 urban ad post (Fig.3).

Besides this network, S.N. medical college Jodhpur also caters specialized health services with its three associated hospitals namely Mahatma Gandhi Hospital, Mathura Das Mathur Hospital and Ummed Hospital.

There are Railway, Military and ESI hospitals those renders medical services for their beneficiaries.

Regarding Laboratory surveillance L1, L2 and L3 level labs are available in Jodhpur. In rural areas PHCs and CHCs are equipped for malaria and tuberculosis smear examination, while in urban settings these services caters by dispensaries, satellite and other hospitals of state govt. working under CMHO (Fig.4).

One L2 level Communicable diseases laboratory is situated at Mandore Satellite Hospital under CMHO Jodhpur for laboratory surveillance at district level. This laboratory provides facilities for haematology examinations, Widal test, VDRL, HBsAg, lipid profile, kidney function tests, liver function tests and blood glucose besides the malaria parasite, AFB for tuberculosis and water bacteriology.

Medical college laboratories are state level laboratories equipped for testing Gram's staining, culture and sensitivity, KOH mount for fungus, stool examination, ASO test, VDRL, HBsAg, IgG and IgM test of dengue, Brucella Antibody test, HCV card test, MP QBC, Typhidot, TPHA, indirect haemagglutination test for amoebiasis, mycodot, Toxoplasma IgG and IgM, Rubella IgG and IgM, CMV IgG and IgM and Herpes Simplex IgG and IgM besides other biochemistry and histological examinations.

Desert Medicine Research Centre is an organization of Indian council of medical research of national repute in desert health research. The centre helps the system in identification, prioritization, of health problems and through the development of prevention and control module of diseases through its research output. DMRC helps the system through diagnosis of malaria, dengue, AFB culture and sensitivity, micronutrient estimation and urinary calculi chemical analysis under research projects.

Other departments of importance to public health in Jodhpur are laboratory, public health engineering department and Regional Public Health Laboratory, entrusted with the regular monitoring of drinking water and edible items of people.

Discussion

Malaria and Tuberculosis are the Major Public Health Priorities in Jodhpur. To prevent and control them national vector borne disease control programme and revised national tuberculosis control programme are in position. Health system is equally equipped with health care and laboratory surveillance at various levels in Jodhpur. Laboratory setup in Jodhpur is capable of detecting outbreaks by most of the diseases under regular surveillance, except virus isolation of Polio and Measles. Infant mortality and maternal mortality ratio are higher than the national figure in Jodhpur. Measles immunization among children under one year age, proportion of births attended by skilled health personnel, percentage of women receiving antenatal care (at least 1 visit) and proportion of tuberculosis cases detected and cured under DOTS are higher in Jodhpur than national figure. While on the other hand eligible couple protection rate, prevalence rate associated with tuberculosis, and percentage of estimated new smear-positive tuberculosis cases registered under the DOTS

respectively. Percentage of vitamin A supplementation is better in Jodhpur than national level.

Conclusion

Malaria and tuberculosis are the major public health priorities in Jodhpur and prevention and control programmes are running. Health care delivery system and laboratory surveillance system are quite well equipped for detecting, confirming and controlling the outbreaks caused by most of diseases under regular surveillance in IDSP. All millennium development goal indicators are not available at district level. Maternal and child health indicators are poor in Jodhpur so need strengthened activities under reproductive and child health component.

Recommendation

Surveillance data analysis of malaria will give insights about the distribution of problem in area so it is the need. Surveillance system and programme pertaining to malaria need to be described and evaluated to provide supports for the local health planners to manage malaria in a better way.

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3. NFHS 3 Report
4. Records of Office of the Chief Medical Officer of Health
5. Records of Office of the Public Health Engineering Department Jodhpur
6. Millennium development goals, India country profile, Unicef, World Health statistics, 2006
7. WHOSIS, Core health indicators- www.Who.int/Whosis/database on 12/10/2007
8. Records of Office of Reproductive & Child Health , Jodhpur
9. TB India 2007, RNTCP ststus report, Central TB division, DGHS, Ministry of Health & Family welfare
10. Quarterly Bulletin on Demographic indicators & progress of Family welfare & National Rural Health Mission-2006

Fig.-1 Location of district Jodhpur, Rajasthan, India, 2007

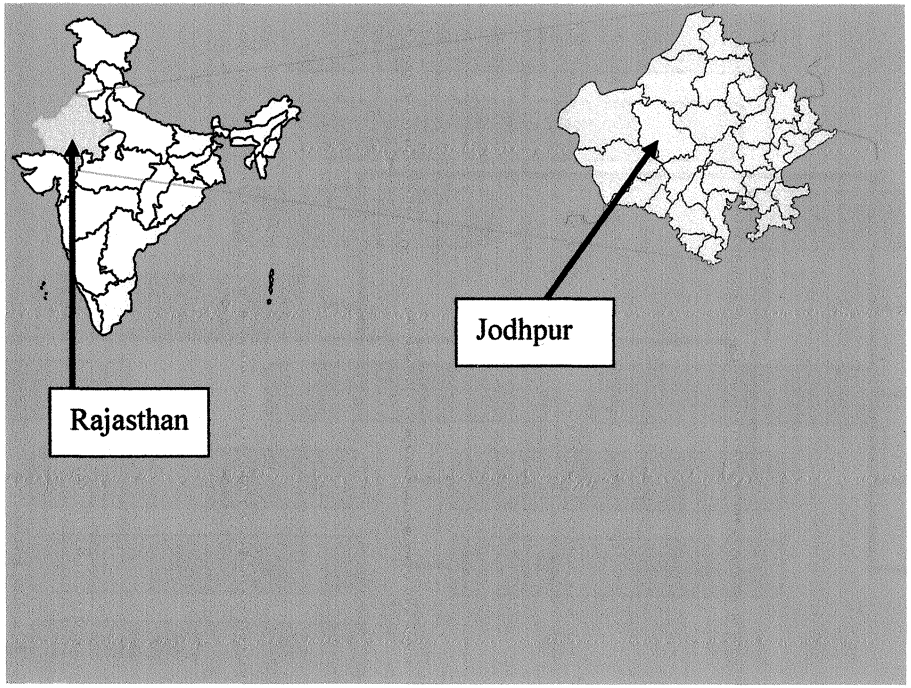

Fig. 2 Organogram of Health System (Administrative) in district Jodhpur, Rajasthan, India, 2007

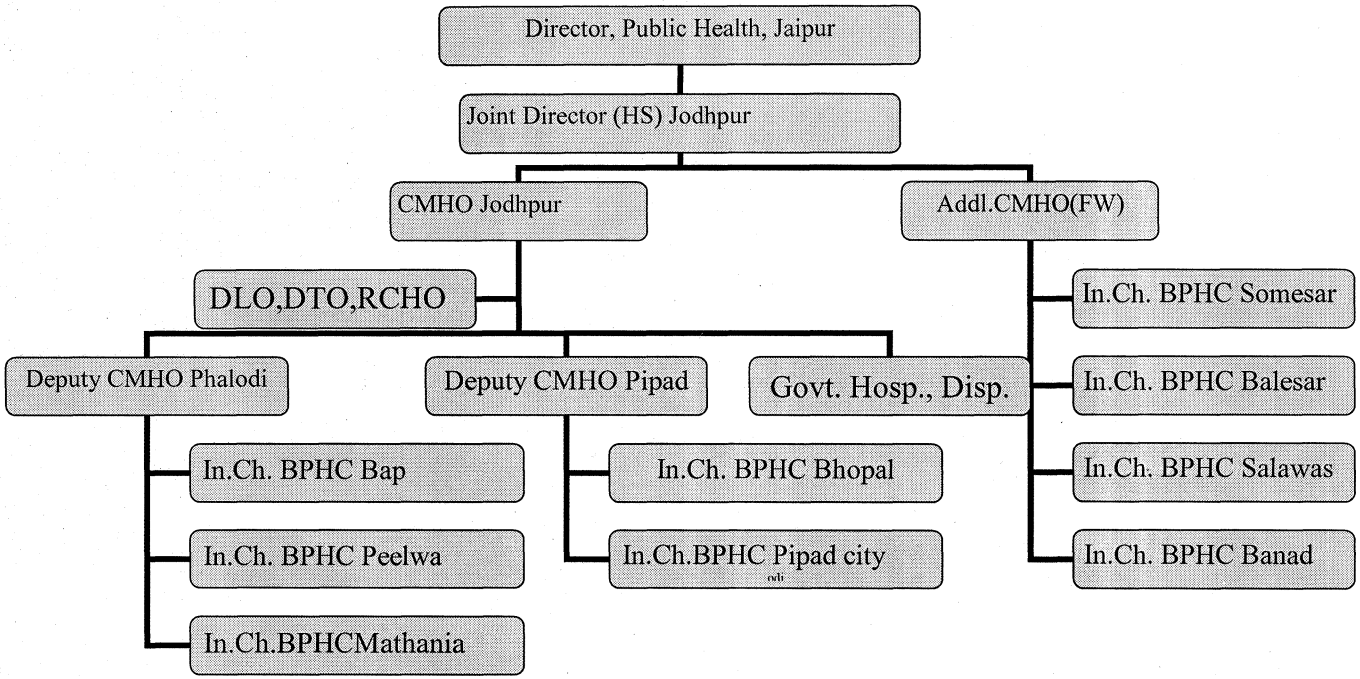

Fig. 3 Organogram of health care delivery system in district Jodhpur, Rajasthan, India, 2007

