FIELD PROJECT REPORTS

By

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CERTIFICATION

This is to certify that all the field projects submitted in this Bound Volume are original work carried out by **Lal Anant Kumar Sai Deo** during the 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 by him in part or whole for any other (Publication or degree) purpose.

for **Director,**

National Institute of Epidemiology,

(ICMR), Chennai.

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CONTENTS

FIRST FIELD POSTING

Situational analysis of Sambalpur district, Orissa, India, 2007-08

Introduction

India the nation is a fast developing country economically in South-East Asia region with 1.15 billion people contributing one-sixth of global population. Though India has registered significant progress in improving life expectancy at birth (male: 63.87 years and female: 66.97 years), reducing under five mortality (76/1000 live birth, 2006) and infant mortality (57/1000 live birth) over last few decades, a high proportion of population, especially in rural area, continues to suffer and die from preventable diseases. National rural health mission (NRHM) has been launched 2005 with a view to bring about remarkable improvement in the health system and the health status of the people, especially those who live in the rural area of the country.

Orissa has made much progress with respect improving health of its people over last two decades. The crude death rate (CDR) declined from 13.1/ 1000 population to 9.6 (SRS 2004) and Infant mortality rate (IMR) has declined from 130/ 1000 live birth to 65 (NFHS III). The maternal mortality rate (MMR) is estimated to be 358/ 100, 000 live birth as compared all India average of 301[2] (NFHS II). Orissa contribute one-third of malaria death in the country. I have been working as Medical officer of University college of engineering , Sambalpur and before that served as Assistant surgeon in different institutions starting from Primary health center to District level, prior to enrolment in the Master of Applied Epidemiology course.

The key elements of the situation analysis were to describe the geographical, demographical and socio-economic characteristics, important health related millennium development goals indicators, organizational set up of the health system, major public health priorities in relation to the Sambalpur district, Orissa.

Methods

We collected information on Demographic and administrative profiles the district from the district statistical and district rural development office. We calculated the projected population for 2007 of the district basing on census report 2001 and population growth rate. We calculated age and sex wise distribution from the projected population for 2007 basing on 2001 census. We collected millennium development goal (MDG) related health information from the public health and family welfare wings of the district health department. We also searched the World Bank, the millennium development, the World health organization, the UNICEF, Government of India websites for more information on MDG of Orissa and India. . We collected surrogate indicators for MDG to compare with the state and national level.

We also visited few primary health centers and sub centers to observe the primary health care delivery system and availability of infrastructure. We collected information on availabilities of laboratory resources at the district and the block level.

Results

Description of Sambalpur district

Sambalpur is located in the Western part of Orissa, 320 kms from Bhubaneshwar the state capital. This district consists of a semi tribal population with a geographical area of 6657 sq kms. Located between Latitude 20 ^{o} 54' (North) to 22 ^{o} 11' (North) and Longitude 83 ^{o} 49'(East) to 84 ^{o} 45' (East).The annual rain fall is 1527 mm. The district has tropical temperate climate, with extreme heat during the summer season. Area consists of large forests and mostly irrigated agricultural lands. People depend on agriculture and forestry but the socio economic also the demographic profile is fast changing with rapid industrialization since recent years.

Population

According to the 2001 census report the total population of Sambalpur district is 9, 35,613. The population density is 141 per sq km. The female/male sex ratio is 969/1000. 40% of the population is below poverty line. Scheduled tribes constitute 35% and Scheduled cast 17% of the population.

Laboratory resources

The district has laboratory facilities at the all the 9 blocks and district level. At the primary health care level i.e. in the block PHCs routine investigations like urine, stool, blood examination for malaria, typhoid and sputum for tuberculosis are available. There are 29 sector level microscopy centres for diagnosis of malaria in the district. At secondary level i.e. in district head quarter hospital, laboratory test facilities available are for malaria, filaria, typhoid, HIV, leprosy, stool (routine, microscopic and occult blood) urine (routine, microscopic), bile salt and pigment, sputum, and seminal fluid analysis. Under Revised tuberculosis control programme, 22 designated microscopy centres (DMC) are established, 9 are at the block and 12 at

the peripheral health institution level and one at divisional Railway hospital. There are four integrated counseling and testing centres (ICTC) at district and sub-divisional level with facility for diagnosis of HIV. In 2007, under Integrated disease surveillance project (IDSP), one public health laboratory is established at the district level for laboratory investigation of diseases like malaria, cholera, tuberculosis, measles during outbreak situation. There are adequate numbers of trained laboratory technicians and pathologists at the district level.

Major public health priorities

Sambalpur district has several public health problems. Of these, Malaria, leprosy, tuberculosis and diarrhea are the major public health problems in the district. Malaria is a serious problem in the district with an annual parasite index of 22 in 2007 (State average 9.02). The rising trend of the Plasmodium falciparum cases (92% of all the cases in the district) also development of drug resistance in some pockets. There were increased episodes of diarrhea reported from different areas of the district following the rapid industrialization leading to pollution and demographic changes resulting in scarcity of resources. During 2007-08, in Sambalpur, the infant mortality was also high at 47 per 1000 live birth. To reduce the neonatal and infant death in the district, NRHM initiated several strategies like deployment of trained accredited social health activist (ASHA) in every village, antenatal care and skilled birth attendant at the Sub-center level, incentives to the mothers for promoting antenatal care and institutional delivery, transport facilities for institutional delivery and also referral of sick newborn to the nearest health facility. In the year2000, the National tuberculosis control programme (RNTCP) was implemented in Sambalpur district. In Sambalpur, during 2007, the new sputum positive case detection rate was 57 per 100, 000 populations with cure rate 86% and default rate 4.9% among the NSP cases. In

the district, there are 1074 trained DOTS providers, supervisory staffs at the Sub-District level to monitor the programme and involvement of NGOs for IEC/BBC programme.

Organization of the district health system

In Sambalpur district, the health care system is operational on the basis of Primary Health Care approach. Primary health care is provided through 29 Sector PHCs and 9 Block PHC. Secondary health care facility is available at the Sub Divisional Hospitals, Kuchinda, Rairakhole and District headquarter hospital, Sambalpur .Cases from the district are referred to Medical College hospital for tertiary care. The grass root level health infrastructure is a Sub centre, headed by Multi purpose health worker (MPHW) covering about 5,000-10,000 population. The ASHA at the village level serves as a link between the community and health system. The primary job responsibilities of ASHAs to assist the health workers in maternal and newborn care, antenatal care of pregnant care, immunization sessions.

Indicators towards millennium development goal

Goal 1:

The prevalence of underweight among under five children in the Orissa is nearly equal to the national level, where as for district, no information is available. At the national level, vitamin A supplementation of children of age six to 59 months during last six months was 64%, where as it was 25.6% (12-35 months) and 77.6 % (9-35 months) at the state and district level respectively. The proportion of infants under six month who are exclusively breast fed was 46% and 54.5% at the national and state level. However, in the district, the exclusive breast feeding practice is 58% among

children more than six months. We could not collect any information about proportion of population below minimum dietary consumption level.

Goal 4:

The under five mortality rate in Orissa (90.6/ 1000 live birth) is higher than the national level (76/ 1000 live birth), however, no information was available for the district. The infant mortality in Sambalpur (47/1000 live birth) is lower than the state (64.7/1000 live birth) and national (57/1000 live birth) level. In India, measles immunization among children under 1 year of age is 59%, where as the immunization among children between 12 – 23 months is70.5 % and 81% at the district and state level respectively.

Goal 5:

Maternal mortality ratio (MMR) in the state (358/100, 000 live birth) is lower than the national (450/100, 000 live birth) data. No information MMR was available for the district. The proportion of birth attended by the skilled health personells is much lower at the district (29%) as compared to the state (46%) and national (47%) level. The antenatal care among pregnant women was nearly similar at the district (67%) and state(62%) level, where as the coverage was 74% at the national level.

Goal 6:

HIV: In India, the HIV prevalence among antenatal clinic attendees (15 -49 years) is 0.6%, where in Orissa, it is 0.5%. No information was available for HIV prevalence at the district level. The condom use rate at the district (2.0%) level is very low as compared to the state (6.7%) and national (9.8%) level. The condom use rate during the recent higher risk sexual encounter is high in Orissa (45%) as compared to national (30%) level. Proportion of HIV positive women receiving antiretroviral

therapy during pregnancy to prevent mother to child transmission is much higher in Orissa (34%), where as its low at the national (3.6%) level. No data was available for number of children orphaned by HIV/AIDS and percentage of clients diagnosed and treated for STI as per guideline for the district, state and national level.

Malaria: During 2006, in Sambalpur two cases of malaria deaths were reported, where as at the state and national level, it was 184 and 1173 respectively. No death due to malaria in the district reported in 2007-08. At the district level no record was available of women have taken chemoprophylaxis for malaria and at the national level 35% of households are having at least one medicated mosquito net.

Tuberculosis: In India, the prevalence of tuberculosis is 299 per 100, 000 population. In Sambalpur, tuberculosis is an important health problem though the default rate among new sputum smear positive (NSP) tuberculosis cases is low in the district (4.9%) as compared to state (5.3%) the national (4.6%) level. Where as compared to state (81%) and national (84%) level data more than 90% of New sputum positive Tuberculosis cases are registered under DOTS strategy at all levels. cure rate is achieved at the district (86.7%)

Goal 7:

The proportion of population with sustainable access to improved water source was 21% in the district that is lower than the state and national level. The improved sanitary facility in the urban areas is also low (1.5%) in Sambalpur district as compared to Orissa and India.

Goal 8:

No data was available for goal eight for the district, state and national level.

Discussion

Sambalpur in the state of Orissa is now a fast growing district undergoing rapid industrialization and passing through sudden demographic changes experiencing an increase in health burden of the population. In Sambalpur, 40% of the populations are below poverty line and belong to schedule tribes and caste. In the district, several outreach areas and inaccessibility is posing constrains to reach people to provide better health care. In Sambalpur agriculture, forestry and since year 2000 onwards industries are the main occupation and chief source of livelihood.

The district has adequate public health infrastructure in the urban and rural areas. In the district, there are adequate peripheral health workers at the Sub-centers level, where as there is vacancies of medical officers and health supervisors. Under NRHM, one ASHA is deployed in every village, who works closely with the health workers for maternal and newborn care, immunization programme, referral services, and also functions as fever treatment depot for malaria and as DOTS provider under RNTCP.

The district has laboratory facility at district, sub-district and block levels and all the routine investigations are done in these levels. In the district, the public health laboratory is yet to be functional for support of investigations of common outbreak of communicable diseases.

The district is lagging behind in achieving millennium development goals as compared to the state and nation and all so many MDG indicators are not documented at the district level.

Sambalpur district has many public health priorities. Of these, Malaria seeks highest attention in the district. Of the 9 blocks, the Charmal and Jujumura blocks reported

highest API during 2007. Insecticide treated mosquito nets (ITMN) are being distributed, second line antimalarial drugs are introduced in drug resistant areas under the National vector borne diseases control programme (NVBDCP)

Tuberculosis is a public health problem in the district. With adequate laboratory facilities, manpower and good number of DOTS providers at the village level, the district is achieving the programme objectives of 85% cure rate among new sputum smear positive cases and at least to detect such cases in the community.

Sambalpur district achieved elimination of leprosy in 2006 -07. However, again during 2007-08, the prevalence increased to more than 1.0 per 10, 000 population. During 2007-08, the coverage among the female community was achieved at above 40%. But the deformity proportion among the leprosy cases was high at 2% this could be due to low awareness, illiteracy, and inaccessibility.

There is no special program in the district for control of diarrhea but integrated with Integrated management of newborn and childhood management program . Surveillance under Integrated disease control program takes care of the diarrheal diseases.

Sambalpur district has good health infrastructure in both rural and urban areas. However, there are few public health challenges prevailing in the district, of which malaria, tuberculosis, leprosy are the main concern for district health authority. Rapid industrialization has resulted in socioeconomic and demographic changes, migration of population, particularly the younger members of the family in search of well paid jobs in industrial sector and for higher education leaving the elderly at their own . Even the womenfolk also coming out to do work has left nobody to look after the elderly in the family. Thus there is a gradual increase in the number of elderly living

alone in rural areas prone to suffer from health problems as they need assistance to avail health facilities which is not nearby .Change in occupation is encroaching upon traditional family norms , habits, exhausting resources and increasing health burden. There is a felt need to study on the change in socio demographic structure in the district and its impact on the preparedness of the health care providing sector.

Also the future concern are industrial pollution and related health problems which needs improvement in health infrastructure.

In two years of field epidemiology training programme, I shall carry out various projects in the Sambalpur district. My focus will be on communicable diseases mainly malaria, tuberculosis, leprosy. I shall conduct study on health problems in elderly living alone in the rural area of Sambalpur for my dissertation project.

