GUIDELINES SUGGESTED

FOR THE DEVELOPMENT OF

INSTRUMENTS FOR USE

IN

ROLL BACK MALARIA

FOR ADAPTATION AT COUNTRY LEVEL

Postgraduate Institute of Medical Education and Research, Chandigarh

JAN 3-5, 2000

A meeting to discuss the draft guidelines for the development of instruments for use in Roll Back Malaria was held at Postgraduate Institute of Medical Education & Research, Chandigarh from Jan 3-5, 2000. Experts working in the field were invited to discuss the formulation of guidelines for Diagnosis, Treatment, Transmission and Control of malaria.

Accordingly, members were requested to formulate groups for discussion on the following topics:

1. Guidelines for simple ways to diagnose and treat malaria
2. Inter programme linkage with safe motherhood and other programmes.
3. Home care through empowerment of women.
4. Personal protection against mosquito bites.
5. Elimination of breeding places in and around houses.
6. Roll back malaria: a component of healthy city/town/village

The guidelines suggested are submitted herewith for further consideration.

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GUIDELINES FOR SIMPLE WAYS TO DIAGNOSE AND TREAT MALARIA

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What is malaria

Malaria is an illness with fever which if untreated can result in serious complications & death. It is caused by Plasmodium species. These parasites exist as four species

P. vivax

P. falciparum

P. ovale

P. malariae

Of these first two species are the cause of malaria in the Indian subcontinent.

P. falciparum infection can lead to serious illness with potentially fatal complications. The other three usually result in uncomplicated febrile illness. The parasite is transmitted by mosquito bite.

There are approximately 300-500 million clinical cases of malaria per year in the world. Transmission usually does not occur in areas 6000 feet above sea level. In India *P.falciparum* infection is more common in northeastern states, Orissa and forested areas. *P.vivax* is more prevalent in peninsular India. The infection may occur more commonly during or after the rainy season in the tropics. Pattern of drug sensitivity to chloroquine varies in different regions. In India the highest levels of resistance to chloroquine are seen in northeastern states, Orissa, Gujarat and some parts of Rajasthan. Resistance to sulphadoxine-pyrimethamine combination has surfaced in the northeastern states. (Map of India indicating resistance in SE Asia- enclosed Annexure I)).

How to recognise malaria

- Every case of fever in endemic areas or in people with history of travel to high endemicity area in the past four weeks should be considered to be due to malaria unless proved otherwise.
- Other prevalent infections that may cause fever in an area must also be known and kept in mind.
- Classically a prodrome consisting of headache, myalgias, malaise and nausea occur before the first episode of fever.
- Typical fever of malaria occurs in cycles occurring on alternate days (every 48 hours). The fever occurs with chills, rigors and ends with profuse sweating.

P.malariae fever recurs every fourth day (every 72 hours). However, this classical pattern is not seen in all cases, particularly so in *P.falciparum* malaria.

- Atypical symptoms like abdominal pain, vomiting & dry cough may be present in some patients. Particularly in children there is no classical pattern of fever regardless of the infecting species.
- Low blood sugar is an important problem in children and pregnant women with malaria particularly when being treated with quinine. Patients may develop profuse sweating or change in consciousness due to low blood sugars alone.

When to seek medical attention

Certain situations indicate possibility of **severe disease**. Patient should be referred to a health care centre in the following situations.

- Pregnant women and children
- Persistent and/or very high fever.
- Restlessness
- Refusal to feed in children
- Pallor
- Jaundice
- Change in level of consciousness (cerebral malaria, hypoglycemia)
- Convulsions
- Increase in respiratory rate
- Cold & clammy skin
- Bleeding from any site.
- Black or brown discolouration of urine (cola coloured urine)

- Fall in quantity of urine
- Failure to respond to available antimalarial treatment

Laboratory Diagnosis:

- Whenever possible, a blood smear should be collected for identification of malarial parasite before starting treatment. Species identification should be done as far as possible. Report should be available in 24 hours. Where available, dipstick test for identification of *P.falciparum* antigen must be carried out in case a patient is becoming serious and blood smear is negative or is not available.
- In high risk areas, facility for dipstick test for *P.falciparum* should be provided at the fever treatment depots (FTD) for early diagnosis. In case of limited availability of these kits, priority should be given to children and pregnant women.
- Effort should be made to train some responsible community members to diagnose *P.falciparum* by the dipstick method.
- Where facilities are available patient or a blood sample should be taken to a primary health centre for laboratory confirmation of diagnosis. In other cases presumptive diagnosis should be made and treatment be given.
- In case typical attacks of fever are seen, the diagnosis should be taken as malaria and complete treatment given.