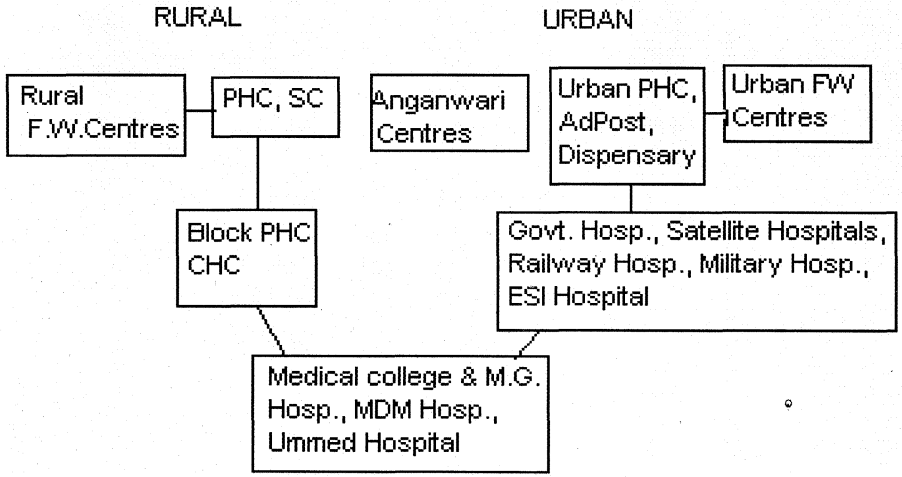

Fig. 4 Organogram of Laboratory Surveillance

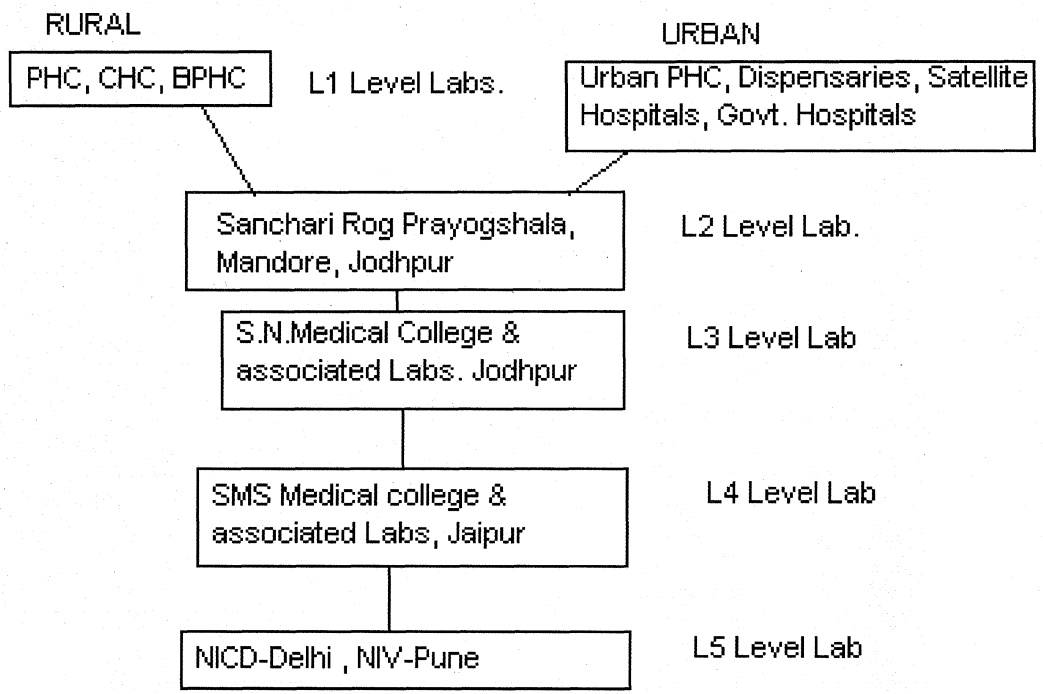

Table 1: Demographic characteristics of the population of district Jodhpur, Rajasthan, India, 2001

Population group	Population size (in thousand)	Proportion of the total (%)
0-4 years of age	379	13
5 - 9 years of age	412	14
10 -14 years of age	378	13
15-44 years of age	1,252	43
44-59 years of age	270	9.3
60 + years of age	185	6.4
Male	1513	52
Female	1372	48
Above poverty level	NF[1]	NF
Below poverty level	NF	NF

[1] Not found

Table-1 continued

General caste	NF	NF
Schedule caste	456	16
Schedule tribe	79	2.7
Other backward caste	NF	NF
Literacy	1656277	57
Total population size (Estimated)	2886505	100

Source

Table-2 Indicators of progress for the health related millennium development goals, Jodhpur, Rajasthan, India 2007

Goal	Indicator	Value of the indicator		
		In Jodhpur (Year)	In Rajasthan (Year)	In India (Year)
Goal 1	Percent of children under three years underweight	46(2007)	44(2005)	47.0 (1996-
	Proportion of population below minimum level of dietary energy consumption	NF[2]	NF	34.7%(
	Percentage of children 6-59 month of age who received one dose of vitamin A in the past six months	87(2007)	NF	51 (
	Percent of children under age 0-6 months on exclusively breast fed	NF	33.2(2005)	37 (
Goal 4	Under-five mortality rate per 1000 children	NF	NF	74 (
	Infant mortality rate per 1000 live birth	74 (2004)	65(2005)	56 (
	Measles immunization among children under one	91(2006)	NF	58.0(
Goal 5	Maternal mortality ratio per 1,00,000 live birth	677(2006)	NF	540 (
	Proportion of births attended by skilled health personnel	91(2006)	43.2 (2005)	43 (

[2] Not found

Table-2 continued

		Eligible Couple protection rate	36(2006)	47.2 (2005)	48.2(1998-
		Percentage of women receiving antenatal care (at least 1 visit)	91(2006)	NF	65 (98 –
Goal (HIV)	**6**	HIV prevalence among 15-24 yrs old pregnant women (15 – 24 yrs women)	NF	NF	0.7 (2(
		Condom use rate of the contraceptive prevalence rate	NF	5.8 (2005)	7.2 (98
		Number of children orphaned by HIV/AIDS	NF	NF	NF
		Percentage of people using a condom during most recent higher risk sexual encounter	NF	NF	51(2(
		Percentage of STI clients who are diagnosed and treated according to guidelines (in Family Health Awareness Campaign 2003)	NF	NF	NF
		Percentage of HIV-positive women receiving anti-retroviral treatment during pregnancy to prevent mother to child transmission of HIV- January 2003 to June 2004	NF	NF	84.5 (2

Table-2 continued

Goal 6 (Malaria)	Malaria death rate	0.0(2006)	NF	0.003 (2
	Proportion of people with uncomplicated malaria getting correct treatment at the health facility and community levels, according to the national guidelines, within 24 hours of the onset of symptoms	NF	NF	
	Percentage of pregnant women who have taken chemoprophylaxis or drug treatment for malaria	NF	NF	NF
	The proportion of households having at least one insecticide treated bed nets	NF	NF	
Goal 6 (TB)	Prevalence rate associated with tuberculosis	173(2007)	132(2007)	299(
	Death rate associated with tuberculosis	NF	NF	NF
	Proportion of tuberculosis cases detected and cured under DOTS	91%(2007)	56%(2007)	86%(
	Percentage of estimated new smear-positive tuberculosis cases registered under the DOTS approach	37%(2007)	56%(2007)	57% (
Goal 7	Proportion of population with sustainable access to an improved water source, urban and rural	99% (2007)	NF	96% & 82% (
	Proportion of urban population with access to improved sanitation	90% (2007)	NF	58%(
Goal 8	Proportion of population with access to affordable essential drugs on a sustainable basis	NF	NF	

Introduction

Globally the incidence of malaria has been reported between 350 - 500 million cases in the year 2004 and disease is considered to be endemic in 107 countries and territories of the world[1]. The morbidity and mortality caused by malaria were 1.4 million and 1173 respectively in year 2007 in India. Similarly the figures of morbidity and mortality because of this disease were 55000 and 46 respectively in year 2007 in Rajasthan state of India[2].

Rajasthan witnessed epidemics of malaria in the years 1994[3],1996[4] and 2003[4]. Malaria outbreaks in Thar desert of Rajasthan have been found in the progression of canal irrigation work of Indira Gandhi Nahar Pariyojna (IGNP)[5]. Importation of cases from other areas found out as the factor for introduction of seasonal malaria in desert ecosystem in another study done in desert ecosystem of Rajasthan[6].

Malaria has been identified as a health problem, also in district Jodhpur, The gateway of Thar desert, by Batra CP et al. He found out the high slide positivity rate of 67.54 % and 54.5 % in sand dunes and canal irrigated area of district Jodhpur[7]. Knowledge on the disease distribution, seasonality variation and its correlation with meteorological indicators may prove useful in better control of the problem. Programme managers can utilize their limited health resources in focused and targeted approach to meet their objective. The present study was carried out as an assignment under the post graduation programme of Master in Applied Epidemiology at National Institute of Epidemiology, Indian council of medical research, Chennai.

Objectives: -

1. To describe the disease distribution in different months and block primary health centres of district Jodhpur
2. To estimate the correlation of malaria incidence rate with meteorological indicators

Methodologyy

Study site

District Jodhpur has geographical area of 22850 square kilometers. Its population is 2.9 million as per year 2001 census. It stretches between $26^0 0'$ and $27^0 37'$ at north Latitude and between $72^0\ 55'$ and $73^0\ 52'$ at East Longitude. It is situated at the height between 250-300 meters above sea level. District comes under arid zone of the state. Its ambient temperature varies from 49 degree centigrade in summer to 1 degree in winter. Average rainfall is 302 mm here. There is no perennial river in the district. Health setup in district composed of 9 block primary health centres (BPHCs)[8].

Data Collection

Monthly Epidemiological reports of 9 Block PHCs, Jodhpur city and district Jodhpur in the MF-4 format were obtained from the Office, Joint Director, Public Health, Jodhpur Zone, Rajasthan and Office, Chief Medical and Health Officer, Jodhpur of period from January 2002 to March 2007 (Except November 2003) accumulating of 62 months.

Meteorological data were also obtained of same period from Meteorological section, Central Arid Zone Research Institute, Jodhpur.

Information on population, total malaria positives, in Nine Block PHCs, Jodhpur city and district of all 62 months utilized in this study.

Meteorological data contained monthly information of mean of maximum temperature recorded daily (Max $^{\circ}C$), mean of minimum temperature recorded daily (Min $^{\circ}C$), mean of relative humidity recorded daily in morning (R.H. 1 %), mean of relative humidity recorded daily in afternoon (R.H. 2 %) and total rain recorded (m.m.) for study period.

Data analysis

We estimated monthly incidence rate of malaria in each of all 62 months for all BPHCs, Jodhpur city and district by using following formula.

Monthly Malaria incidence rate= (Total malaria cases reported in month/ Population of the area in same period) X 100000

The estimated rate expressed as number of malaria cases/ one lac population /month in defined geographic area.

Mean monthly incidence rates and standard deviation computed from monthly incidence rates for different BPHCs, city and district. We estimated this mean for all study years separately and for overall period of 62 months collectively in various BPHCs, city and district. Mean monthly incidence rate for overall period in different BPHCs compared with that of district Jodhpur for difference between means. Critical ratio estimated for comparing these means, the value of critical ratio used for finding out the probability of the difference, if exists any.

The formula for critical ratio is as given below: -

Critical ratio= Difference in Means/ Standard error of Means

We estimated mean monthly incidence rates for all 12 months of year in district Jodhpur only. We plotted this rate in Epigraph in Epiinfo software to describe the monthly pattern of malaria.

Data on monthly malaria cases in district was smoothened with the help of moving average technique. Average number of malaria cases estimated for various months of all studied years. Data smoothening was done to describe the pattern of average malaria cases in study period.

The monthly malaria incidence rates for all 62 months of district Jodhpur analyzed with meteorological indicators of district for finding out the correlation if any. We estimated 'r' value for correlation of these factors. Multiple linear regression analysis performed in SPSS programme to estimate the variation in monthly incidence rate in district with variation in meteorological indicators (predictors). We estimated 'R^2' value as a measure of this variation in SPSS software.