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Table 1: Characteristics of the population of Sambalpur district, Orissa, India, 2007-08

Population Group		Population Size	Proportion of Total (%)
Age	0 – 1	19319	2
	2-- 4	67812	7.02
	5 – 14	215994	22.36
	15 – 29	265453	27.48
	30 – 49	250577	25.94
	50 – 59	63368	6.56
	60 and above	80853	8.37
	unstated	2612	.27
	TOTAL	965988	100
Sex	Male	490722	50.8
	Female	475266	49.2
Socio-economic status	Above poverty level	579593	60
	Below poverty level	386395	40
Caste	General and OBC	468504	48.5
	Schedule Tribe	333266	34.5
	Schedule Caste	164218	17
Total		965988	100

Table 2: Key public health priorities in Sambalpur, Orissa, India, 2007

Public Health Priority	Key Elements	Ongoing Prevention & Control Programme
Malaria	• Annual parasite incidence (API)- 22% during 2007 Slide positivity rate (SPR) -13.4 • Plasmodium falciparum (*Pf*) – 92% • All the blocks of district are highly endemic	• National vector borne disease control program consisting • Early diagnosis and prompt treatment (EDPT) • Vector control by insecticide spray • IEC for personal protection through promoting use of insecticide treated mosquito net and environmental engineering
Leprosy	• Decrease in prevalence rate from 1.1 in 2006-07 to 1./10,000 in 2007-08 • Achieved coverage of female population (40%) • High deformity proportion (2.0%)	• Early detection and treatment by the general health care provider • Availability of MDT at the Sub-centers • Disability prevention and medical rehabilitation facility at the block level • Education of community through IEC/BBC
Tuberculosis	• Low detection of new sputum smear positive pulmonary tuberculosis case (NSP detection rate:57/100, 000 population) in 2007 • Achieved cure rate (86%) among NSP cases • Low default rate (4.9%)	• Sputum microscopy facility at block and peripheral health institution level • Trained DOTS provider at the village level • Full course drugs in patient wise boxes • Supervision and monitoring of programme at the sub-district level • IEC/BBC through regular patient provider meeting and involvement of NGOs in the programme

Table 3: Indicators of progress for the health related millennium development goals, Sambalpur , Orissa, India, 2007

Goal	Indicator	Indicator		
		Sambalpur (2006)	In Orissa (Year)	In India (Year)
Goal – 1	Prevalence of underweight children <5 yrs of age	NA	45.9%[1, 3]	43% (2000-06)[8]
	Proportion of population below minimum level of dietary energy consumption	NA	NA	NA
	% of children 06 to 59 month of age who received one dose of Vit. A in the past 6 month	77.6%[2], [1]	25.6%[3, 3]	64%[9]
	Proportion of Infants under 6 months who are exclusively breast fed	58%[4, 1]	54.5%[2]	46(2000-06)[9]
Goal – 4	Under-5 mortality rate	NA	90.6[4]	76 (2006)[9]
	Infant mortality rate	47[2]	64.7[4]	57[9]
	Measles Immunization among children under one	86%[5, 1]	81.1%**[2]	59 (2006)[9]
Goal –5	Maternal mortality ratio	NA	358[5]	450 (2005)[9]
	Proportion of births attended by skilled Health personnel	28.6%[1]	46.4%[4]	47% (2000-06)[9]
	Contraceptive prevalence rate	39%[1]	59.4%[4]	56%[9]
	% of women receiving antenatal care	67.4%[1]	61.8%[4]	74% (2000-06)[9]
Goal – 6 (HIV)	HIV prevalence among 15 to 24 year old pregnant women	NA	0.5[6,6]	0.6[7,6]
	Condom use rate of the contraceptive prevalence rate	2.0%[1]	6.7%[4]	9.8[4]
	No. of children orphaned by HIV / AIDS	NA	NA	NA
	% people using a condom during must recent higher risk sexual encounter	NA	45%[4]	30%[9]
	% of STI clients who are diagnosed & treated according to guidelines	NA	NA	NA
	% of HIV +ve. Women receiving antiretroviral treatment during pregnancy to prevent mother to child transmission of HIV	0%	34%[7]	3.6%[10]

[1] Children under three years underweight
[2] Children (9-35 months) who received one dose of vitamin A
[3] Children (12 – 35 month) who received vit A dose in last 6 months
[4] Children (six months and above) exclusive breast fed
[5] Children (12-23 months) who have received measles vaccine
[6] Antenatal clinic attendees (15 – 49 age group)
[7] Antenatal clinic attendees (15 – 49 age group)

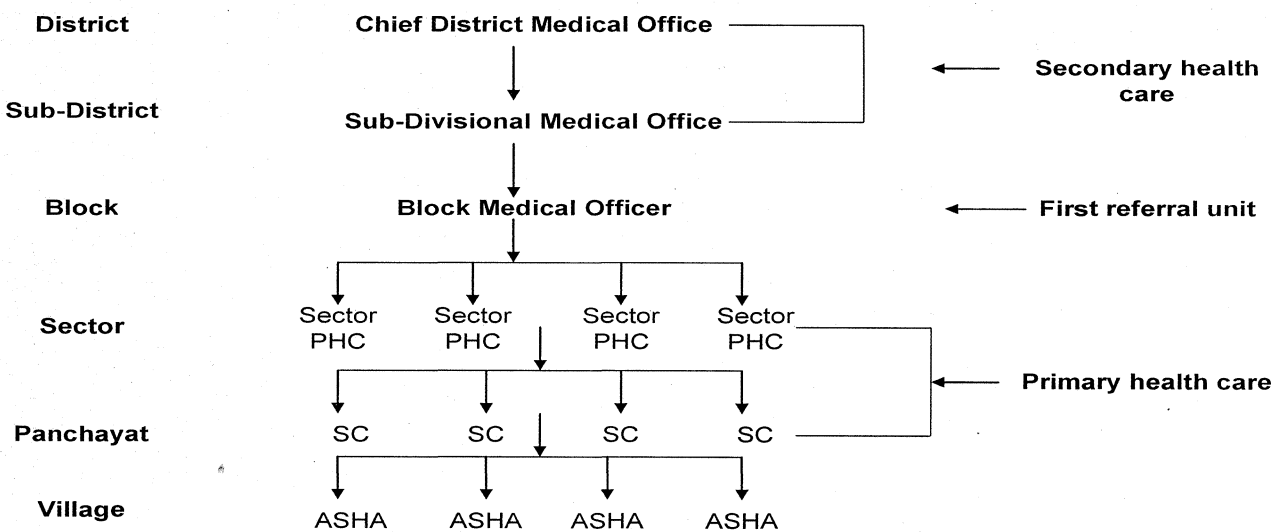
Table 3: Indicators of progress for the health related millennium development goals, Sambalpur, Orissa, India, 2007 (Continued)

Goal	Indicator	Value of the Indicator		
		Sambalpur	In Orissa	In India
Goal – 6 (Malaria)	Malaria death (Absolute no) 2007	0	184 [3]	1173[15]
	Proportion of people with uncomplicated Malaria getting correct treatment at the health facility & community level, according to the National guidelines, within 24 hours of the onset of symptoms	NA	NA	NA
	% of pregnant women who have taken chemoprophylaxis or drug treatment for Malaria	NA	NA	NA
	The proportion of house hold having at list one insecticide treated bed net	NA	NA	35.5%[4]
Goal – 6 (TB)	Prevalence & death rate associated with TB	NA 5.1%[12] (2007)	NA 5.3%[13]	299[16] 4.6%[13]
	Proportion of TB cases detected and cured under DOTS	86.7%[12]	81%[13]	84%[13]
	% of estimated new smear positive TB cases registered under DOTS approach	89.2%[12]	94%[13]	96%[13]
Goal – 7	Proportion of population with sustainable access to an improved water source urban & rural	20.8%[1] (Urban) 1.5%[1] (Rural)	52.8% [14] (Urban), 13.7% [14] (Rural)	95%[9] (Urban) 83%[9] (Rural)(2004)
	Proportion of urban population with access to improved sanitation	22%[1]	35.1%[14]	33%[9] (2004)
Goal – 8	Proportion of population with access to affordable essential drugs on a sustainable basis	NA	N A	NA

Table 4: Potential topics for the various fields MAE – FETP assignments

Assignment	Potential topic
Description and evaluation surveillance system	Integrated disease surveillance program(IDSP)
Secondary data analysis	Malaria
Programme evaluation	National vector borne disease(malaria) control program (NVBDCP)
Dissertation	Study of health problems in elderly living alone in rural area of Sambalpur district.

Figure 2: Organizational structure of public health system in Sambalpur district, Orissa, 2007



Secondary data analysis of malaria, Sambalpur district, Orissa, India 2007

Introduction

Malaria is the 8th highest contributor to the total Global disease burden estimated 247 million cases among 3.3 billion people at risk in 2006 effecting about 107 countries and always at risk are 50% of the world population.[1] Globally malaria attacks 300 to 500 million people every year, out of which 90% occur in, sub Saharan Africa, which also shares the 90% of total death due to malaria in the world. Malaria is the leading cause of death in under five population (20% of all causes).[1]

Comment [n1]: Kindly make sure that your references are in order...

South East Asia including India have 80% of its population at moderate to high risk of malaria, 90% of which lives in Myanmar, Thailand and India. Most of the death is caused by *Plasmodium falciparum* species.

India reported a total10.6 million malaria cases that is 60% of the South-east Asia during 2006[5] including 15000 deaths and 4900 of them in under-five children majority being due to Plasmodium falciparum. Most of the endemic area belong to Orissa, Chhatisgarh, Assam, West Bengal, Arunachal Pradesh, Mizoram, Meghalaya, Manipur, Maharashtra, Rajasthan with Annual Parasite Index (API) more than >5. Malaria is one of the most important cause of economic loss for the nation leading to poverty and lowering of physical and intellectual standard of the population affected.In 1994 the net savings due to malaria control was estimated Rs.65132.1million (US$1431million) .Every Rupee invested in malaria control gave a direct return of Rs.19.70 with man day saved were 1328.75 million per year[2].

Malaria control program in India is under National Vector Borne Disease control Program (NVBDCP) since 2002 along with four other diseases namely Dengue, Kalaazar, Japanese encephalitis and Filaria.[4]The components of NVBDCP are (1)Early case detection and prompt treatment, (2)Selective vector control activities, like indoor residual spray, (3) use of insecticide treated bed nets, culture of larvivorous fish and environmental engineering, (4)capacity building for optimal utilization of manpower and (5).Monitoring and evaluation.

The state of Orissa has 4% of the land area and 3% of population of India, however, the state accounts for 24% of malaria cases and 16% of deaths that occur in the country (2006) More than 85% cases are due to Pf parasite. The endemicity and transmission of malaria is perennial and constant in the area.

In Orissa malaria has been a serious health problem and given top priority since long. During 2007 Orissa reported 3,65,593 number of malaria cases including 214 deaths[3] Of these deaths, majority were due to Plasmodium falciparum infection and Chloroquine resistance. Most of the Orissa is endemic for malaria.

Sambalpur district of Orissa too is highly endemic and surrounded by equally endemic districts like Jharsuguda, Deogarh, Anugul, Subarnapur, Boudh and Bargarh. Sambalpur district has other congenial eco-climatic condition favoring the perennial transmission due to presence of plenty of water- bodies, large forest coverage, large scale industrial activities with migratory population, exophillic and exophagic vector behavior with high efficiency moreover problem of drug resistance further aggravate the situation[5-6]. We

conducted a secondary data analysis of malaria in Sambalpur with the objectives to (1)Estimate the malaria burden for Sambalpur district (2)Examine the trends of malaria (3)Compared the district level malaria indicators with State level data (4)Recommend strategies for planning malaria control measures.

2. Method

2.1 Study design

Descriptive study based on malaria survey data of state, district and block level.

2.2 Study population

Population of Sambalpur district –9, 65,988 (2007).

Case definition

We defined a case of malaria as the occurrence of fever with a blood slide positive for malaria in a resident of Sambalpur district, Orissa, India between 2002 and 2007.

Collection of surveillance data

We collected the district level data from the office of the chief district medical officer and Assistant district medical officer (Public health) in charge of malaria Sambalpur. State data was collected from the office of Joint Director NVBDCP in the state health directorate. For the state and district we included the available data for the year 2002 to 2007.For the total nine blocks of the district we included the annual reports to calculate the seasonal trend and disease burden.

Malaria indicators

Annual Parasite Incidence (API): We divided total number of blood smears positive for malaria parasite in a year by total population to calculate API. Epidemiologically, this parameter depends upon the adequacy of case detection mechanism i.e. ABER. If ABER is adequate, this parameter is the most important criterion to assess the progress of malaria control programme. Under NAMP, API of more than 2 in any area is considered to be public health problem. As per Modified Plan of Operation, areas more than two API is to be brought under spray operation.

Annual Blood Examination Rate (ABER): We divided total number of blood smears examined for malarial parasite in a year by total population to calculate ABER. Epidemiologically, this parameter reflects the efficiency and adequacy of case detection mechanism. In the Modified Plan of Operation, the minimum prescribed is 10% of the population in a year.

Slide Positivity Rate (SPR): We calculated SPR by dividing total number of blood smears found positive for malaria parasite by total number of blood smears per 100. This parameter is less dependent on case detection mechanism (ABER). This parameter is more reliable than API in areas where ABER fluctuates from year to year. Whenever the case detection mechanism is inadequate, this is a dependable parameter for determining the progress of containment measures and gives information of parasitic load in the community.

Plasmodium *falciparum* Percentage (Pf %): We calculated Pf % by dividing the total number of blood smears found positive for Pf by total number of blood smears positive

for malaria parasite per 100. Epidemiologically, this parameter gives the relative proportion of P*f* infection and identifies trends of P*f* incidence in relation to total caseload of malaria in the community. It indirectly reflects the mortality risk in the community from malaria since all deaths are caused by P*f* malaria only[7]. It is also useful in predicting malaria epidemics. If this parameter is high there is necessity for intensification of intervention measures on the priority basis to control Plasmodium falciparum.

Descriptive epidemiology

For time analysis we graphically represented the seasonal trend by calculating and plotting the average number of Annual Parasite Index (API) per month for the year 2002 to 2007.

For the place analysis we represented the geographical distribution of malaria in the different blocks of Sambalpur district through a map showing the API of malaria in each block.

For analysis in person, we calculated age and gender specific incidence by using population of 2007 projected from census 2001 .

3. Results

Malaria indicators

API remains high throughout the year at above 20 declaring the area "high risk" showing a steady trend and no decline during six years. API was seen lowest in June 2005 at 10.69 and highest in November 2005 at 39.7. (Figure-2)

The ABER of the district was always more than 10% at an average of 17% for the last six years suggesting adequate fever surveillance above the state average of 12%.SPR in the district remained steady at an average of 17 much above the state average of 9%.

Plasmodium *falciparum* percentage (P*f*%).

The state and the district show a rising trend in the year's 2002 to2007. In the district P*f*% has increased from 86 % in 2002 to 92 % in 2007 which is more than the state 83 % in 2002 to 86 % in 2007. Overall in the district, P*f* accounted for 87 % of all malaria cases in the 6 years period.