How to manage malaria

Home care

- Fever should be brought down as quickly as possible with tepid water sponging Paracetamol 500mg to 1gm for adults and 10mg/kg per dose for children may be used in patients with very high fever and failure of physical means.
- Patient should be given plenty of fluids.
- Glucose or sugar solutions must be given, particularly to children and pregnant women.

Community level

- If a presumptive diagnosis of malaria is made then the local fever treatment depot should be contacted and patient treated with chloroquine.
- Treatment policies will largely depend on the local endemicity of parasite and sensitivity pattern. Drug policies already laid out by the malaria control guidelines of individual countries should be followed.
- There is no benefit of giving Primaquine to all patients in hyper-endemic areas given the risk of haemolysis in G6PD deficient individuals.
- It is to be noted that chloroquine and quinine can safely be given during pregnancy including the first trimester. However, quinine infusion should be in dextrose solution to avoid hypoglycemia.
- Primaquine should not be given during pregnancy and in infants.
- Sulpha-pyrimethamine combination can be given after the first trimester up to one month prior to delivery.

- Sign of serious illness should be actively looked for and the patient referred to a primary health centre as per indications mentioned above.

Administrative level

- There should be a functional drug distribution centre (DDC) or fever treatment depot (FTD) in each village and urban slum.
- Timely replenishment of antimalarials should be made to DDC/FTD.
- Paediatric chloroquine formulations should be available.
- Local patterns of drug resistance should be known.

Chemoprophylaxis

Should be offered as per national guidelines to:

- All travelers from non-endemic to endemic areas.
- Pregnant women in endemic areas.

INTER PROGRAMME LINKAGES WITH SAFE MOTHERHOOD AND OTHER PROGRAMMES

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Malaria is one of the diseases that affect motherhood both directly and indirectly. Malaria by itself can produce anemia and sometime maternal mortality. Besides, deaths due to malaria among children cause insecurity in the family, thereby denying family planning. Integrating both programmes would increase programme effectiveness and efficiency.

Malaria in pregnancy as part of Reproductive and Child Health (RCH)

Malaria in pregnancy should be included as part of the RCH. This should be incorporated into the syllabus with specific emphasis on the treatment schedule and prophylaxis. RCH programme should also invest in malaria control through purchase of antimalarial drugs in emergency situations. Treatment of pregnant women and children should follow the national drug policy on malaria. No other drugs or systems should be used when malaria has been diagnosed.

Malaria as a part of Integrated Management of Childhood Illness (IMCI)

As is done in African countries malaria among children should be incorporated as one of the diseases under the IMCI programme. This will ensure that medical practitioners develop the skills for diagnosing and treating children with malaria and in managing complications.

Link up with Integrated Child Development Services (ICDS) project

Since ICDS is a nationwide project malaria control especially among pregnant women and children can be brought under the ICDS programe. Anganwadi workers may be trained to identify and refer pregnant women and children presenting with signs and symptoms suggestive of malaria to facilitate early diagnosis & treatment. They may also be trained to provide presumptive and complete treatment, prevention of man- mosquito contact through bed nets, elimination of breeding site etc. A periodic review & ret-raining should be undertaken.

Health Workers involved in Malaria

Since Female Health Workers (FMPHW) and ANMs are directly responsible for pregnancy care and childhood illnesses, they should be trained fully on the management of malaria. Since this is a centrally funded programme all posts are likely to be filled up which would ensure complete coverage.