Result

Mean monthly incidence rate for malaria among different BPHCs, Jodhpur city and district for different years is given in table 1. The BPHC Bap had the highest mean incidence rate of malaria for years from 2002 to 2005; Bap comes on second position in year 2006. Block PHC Banar reported maximum rate in the year 2006. In the year 2003 Jodhpur district reported highest mean incidence rate of 25.42 cases per 100000 population in period from 2002-2006. When we look on over all period of 62 months for differences in mean incidence rates, Balesar, Banar, Bap, Mathania, Pilwa and Somesar BPHCs reported higher mean incidence rate, on the other hand Bhopalgarh, Jodhpur city, Piparcity and Salawas reported lower mean incidence rate than the district Jodhpur. The value of critical ratio was 2.677 for Banar BPHC, which is significant with $p<0.01$. For Bap it was 2.65, which is significant at $p<0.01$ and for Bhopalgarh it was 6.17, which is significant at $p<0.001$. Similarly critical ratio was 7.46 for Jodhpur city, which was significant at $p<0.001$ and for Salawas its value was 10.53, which is also found significant at $p<0.001$.

Test of significance put Banar and Bap BPHCs at significantly higher mean incidence rate level than the rate in district Jodhpur. Jodhpur city, Bhopalgarh and Salawas BPHCs reported significantly lower mean incidence rate level.

Fig.1 shows the Epi-graph of mean monthly incidence rates for all 12 months in overall period in district Jodhpur. Graph explains that the incidence rate begins to rise by the month of March and gradually reaches higher till August, after that it abruptly rises till its peak reached in the month of September. Graph begins to decline by month of September till it reaches its lowest level in November. Importantly, graph never touched the zero incidence rate.

Average malaria cases derived from moving average technique are plotted against the months of respective years in Fig-2 for district Jodhpur. Graph shows that the upward trends in average malaria cases are noted frequently in months of June and July. Curve attains its peaks in months of August, September and October then it declines in months of November, December and January. Graph shows that the average cases in year 2003 were more than 2.5 times the average cases in year 2002. In year 2005 and 2006 peaks of graph were at lower level than year 2002. Otherwise in all the years pattern of occurrence of cases was more or less similar across all years.

Pearson's correlation coefficient's value was 0.253 for the correlation of monthly mean relative humidity in morning (RH1%). This value is more than the tabulated value of 'r' 0.250 at 0.05 probability of significance. RH1% is found significantly correlated with monthly malaria incidence rate in district Jodhpur at $p<0.05$. Correlation coefficient's value was 0.249 for monthly mean relative humidity in afternoon. Since value of 'r' is lower than tabulated value of 0.250, this correlation was found insignificant at $p= 0.051$, though it was borderline.

Using monthly malaria incidence rate as dependent variable and maximum daily temperature, minimum daily temperature, relative humidity in morning, relative humidity in afternoon and rain in millimeter as independent variable in SPSS, 'R^2' value was determined and it came as 0.299.

Discussion

The mean monthly malaria incidence rate of district Jodhpur ranges from 0.67 cases per 1 lac population per month in year 2006 to 25.42 cases per month per 1 lac population in year 2003. This rate is reported as 10.73 cases per 1 lac population per month for overall period in district. This rate indicates all time persistence of disease in desert district Jodhpur at least in study period. Significant differences in mean incidence rates found among various Block primary health centers of district Jodhpur probe toward the local transmission dynamics of malaria. Banar and Bap block primary health centres have shown significantly higher mean incidence rate than the mean incidence rate of Jodhpur district. This finding of the study indicates the presence of blocks with relatively high transmission of malaria. These high transmission foci can be prone for occurrence of malaria outbreak.

On the other hand Bhopalgarh, Jodhpur city and Salawas reported significantly lower mean incidence rate than Jodhpur total. Out of these three areas, Jodhpur city belong to urban setting that is equipped with best medical facilities available in district. City renders health facilities through three hospitals attached with medical college here and satellite hospitals and dispensaries. Bhopalgarh and Salawas represent the rural setting of Jodhpur, in spite of this, these BPHCs exhibited significantly lower incidence rate of

malaria, which is quite interesting to study in detail as a role model to decrease the rates in high incidence rate areas of rural setting.

Fig.1 and Fig.2 define the dynamics of malaria incidence rate in Jodhpur district across the studied various years and in totality. If we leave the exceptional case of year 2003 otherwise cyclical trend is found in occurrence of malaria in Jodhpur. Monsoon and post monsoon period are the period of high alert against impending rise in malaria in district Jodhpur. During study period Jodhpur faced outbreak of malaria in year 2003.

Correlation study found out the relative humidity in morning time as the good correlation factor. It is likely that the incidence rate correlated with relative humidity in morning. Trends for rise in RH1 % should be under vigil for better control of malaria incidence in Jodhpur. Preventive and control measures targeting the high transmission foci during monsoon and post monsoon season would help in better control of disease in community. R^2 value obtained through multiple linear regression explained about 30% variation in malaria incidence rate with meteorological indicators. For remaining variations in monthly incidence rate, other factors like importation, residing nearby Indira Gandhi canal and other unknown factors can be responsible.

Study to find out the risk factors associated with malaria in high transmission area might prove useful and can provide insight about the Epidemiology of malaria in desert district.

Limitation of the Study

Study is based on the public health surveillance data. Representation from private practitioners is hardly available. Although study may not have described all malaria cases of community, even than it provides the major distribution and trends of malaria in district.

Conclusion & Recommendation

Malaria is a persistent health problem in district Jodhpur at least in study period. Rise in malaria cases begins before monsoon and get aggravated in period from July till October. Anti mosquito measures should begin before Monsoon. Foci with relatively high transmission of malaria deserve for extra vigil under programme activities. Rise in relative humidity in morning hours may work as warning signal against impending rise in malaria cases. Study of the surveillance system and associated factors of malaria are needed to understand the problem better.

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Table-1 Mean monthly incidence rate (Standard Deviation) in different place and time

BPHCs	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Overall period (62 Months)
Balesar	6.97 (9.30)	65.53 (163.14)	14.51 (14.14)	6.77 (6.66)	0.16 (0.29)	18.83 (70.48)
Banar	21.57 (15.34)	39.59 (71.34)	28.36 (20.36)	11.47 (11.21)	34.56 (57.89)	22.59 (34.92)
Bap	28.58 (26.69)	93.19 (182.44)	45.58 (22.77)	16.30 (6.86)	10.32 (4.48)	38.06 (81.05)
Bhopalgarh	5.11 (4.81)	8.43 (17.66)	5.11 (4.93)	1.74 (1.31)	0.13 (0.22)	4.25 (8.28)
Jodhpur city	4.99 (3.05)	7.81 (13.26)	6.82 (4.87)	3.07 (1.38)	0.00 (0.00)	4.61 (6.47)
Jodhpur district	10.69 (8.91)	25.42 (53.55)	11.72 (7.14)	4.40 (2.23)	0.67 (0.36)	10.73 (23.72)
Mathania	15.84 (17.48)	24.29 (52.89)	13.49 (11.93)	3.90 (2.41)	0.34 (0.31)	11.92 (24.80)
Pilwa	4.27 (4.37)	38.72 (86.05)	21.24 (11.90)	6.37 (3.46)	0.32 (0.56)	13.85 (37.82)
Pipar city	27.78 (32.25)	4.97 (8.44)	4.82 (5.44)	3.07 (2.93)	0.00 (0.00)	8.73 (17.49)
Salawas	1.37 (1.53)	6.84 (13.77)	2.01 (1.70)	0.94 (1.00)	0.12 (0.21)	2.41 (6.22)
Somesar	9.10 (9.01)	76.88 (196.89)	5.57 (4.90)	1.34 (1.36)	0.36 (0.62)	19.13 (85.22)

Fig. 1 Means of monthly malaria incidence rates in different months of year in district Jodhpur, Rajasthan, India, 2007

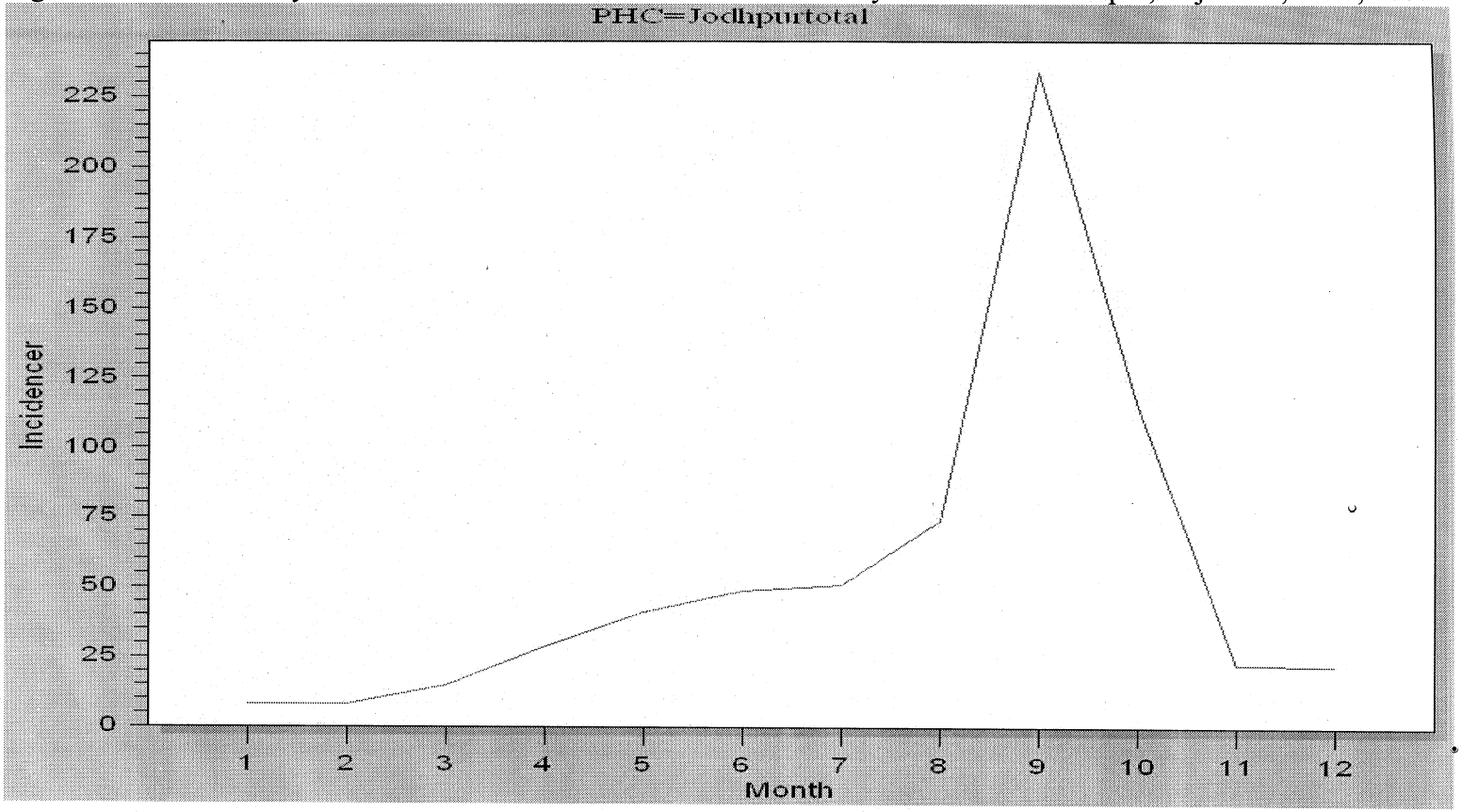

Fig-2 Seasonal variation in Average Malaria cases in Jodhpur District with Data smoothening, 2007