Descriptive epidemiology

Incidence by time

The incidence of malaria increased from the month of June with seen seasonal 3 peaks in the months of June, August and November. Lowest in the months of February and March each year.(Figure-2)

Incidence by place

All the nine blocks and one Sambalpur urban API was >2 during 2007 (Figure-1). Charmal (API-150) and Jujumura (API-32) had the maximum burden of malaria. Blocks with lowest burden was Debeipali (API-4.4) followed by Themra (API-5.13).

Incidence by age and sex

Malaria affected all age groups but the incidence was highest in >15 years age group.(Table-3).The incidence was slightly higher among males (21 per1000) as compared to females (18 per 1000)

4. Discussion

Our analysis of malaria secondary data in Sambalpur district of Orissa related to ongoing malaria control program brought out several issues. First there was a rising trend of malaria also the *Plasmodium falciparum* percentage in the district as well as state in all these years.

The transmission was perennial. Malaria is a serious problem in the district with an API of 22 in 2007 (state average 9.02). The rising trend of the malaria and Pf cases is not due to artifact since the ABER was adequate throughout. Several factors may explain the increase in malaria burden. **First** the total population denominators have changed during the study period of six years due to the rapid industrialization and migration of population to the area. **Second** the inadequate vector control activities for the last several years, mainly Indoor residual spray (IRS) with DDT, may be due to absence of a full time district malaria officer (DMO) to supervise the ante malarial activities could have compromised in the quality of the spray activities.

The NVBDCP, Govt. of India guidelines advocates two rounds of IRS with DDT per year in areas with API >2 covering minimum 80% households during malaria transmission period. The delay in implementation due to various reasons starting from availability of funds in time to erratic climatic conditions, selection criteria for the spray

activities, poor quality of spray are the lacuna which might have allowed the malaria vectors to proliferate leading to uninterrupted disease transmission.

WHO field guide on malaria epidemic assessment also recognizes the fact that when vector control measures weaken or break-down, there may be a gradual year-by-year return to the pre control endemicity. This may result in seasonal peaks increasing year by year, sometimes to levels that surpass the epidemic threshold, causing outbreaks and malaria related deaths[8] **Thirdly** all the blocks in the district had adequate ABER suggesting surveillance is in place but same thing cannot be said about the action taken after analyzing the data in the form of vector control activities as the endemicity remains high throughout the period.

Malaria and P*f*% was highest in the Charmal and Jujumura block though rest all of the blocks also in the high risk area group. The incidence was higher among the 15 years and above age group and males.

Thirdly though the surveillance data is adequate there may be under reporting of the malarial deaths. The surveillance data shows very few death caused by malaria which may be due to underreporting as the private health care providers were not fully involved in the process where as, they cater almost to 70% of the population. Next there was change in demographic characteristics in the area due to rapid industrialization leading to change in population denominators, development of labor colonies and proliferation of slum areas causing problem in waste management and disposal also creation of new water bodies. Added to this the climatic factors may be responsible in the form of unusual, untimely, erratic rainfall in the area, temperature and humidity, presence of large

forest coverage, hilly areas, numerous streams, dams, canals, irrigated lands suitable for effective vector proliferation might have contributed to the increased burden but the non availability of sufficient meteorological data of the district was a limiting factor for a meaningful interpretation in our study.

Lack of follow up action after the analysis of malaria surveillance data, under reporting of malarial death cases needs the urgent attention of the district health managers. Studies in the district have shown development of Chloroquine resistance, in Pf species in several areas is a matter of concern. Charmal block is declared Chloroquine resistant. More studies are required to assess the Chloroquine resistance in remaining areas to review the treatment strategies.

Limitation in our study are that we are constrained to only the reports available in the Public health department that too is incomplete as it lacks the report from the medical college. There are no figures from the private sector for health care, which is again catering to 70% of the population who are seeking health care. There is no data available regarding the awareness level of population in the district about protection against malaria.

Based on the secondary data analysis of malaria data in Sambalpur district, we conclude that the district is highly endemic and malaria is on rise with highest risk of transmission in the Charmal and Jujumura blocks. Pf % is also increasing every year. This rise may be explained by combination of low quality of vector control activities , inadequate supervision and monitoring, congenial climatic conditions favoring vector efficiency,

development of Chloroquine resistance in Pf species, improper management of water bodies providing breeding sites for mosquito vectors and lack of knowledge in the population regarding personal protection.

Basing on these findings, we propose number of recommendations. First, to evaluate the malaria programme in terms of inputs, process, output and outcome. Secondly, to address the under-reporting we recommend to evaluate the surveillance activities of the programme. Thirdly, educate the population regarding personal protection , to propagate the knowledge and practice of the use of Insecticide treated mosquito nets(ITMN). Fourthly make the provision of early diagnosis and treatment with easy availability of antimalarial medicines with considering 2nd line medicines to be made available in the health institutions of the areas where chloroquine resistance has developed. Early referral of complicated malaria cases to higher institution to prevent death.

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Table 1 : Epidemiological situation of Malaria in Orissa state,2002-2007*

YEAR	Population	BS collected	BS examined	Positive	Pf	Death	ABER	SPR	Pf %	API
2002	37441470	4570466	4570466	473223	393523	465	12.21	10.35	83.16	12.64
2003	38002540	4430957	4430957	421323	350619	333	11.66	9.51	83.22	11.09
2004	38610581	4369409	4369409	416771	351737	283	11.32	9.54	84.40	10.79
2005	39228350	4808146	4808146	391261	337934	255	12.25	8.15	86.37	9.97
2006	39852081	4942464	4942464	372710	324893	253	12.3	7.5	87.1	9.3
2007	40489714	4832966	4689934	365593	317116	214	11.93	7.79	86.74	9.02

* Annual blood examination rate (ABER): Number of slides examined divided by the total population (%)
Slide positivity rate (SPR): Number of positive slides divided by the total number of slides examined (%)
Annual parasite incidence (API): Number of confirmed malaria cases per 1000 population
BS: Blood slides, Pf: slides found positive for Plasmodium falciparum

Table 2: Epidemiological situation of Malaria in Sambalpur district; Orissa, 2002-2007*

YEAR	Population	# blood slides collected	# blood slides examined	# positive for malaria	# Plasmodium falciparum	# deaths	ABER	SPR	Pf %	API
2002	921232	163386	163386	21979	18897	40	17.7	13.4	86 %	23.8
2003	927186	164681	164681	22831	19746	20	17.7	13.8	86 %	24.6
2004	935558	159198	159198	20515	16587	05	17.1	12.8	80 %	22.1
2005	944753	166550	166550	22188	19932	05	17.8	13.3	89%	23.7
2006	953885	166558	166558	20771	19070	03	17.4	12.4	91 %	21.7
2007	965988	157079	157079	21122	19502	00	16.3	13.4	92 %	22

* Annual blood examination rate (ABER): Number of slides examined divided by the total population (%); Slide positivity rate (SPR): Number of positive slides divided by the total number of slides examined (%); Annual parasite incidence (API): Number of confirmed malaria cases per 1000 population; Pf: slides found positive for Plasmodium falciparum

Figure 1: Annual Parasitic Incidence (API) in various blocks of Sambalpur district, Orissa, 2007

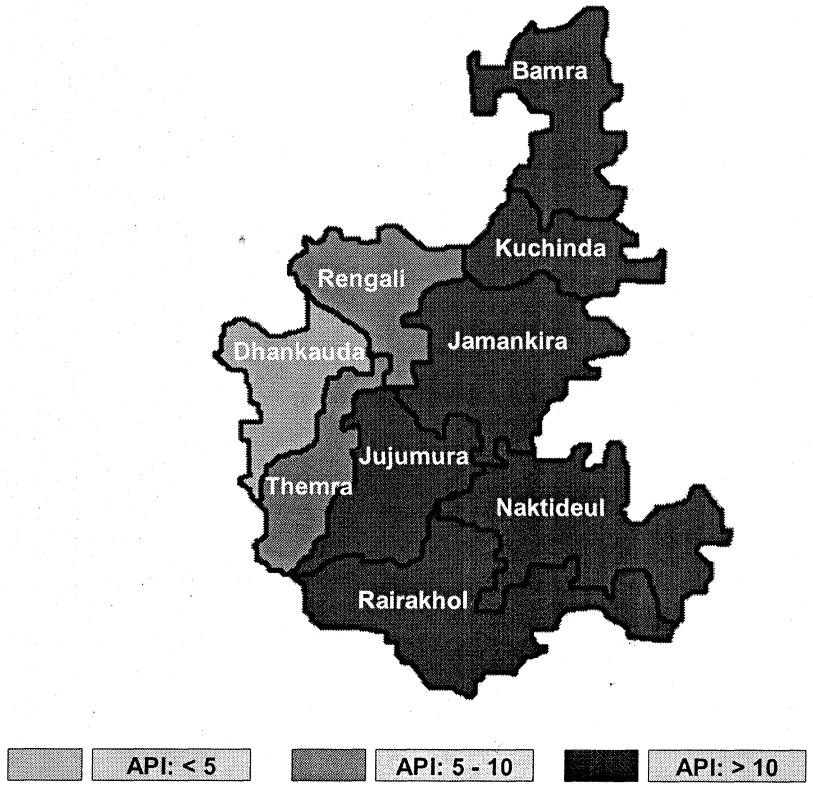

Figure 2; Distribution of average monthly Annual parasite incidence of Sambalpur district, Orissa,2002-2007

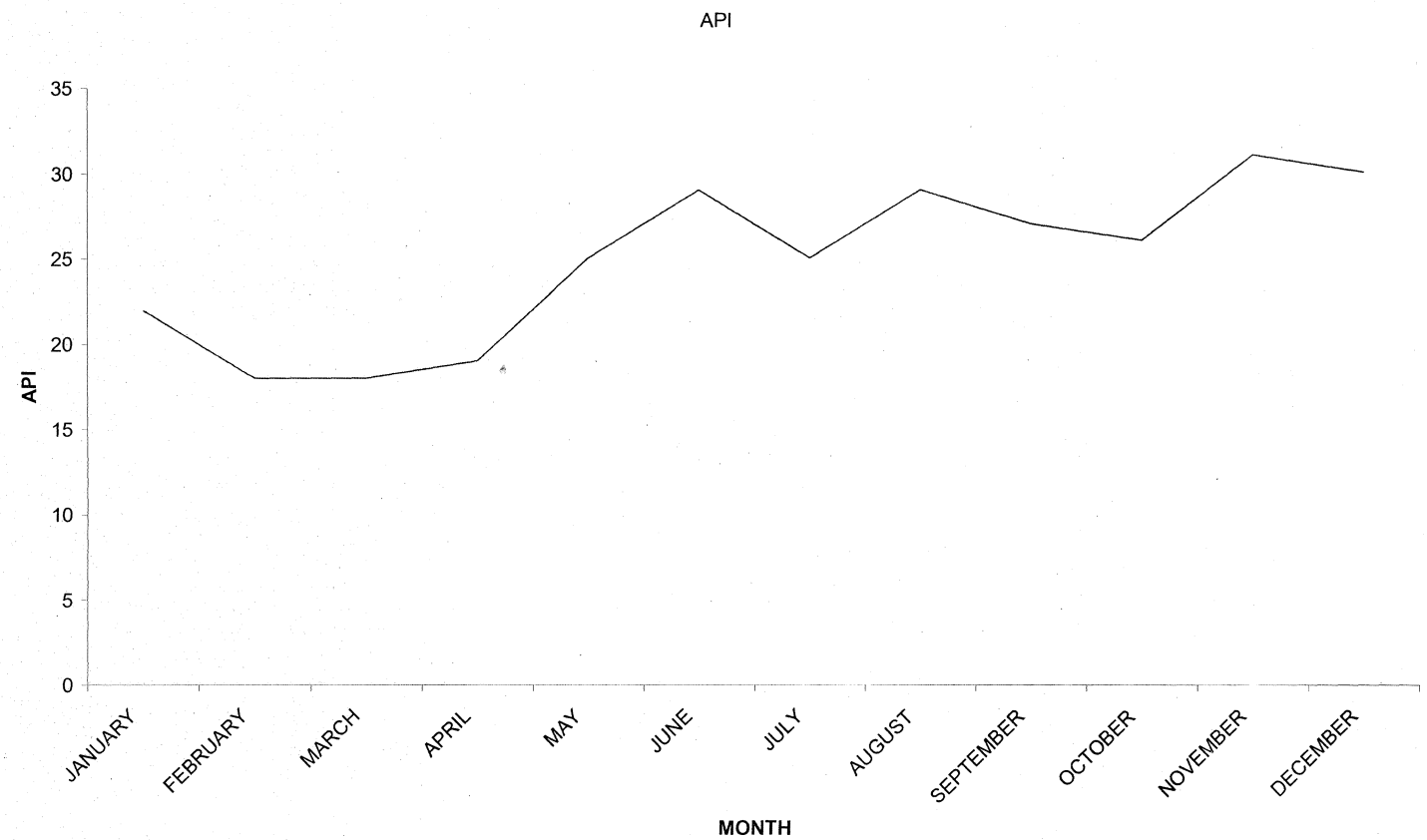

Table 3; Incidence of malaria by age and sex distribution, Sambalpur , Orissa, 2007

Demographic characteristics		Population 2007 projected (Census 2001)	Incidence	Incidence rate per 1000
Age group	0-1	21,573	711	32.9
	1-4	75,723	3,418	45.1
	5-14	2,41,194	6,145	25.4
	15 & above	7,40,196	10,848	14.6
Sex	Male	5,50,131	11,434	20.7
	Female	5,28,557	9,688	18.3
Total		10,78,688	21,122	

SECOND FIELD POSTING

Description and evaluation of Integrated Disease Surveillance Programme in Sambalpur district, Orissa, India, 2007-08

Introduction

Surveillance is defined as the ongoing, systematic collection, compilation, analysis and interpretation of data with dissemination of information to those who need to know in order that action may be taken. Surveillance goes beyond reporting of cases. The challenge of public health surveillance is to generate information that guides interventions that address public health needs and priorities effectively and efficiently.