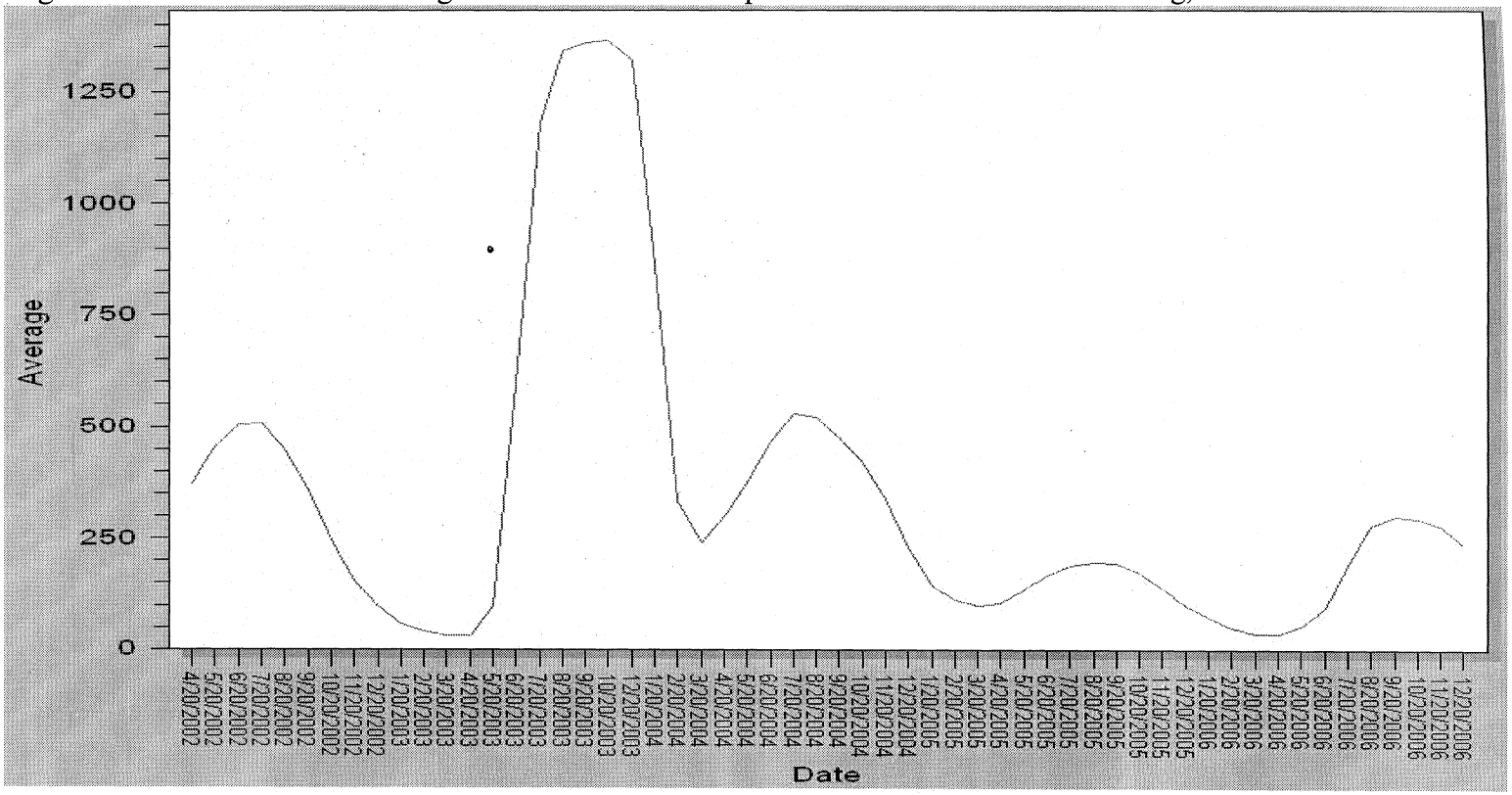

Table-2 Coefficient of correlation(r) of monthly incidence rate of malaria in district Jodhpur with meteorological indicators

Sr.No.	Meteorological indicators	Coefficient of correlation (r)	(2 tailed)
1	Max ^{0}C	0.162	0.21
2	Min ^{0}C	0.211	0.099
3	R.H. % 1	0.253	0.047
4	R.H. % 2	0.249	0.051
5	Rain (m.m.)	-0.048	0.711

Source: Meteorological data received from CAZRI, Jodhpur, 2007

SECTION 2:

SECOND FIELD POSTING

Introduction

Malaria is a communicable disease caused by protozoan parasite Plasmodium[1]. World malaria report 2008, provides an estimated figure of 247 million cases of malaria and a million deaths due to it, in year 2006. This report indicates the endemicity of the disease in 109 countries of the world[2]. Estimated figures for cases and deaths due to malaria were 21 million and 35000 respectively for south east Asia region in year 2006[2].

Total malaria cases estimated for India were 10.6 million in 2006. India contributed for 60% share of the total cases estimated for the south east Asia region in same year. Total number of deaths due to malaria in India estimated were15000[2]. Rajasthan is one of the most affected states of country[2]. This contributed 8% cases of Malaria in the country in year 2003[3].

A study published in 1999 had found out the high slide positivity rate for malaria in district Jodhpur[4]. Malaria has come out as a perennial health problem in district Jodhpur for last five years (2002-2006) in surveillance data analysis of the author[5].

Prevention and control activities for malaria are being implemented through national vector borne diseases control programme[6]. Malaria control programme is supported by surveillance system to achieve its objectives. The purpose of surveillance is to detect changes in trends or distribution in malaria in order to make malaria control programme able for taking adequate investigative or control measures[7]. Integrated disease surveillance project has launched in Jodhpur, Rajasthan. This project covers surveillance of 9 core diseases including malaria[8]. Considering the perennial nature and outbreak potential of this emerging disease in desert part of Rajasthan, there was a need to study the surveillance system for malaria in Jodhpur.

The study attempts to describe and evaluate the malaria surveillance system in Jodhpur.

Objectives

To describe & evaluate the surveillance system for malaria in Jodhpur, Rajasthan, India, with special emphasis on simplicity, acceptability, sensitivity and representativity attributes of surveillance system.

Methods

IDSP project implementation plan, online IDSP manuals of national institute of communicable diseases, online IDSP document's WHO-version and government of India-version were consulted to know the recommended guidelines. Qualitative interview of key informants at office of chief medical & health officer and IDSP cell were undertaken. Surveillance reports, forms, registers were seen at district, block, primary health centre, and health sub centre level. Quantitative interview of persons involved with surveillance activity was conducted at all levels. Qualitative and quantitative interviews generated the knowledge about diseases under surveillance, population under surveillance, case definition, type of system, forms used, reporting mode, data structure, data flow, data analysis, indicators, feedback, and action taken.

Since the objective of malaria surveillance system is to detect the trends and changes in the distribution of malaria, the qualitative attributes that were considered for its evaluation were simplicity, sensitivity, acceptability and Representativity.

1. Simplicity

Documents and forms of surveillance were seen for ease of operation, clarity and length. Quantitative interview was also taken to know the proportion of respondents who find the system simple.

2. Sensitivity

Reports and outputs were seen in order to ascertain the type and proportion of reporting units. Proportion of cases captured by the system, out of total malaria cases seen at various government health facilities in last one-month period estimated as a measure of sensitivity.

know the recommended and actual participation by health facilities.

4. Representativity

Health facilities visited to know about the time, place and person representativity of the data collected by those units. Outputs, reports of various health facilities were seen for representation of time, place & person characteristics in respect to cases captured by them.

Result

1. Description of the surveillance system: -

a. Diseases under surveillance

There are three categories of diseases under IDSP.

1. Diseases under regular surveillance: - malaria, acute diarrhoeal diseases, typhoid, tuberculosis, measles, polio, road traffic accidents, plague and hemorrhagic fevers.
2. Diseases under sentinel surveillance: - HIV/HBV/HCV, water quality and out door air quality monitoring.
3. Non-communicable diseases risk factors: - anthropometry, physical activity, blood pressure, tobacco and nutrition.

b. Population under surveillance

Entire general population of district Jodhpur is under surveillance for malaria

c. Case definition

Different case definitions are being used for malaria, depending over the health facility that captures the case

Suspected case- any fever patient – at the level of health sub Centre, fever treatment depot, drug distribution center, and malaria link volunteer

spleenomegaly, convulsions, coma, shock,
pulmonary edema – at primary health Centre level

Confirmed case- clinical case as above along with presence of malaria parasite in Blood smear and /or positive rapid diagnostic test for malaria – at laboratory level

d. **Type of system**

Active and passive type of surveillance is in place in district Jodhpur along with mass surveillance of outbreak prone areas in potential season. Mass screening of population is done under mass surveillance through blood smear examination in outbreak potential area irrespective of fever status.

e. Forms used

As per IDSP guideline and key informants at district, following forms are used. S-form at health sub centre for reporting to PHC, P-form at PHC, CHC and block PHC for reporting to district surveillance unit, L-form at laboratories associated with PHCs and CHCs and D-form at district level for reporting to state surveillance unit.

In actual situation most of the health sub centres were reporting to PHCs about the fever cases by writing the date, patient's name, father's name, age, address, gender, slide number on plane paper along with blood smear. PHCs, CHCs and block PHCs were reporting to district surveillance cell on MF-4, MF-5 and MF-11 formats.

f. Reporting mode

From HSC to PHC weekly and whenever cases occurs, from PHC, CHC to block PHC weekly and monthly and from block PHC to DSU weekly as well as monthly.

g. Data structure

At HSC level individual information of fever case along with date and place name. At PHC, BPHC level data constitute of aggregated number of blood slide collection, examination, and positives for malaria as per type of surveillance

h. Data flow

Data flow from the peripheral grass root level worker to the directorate of NVBDCP, New Delhi. Peripheral health workers e.g. multipurpose health workers (MPW) collect the blood slides during their community visits from fever patients and health sub centres and send the collected slides twice in a week to the primary health centre. Female health workers also bring the slides with patient's data to PHC if the PHC is on the route for home. Female health workers bring slides with patient's data whenever they attend the monthly PHC meeting. Health supervisor collects the slides from health sub centre and bring up to PHC. From the PHCs report is compiled fortnightly and monthly and sent to office of block PHC, thereafter the compiled report is sent to district chief medical & health officer. In the district the data is compiled monthly and quarterly in year and sent to the state head quarter, and thereafter to the NVBDCP office, New Delhi.

i. Data analysis

Simple analysis is done at HSC level by looking at any change in number of cases with respect to time, place and person. At PHC, Block PHC and district level aggregation of cases is done with respect to week of reporting, age, gender, type of surveillance, deaths, type of malaria. Compiled data is used for determining the malaria related rates and ratios.

j. Indicators

Following indicators are being used in malaria surveillance in district Jodhpur at PHCs, CHCs, Block PHCs and district level.

h. Data flow

Data flow from the peripheral grass root level worker to the directorate of NVBDCP, New Delhi. Peripheral health workers e.g. multipurpose health workers (MPW) collect the blood slides during their community visits from fever patients and health sub centres and send the collected slides twice in a week to the primary health centre. Female health workers also bring the slides with patient's data to PHC if the PHC is on the route for home. Female health workers bring slides with patient's data whenever they attend the monthly PHC meeting. Health supervisor collects the slides from health sub centre and bring up to PHC. From the PHCs report is compiled fortnightly and monthly and sent to office of block PHC, thereafter the compiled report is sent to district chief medical & health officer. In the district the data is compiled monthly and quarterly in year and sent to the state head quarter, and thereafter to the NVBDCP office, New Delhi.