Prior to IDSP the state had a surveillance system, the Orissa Multi Disease Surveillance System (OMDSS) with support from World Health Organization (WHO) in all the 30 districts of the State[1]. Following the disastrous super cyclone in 1999, the state of Orissa implemented an emergency public health surveillance system in the 12 affected coastal districts with the assistance of a number of non-governmental organizations. This resulted improvements in reporting and management of outbreaks in these areas, which ultimately led to reduction in morbidity and mortality. This was expanded to all the 30 districts of the State in 2001.

In 2004, the Government of India launched the integrated disease surveillance programme (IDSP) with World Bank assistance. Several issues were addressed in IDSP regarding diseases kept under surveillance, levels of data collection, involvement of private sector and medical colleges, functioning of a public health laboratory.

In this context, we reviewed the ongoing IDSP at Sambalpur district with the objectives to (1) describe the ongoing IDSP in the context of the transition from OMDSS (2) identify the strengths and weaknesses of IDSP (3) identify gaps and underlying factors contributing to the gaps (4) suggest measures for improvement based on review and analysis of ongoing IDSP in Sambalpur

district of Orissa.

Methods

To describe the surveillance System, we reviewed the surveillance records and surveillance data. We interviewed various stakeholders at all levels, from the health sub centres to the district. We observed and took part in the routine procedures, including case identification, data transmission, data management, quality control and data analysis,

We reviewed the state Project Implementation Plan (PIP) for IDSP. We attended the state level training of IDSP (TOT) and closely examined the IDSP training modules, we identified specific issues that required attention and taken care of. To take care of the issues identified, we proposed recommendations basing on the findings as well as by comparing them with the PIP developed for IDSP at the state level.

Results

Description of Integrated disease surveillance project

IDSP is the backbone of public health delivery system in the country. It provides essential data to monitor progress of on going disease control programs and help in proper distribution of the allocation of resources. It is able to detect early warning signals of impending outbreaks and helps initiate an effective response in a timely manner. IDSP also facilitates the study of disease patterns in the country and identify new emerging diseases. It plays an important role in getting political and public support for the health programs in the country. (Figure 1)

Objectives of IDSP were to (1) establish a decentralized state based system of surveillance for communicable and non-communicable diseases, so that timely and effective public health actions can be initiated in response to health challenges in the country at the state and national level (2) improve the efficiency of the existing surveillance activities of disease control programs and

facilitate sharing of relevant information with the health administration, community and other stakeholders so as to detect disease trends over time and evaluate control strategies.

Component 1. Establishment and Operation of a Central-level Disease Surveillance Unit.

Under this component, Ministry of Health and Family Welfare has established a new Disease Surveillance Unit at the central level to help coordinate and decentralize disease surveillance activities. The new unit supports and complements the states' disease surveillance efforts. Existing permanent staff reassigned from within the existing infrastructure manages the unit along with the regular health staff. This component takes care of the the constraints of lack of coordination despite central control of surveillance activities and the requirements for changing the diseases included in the system. Effective coordination of disease surveillance activities depends on establishing the appropriate processes and institutional arrangements at the central level. This was done through the creation of a small disease surveillance unit to support the states disease surveillance efforts.

Component 2. Integration and strengthening disease surveillance at the state and district levels.

This component takes care of the constraints imposed by lack of coordination at the sub-national levels, the difficulty in using of modern technology and data management techniques, the inability of the system to act on information and the need for including other stakeholders. It integrated and strengthens disease surveillance at the state and district levels, and involves communities and other stakeholders, in particular, the private sector.

Component 3. Improved laboratory support. This component consists of: (1) upgrading laboratories at the state level, in order to improve laboratory support for surveillance activities. Adequate laboratory support is essential for providing on-time and reliable confirmation of suspected cases; monitoring drug resistance; and monitoring changes in disease agents; (2)

introducing a quality assurance system for assessing and improving the quality of laboratory data.

Component 4. Training for disease surveillance and action. The changes under the first three components requires a large and coordinated training effort to reorient health staff to an integrated surveillance system and provide the new skills needed. Training programs includes representatives from the private sector, NGOs and community groups.

Diseases conditions under the surveillance program (Table-2)

(i)**Under Regular Surveillance** :Diseases under regular surveillance are vector bourn disease - 1.Malaria, Water borne disease-2. Acute diarheal disease like cholera and 3.Typhoid, Respiratory disease-4.Tuberculosis, Vaccine preventable disease-5. Measles, Diseases under eradication-6.Polio, Other condition like-7.Road traffic accidents (Linkup with police computer), Other International commitments 8.Plague, Unusual clinical syndromes (causing death/hospitalization) 9.Meningoencephalitis/Repiratory distresss/Hemorragic fever and other undiagnosed conditions

(ii)**Under Sentinel Surveillance:** Sexually transmitted diseases/Blood borne diseases 10.HIV/HBV, HCV, Other Conditions like11.Water Quality, 12.Outdoor Air Quality (Large Urban centers)

(iii) **Under Regular periodic surveys:** NCD Risk Factors 1.Anthropometry, Physical activity, Blood Pressure, Tobacco, Nutrition, and Blindness

Additional State Priorities: Each state may identify up to five additional conditions for surveillance. For Orissa- Anthrax, Leptospirosis, Skin diseases, snake bite and Heat stroke

HIV-Human immuno deficiency virus, HBV-Hepatitis B virus, HCV- Hepatitis c virus,

NCD- Non communicable diseases

Case definitions

There are 3 levels of case definitions; syndromic, clinical and confirmatory to be adopted by health workers, medical officers and laboratory respectively.

Data collection and transmission

The integrated disease surveillance programme covers on the whole population of the District including urban and rural areas. It has the wide network of Anganwadi workers of the integrated child development scheme (ICDS), accredited social health activist (ASHA) of the National rural health mission (NRHM) along with the regular health staff. However, in addition to the baseline surveillance system in the public sector, a sentinel system is in place in collaboration with a number of private practitioners, starting with one per block in the first year in rural areas. In urban areas, other public sector providers (e.g., Government of India facilities such as railways hospitals, employee state insurance facilities and hospitals belonging to local governments), private practitioners and private hospitals are included in the system IDSP considers three levels of case

definitions: Suspected cases, probable cases and confirmed cases. First of all, multi-purpose health workers, males and females will use a syndromic approach to report suspected cases. Secondly, medical officers will use a more advanced level of case definitions to report probable cases. Thirdly, laboratories will use tests to report confirmed cases for selected diseases, including cholera, typhoid, tuberculosis and malaria. Both active and passive methods are used to detect cases within the public and private sector. With respect to surveillance activities within the public health care system, the mode of data transmission remains identical for the most part throughout the implementation of the integrated disease surveillance programme. Data transmission is through the telephone at peripheral level and Internet at the block primary health center and the district surveillance unit level. With respect to surveillance activities within the private health sector, providers transmit data directly to the sector primary health center or to the block primary health center (in rural areas) or directly to the district surveillance unit (urban areas) through telephone, fax, courier, post or manually.(Figure 2)

The three main sources of data are tapped within the system for collection of surveillance data. Routine reporting is conducted at the PHC by the ANMs and HWs. State specific diseases are added to this total of not more than 15 disease conditions including the state list. Information related to geographical changes in prevalence is obtained by the system by sentinel surveillance. This form of surveillance is used for HIV, HBV, HCV, Water Quality, and Air Quality etc. Special teams are developed to assess NCD risk factor surveillance.

Integrating private practitioners in surveillance

Health delivery in our country is by private health providers (Private Practitioners - PPs) of traditional or modern medicine. Valid and timely information on disease patterns can be collected only if they are integrated into the Disease Surveillance Program. It is logistically difficult to include all PPs and maintain the quality of data collection. Therefore selected Sentinel Private Practitioners (SPPs) are made part of the program so as to detect trends of disease and identify the occurrence of outbreaks, early. The district surveillance officer is responsible for integrating SSPs in the district. The selection criteria is willingness to participate in the program, SPPs who are likely to come across a large number of cases of the disease of interest and Previous experience with collaboration on health programs with the Public Health System.

Integrating Medical colleges

Medical colleges are currently not contributing effectively to surveillance activities in the country. Diseases presented at medical colleges are not being reported to surveillance officers due to poor motivation and other commitments. In IDSP, a defined role for all the medical colleges of the country has been proposed. In this way it would become part of urban surveillance activity, because most of these colleges are situated in urban areas will report to the district surveillance officer and ensure that relevant information is sent in on time.. In addition to data collection Medical colleges can contribute to the IDSP as Reference laboratories, Quality Assurance / Evaluation, Training, Epidemic Investigation / response in collaboration with DSO or SSO (State Surveillance Officer) and NCD Surveillance.

Data analysis and feedback

Analysis is necessary at all levels for the optimum utilization of information. However, at the periphery only frequency tables are necessary and this is being automated by the use of computers. More detailed analysis is necessary at the district, state and central levels so that summary feed back reports and interpretations of results of surveillance data are possible without delay. The

analyzed reports need to be sent to the district / state administration and other stake holders and will guide the surveillance actions. Data analysis has to be made on the basis of Time, Place and Person. These reports need to be tabulated and percentages need to be calculated by age groups affected and gender. If mortality is an issue, these need to be calculated from available data. Modeling can be done based on information on both sentinel and regular data collection to calculate disease burden in the community. Analysis will also look into 1) Timeliness of reporting units 2) Completeness of reporting 3) Trend changes between reporting units (between private and public reporting units located in rural and urban areas respectively).

Most of the primary analysis will be automatic background activity of the computer program at the district and state levels. The program will produce results on trends of disease, of time and space, and produce reports regularly, and on detecting deviations from the normal. The district and state surveillance officer will perform specific additional analysis required for each disease.

Feedback and sharing information

Sharing of information with all stakeholders for effective public health action is the primary purpose of the IDSP. Regular reports generated by the district surveillance unit will be shared with all the stakeholders of the program at the district level and the stakeholders at the state level will share all reports generated by the state surveillance unit. The reports will be available through internet / intranet services which can be obtained by dial up services to the district surveillance unit and through the IDSP network at the district level.

Health workers, males and females in health sub centers look for unusual events or for the occurrence of two or more of cases of illness presenting with similar symptoms. Medical officers in sector primary health centers and block primary health centers describe health events by time, place and persons to (1) detect outbreaks using pre-set thresholds adapted to each disease and (2) monitor seasonal trends without calculating rates. The district surveillance unit in district headquarters analyze the data through calculating weekly rates for comparison with (1) the previous three weeks and (2) the identical time period of the previous year and will plot incidence rates graphically over time to detect trends. Feedback will be in both directions to (1) keep the channels of communication open, (2) keep the staff informed of the larger picture, (3) assist health care workers in assessing their performance, (4) motivate and educate the teams. In practice, feedback mechanisms will include weekly memos and monthly reports issued at the district.

Use of data to make decisions

The integrated disease surveillance Project generate information that requires action by various stakeholders and departments (e.g., the rural water and sanitation scheme, the police, non-governmental organizations, women and child development and the pollution control board). Thus, the district discusses actions to be taken in inter-departmental surveillance committees that will reach beyond the health care sector. Whenever an outbreak situation will be beyond the control of the medical officer of the block primary health center, a District Outbreak Investigation Team (The district Task Force) manages the response with a mandate to take action.

Review

We used the following indicators to assess the various attributes of the Integrated disease

surveillance programme.

1. Diseases kept under surveillance

1. **Simplicity**

With the introduction of the integrated disease surveillance programme, the different levels of case definitions i.e. syndromic, clinical and confirmatory and the different reporting frequency for the health workers and the medical officers adds a level of complexity to the data transmission In addition, it has increased the complexity of the data analysis procedures.

2. **Acceptability**

During the 52 weeks of a year, a total of 728 reports were expected from 14 reporting units of Sambalpur district (9 block primary health centers, Government Hospital. Hirakud, Police hospital, two Sub Divisional Hospitals and a District Head Quarter Hospital). It has been observed that the reporting units ranged between 60% to 65% during 2007-2008. There fore IDSP in Sambalpur has not yet functioned to be called an acceptable system i.e. below 80%.

3. Sensitivity

The current surveillance system involves 167 health sub centers, 29 sector primary health centers 9 block primary health centers, 2 sub-divisional hospitals and 1 district headquarters hospital. These facilities represent the entire public health care delivery system in Sambalpur. With the implementation of IDSP, the sensitivity of the system was anticipated to increase because of easier, user-friendly syndromic case definitions for male and female health workers and inclusion of the private sector. However As the private sector is not fully involved with the programme which captures 70% of population, the sensitivity of IDSP has decreased.

4. **Predictive value positive**

The proportion of health care workers who understand the case definition and the proportion of health care workers who apply correctly the case definitions range between 30% to 40%. As the integrated disease surveillance programme was introduced the predictive value positive was expected to increase as (1) health care workers were supposed to receive additional training and (2) laboratory strengthening to provide biological confirmation for a number of selected diseases. But delay or no regular training of the health care workers have not added to their knowledge about the diseases added to the surveillance system.

5. **Representative ness**

The public health care system is spread out evenly throughout the district of Sambalpur, but this system is being used only by 30% [1] of the population. The integrated disease surveillance programme was supposed to increase the representative ness through inclusion of sentinel private health care providers and a broader range of public health care providers but delay and lack of complete involvement of the private health delivery sector has lowered the representative ness.

6. **Flexibility**

The surveillance system has the capacity to adapt to different situations, including daily reporting in the case of outbreaks and disasters and additional conditions under surveillance such as snake bites and skin diseases during the floods and heat-related disorders each summer. That shows the flexibility of the IDSP.

7. **Timeliness**

The IDSP is a day specific program, timeliness and completeness are most important. With the introduction of new means of communication in the districts, the timeliness of the system has

improved to some extent, particularly funds are made available to provide telephones in primary health centers and to connect the block primary health centers to the Internet. But shortage of computer trained technical staff with knowledge about health programs and disturbed internet facilities at the periphery level causing delay in data inflow there by compromising with the timeliness.