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j. Indicators

Following indicators are being used in malaria surveillance in district Jodhpur at PHCs, CHCs, Block PHCs and district level.

1. Annual blood examination rate (ABER)

$$\frac{\text{No. of smears collected \& examined in 1 year}}{\text{Total population}} \times 100$$

2. Annual parasite incidence (API)

$$\frac{\text{No. of smears Positive for malaria in 1 year}}{\text{Total population}} \times 1000$$

3. Slide positivity rate (SPR)

$$\frac{\text{No. of smears Positive in 1 year}}{\text{Total no. of smears examined}} \times 100$$

4. Slide falciparum rate (SFR)

$$\frac{\text{No. of smears Positive for falciparum in 1 year}}{\text{Total no. of smears examined}} \times 1000$$

5. P. *falciparum* Percentage (Pf %)

$$\frac{\text{No. of smears Positive for falciparum in 1 year}}{\text{Total no. of smears examined}} \times 100$$

The feed back about the results of the slides send twice in a week to the peripheral workers. Feedback to the peripheral workers is also given during the monthly review meeting at the PHC. District office and block PHC gives the feedback to lower level regarding the monthly epidemiological report. Feedback is also given during the supervisory field visits.

Though there was not even a single feed back in writing available with health facilities, issued during last one month.

I. Action taken

All the health facilities take action on feedback received from higher authority. Most common action, which took after feedback, was searching for more cases to achieve the target of ABER.

Evaluation of the surveillance system: -

a. Simplicity

Case definition are simple for different level, Form-S and P contains information on fever cases <5 years and >5 years between male and female. It is very easy to enter data age and sex wise with area and time of reporting. Key informants also find the system simple during qualitative interview.

But in practice, there were many types of MF formats in use for malaria surveillance, which makes the system complex. However during quantitative interview, 100% health workers found the system simple (Table-1). IDSP suggests for report submission in weekly and monthly basis only, so there is not any confusion regarding it. Day of submission by different health facility is decided, so there is not any dilemma regarding day of the report.

The surveillance system of malaria in Jodhpur is having active, passive and mass surveillance component. In passive surveillance all the patients diagnosed and treated at SC, PHCs, CHCs, and block PHCs are captured by the system. While in active surveillance, health worker approach the fever cases in community and take blood smear for testing. So patients who could not attend the care facilities also captured. During out break prone season mass blood surveillance done for malaria to root out the hidden focus.

Since the network of HSCs, PHCs, CHCs, and district hospitals are in both rural and urban area, most of the cases in community are detected by the surveillance system. IDSP has given due consideration for private sector involvement for surveillance, so patients attending to private practitioners will also be reported. However in Jodhpur, involvement of private sector is yet to come.

100% of health facilities were sending the report for malaria surveillance (Table-2). System is sensitive enough to detect cases in rural and urban community equally. It is capable of detecting cases through health facilities network and from home also.

c. Acceptability

IDSP documents have provision for monthly reporting by private practitioners, private clinics and hospitals to increase their willingness to participate. Through qualitative interview, it was known that network of health sub centres, primary health centres, community health centres, block primary health centres, dispensaries, satellite hospitals, medical college hospital, railway hospital, army, air force and border security force hospitals were participating under malaria surveillance. Acceptability by private practitioners was low as only few were participating in surveillance.

Quantitative interview of health facilities gives the proportion of health facilities participating in surveillance and the result is given in table-3.

Acceptability by the government health facilities of the system was 100%, as all levels of health facilities were complying the system.

ASHA, teacher, drug distribution centre and fever treatment depot, report the fever cases to concerned health sub centre and give presumptive treatment also. This provision makes the surveillance data representative of all the sectors and community as well as save time for health workers for other activity. Surveillance forms report the malaria cases age and gender wise. The surveillance reports and records of fever cases were seen for coverage of time, place and person characteristics and the result are given in table-4.

Discussion

Though the IDSP has launched in state Rajasthan, it yet to come at grass root level for implementation. The ongoing surveillance is simple in respect of defined case definition for malaria. The surveillance system is being implemented with multiple MF reporting formats in district. These formats are so much in number that it often confuses the person. The existing system is having active and passive arms for surveillance for picking up the cases from health care institutions and community as well. The reporting mode is well defined, each institution knows, whom to report for cases. Data is reported as individual line listing from health sub centres and in the form of aggregated cases in terms of health subcentre's name, week or month of reporting, age group and gender from PHCs, block PHCs. It does not contain information on pregnancy status of female patients, a highly vulnerable and marginalized population group. Surveillance information deserve due importance for this group under the conditions when there is different drug regimen for treatment.

Channel of persons is well maintained in transmission of data from one level to other. Data generated from grass root level worker travels to district level with defined way. Grass root level workers simply look for the clustering of fever cases if any, among particular age group, gender and in particular place and week or month. They do not do any analysis using number of cases and denominator. At PHCs, block PHCs few malaria related rates were found for use in surveillance system. Annual parasite incidence, annual blood examination rate, slides

that estimates these.

Feed backs and action taken were well taken, as most of the health institutions received the feedback during monthly meeting for compliance. Although there was not any written feedback in respect to report or slides received from health sub centres. 100 % of health participants found the system simple. The existing so many reporting formats make the system too complex to understand. Though the system does not gives the information about the proportion of cases in community picked up by the system, system has wide approach to malaria patients through active and passive surveillance in rural and urban areas. System was found to be 100% sensitive in picking up the fever patients who were in various registers of different health facilities. There may be some left out cases in community from surveillance, even than this limitation does not prevent the system from detecting any change in trends and distribution of cases in community. Acceptability was 100% amongst the government health facilities, all were sending the reports to head quarter. All health facilities were sending the reports with time, place and person characteristics of all fever and confirmed malaria cases.

Conclusion & recommendation

Malaria surveillance is going on as per protocol of national anti malaria programme in district Jodhpur. IDSP has launched in district but it is still in training stage only, so at the stage of health sub centre and PHCs it is yet to implement. Existing malaria surveillance is exhaustive in number of formats being used. There is not any involvement of private parishioners, private nursing homes and private laboratories for the surveillance.

Integrated diseases surveillance project need to be implemented in district covering all health facilities, from health sub centres, PHCs, CHCs and block PHCs. Due representation of private sectors in the field of health services and malaria in pregnant women is also needed in district.

Limitation of the study

Sensitivity of the surveillance system was estimated on the basis of proportion of health facilities submitting the malaria surveillance reports regularly. This may not represent the actual number of cases in community. Even than this limitation does not restrict the ability of system in detecting the trends and distribution of malaria cases in community.

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Table-1 Percentage of persons who found the surveillance system of malaria simple in Jodhpur, Rajasthan, India, 2008

Level	No. of persons found system simple	Total persons interviewed	Percentage of persons found system simple
Village level	11	11	100
PHC, CHC level	6	6	100
District level	2	2	100
Total	19	19	100

Table-2 Percentage of health facilities visited submitting reports of Malaria surveillance in Jodhpur, Rajasthan, India, 2008

Participating facilities	Facilities submitting reports	Total facilities interviewed	Percentage of submitting reports
Village level (SC, FTD)	11	11	100
PHC, CHC level	6	6	100
Total	17	17	100

Table-3 Percentage of health facilities which were participating in malaria surveillance in Jodhpur, Rajasthan, India, 2008

Type of facilities	Units participating in the system	Total units surveyed	Percentage
Village level	11	11	100
PHC, CHC level	6	6	100
Total	17	17	100

Table-4 Percentage of health facilities representing time, place and person characteristics of malaria cases in Jodhpur, Rajasthan, India, 2008

Level	Units representing Time, place & person	Total units surveyed	Percentage
Village level	11	11	100
PHC, CHC level	6	6	100
Total	17	17	100

Introduction

Malaria is a communicable disease caused by protozoan parasite Plasmodium[1]. World malaria report 2008 provides an estimated figure of 247 million cases of malaria and 1 million deaths due to it, in year 2006. This report indicates the endemicity of the disease in 109 countries of the world[2]. Estimated figures for cases and deaths due to this disease were 21 million and 35000 respectively for south east Asia region in year 2006[2].

Total malaria cases estimated for India were 10.6 million in 2006. Country contributed for 60% share of the total cases estimated for the south east Asia region in same year. Total number of deaths due to malaria in India estimated were15000[2]. Rajasthan is one of the most affected states of country[2]. This contributed 8% cases of malaria in the country in year 2003[3]. A study published in 1999, reported the values of slide positivity rate and slide falciparum rate as of 67.54 % and 7.10 % in district Jodhpur of Rajasthan[4]. Disease has come out as a perennial health problem in district for last five years (2002-2006) in surveillance data analysis study of the author[5].

Prevention and control activities for malaria are being implemented through national vector borne diseases control programme (NVBDCP). NVBDCP is the nodal agency for prevention and control of malaria, lymphatic filariasis, dengue, kala azar, japanese encephalitis and chickungunya in India with support of state level programme officers responsible for implementation of the programme[6].

NVBDCP aims to prevent and control the Malaria morbidity and mortality in state and in country as a whole. Main aim is the reduction of the disease to a tolerable level in which the human population can be protected from malaria transmission with the available interventions[6].

Objectives

To describe & evaluate the programme critically with respect to attainment of its objective and to make the evidence based recommendations.

We used in depth qualitative and quantitative interview beside observing the various forms, reports, registers and output of the programme. Health manager, programme implementers at district and health unit's level were consulted about context, evolution and need. There perspectives were gained about the programme and its utility ensured through their consent.

Print and electronic material on the malaria control programme and its activities consulted. A sample of stakeholders such as manager, implementers, workers, and beneficiaries interviewed with pretested schedule to collect information on programme activities and achievements. Documents, reports, outputs of health facilities were seen to understand the programme at implementation level. The collected information was summarised in a logic model and described to stakeholders.

The evaluation study was designed with the help of logic model developed. Specific indicators and sources of data were identified for evaluating various elements of programme viz. input, process, output and outcome. Full study protocol along with questionnaires prepared and discussed with stakeholders to get their thoughts and comments.

After getting their approval, data was collected by research scholar on a pretested questionnaire from randomly selected block Banar about the programme activities and achievement, to gather the credible evidence. Data was entered in Microsoft excel computer programme and data management and cleaning was done in Epi-info software before analysing it. Conclusions made based on analysis and interpretation of data. Conclusions discussed with stakeholders for suggesting recommendations. Report disseminated to programme workers to ensure its use.

Sampling procedure

A block primary health centre Banar was selected at random out of total 9 in Jodhpur. All of the 6 primary health centres of block Banar were visited beside the office of chief medical and health officer, Jodhpur. Two sub centres selected randomly from each of the selected PHCs. Total 19 health facilities were visited.

A sample of 60 community members was estimated to assess the awareness level about the malaria transmission and prevention based on earlier report on awareness about malaria in general population[7]. To estimate the sample following assumption were made:

Target population of Jodhpur – 30,000,00

Estimated proportion - 3 %

Confidence interval - 5 %

Confidence co-efficient - 95 %

Expected non responders - 33 %

Result

Description of programme

Government of India launched the national malaria control programme (NMCP) in 1953[8]. In 1958, NMCP was converted to the national malaria eradication programme (NMEP). In 1977 the modified plan of operation (MPO) was launched with the immediate objectives to prevent deaths and to reduce morbidity due to malaria. Later on national anti malaria programme was formulated in 2000 for control of malaria. Currently the national vector borne disease control programme (NVBDCP) has taken up the control activities. NVBDCP is being implemented in whole country including state Rajasthan. The strategy for control of malaria involves (1) early diagnosis and prompt treatment (2) integrated vector management and (3) promotion of personal protection measures.

Prevention and control activities under programme depend on whether the area lies in rural or urban setting and its type viz. high or low risk area. Medical officer's format under malaria surveillance explains the criteria adopted to identify high-risk areas in rural and urban settings as given under: -

Rural area

1. Recorded deaths due to malaria (on clinical diagnosis or microscopic confirmation).
2. The slide positivity rate (SPR) is to be used for the identification of areas as follows:
   A. Doubling of SPR during the last three years provided the SPR in second or third year reaches 4% or more
   B. Where SPR does not show the doubling trend as above but the average SPR of The last three years is 5% or more.
   C. SPR is 3% or more during any of the last three years. provided the proportion of P.falciparum is 30% or more
3. Any area having a focus of Chloroquine resistant P.falciparum
4. Tropical aggregation of labour in project areas and new settlements in endemic/receptive and vulnerable areas.

Urban area

A. The SPR 10% and above during any of the last three years is identified as high-risk areas.
B. Population of 50,000 or more and SPR more than 5% or the ratio of clinical malaria cases to fever cases more than one third as per hospital/dispensary statistics during the last Calendar year.

The strategies of malaria control in the rural areas are:

a. **Early diagnosis and prompt treatment (EDPT)** through drug distribution centres (DDC), fever treatment depots (FTD). DDC provides the presumptive treatment of malaria to each fever cases; while FTD collect blood smears from fever cases and provide presumptive treatment after blood smear and radical treatment if the sample found positive for malaria on slide examination at a microscopy facility. In addition to this, EDPT also provided at health sub centres, primary health centres, community health centres and block hospitals. At health sub centre, Female health worker collect blood smear from each

centre for microscopic examination. Female health worker give the presumptive and radical treatment before and after microscopic examination respectively, if smear found to be positive for malaria. Patients coming at primary health centres, community health centres are diagnosed on same day and receive the radical treatment. Female & male health workers are expected to visit every village on fortnightly basis for home calls to screen fever cases and make blood smear slides.

b. **Integrated vector management** by:

- Yearly two round of indoor residual spray with DDT in high-risk area of malaria. First round begins on 15th May and ends on 31st July. Second round begins on 1st of August and ends on 15th October.
- Use of biological vector control measure as larvivorous fish in ponds, water bodies etc.
- Use of larvicides such as Temephos and malaria larvicidal oil in clean and dirty water respectively

c. **Personal protection measures**

- Promotion of use of insecticide treated bed nets (ITBNs) through free or subsidized supply to below poverty line (BPL), population living in remote, inaccessible areas with high risk of malaria as well as insecticide treatment of community owned bed nets
- Information, education and communication (IEC) to enhance awareness among members of the target communities about causes, prevention and treatment of malaria

Strategies for malaria control in urban areas:

a. Early diagnosis and prompt treatment

EDPT in urban areas are provided through network of urban dispensaries, satellite hospitals, medical college associated hospitals, urban primaries, maternal & child health centres and urban ad post etc. There is not any wing for active malaria search in urban areas.

b. Integrated vector management by:

- Use of larvivorous fish in the water bodies such as slow moving streams, lakes, ornamental ponds, water fountains etc.
- Baytex larvicide is used for water bodies, which are not suitable for larvivorous fish like household water tanks.
- Pyrethrum aerosol spray is used as and when required

c. **Personal protection measures**

- Awareness campaigns are undertaken to increase the acceptability of personal protection measures.

Evaluation of the programme

I surveyed six primary health centres (PHCs) of Banar block primary health centre (BPHC) and 12 health sub centres (HSCs). A minimum of 5 community members were asked to recruit in interview to assess the awareness level and to know the practicing personal protection measures against malaria prevention. If there were more persons willing to be recruited in interview, they all included. Out of the 12 HSCs one was closed on day of visit so adjoining HSC was approached but unfortunately that was also not open so one HSC could not be included.

Results of the evaluation indicators are as following: -

Input indicators

Out of the 200 medical officers sanctioned in district, 195 (98%) were in place and trained for malaria. Out of 50 MPW (Male) sanctioned, there were 45 (90%) trained MPW in place for malaria. There were 90 (90%) trained laboratory technicians in place against 100 posts sanctioned. There was not even a single entomologist in place for Jodhpur district. 83% (5 out of 6) health facilities received adequate supply of insecticide. 23% of health facilities were having adequate supply of larvivorous fishes. Only 12% health facilities received the bed nets, in excess to 95% of their requirement (Table-1). NO health facility was having adequate supply of rapid diagnostic test kits.

Only 24% health facilities against (4 out of 17), reported at least one entomological survey done in their area in last year. One health facility reported >50% coverage with IRS, three other reported <50% and remaining 13 reported nil coverage for insecticidal residual spray in their area. 0% of health facilities used Gambushia fishes as larvivorous measure. Out of 17 only 2 had received >95% of required bednets, those 2 also not distributed the bednets to beneficiaries; in other way 0% beneficiaries received the bednets. 10 % of the respondents owned a mosquito net. 89% of respondents reported home visit by health worker in last 15 days. The range of ABER was from 1.45 to 15.56. Only 1/3rd of PHCs had achieved the target of MBER of 0.8 in month of non-transmission season. Any PHCs did not send the required sample for cross checking in last year. One PHC send the 2.53% of smears for cross checking, out of which 100% samples found in agreement (Table-2). The delay in between date of examination and date of collection was of 2.94 mean days in all fever cases irrespective of type of surveillance.

Output indicators

5% of respondents told that their household has sprayed with IRS in last year. 11% of respondents told that they sleep under net. 93% of respondents were aware about malaria transmission. 100% of respondents were aware about at least one malaria prevention measure. 34% of respondents reported use of some anti mosquito material. There was the delay of 0.8 mean days between date of smear collection and date of radical therapy. 100 % of malaria patients were treated with correct treatment and completed the therapy. No facility had run out of stock for at least a week in last one-month period. Only 1/3rd of PHCs had been achieved the target of ABER of 10% in last year.

Outcome indicators

There was not even single death due to malaria in health facilities surveyed as well as in the district. The range of slide positivity rate was from 0 to 2.64 in all 17 health facilities visited. While this rate was 0.58 in district whole. Only 1 PHC reported

proportion of plasmodium Falciparum cases in the district was lower then 1%.

Discussion

District Jodhpur is a low risk area as per the data of SPR, PF% and death due to malaria in last year. Health facilities also found to be in low risk areas, because all were having SPR of less than 3 with proportion of plasmodium falciparum cases less than 1%. Only one PHC, which is in periurban area have shown highest SPR of 2.64 with PF% of 0.57%. The malaria prevention and control programme is implementing as per the guidelines of programme for low risk area.

For the early diagnosis and prompt treatment of malaria cases, trained medical officers, MPW (male) and laboratory technicians were in good proportion, not less than 90%. Absence of Entomologist in district is noteworthy. Use of larvivorous fishes has promoted in urban as well as in rural areas by the programme irrespective of risk status. Only 23% of health facilities were having supply of fishes; this is the area that deserves for improvement. Rapid diagnostic kits were not available for any health facilities, though one PHC was without the functional microscopy center. Such area needs the supply of RDT. 82% of health facilities received the adequate supply of larvicide; this figure may be increased with supply of larvicide. There was not any deficiency found of anti malarial drugs because 100% health facilities were having adequate stock of drugs.

Home visit by the health workers for active case search was found to be satisfactory as 89% of respondents reported for home visit in last 15 days. ABER is the indicator that needs the attention of health planners in district because only 1/3rd of PHCs had been achieving the target in last year. Quality control measure for laboratory assessment is also lagging behind. Mean delay of days between date of collection and date of examination was 2.94 days, which need for further reduction.

Awareness indicators about malaria transmission and prevention found to be satisfactory; 93% of respondents were aware about malaria transmission. 100% of respondents were aware about at least one malaria prevention measure. All positive cases were given the radical therapy on the same day that is the strength of the programme.

Although the Jodhpur had faced outbreak of malaria in past, it is now a low risk area; an indicator of performance of programme. Supply of larvivorous fishes, larvicide, and RDT need attention of planners and their supply should be increased particularly in deficient areas like PHCs without technicians and remote areas. All PHCs should be motivated for the blood smear collection from their area, to achieve the target of ABER.

Limitation of the study

The study area was chosen based on high mean monthly incidence rate. Other areas does not have representation in study, though those could be from low incidence areas.