8. **Usefulness**

The decision to implement the integrated disease surveillance programme in the district of Sambalpur was taken way back in 2006 but started functioning only during the end of 2007 in fact in its infant stage still it has generated useful information to make decisions by the district administration for the population affected. Diarrhea outbreaks and food poisoning outbreaks were often captured and thus preventive and control measures were taken at the earliest possible time. In addition to outbreak detection, the system generated information that was compiled in a district communicable disease database that was analyzed to estimate the burden of disease associated with selected conditions.* Usefulness of the IDSP is that it covers a greater range of diseases.

9. **Cost**

The integrated disease surveillance programme that has led to increased expenses for (1) development of the laboratory infrastructure, (2) expansion of the system to other participant groups (3) newer means of communication and deployment of skilled personnel.

Discussion

The Integrated disease surveillance system has now been in operation since December 2007 in Sambalpur district. It has the wide network of Anganwadi workers of the integrated child

development scheme (ICDS), accredited social health activist (ASHA) of the National rural health mission (NRHM) along with the regular health staff. It processes complete information about key diseases of public health importance and epidemic potential from grass root level up to the state level on time every week. It is a system that considers three levels of case definitions: Suspected cases, probable cases and confirmed cases. The multi-purpose health workers, males and females use a syndromic approach to report suspected cases. Secondly, medical officers use a more advanced level of case definitions to report probable cases. Thirdly, laboratories use tests to report confirmed cases for selected diseases with case definitions, procedures and reporting channels clearly defined and established. It is supposed to keep staff alert about communicable diseases and contributes to increase preparedness through regular weekly activities. It remains highly adapted to public health emergencies, including floods during the monsoon and heat waves in summer. The inclusion of non-communicable diseases and road traffic accidents has broadened the scope of surveillance activities

But there are a number of challenges. (1) A number of case definitions remain hard to understand for some of the health workers. There is already a great delay in training of staff and doctors (2) There is little engagement of the private health care system that accounts for a 70% of health care services delivery (3) the mode of data transmission is at times affected due to poor communication systems and information technologies at the peripheral level also there is lack of supervision and supervisory staff in position. (4) The laboratory infrastructure in the district still demands more attention hence limits the specificity of some case definitions (5) No data analysis is being done at the lower levels. (6) The response to outbreak in terms of investigation and control is still difficult by the limited human resources available who are already loaded with multiple works.

Newer mode of communication with skilled personnel and up gradation of information technologies will improve connectivity. Laboratory strengthening will lead to early confirmation of

diseases of epidemic potential.

Recommendations

The most important thing is to sensitize all persons concerned as they are dealing with three levels of data set. Additional rounds of training will provide opportunities to further clarify case definitions that are problematic. People at grass root level should be given input especially on the new diseases included. The proper and total engagement of the private sector only will increase the representative ness of the system. Newer mode of communication with skilled personnel and up gradation of information technologies will improve connectivity.

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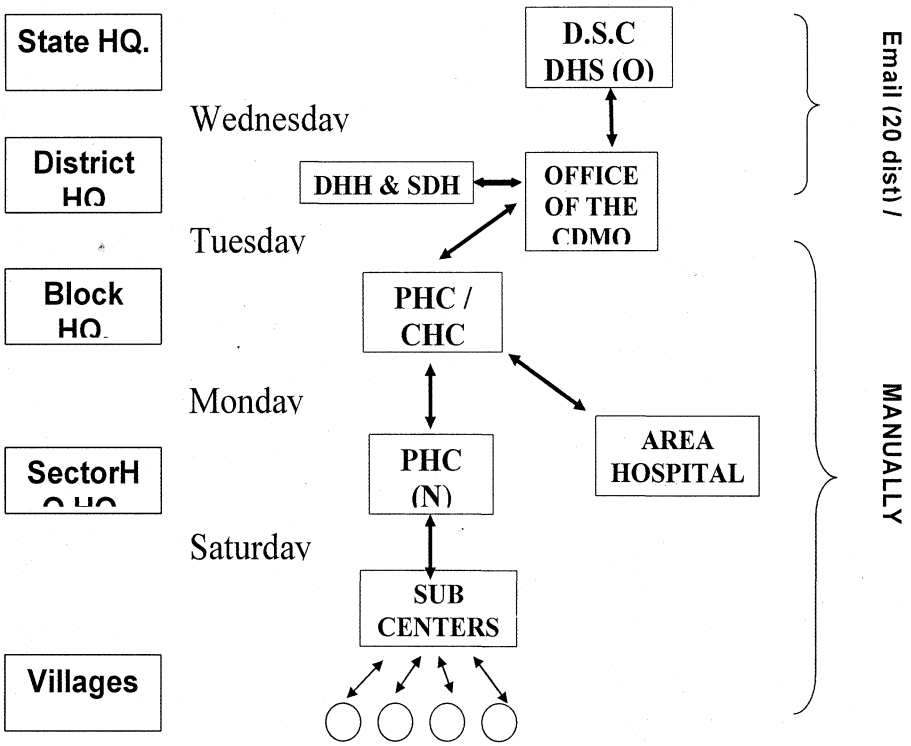
Figure 1. Health Infrastructure, IDSP Sambalpur district, Orissa, 2008



Table—1. Integrated disease surveillance programme, Orissa, India, 2007.

Characteristics	Integrated disease surveillance programme
Stakeholders	• Broader involvement of the public health care system • Sentinel private health care providers • Professional health care worker associations • Rural water and sanitation scheme • Police • Non governmental organizations • Pollution control board
Population under surveillance	• Patients attending public health care facilities • Patients attending sentinel private health care facilities
Data collection	• Children < 5 and persons 5 years of age and older • Male and females
Case definitions	• Suspected cases (Syndromic approach) • Probable cases (History and examination) • Confirmed cases (Laboratory criteria for For cholera, typhoid, tuberculosis and malaria)
Events under surveillance	• Communicable diseases • Water and air quality • Non communicable diseases and nutritional status (Through special surveys)
Data transmission	• Manually, by phone and by Internet up to district level • Servers at district level for transmission to the higher levels
Reporting interval	• Daily during disasters or outbreaks • Weekly for medical officers in primary health centers • Every two week for health care workers in health sub centers • Monthly for laboratories • Periodic surveys for non communicable diseases

TABLE-2 : DISEASE, REPORTING UNIT, TYPE OF SURVEILLANCE, REPORTING FREQUENCY, CONFIRMATION*

Disease Conditions	Unit	Method of surveillance	Reporting Frequency	Confirming/ Reporting	Lab Confirmation
Tuberculosis	PHC	Passive	Daily	Weekly MO	Peripheral Lab
	SPPs/PH		Weekly	Weekly	
	DH H		Daily	Weekly DTO	
	Micro C		Daily	Weekly DTO	
	P-Lab		Weekly	Weekly	

* PHC-Primary health center , SPP-Sentinel private practitioner, PH-Private hospital, DHH-District headquarters hospital, Micro c-Microscopic center, PLab-Pathology laboratory, DPHLab-District public health laboratory, SAC-State AIDS cell, WB-Water Board, PCB-Pollution control Board, DSO-District surveillance officer

Disease Conditions	Unit	Method of surveillance	Reporting Frequency	Confirming/ Reporting	Lab Confirmation
	DPHLab		Daily	Weekly LD	
Malaria	PHC	Active and Passive	Daily by HW	Weekly MO	
	SPPs/PH		Weekly	Weekly	
	DH		Daily	Weekly DMO	
	Micro C		Daily	Weekly (ADPH)	Peripheral Lab
	P-Lab		Weekly	Weekly	
	DPHLab		Daily	Weekly LD	
	Other		Weekly	Weekly MO/DMO	
Cholera	PHC		Daily by HW	Weekly MO	Peripheral Lab
	PHC	Passive	Weekly	Weekly MO	

Disease Conditions	Unit	Method of surveillance	Reporting Frequency	Confirming/ Reporting	Lab Confirmation
	SPPs/PH		Weekly	Weekly	
	DH		Daily	Weekly DMO	
	DPHLab		Daily	Weekly LD	
	Other		Weekly	Weekly MO/DMO	
Typhoid		Passive			
	PHC		Weekly	Weekly MO	
	SPPs/PH		Weekly	Weekly	
	P-Lab		Weekly	Weekly	Peripheral Lab and District Lab
	DH		Daily	Weekly DMO	
	DPH Lab		Daily	Weekly LD	

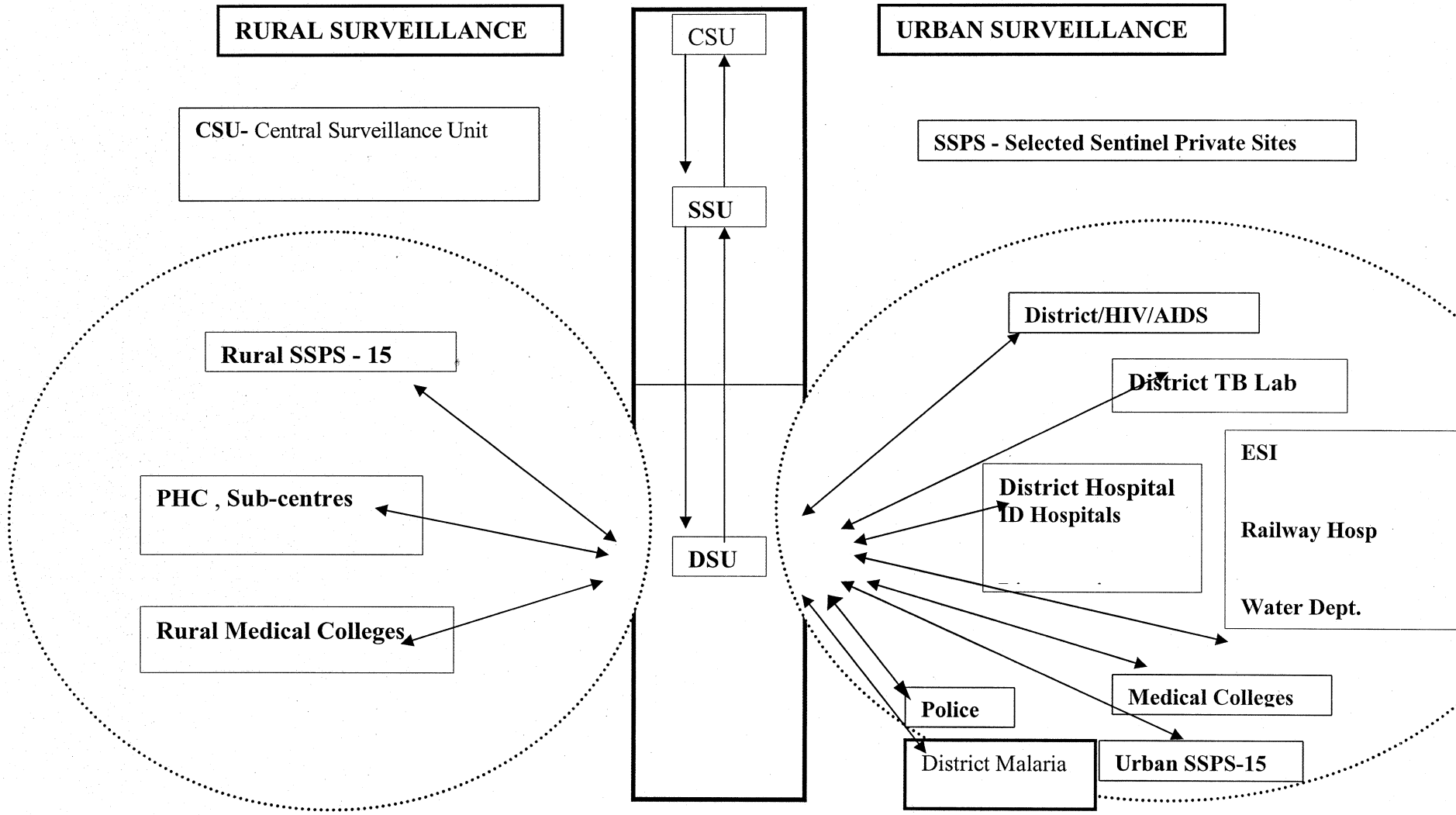
Disease Conditions	Unit	Method of surveillance	Reporting Frequency	Confirming/ Reporting	Lab Confirmation
Measles					
	PHC	Active	Daily by HW	Weekly by MO	
	PHC	Passive	Weekly	Weekly by MO	
	SPPs/PH	Passive	Weekly	Weekly	District Laboratory
	DH		Daily	Weekly DMO	
	Other		Weekly	Weekly MO/DMO	
Polio					
	PHC	Daily	Weekly MO	State and Reference Labs	
		Follow current system)	Weekly MO		

Disease Conditions	Unit	Method of surveillance	Reporting Frequency	Confirming/ Reporting	Lab Confirmation
	DH	Follow current system	Weekly DMO		
	SPPs/PH	Follow current system	Weekly DMO		
	Other	Weekly	Weekly		
Unusual clinical syndromes / Diseases with international commitments	PHC	Daily	Weekly DMO		
	PHC	Weekly	Weekly DMO	Peripheral, District and State Labs	
	DH	Daily	Weekly DMO		
	Other	Weekly	Weekly		

Disease Conditions	Unit	Method of surveillance	Reporting Frequency	Confirming/ Reporting	Lab Confirmation
State Specific Diseases Anthrax ,leptospirosis,skin diseases, snake bite, heat stroke	PHC	Daily by HW	Weekly by MO	District and State Labs	
Road Traffic Accident	SP.Police	Weekly	Weekly	NA	
HIV – ANC data	SACS	Once in a month	Once in 3 months	District Lab	
Water Quality	PHC WB	Monthly Monthly	Monthly MO Monthly DSO	Peripheral and District Labs	

Disease Conditions	Unit	Method of surveillance	Reporting Frequency	Confirming/ Reporting	Lab Confirmation
Out door Air pollution	PCB	Twice weekly	Twice weekly	State Lab	
NCD Risk Factors	DSO	Once in 1 year	1 Years DSO	State Lab	

Figure 2. STRUCTURAL FRAMEWORK OF INTEGRATED DISEASE SURVEILLANCE PROJECT, Sambalpur, Orissa



Evaluation of the National Anti Malaria Program in Sambalpur district, Orissa, India, 2007

1. Introduction

Malaria is the 8th highest contributor to the total Global disease burden estimated 247 million cases among 3.3 billion people at risk in 2006 effecting about 107 countries and always at risk are 50% of the world population.[1]

Globally malaria attacks 300 to 500 million people every year, out of which 90% occur in, sub Saharan Africa which also shares the 90% of total death due to malaria in the world. Malaria is the leading cause of death in under five population (20% of all causes). In 2007, malaria still considered as a major public health problem in more than one hundred countries inhabited by a total of approximately 2, 4 billion people, representing about 40% of the world's population[1]. in 2002, WHO estimated that the annual burden of malaria was 1.1 million deaths and 300-500 million cases with 4.65 million DALY's lost in 2.4million cases (WHO-report). Over 90% of the disease burden is in Sub-Saharan Africa and the vast majority of deaths occur among young children in that part of the world. The remaining burden is distributed between the Indian sub-continent, South-East Asia, Oceania and the Americas. The malaria burden in the South-East Asia WHO Region remained stable between 1991 and 2000 with about three million cases reported annually[2]. An estimated 1,200 million people (80%) of South East Asia Region population - are at risk of malaria. Of these, 90% at moderate to high risk of malaria lives in India, Indonesia, Myanmar, Sri Lanka and Thailand. India accounts for

85% of the total number of malaria cases in the South-East Asia WHO region. In 2000, India reported 2.15 million cases of malaria and 948 deaths[3]. Though the total number of reported malaria cases has been stable around two million annually in the country since 1994, there has been a shift in the species. Plasmodium falciparum, the main cause of severe malaria, now accounts for more than 60% of malaria cases and 90% of malaria deaths in the country. It became the major species, particularly in endemic and forest areas4. The states of Orissa, Jharkhand, Bihar, Chhatisgarh, Madhya Pradesh, Gujarat, Rajhasthan and the North-Eastern region are the most affected areas in the country.

Orissa, one of the eastern states of the country is highly endemic for malaria. All 30 districts are endemic of malaria in the state. The district of Sambalpur located in the western part of Orissa is highly endemic for malaria. Surveillance data analysis indicates perennial transmission [4]. The potential for outbreaks adds to the public health importance of the disease in the district. We evaluated of the activities of the National anti malaria program tagged with national vector BorneBorne disease control program(NVBDCP) in Sambalpur district, Orissa, India. We evaluated the National Anti-Malaria Programme (NAMP) with objectives to (1) describe the performances of different components of the NAMPin terms of input, process, outcome and impact (2) estimate the community knowledge and participation in malaria prevention and control, including health seeking behaviors and (3) formulate recommendations.

2. Methods

Description of the programme

We reviewed in detail the operational manual for malaria action program (MAP) 1995 of the NAMP(Government of India),NVBDCP(2005). We also discussed on different operational issues of the program in Sambalpur district with program managers at district, health facilities, microscopic centers and sub center level.

Indicators used

We considered the population of Sambalpur district to evaluate the national anti malaria programs(now under NVBDCP) in terms of input, process, outcome and impact indicators.

Input indicator

Our input indicators, included the proportion of medical officers, laboratory technicians, multipurpose health supervisors, multipurpose health workers trained and in position, the proportion of health facilities that utilized 95% of their malaria funds in 2007-08, the proportion of health facilities with adequate stock of anti-malarial drugs, residual insecticides and materials for information, education and communication.

Process indicator

Our process indicators included the median time taken to examine a blood smear and start of radical treatment for positive cases from the day of blood smear collection, discrepancy rate in laboratories, the proportion of malaria patient treated with correct anti-malarial drugs at health facilities and the proportion of health institutions monitored and supervised regularly by superior officers.

Outcome indicator

Our outcome indicators included the proportion of microscopic center functioning to its requirement, the proportion of health facilities full filling the target of annual blood examination rate (10% of population), the proportion of complicated malaria cases cured, the proportion of population sprayed by insecticide and the proportion of health facilities had not run out of stock of anti-malarial drugs for at least week. We used knowledge and participation of community as an outcome measure of information, education and communication activities. Our impact indicators included the case fatality ratio at health facility, the annual parasite index (number of blood smear positive for malaria by microscopic examination per 1000 population), the slide positivity rate (number of blood smear positive for malaria by microscopic examination per 100 examined smear), percentage of the plasmodium falciparum and percentage of high-risk sub centers.

Survey

We conducted a survey of all blocks of district Sambalpur where the National Anti malaria program under(NVBDCP) was implemented. We selected thirty clusters (villages) with a probability proportional to population size. In each cluster we selected 10 households. In each household we selected one adult above the age of 20 years randomly for interview. We also selected sub centers, microscopic centers and health care facilities in which the population of the sample had access to. We calculated a sample size of 300 by assuming the highest possible utilization rate of health services at the community level at 50% (as there was no data available about the percentage of utilization of the services), an alpha error set at 5%, a precision at 5% and an anticipated proportion of non-response of 15%. We used pre-tested questionnaire to collect information from the district, health facilities, microscopic centers, sub centers and the community. We translated pre-tested questionnaires of sub center and household into Oriya. The principal investigator and his trained staff conducted the interview. We analyzed evaluation data by using excel and EPI 3.5.1. We also analyzed program data routinely reported from the sub center to the district.

3. Results

Description of the programme

The basic strategy of national anti malaria program was to (1) ensure community access to early diagnosis and prompt treatment, (2) conduct selective vector control, (3) promote personal protection community use of bed net (especially insecticide treated), and (4) built capacity for community participation in prevention and control through capacity building with a network of community health services. From operational point of view, the aim was to identify high-risk areas in the country. The criteria for high risk area were (1) recorded deaths due to malaria (on clinical diagnosis or microscopic confirmation) with plasmodium falciparum infection during the transmission period with evidence of locally acquired infection in an endemic area, during any of the last three years, (2) a

slide positivity rate (percentage of smear positive for malaria parasite to number examined) above 5% on average in last three years, (3) a slide positivity rate of 4%, doubled in last three years, (4) a slide positivity rate is 3% with a proportion of plasmodium falciparum of 30% or above, (5) a focus of chloroquin resistant plasmodium falciparum or (6) an area with tropical aggregation of labor or new settlement. Each year, district had to compile the epidemiological data and earmark sub-centers as high risk.

Early diagnosis and prompt treatment

Early diagnosis and prompt treatment is the most important activity to prevent malaria-associated mortality at the periphery. The malaria action program described three types of facilities. First a malaria clinic with facility for presumptive treatment, smear collection and microscopy had been in each health facility. Second a fever treatment depot with facility for presumptive treatment and smear collection had been available for one thousand populations. Third Anganwadi work er or any other volunteer (e.g. Accredited social health activist ASHA, community health guide) had to establish a drug distribution center with facility for presumptive treatment. The case detection was strengthened by fortnightly domiciliary house-to-house visit to detect episodes of fever and collect blood smears. Microscopic facility had to be available at the ratio of one for every 30,000 population in plain area and one for every 20,000 population in tribal areas. Laboratory technicians sent the report of blood smear within 48 hours of examination to the peripheral staff for radical treatment (gametocytocidal action for plasmodium falciparum and anti-relapse action for plasmodium vivax), if required. Quality control of the laboratory was to be done through a cross checking results at laboratories at the regional office of health and family welfare and at the state headquarter.Time taken for the initiation of antimalarial treatment was same day in the institution and 1 to 7 day in the periphery(median 4 days)

Residual insecticidal spray

While early detection and prompt treatment prevented mortality in the population, the residual insecticidal spray aims at preventing transmission to reduce morbidity in the community. The recommended short-term intervention measure in the malaria action programme was two round of residual spray with DDT (50% concentration) in all areas with annual parasite index (number of blood smear positive for malaria parasite annually

per thousand population) of two or above and a selective additional round in a few villages with perennial transmission. To obtain the best result, the national programme coverage of rooms had to exceed 80% and insecticide had to be used in recommended quantity as per programme guideline.

Bed net as personal protection

Bed nets especially insecticide treated are amongst the most effective tools to reduce malaria transmission and mortality. Use of bed net during sleep prevented the contact between the host and the vector.

Information, education and communication

Participation of the community in the prevention and control of malaria was a key for success of malaria control. Information, education and communication played an important role in promoting protective and preventive habit among individuals and in the community. Also patient education created demand for appropriate services from the health delivery system. Capacity building of health care service provider is another issue for improvement towards malaria control. The strategy for achieving this goal includes in-service and refresher training courses for the medical Officers, laboratory technicians, supervisory staff and multipurpose health workers.

Evaluation of the programme

We evaluated 9-health facilities, 10 microscopic centers and 30 sub-centers. During the survey, we interviewed 300 community members sampled from 20 villages and 10 urban areas .

Input indicator

In health facilities, microscopic centers and sub centers, 118 of 138 medical officers (85%), 9 of 10 laboratory technicians (90%) and 274 of 325 MPHW (84%) were in position to sanctioned post. Of the personnel in position, maximum have not been receiving regular training. Training being imparted in batches but training schedule was not fixed. Only 25 of 25 medical officers (100% target for the year 2007), 5 of 5-laboratory technician (100% for2007) and 30 of 30 health assistants (100% for2007) had

been trained in malaria and rest waited when their turn comes. All the 30 villages had drug distribution center. All the nine health facilities utilized 95% of the received malaria funds during the financial year 2006-07. All the 22 gangs required for spray operation worked. Stock of DDT was exhausted after the operation and there was no stock for next operation. Hatcheries for larvicidal fish in required number were present and functional.

Process indicator

The interval between blood smear collection and examination ranged from 1 to 3 days for passive case detection in health care facilities and from 7 to 14 days for active case detection. The interval between blood smear collection and radical treatment ranged from 7 to 14 days. Blood smear were sent for cross-checking to referral laboratory every month during 2007. Experienced technicians at the district headquarter re-examined positive and the negative smear samples from different microscopic centres of the district to estimate discrepancy rate. The overall discrepancy in district was 3 slides in number which was negligible. District health officials supervised 7 of 30 sub centers (31%) once in a year. Medical officers supervised 15 of 30 sub centers (50%) once in every quarter and malaria inspector supervised 9 of 30 sub centers (30%) once in a month. Health workers visited 75 of 300 households (25%) with in fortnight. Hatcheries contained larvicidal Gambusia fish for distribution.

Outcome indicator

Of 29 sanctioned microscopic centers, 20(74%) are functioning and were able to examine blood smear to specified annual target. as per malaria action programme in district. Of 9 health facilities and 30 sub centers none reported weekly or longer stock-outs of anti malarial drugs. Of 9-health facility 6 (66%) were sprayed with insecticide 50% DDT in 2007. Sprayed population was 3,42,271 (67,112 households) (sub center with annual parasite index five or more) of the target 5,44,831 in 2007 (63%). Household survey data indicated 40 of 300 households heads (13%) had their household had been sprayed in 2007. Regarding ownership of bed net 210 of 300 households (70%) surveyed owned at least one bed net and 150 of 300 households (50%) surveyed used bed net during

sleeping. 75 of 300 households (25%) knew the location of the drug distribution center respectively. Of the 300 households, 195 (65%) sought health care from medical officer of the health facility, 45 (15%) from the Multipurpose health worker and the rest(20%) from the local private practitioner. 278 of 300 household heads (92%) knew that malaria was transmitted through vector mosquito and the rest did not have an opinion about the transmission. 278 of 300 household heads (92%) knew how to recognize the symptoms of malaria.

Impact indicator

Malaria was endemic in the whole district. 92% of the total incidences of malaria cases (19,502 of 21,122) are *Plasmodium falciparum* cases. Annual parasite incidence(API) remains high at 22 with perennial transmission showing no change in the malaria scenario.

4. Discussion

The National anti malaria program under NVBDCP in Sambalpur had good infrastructures support and logistic supply and used sufficient funds for early detection and prompt treatment activity of malaria control arm of NVBDCP. Human resources (i.e. medical officers, laboratory technicians and health workers) were in positions in most of the centers. However, less number of drug distribution center, fortnightly domiciliary visit by health workers, monitoring and supervision increase the workload in health care facilities. Laboratory support was good and there was crosschecking mechanism in place. Insecticide residual spray operations were insufficient. Only one half of households used bet nets during sleeping.

Microscopy centers are sanctioned but not functioning to the requirement due to lack of skilled personnel in position. The poor performance of laboratory increased the median time between blood smear collection and examination and delayed the radical treatment. This, allowed community transmission of falciparum malaria and increased in morbidity. Although cross checking of examined blood smear indicated an overall low discrepancy

rate in district. The proportion of plasmodium falciparum malaria cases was very high than national average of 2 to3%. Possible reasons include delay in case detection, delay in start of anti malarial treatment. However, timely and correct use of anti-malarial drugs at peripheral health facilities explained for low case mortality due to malaria in district. Monitoring and supervision was insufficient at each level. This could lead to a failure of detection of early warning signals of outbreaks in high-risk sub centers. Many staff members, especially medical officers and laboratory technicians, had not been trained. This may lead to poor active surveillance and high discrepancy rate in laboratory in future.

Insecticide residual spraying was the weakest part of the programme. Limitations were both in input and process, including insufficient stock of insecticides, insufficient sanction of spray gang, improper timing of spray operation, overall poor room coverage and a difference between the reported and actual coverage limited the benefit of insecticide residual spray

The district had good material support for information, education and communication (IEC) activities. All of the health facility and sub center were provided with IEC materials. Majority of the community sought health care from government sector and most community members knew how to recognize symptoms.

Use of bed net as personal protection method was common in the district, but still a large section did not use bed nets. Several studies in country and aboard indicates demographic characteristics, socio-economic conditions and knowledge, attitude and practices of households and individuals played important role towards ownership and non-ownership of bed net , those who had a bed net did not consistently use them. Poor ventilated house, outdoor sleeping habit and lack of knowledge about transmission of malaria may be the possible reasons of differentiate using and non-using issues bed nets.