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Table-1Logic model of malaria control programme

	Vector control	Personal protection	Early diagnosis & treatment	
Input	• Entomologist • Insecticides • Larvicides • Larvivorous fishes	• Insecticide treated bed nets • Capacity development through IEC	• Functional microscopy centres • Trained health care workers	• Trained health care workers • Medicines
Process	• Entomological surveys • Insecticide spray • Use of larvicides • Use of larvivorous fishes	• Ownership of bed nets • IEC campaigns	• Microscopic examination • Quality control measures	• Free treatment
Output	• House holds effectively sprayed • Larvicides used • Larvivorous fishes applied	• Sleeping under mosquito net • Using personal protection measure	• Population screened for malaria	• Patients received recommended treatment
Outcome	• Deaths due to malaria • Slide positivity rate • Plasmodium falciparum percentage			

Table-2 Input indicators in malaria control programme in Jodhpur, Rajasthan, India, 2008

Indicator	No. of health facilities showing indicator	Total health facilities	Percentage of health facilities showing indicator
Health facilities with adequate spray squad	5	6	83%
Health facilities having functional microscopy centre	5	6	82%
Health facilities with adequate materials for IEC	14	17	82%
Health facilities with adequate supply of larvicide	14	17	83%
Health facilities with adequate stock of anti-malarial drugs	17	17	100%

Table-3 Process indicators in malaria control programme in Jodhpur, Rajasthan, India, 2008

Indicator	No. of health facilities showing indicator	Total health facilities	Proportion of health facilities showing indicator
Insecticidal residual spray	4	17	24%
Health facilities using >95% of supplied Malaria Larvicidal Oil	14	17	82%
Facilities managed at least one IEC awareness camps	17	17	100%
Smears send for cross examination	1	6	17%

SECTION 3:

OUTBREAK INVESTIGATION

Introduction

Typhoid fever is caused by bacteria Salmonella typhi. Disease spread through the ingestion of food or drink contaminated by urine or faeces of infective people. Disease may present clinically with high fever, malaise, headache, constipation or diarrhoea, rose coloured spots on chest, liver and spleen enlargement[1]. Global burden estimate that typhoid caused 21 million cases and 216510 deaths in year 2000[2]. World health organization has initiated an international Salmonella surveillance programme in January 2000. Its primary goal is to enhance the capacity and quality of *Salmonella* surveillance, serotyping and antimicrobial resistance testing throughout the world. This programme now has close to 1100 members from 153 member States[3]. Typhoid may occur either as outbreaks[4,5,6], or sporadically in community[7,8,9,10].

Typhoid is under regular surveillance by integrated disease surveillance project of India[11]. Annual typhoid incidence rate of 493.5 cases per 100,000 person years has estimated in India in one study[12]. Outbreaks of typhoid have reported from Maharashtra[13,14], Bangalore[15], West Bengal[16,17] and Pondicherry[18] in India.

Cases of typhoid have been reported from Rajastahn for long time back[19,20]. Information on typhoid in desert part of Rajasthan is scarcely published. Daily newspaper "Dainik Bhaskar" alerted on 7th June 2007 about the outbreak of fever with headache and stomachache in Varkana village of district Pali, Rajasthan. This study presents the investigation report of the outbreak. Investigation was carried out as a field assignment under field Epidemiology training programme, an off campus training programme, running at National institute of Epidemiology, Chennai, India. We investigated the outbreak in close coordination of local health team to identify the source of infection and to suggest for preventive and control measures.

Methodology

We visited the village Varkana on 7th June 2007 and interviewed the health care authorities at various levels about usual incidence rate, any change in surveillance system and population movement in affected area. Physicians, paediatrician and laboratory technician, operating health camp at ad post Varkana were discussed about clinical presentations of cases, laboratory findings and possible source of infection.

feast, and street venders selling eatables. They were also asked for possible source of infection.

Epidemiological investigation

We framed an operational definition to recruit maximum number of cases in study. Data on patients, meeting operational definition criterion, was collected through active and passive surveillance system. Cases were described in terms of time, place and person characteristics to arrive an etiological hypothesis for outbreak. We carried out retrospective cohort study on 8th June 2007 to test the etiological hypothesis. Sample size of 108 residents was estimated based on 2100 target population, 50% estimated proportion (p=0.5), 95% confidence co-efficient (Z=1.96), 10% confidence interval (d=0.1). 12 more numbers were added for non-responders if any during study. We used the formula $N= Z^2 pq/d^2$ for sample size estimation. 108 households were selected through draw of name slips, prepared from the village census list. One respondent was recruited in study from each household. Household member seen first at home visit was recruited in study.

Environmental investigation

Village was observed for sanitary conditions and practices, drinking water supply, and presence of shop with locally made eatables. Suspected samples were collected and sent to laboratory, public health engineering department, Jodhpur to test for contamination.

Finally follow up visit was made later on 4th July 2007 to look for the impact of control measures undertaken after outbreak investigation in field.

affected area. The usual rate of fever was 1-2 cases per month in affected village in last 3 years. Most of the cases were suffering from continuous fever with stomachache, pain in abdomen, diarrhoea or constipation and vomiting. Patients did not present with symptoms suggestive of respiratory tract infection, any type of rash or hemorrhagic manifestations. All cases found to be negative for malaria parasite examination in JSB (Jasvant Singh Bhattacherji) stained thick and thin smears of their blood samples. These clinical presentations suggested for typhoid. Typhoid was thought as possibility in absence of malaria and other probable diseases like, dengue, chikengunya, and lower respiratory infection. Till 8th June 2007, a total of 209 cases were reported through surveillance system in Varkana village. Patient's sera sent for Widal agglutination slide test at community health centre, Rani gave clue of the outbreak. Majority of those samples i.e. 43 out of 70, indicated the outbreak of typhoid fever in village. Laboratory findings supported the clinical suspicion. The clinical features of cases in Varkana were in close agreement of clinical features of Typhoid. The working diagnosis was supported by high rate of positivity in Widal test.

There was not any common meal, food handler/distributor in village in last one-month period. People used the open place for defecation near village. Health personals were suspecting the local water supply of public health department as the source of infection; this was considerable particularly in absence of any shared common meal by villagers in last one month.

We defined the suspected case of typhoid as "Occurrence of sustained high grade fever with or without headache, stomachache, diarrhea, vomiting, constipation, loss of appetite with negative test for malaria in residents of Varkana village, District Pali, Rajasthan since 7th May 2007". There were 209 cases reported through system till 8th June 2007; the number rose to 219 by the time the follow up visit was made on 4th July 2007. All 219 cases fulfilled our operational definition.

Epidemiology

First case detected on 18th May 2007. Epidemic curve begins on 18th May 2007 and reaches at peak on 6th June 2007 after that it declines till it last on 17/06/2007. In four weeks duration the curve rises gradually till its peak, declines later on making it an unimodel curve (Fig.-1).

The village is situated on the bank of dry River Sukri. Drinking water was available either through government supply or personal tube wells. Government water supply was through 2 hand pumps and 3 overhead tanks at common places. There was open well, supplying water to all the three overhead tanks in village. Spot map shows the clustering of cases in area supplied by Govt tanks for drinking water. The Meghwal colony, Khimawat colony, Dhani and Teachers colony had shown few cases. Member of these colonies were using water either from government hand pump or through personal tube wells (Fig.-2).

Attack rate of disease was 104 cases per 1000 population. This rate was 95.45 and 114 cases per 1000 population of male and female respectively. Attack rate noted was 133.33 and 276 cases per 1000 population of age groups of 5-9 years and 10-14 years respectively (Table-1).

After describing the cases we suspected that drinking water from government tanks could be source of infection. To begin with we postulated null hypotheses that there is not any association between disease occurrence and drinking water from suspected tanks. Retrospective cohort study was done on 8th June 2007 to test null hypotheses.

Among the 108 villagers interviewed, 60 were found to either have suffered from disease or suffering currently. Widal test report was available with 20 cases only, out of them11 were found to be positive (Table-2). Relative risk of disease was 11.1 with 95 % confidence interval of 3.7-33, among those exposed to water from government tanks as compared to those exposed to hand pumps and personal wells for drinking. This association was found significant at $p<0.05$ (Table-2).

Persons exposed to Govt. tanks and hand pumps & personal wells were at 3.75 times higher risk of developing disease than the reference group with 95 % CI limits of 1.02-13.8. Since the 95% CI begins with 1.02 that is very closer to 1 and expected value for one cell is less than 5; so we applied Fisher Exact test. 1 tailed probability value for Fisher Exact test found was 0.048 ($p< 0.05$), which is significant (Table-2).

contamination test, two found positive. Two water samples from different hand pump sent for test reported negative. Dirt and animal droppings were present around open well, i.e. source of water for government tanks. Some dirt was also observed inside well, which could be animal's dead body.

We recommended for temporary withhold of drinking from culprit tanks. Local health staff and water supply department were suggested for immediate cleaning of tanks and open well. Chlorination of well and tanks was ensured before supply of water begins. People motivated for hygienic practices and use of water from other sources till chlorinated water made available in tanks. Construction of platform around well and its lid suggested as mid term measures. Health staff and general people educated about the chlorination, disease surveillance and hygienic practices for long-term goal.

Discussion

There was not any change in surveillance and population movement within last one month, therefore we ruled out the chance of pseudo outbreak. Numbers of cases reported were clearly in excess of expected cases in this place in same month of last year. These findings, verify the existence of a real outbreak in village Varkana, district Pali, Rajasthan. Clinical presentation of cases was in accordance to the WHO criterion[1]. Epidemic curve with single peak and moderate duration of about one month is suggestive of the common source outbreak of disease with incubation period of approximately 15 days to one month, which is a similar requisite for typhoid[1].

In high and medium incidence areas proportion of typhoid cases differs widely in different age groups, maximum proportion occurs in 0-4 years age group[2]. In low incidence rate areas proportion does not differs much across the age groups, however maximum proportion of cases belong to 20-24 years age group[2]. In this outbreak maximum attack rate noted in 10-14 years age group may suggest for low incidence of typhoid in desert of India. Kulkarni AP et al also reported higher rate among 1-14 year age group of persons in Maharashtra[13].

Exposure to the drinking water from government water supply was found significantly associated with the disease. Dose response effects observed with the exposure of tanks water also add evidence for its causality. This finding is in consistency with other

possibilities of its contamination. Result of water sample for faecal contamination adds other evidence for the source of infection. Typhoid outbreak in western countries is commonly transmitted through food items like fruit salad[4], raw almonds[5], cake[21] and handling dog food[22]. This may be because of the improved sanitary measures and efficient water supply in those countries. Recommended control measures found effective during follow up visit of place. When we visited the village for follow up, outbreak already ended up almost 15 days before.

There are few limitations in this study. Drinking water was tested for faecal contamination, which is indirect evidence for probable presence of Salmonella typhi in water. This evidence may or may not come true, on microbiological testing of water for causative bacteria. We have taken probable case definition for typhoid in this outbreak. Because of cross reactivity of antigens of salmonella typhi with non typhoidal salmonella, malaria and dengue, false positive cases would have entered in our study[23]. Malaria was excluded based on negative blood smear examination. Though nobody presented with retro orbital pain, which occurs commonly in dengue, even we cannot exclude it based on clinical ground alone. Probability of dengue may be minimal in hot weather of desert village, because it is mostly considered an urban problem. We cannot exclude the non-typhoidal salmonella. Even then these limitations do not restrict us from recommending for practicing good hygiene, clean and chlorinate water, health education of general population and surveillance of such cases by system in future.

Conclusion

There was an outbreak of typhoid in village, which affected 219 persons of all age groups and both gender. Drinking of water from overhead tanks of water supply department was associated with this outbreak. Preventive and control measures undertaken after analytical epidemiological study helped in terminating the outbreak.