One of the potential biases of our study was interviewer bias. To minimize the possible interviewer biases, team members are carefully selected to avoid exchange of members between sub center and community. Some information provided by health workers and community members could have been inaccurate due to recall bias. Consistency between report and records of treatment of malaria patient were based on manual calculation by evaluation teams, human error in calculation cannot be ruled out.

This study allowed recommending measures for improving the anti malaria programme in Sambalpur district. First, we recommend filling up of vacancies, setting up more number of functioning microscopic centers, with placement of skilled staff. Second artemisinine based combination (ACT) therapy for treatment of malaria positive case patients in place of chloroquine + primaquine(CQ+PQ)therapy to check the risk of development of drug resistance, conduct quality insecticidal residual spray in time and logistics in six endemic blocks in proper time (March-April and August-September) maintaining quality and quantity , we recommend proper supervision and engagement of more spray squads to complete spray operation in time. Third, promote use bed nets particularly insecticide treated ones as personal protection methods. Impregnate insecticide treated bed nets owned by the family. Effectiveness of bed net in control of malaria depends on various factors, such as acceptability, feasibility and affordability related to ownership and use of it.We recommend more number of insecticide treated bed net to be distributed in the community. A community study to identify factors associated with ownership and uses of bet nets along with knowledge, attitude and practices to improve the situation of use of bed net. Mass campaigning to increase knowledge, attitude and practices regarding vector control and personal protection for the community including health seeking behavior particularly for fever. Initiate training for private health service providers for malaria case managements under public private partnership. And improvement in supervision at all supervisory level of the district.

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Figure-1: Logical frame indicating input, process, output and impact indicators to different strategies of NationalAntimalaria program under Vector born disease control programme(NVBDCP),Sambalpur district, Orissa, India, 2007.

	National vector born disease control programme strategies			
	Early detection and prompt treatment	Vector control measures	Personal protection	Information, educatio communication
Input	Medical officer in position Medical officer Trained Lab. technician in position Lab. technician Trained Multipurpose Health Supervisor- in position Multipurpose Health Supervisor- Trained Multipurpose Health Worker- in position Multipurpose Health Worker-Trained Health facility able to utilize 95% of fund Number of sub centre functioning in respect to requirement Established DrugDistrbutionCenter(DDC) in the district Established FeverTreatmentDepot(FTD) in the district Adequate stock of ante malarial drugs Logistic supply	*Insecticidal residual spray-* % of spray gang engaged to work % of health facility having adequate stock of insecticide *Larvicidal measures-* Construction of hatchery for Gambusia fish(larvicidal) culture at district and block level. Availability of Gambusia fish at district level.	% of house-hold having at least one bed net % population ITBN supply to BPL family	Percentage of health facility have IEC mat for malaria
Process	Patient treated in public sector Patient treated with 2nd line of drugs Technician examine slide as per target House visited by health workers Population know location of FTD	% house hold covered % House hold sprayed among targeted Identification of breeding sites for mosquito Availability of Gambusia fish at block level	% population use bed nets % house hold supplied one bed nets among targeted population	# awareness camp hel the year
Outcome	Health facilities able to confirm malaria diagnosis Health facility able to collect blood smear as per target of national policy Patient cured after treatment Health facilities reporting no disruption of stock of anti-malarial drugs for 1 week	% spray done in quality(G.O) % house hold covered by spray No. of breeding sites treated with Gambusia fish	Proportion of ABER decreased	% of community men able to recognize sym of a febrile illness % population knows l nets use prevent mala
Impact	Case fatality rate Slide positivity rate Plasmodium falciparum percentage	Reduction of (1)Annual Parasite incidence (2)Percentage of complicated malaria (3)Percentage of high risk sub-center		

Table-2. Some selected indicators of anti malaria activities under NVDCP in Sambalpur district, Orissa, India, 2007.

Component	Indicators	n/N	%
Input	Medical officer in position	**118/138**	**85**
	Medical officer trained	**25/25**	**100**
	Lab. technician in position	**9/10**	**90**
	Lab. technician Trained	**5/5**	**100**
	Multipurpose Health Supervisor- in position	**15/42**	**35**
	Multipurpose Health Supervisor- Trained	**7/7**	**100**
	Multipurpose Health Worker(M)- in position	**99/120**	**82**
	Multipurpose Health Worker(M)-Trained	**30/30**	**100**
	Multipurpose Health Worker(F)-in position	**175/205**	**85**
	Multipurpose Health Worker(F)-Trained	**-**	**-**
	Health facility able to utilize 95% of fund	**9/9**	**100**
	Number of sub centre functioning in respect to requirement	**167/167**	**100**
	Established DDC in the district functioning out of sanctioned	**659/734**	**89**
	Established FTD in the district	**521/777**	**67**
	Adequate stock of ante malarial drugs	**All**	**100**
	Logistic supply	**9/9**	**100**
	Sanctioned malaria fund to blocks as per demand	**9/9**	**100**
	Health facilities utilized 95% of received funds	**9/9**	**100**
	supply of 2nd line of anti malaria drug to health facilities	**9/9**	**100**
	spray gang engaged to spray in district	**22/22**	**100**
	Health facility having adequate stock of insecticide	**9/9**	**100**
	Construction of hatchery for Gambusia fish culture at district and block level	**10/10**	**100**
	Availability of Gambusia fish at district level	**Yes**	**100**
	Distribution of Insecticide treated bed net (ITBN) to BPL households	**87850**	

	Indicator	N/N	%
	House-hold having at least one bed net	**210/300**	**70**
	Supply of material on IEC in blocks	**9/9**	**100**
Process	Sub center visited by district official once in a year	**38/167**	**22**
	Sub center visited by medical officer once in a quarter	**15/30**	**50**
	Patient treated in public sector	**21122/157079**	**13.5**
	Patient treated with 2nd line of drugs	**NA**	**NA**
	% technician examine slide as per target	**7/10**	**70**
	% house visited by health workers	**75/300**	**25**
	% population know location of FTD	**75/300**	**25**
	Percentage of house hold sprayed in quality and quantity	**67112/67399**	**99**
	Identification of breeding sites for mosquito/Fish released	**1300/761**	**58**
	Availability of Gambusia fish at block level	**10/10**	**100**
	severe malaria patient treated with correct anti malarial drugs	**NA**	**NA**
	IEC- meeting held in the year	**180**	
	use of 95% malaria funds by blocks	**9/9**	**100**
	Blood slides examined by lab. technician as per target	**20/28**	**71**
	Discrepancy of test results of slides of the microscopic centre	**3 in no.**	
	the median interval in days between blood collection and examination	**7**	
	Sub center visited by malaria inspector once in a month	**NA**	**NA**
Outcome	MPHW of SC fulfilling the target of blood slide collection	**158 /167**	**95**
	SC having stock-out of anti malarial drug for more than one week	**0 /167**	**0**
	severe malaria patient cured after treatment	**NA**	**NA**
	blood slides examined by malaria technicians without having backlog	**20/28**	**71**
Impact	annual blood slide examination rate (ABER)	**16.3**	
	Annual parasite incidence(API)	**22**	
	Plasmodium falciparum percentage (PF %)	**91**	
	Case fatality rate (CFR) due to PF malaria	**0**	**0**
	Total number of deaths	**0**	**0**

OUTBREAK INVESTIGATION

An outbreak of Cholera associated with contaminated well at Kesapali, Sambalpur, Orissa, India, 2008

Introduction

Cholera is an acute diarrheal disease caused by ingestion of *Vibrio cholerae*. Transmission occurs through direct faecal-oral contamination or through ingestion of contaminated water and food. *Vibrio cholerae* produces a toxin that stimulates the secretion of water and electrolytes in the intestinal tract. Patients with Cholera may suffer from acute watery diarrhea, vomiting and dehydration but rarely present with fever.[1] The disease is characterized by a sudden onset of acute watery diarrhea that can lead to death by severe dehydration and kidney failure. The short incubation period (two hours to five days), the infectious stool enhances the potentially explosive pattern of outbreaks. Cholera is an extremely virulent disease that affects both children and adults. Individuals with lower immunity, such as malnourished children are at greater risk. Two serogroups of V. cholerae, O1 and O139, can cause outbreaks. V. cholerae O1 causes the majority of outbreaks worldwide. The serogroup O139, first identified in Bangladesh in 1992, possesses the same virulence factors as O1, and creates a similar clinical picture[3]. Currently, the presence of O139 has been detected only in South-East and East Asia. Globally 52 countries reported 236, 896 cases of cholera and 6311 deaths to WHO in 2006, which shows 79% increases in cases as compared to 2005 report.

India remains endemic for cholera, particularly in the Eastern part [(1).] Vibrio cholerae O139 emerged in the country since 1992 [(2)], but does not account for the majority of cases [(3)]. In the Eastern state of Orissa, clusters of acute diarrhea are common. However, laboratory investigations are difficult. Many clusters of diarrhea are not investigated using laboratory

methods that could lead to the identification of an etiological agent. Thus, cholera may be under-recognized [4].

On evening of 24 July 2008, the local leader of village Kesapali, Sambalpur informed the district surveillance cell regarding clustering of diarrhea cases including deaths in their village. On request of the District health authority, we planned an outbreak investigation and proceeded to the village immediately along with the district task force to characterize the agent, describe the persons affected, identify the sources and formulate recommendations for control.

Methods

Descriptive epidemiology

We confirmed the outbreak after verifying the previous records of local health facility. We defined a case as occurrence of diarrhea and vomiting in a resident of Kesapali from 22 to 27 July 2008 and searched for cases door-to-door. We constructed an epidemic curve to describe the development of the outbreak over time. We plotted the cases on a map to understand the geographical distribution of the cases. We calculated the Incidence by age and sex using population denominators collected during the door-to-door case search. This case definition was consistent with the recommendations of the Orissa Multi Disease Surveillance System (OMDSS). We used trawling questionnaires to generate a hypothesis on the basis of descriptive epidemiology. We could identify an initial patient with a date of onset that preceded all others. We interviewed the family members of the index case with special reference to travel to any cholera affected area.

Laboratory investigations

To confirm the suspected diagnosis of Cholera, we collected rectal swabs from a sample of case patients selected at random before starting treatment with antibiotics and sent them for laboratory examination to the Regional Medical Research Center, of the ICMR in Bhubaneswar.

Environmental investigations

.We did not test the water samples since all the wells were heavily chlorinated immediately after the outbreak. The hypothesis generating interviews pointed to a contaminated well as the potential source of the outbreak. Hence, we reviewed the water supply and sanitation situation through interviews of the index case patient, observations and interviews of community leaders.

Analytical epidemiology

To identify risk factors we conducted an unmatched case-control study. We included all case-patients in the study. We recruited equal number of the neighborhood control-subjects from who apparently did not have cholera. Among the healthy neighbor of cases. We collected data on source of drinking water, mode of sanitation, habits of hand washing before meals, food habits from the case patients and the controls. We compared the exposure variables between cases and controls and calculated odds ratio and 95% confidence intervals. We calculated the fraction of cases attributable to the exposure in the population using the formula: the proportion of cases exposed multiplied by the attributable fraction among exposed (odds ratio – 1/ odds ratio).

Interventions

Case patients were isolated in the village for treatment . We ensured one team which consisted of one medical person and one volunteer, who were accountable for the supervision. We gave contact treatment to all family members of the diseased. We referred complicated cases to district head quarter hospital, Sambalpur. All the cases were clustered around one open well. We chlorinated all wells used for domestic purpose and stopped using open well water, pond water for drinking purpose. We adopted strict sanitary measures for excreta disposal. We communicated our findings to the Chief district medical officer, Sambalpur and to State Surveillance cell, Bhubaneswar, Orissa. We interacted with the Public health department to repair the default tube well in priority basis.

Results

Descriptive epidemiology

The surveillance data for the district and the village between 2006 and 2008 confirmed the unusual increase of incidence. The incidence in the primary health centre area in July 2008 was higher than in the rest of the district and higher than in the same area during the previous years. Further investigations ruled out recent population influx or any change in the reporting system. Thus, this episode was confirmed to be an outbreak.

We identified 12 cases among the 896 residents of the village (Attack rate: 1.3%). There were no deaths. 60% had dehydration and 50 % had vomiting. There was an initial case on 22 July followed by a rapid increase in the number of cases leading to a peak on 24 July and a progressive subsequent decrease and the last case was on 27 July (Figure 1). The spot map showed clustering of cases near an open well of the village (Figure 2). (Table -1).

Of the 12 case-patients, 6 (50%) were clustered around the unprotected well located next to the residence of the index case-patient (Figure 2). Hypothesis generating interviews with this index case-patient indicated that this person fell sick and soiled his clothes with diarrhea. Thus, he left his house (shown as a red squire on the map) and washed his soiled clothes in the unprotected well in his own backyard (Figure 3). Thus, we generated the hypothesis that the source of the outbreak could have been drinking water from the contaminated well.

Analytical epidemiology

We included all 12 case patients and recruited 12 healthy neighbors as controls in our case control study. Those who have taken water from the open well were six times highly likely to have had cholera as compared to those who have not taken water from the open well (OR: 6.0, 95% CI: 1.01-35.4) with a population attributable fraction of 61%. (Table2)

Laboratory investigations

Of the five rectal swabs, three of them confirmed as *Vibrio cholerae* O1 Ogawa in the Regional Medical Research Center, of the ICMR in Bhubaneswar. Water sample was not examined as all the wells were heavily chlorinated after the outbreak.

Environmental investigations

The well where the index case-patient washed himself and his clothes was unprotected. It had no brim and no platform (Figure 3).

The index case gave history of travel to a cholera affected area. People including the index case, residing near the open well located in the backyard of the index case, were mostly affected. They were drinking water from the open well regularly and using the water for all other purpose. Tube well was there but not functioning properly. The well was above ground level with a raised, protective ring, but uncovered and had a wide wooden log over it and

people were in the habit of taking out water by standing over that log. People used to take bath and wash their cloths also near the brim.

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Discussion

An outbreak of cholera struck the village of Kesapali in Orissa in July 2008. The investigations suggested that the outbreak might have been caused by an unprotected well that had been contaminated by an initial case-patient who washed himself and clothes soiled with faeces while he was convalescent.

A significant attack rate, propagative type of transmission and dehydration among adults suggested Cholera. The attack rate was high among adults, which was compatible with the diagnosis of cholera. Females had a slightly higher attack rate. The laboratory findings substantially supported the diagnosis. From the analytical study we identified a number of risk factors, related to drinking water from open (unprotected) well. Therefore this could be the way the water could have been contaminated. Scholars from the Indian Field Epidemiology Training Programme investigated three cholera outbreaks in three states between 2001 and 2005 [6-8].Of these, all were associated with unsafe water sources. In 2003, Scholar from the Indian Field Epidemiology TrainingProgramme we investigated an outbreak of cholera in a district of Orissa. This outbreak had been caused by an unprotected well that had been contaminated by an index case-patient [5].

Recommendation

We recommended the district administration to ensure safe drinking water. We addressed the villagers not to drink water from the contaminated open well, to use tube well water & to maintain personal cleanliness.

Reference:

1. Sur D, Dutta S, Sarkar BL et al. Occurrence, significance & molecular epidemiology of cholera outbreaks in West Bengal. Indian J Med Res 2007; 125:772-6.

2. Ramamurthy T, Garg S, Sharma R et al. Emergence of novel strain of *Vibrio cholerae* with epidemic potential in southern and eastern India. Lancet 1993: 341: 703-4.

3. Singh JS, Khanna KK, Jain DC, Sachdeva V, Sharma RS, Verguese T. Epidemiology and transmission of V. cholerae O1 and V. cholerae O139 infections in Delhi in 1993. J diarrhoeal Dis Res 1996; 14: 182-6.

4. Zuckerman JN, Rombo L, Fisch A. The true burden and risk of cholera: implications for prevention and control. Lancet Infect Dis. 2007 7:521-30.

5. Das A, Manickam P, Hutin Y, Pal BB, Chhotray GP, Kar SK, Gupte MD. An outbreak of cholera associated with an unprotected well in Parbatia, Orissa, Eastern India, 2003. (*In Press*: *Journal of Health, Population and Nutrition*, 2008)

6. Das A, Rao TV, Gupte MD. Investigation of an outbreak of Cholera in a community – Parbatia, Dhenkanal, Orissa. The Third TEPHINET Global Scientific Conference; 2004; Nov 8-12; Beijing, China.

7. Mohan A, Radhakrishnan R, Dhanapal, Manickam P, Gupte MD Outbreaks of cholera Central Tamil Nadu, 2002. The Third TEPHINET Global Scientific Conference; 2004; Nov 8-12; Beijing, China.

8. Saha S, Ramakrishnan R, Gupte MD. Cholera outbreak at Kachua village of Magrahat-I block,South 24 Parganas, West Bengal, India, 2005. The Third Southeast Asia and Western Pacific Bi-Regional TEPHINET Scientific Conference; 2006; Jan 9-12, Chennai, India

Table 1: Incidence of Acute diarrhea cases by age and sex, Kesapali, Sambalpur, Orissa, India, 2008

Characteristics		Cases	2008 population	Attack rate per 100
Age	0-4	2	91	2.2
	5& more	10	805	1.2
Sex	Male	5	554	0.1
	Female	7	342	2.0
Total		12	896	1.3

Table 2: Characteristics of acute diarrhea cases & controls at Kesapali, Sambalpur, Orissa, India, 2008 (n=12)

Characteristics	Case		Controls		Odds Ratio	95% Confidence interval
	#	%	#	%		
Age more than 5	10	50	10	50	1	0.12—8.5
Male gender	5	38.5	8	61.5	0.4	0.06—1.9
Use water from open well	8	72.7	3	27.3	**6.0**	**1.0—35.4**
Use tube well	4	30.8	9	69.2	0.2	0.02—0.98
No hand washing	7	64	4	36	**2.8**	0.5—14.7
No sanitary facility	6	60	4	40	**2**	0.4—10.4

Figure 1: Cases of Acute diarrhea by day of onset at Kesapali, Sambalpur, Orissa, India, 2008 (n=12)

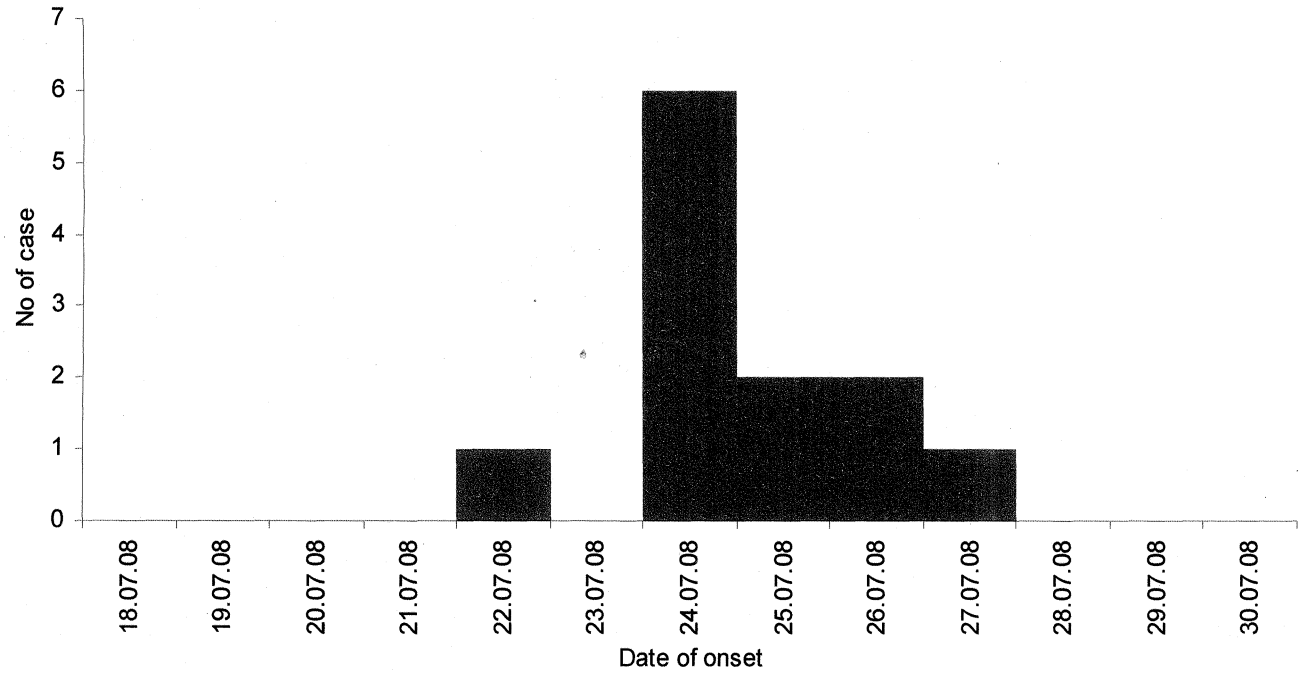


Figure 2: Cases of Acute diarrhea by residence at Kesapali, Sambalpur, Orissa, India, 2008 (n=12)

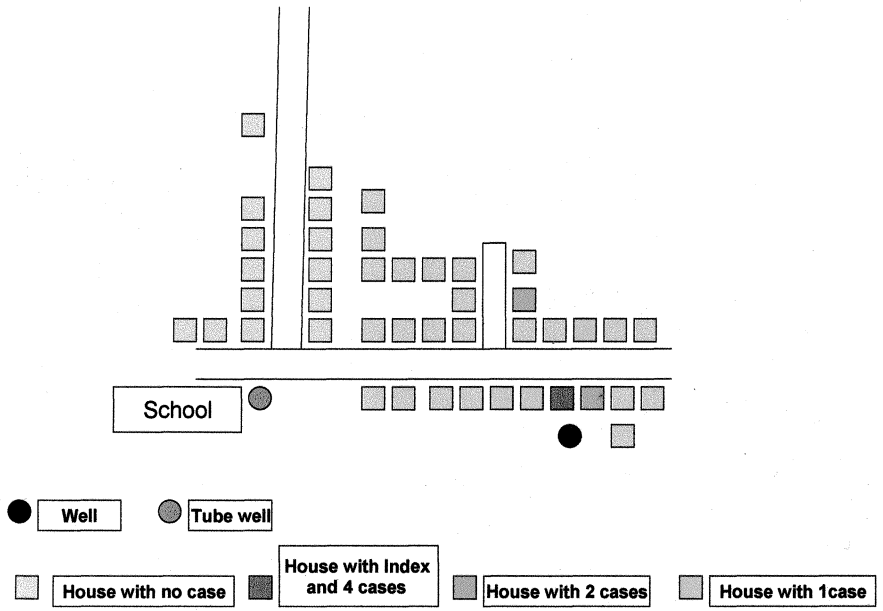
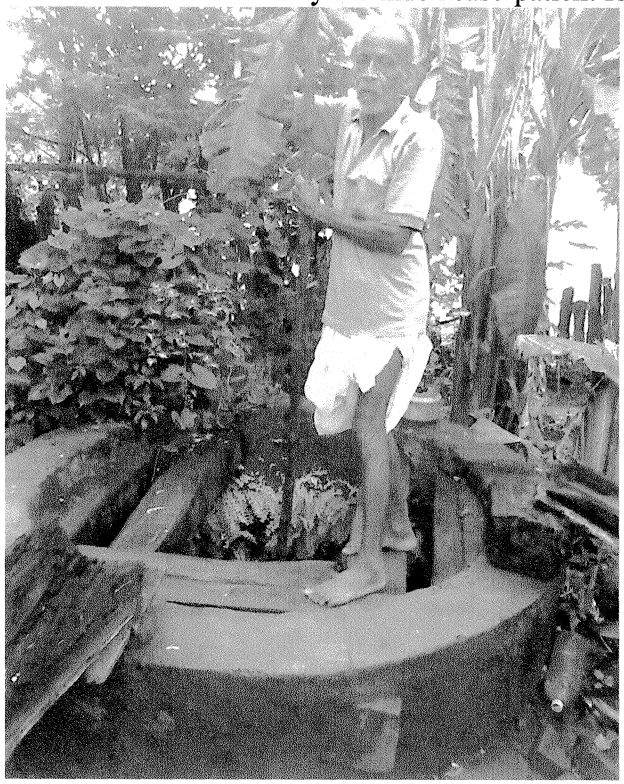


Figure 3. The implicated open well without brim used by the index case-patient for bathing and washing clothes



SCIENTIFIC STUDY CRITIQUE

Scientific study critique

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:

1. Vashishtha VM, Nayak NC, John TJ, Kumar A. Recurrent annual outbreaks of a hepato-myo-encephalopathy syndrome in children in western Uttar Pradesh, India. Indian J Med Res 125, 2007(4); 125: 523-533

2. Vashishtha VM, Kumar A, John TJ, Nayak NC. Cassia occidentalis Poisoning Causes Fatal Coma in Children in Western Uttar Pradesh.Indian Pediatrics 2007; 44:522-525

Reviewer: **Lal Anant Kumar Sai Deo**

General narrative comments

This outbreak investigation on acute hepatomyeloencephalopathy among children addresses a problem of public health importance and is good attempt to identify the cause for the outbreak. In the present and previous study in the same area by the author, the systematic approach for outbreak investigation was not followed. The outbreak was not described in terms of time, place and person. Results of analytical case control study were well presented. Limitations were not clearly presented. The writing was simple and easy to understand, however few paragraphs lack sequence.

Area	Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree)					Explanations
		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.			√			In the introduction, description of local health problem is mentioned clearly, but, the global and regional situation is not mentioned.
	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.			√			The type of study, case definition, inclusion criteria, sampling procedure, data collection procedure and analysis plan is well described. The description of outbreak in terms of time, place and person is missing in methods section.
	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).				√		The results are tabulated with adequate statistical information and the results address the research question.

Area	Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree)					Explanations
		1	2	3	4	5	
	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.				√		The results are well summarized and interpreted. The limitations of the study are not well defined. However, recommendations are specific as per the findings.
Methods	The study design is adequate to meet the objective.					√	Case-control study is appropriate, as the disease is rare one.
	The study population is well defined and relevant to the research question				√		Study population is well defined.
	Definitions are specified, sound and based upon standardized criteria when available.			√			Case definition is designed based on findings of the previous study in the same area.
	Sampling methods are statistically sound and adapted.			√			The method adopted for selecting cases and controls is mentioned.
	The sample size was estimated beforehand appropriately.				√		The procedure for sample size calculation is not described in methods.
	The study is exempt from bias.			√			There may be recall bias
	The data that were collected are well described and relevant.				√		Data were well described and relevant.
	The data was collected was of sufficient quality.			√			Procedure for quality control measures during data collection is not mentioned.

Area	Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree)					Explanations
		1	2	3	4	5	
	The analysis is thought beforehand and appropriate.			√			Descriptive study in terms of time, place and person is not done how ever, analytical study is done to find the cause of death.
	The indicators generated are appropriate and well calculated.			√			The indicators are well calculated and appropriate.
	The statistical tests used are appropriate and well computed.			√			The statistical tests are well computed.
	Appropriate attention has been given to human subject protection issues.	√					A human subject protection issue is not mentioned in methods.
Writing	The content is well distributed by chapters and sections.			√			Yes ,the content is well distributed
	The language is simple and clear. The word count is < 3000.				√		Though the language is simple and clear, some statistical words are used. The word count is less than 3000 words.
	The writing is sequential, going from one point to the next.			√			The writing is not sequential.
	The active voice is used throughout.		√				Active voice has not been used throughout.
	The vocabulary is precise, consistent and standardized.			√			The vocabulary is not precise and inconsistent

Area	Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree)					Explanations
		1	2	3	4	5	
Tables and figures	There are no more than five tables and or figures. All are needed.			√			The number of tables and/or figures is less than five. All are needed.
	The choice of graph or table to display information is judicious.			√			Additional table, graphs and spot map could have been given for the descriptive analysis
	The tables are clear, exact and the totals add up.			√			Tables are exact and clear. But some zeros are not rounded up to nearest value
	The graphs are effective, appropriate and understandable.			√			No graph is presented, only the photograph of the toxic plant is given