Authors are thankful to the Dr. Sanjeev Tak, Deputy Chief medical & health officer, Bali for extending his support in accessing the surveillance and laboratory data of patients. We also extend out thanks to all team members of Ad post Varkana, community health centre, Rani, who worked in cooperation with us in identification of this outbreak.

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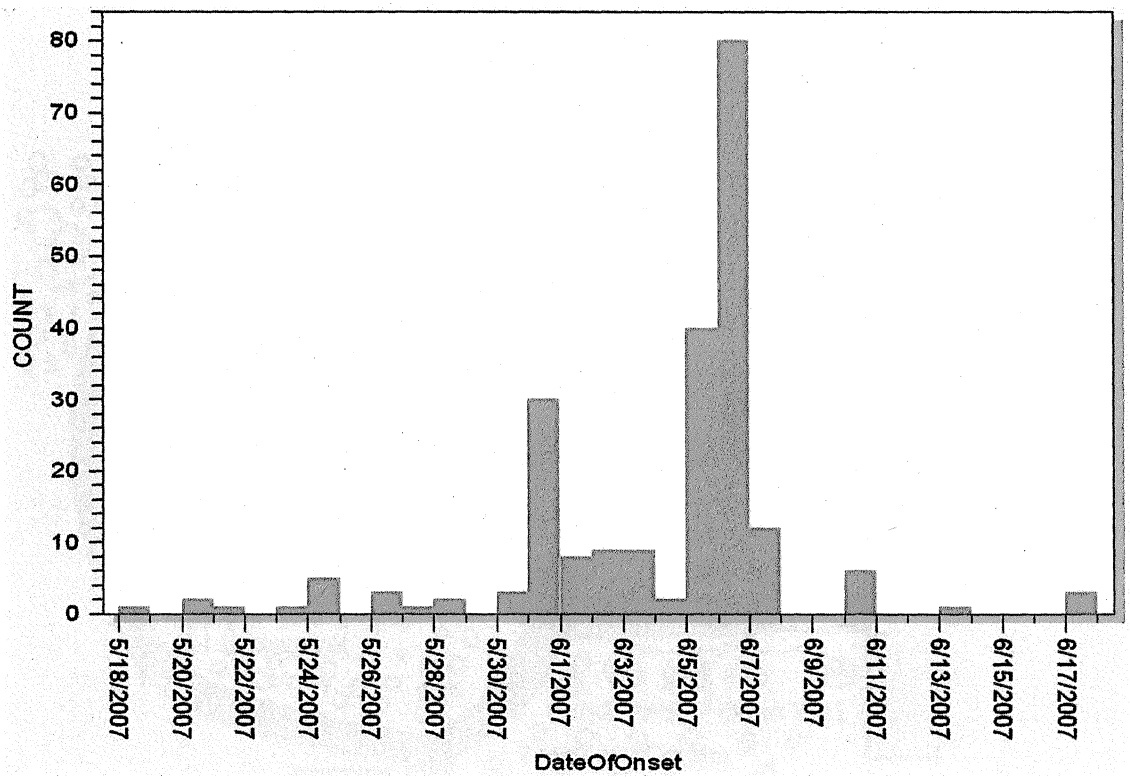

Fig.-1. Epigraph for onset of cases of typhoid in varkana village, district Pali, Rajasthan, India, 2007

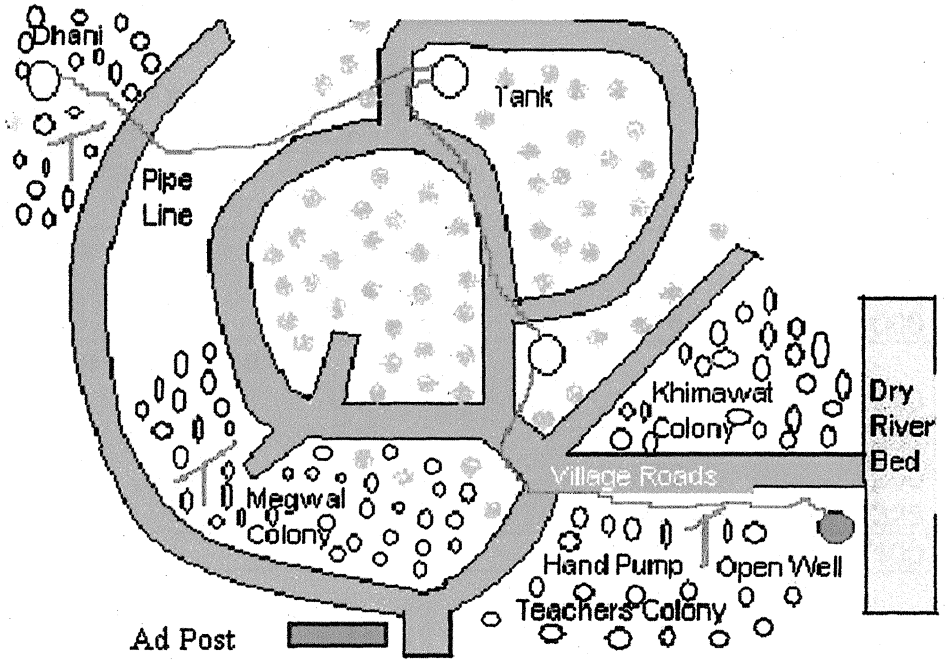

Fig. 2 Spot map for distribution of households of diseased (Orange spots) and non-diseased (Blank circles) persons in village Varkana, district Pali, Rajasthan, India, 2007

Table -1 Age and gender wise attack rates of typhoid in village Varkana, district Pali, Rajasthan, India, 2007

Characteristics		Total Cases	Population	Attack rate (cases per 1000 population)
Sex				
	Male	105	1100	95.45
	Female	114	1000	114
Age group (years)				
	0-4	15	270	55.55
	5-9	34	255	133.33
	10-14	69	250	276
	>15	101	1325	76.22
Total		219	2100	104.28

Table-2 Relative risks of typhoid amongst persons exposed to different sources of drinking water in village Varkana, district Pali, Rajasthan, India, 2007

Source of drinking water	Disease Present	Disease Absent	Incidence rate (%)	Relative risk	95% C.I.
Govt. tank	52	4	92:8	11.1	3.7-33
Govt. tank & Hand pump & personal well	5	11	31.2	3.75	1.02-13.8
Hand pump & personal well	3	33	8.3	Reference	Reference

SECTION 4:

JOURNAL CRITIQUE

Master of Applied Epidemiology (MAE) – Indian Field Epidemiology Training Programme
Scientific study critique form

General information:

Title of the paper: *Cassia occidentalis* poisoning as the probable cause of hepatomyoencephalopathy in children in western Uttar Pradesh

Authors: V. M. Vashishtha, Amod Kumar*, T. Jacob John[+] & N.C. Nayak[#]

References: Mangla Hospital, Bijnor (UP) ,*Department of Community Health, St Stephens Hospital, New Delhi [+]Christian Medical College,Vellore & [#]Sir Ganga Ram Hospital, New Delhi, India

Reviewer: Dr.P.K.Anand, MAE-FETP scholar, VIIth cohort, NIE(ICMR), Chennai

Date: 10/11/2008

General narrative comments:

Authors investigated an outbreak of hepatomyoencephalopathy among children of district Bijnaur, UP. They did not describe the outbreak in terms of time, place and person characteristics. Authors derived their aetiological hypotheses based on news alert in local print media. To determine whether the hypothesis was true, authors carried out analytical case control study. Authors recruited 18 cases. Each case was matched with three controls +/- 1 years of age. Participants were recruited without their consent, though this is justifiable in outbreak investigation case. Analysis was done without matched OR. Authors are over confident about the aetiology of this outbreak. They have concluded without considering effects of bias, confounders and effect modifiers. They should have matched case and controls with gender also. They have not estimated OR in genders separately. That's why result is confusing. The case definition is non-specific of the situation. This clinical presentation can be caused by other factors also. Authors also pointed out it in discussion. Interview is based on past exposure among children. Information about children by their parents is less reliable also. Parents cannot be present all the time with children. Authors have not advised for any immediate, short-term measures to contain this outbreak. Long term measures for prevention of such outbreaks also lacking in study. Investigating outbreak without recommendation for control measures are unethical.

Area	Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree) [3]					Explanations [4]
		1	2	3	4	5	
Overall assessment of the paper	The background provides a description of the public issue at the global and local levels and logically introduces the need to answer a specific research question.		√				Problem at global and country lavel is no discussed.
	The methods section provides sufficient information on the methods used, including the type of study, the sampling strategy, the case definitions, the data collection and the data analysis.		√				There is confusion regarding case-contro recruitment and statistical analysis
	The results reports sound scientific results that meet the study's objective and the research question. They are presented with sufficient details and adequate statistical information (e.g., Confidence Intervals).			√			Information and effects confounders, effe modifiers and dose response not presente
	The discussion summarizes and interprets the results, discusses the findings in view of what is already known, frames what the results of the study can support, defines the limitation of the work and suggests next steps in terms of (1) intervention and (2) research.			√			Summarizes in view of available knowle frames the support by study. Limitations have not defined particularly, bias, confounders and their possible effect on study. Suggest for further research.

[3] Tick appropriate box.
[4] Provide explanation to justify your grading of each of the items.

Area	Checklist items	1	2	3	4	5	Explanations
Methods	The study design is adequate to meet the objective.			√			Cases had matched only for age not for gender
	The study population is well defined and relevant to the research question	√					Not defined at all, even not given
	Definitions are specified, sound and based upon standardized criteria when available.					√	Cases and controls were defined
	Sampling methods are statistically sound and adapted.			√			All cases recruited in study
	The sample size was estimated beforehand appropriately.	√					Method has not given
	The study is exempt from bias.		√				Specificity of case definition not given
	The data that were collected are well described and relevant.				√		Described sufficiently
	The data was collected was of sufficient quality.				√		
	The analysis is thought beforehand and appropriate.		√				Matched OR should be estimated
	The indicators generated are appropriate and well calculated.			√			Information not given
	The statistical tests used are appropriate and well computed.	√					It should be matched Odds ratio
	Appropriate attention has been given to human subject protection issues.	√					Study done without consent

Area	Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree)					Explanations
		1	2	3	4	5	
Writing	The content is well distributed by chapters and sections.	√					Mixing of method and result in introduction
	The language is simple and clear. The word count is < 3000.				√		Language is OK. Words area 328 more than the standard 3000.
	The writing is sequential, going from one point to the next.		√				Mixing of ideas and gaps in link
	The active voice is used throughout.		√				Passive voice used many places
	The vocabulary is precise, consistent and standardized.			√			OK
Tables and figures	There are no more than five tables and or figures. All are needed.	√					Tables and figure are three only a all are needed
	The choice of graph or table to display information is judicious.				√		Matched OR can be given in Table –II
	The tables are clear, exact and the totals add up.					√	Tables are clear and the totals adc
	The graphs are effective, appropriate and understandable.					√	Diagramme gives pictorial view c plant