Training of local care givers

There are a variety of categories of personnel in the community who could be trained for malaria treatment. These could include:

Teachers

Pharmacists

Forest guards

Post masters

PDS-shop keepers

Religious leaders

Traditional/Local practitioners

Panchayat leaders

Malaria link volunteers

Fever Treatment Depots (FTD)/ Drug Distribution Centre (DDC) personnel

They should be trained to suspect malaria early among those with fever. If presumptive treatment is started then they should ensure complete course of treatment. One full course of drugs may be provided in one strip. In case of severe illness with loss of sensorium and or loss of consciousness they should refer them to pre determined referral centres. If Dais are trained they should be taught to suspect malaria and refer. They should remove misconceptions surrounding malaria.

Project/Construction related malaria

Major projects and construction works are providing migrant labour with gainful employment. In addition, seasonal agriculture work also supports migrant labour. These categories of persons should be identified as high risk groups for malaria.

If such a group (including their family members) is more than 3000 strong, the health department should post one ANM or Female Health worker exclusively for this population. Alternatively the project management itself can employ an ANM or FMPHW to handle both reproductive health needs as well as needs of malaria. If the population is smaller and scattered over a larger area then the individual health worker should give priority to migrant labour as high risk groups.

The managers and supervisors of these projects should be educated about the problem of malaria, how it can be handled and the available resources from the government. In this way the management may be encouraged to take interest in the

welfare of the migrant labour and provide support for safe motherhood and malaria control among the labour.

Other special situations that need support are

A border malaria

- interstate
- state-international

B infrastructure for urban slums

C stone quarries

D brick kilns

E road constructions

F building constructions

G dams

H industrial constructions

Special efforts must be made to plan locally for each of these situations for malaria control.

Personal Protection

When personal protection measures such as nets are promoted in the community then the community should be encouraged to give priority to pregnant and lactating women first, followed by children in ascending order of age and finally other adult and male members.

Dais and health workers could promote the social marketing of nets and other preventive measures. All individuals may be encouraged to pay some money to give value to the net. Malaria control should be a part of the work of all health workers

especially because of problems associated with pregnancy and childhood. Dais and MPHWs can provide IEC on personal protection. In general the people have a desire for protection from mosquito bite.

Malnutrition and Malaria

Anemia is the most common malnutrition problem associated with malaria. The anemia may be present prior to malaria, or this may be exacerbated by malaria or malaria itself can cause anemia. In all such situations emphasis should be on simultaneous treatment of malaria and anemia.

Guidelines on Integration by District Leadership

Since malaria control requires integration of different sectors within and outside health, for effectiveness at the District level only the Collector, Magistrate or Commissioner can bring about this integration. The following are some suggested guidelines which may help the leadership.

- The malaria situation should be reviewed periodically as part of the overall review of the district activities. Emphasis could be made prior to, during and after the transmission season.

- Review the situation of malaria at the district level with focus on pregnant women, children, complicated cases, deaths, types of malaria, pattern of utilization of drugs etc. Information should be obtained from Govt. hospitals/dispensaries, private practitioners and medical institutions. This should be a two way process. The malaria staff may proactively involve individuals in providing the information. Instead of passively waiting for information, different approaches may be used to obtain the information. Feed back should be provided by malaria staff on action taken. Different

individuals involved with sources of malaria information may be invited for the review meeting.

- Identify available resources within various sectors at the district level which can contribute to malaria control as necessary.

> In one of the Districts of Himachal Pradesh, two departmental heads were blaming each other for acute diarrhoea and deaths. A new collector made both parties sit together, identified the needs of both. The collector was able to identify resources in another department for needed repairs & maintenance as well as resources for IEC in the education department. By pooling the available resources the problem was

- The collector should insist upon the Assessment of impact on Environment of all major projects undertaken in the district and ensure necessary modification in design.
- Integrate malaria control with other ongoing programmes like Pulse Polio Immunization, RCH, ICDS etc.
- Review staffing positions, filling up essential vacant positions or make alternate arrangements
- Review training programmes conducted for malaria control
- Malaria epidemics could be cyclical and can occur even in non tribal areas. Epidemic warning signs and preparedness for epidemic should be reviewed especially prior to the transmission season.
- Promote better inter departmental coordination.

The following programes/institutions may be also involved

- DWCRA/Self Help Group
- Labour Welfare Board

- Tribal Welfare
- Island authorities
- Women welfare
- Swastha Karimi scheme
- PMRY – to include folk artists as an economic activity.
- Social Forestry
- Mahila Samaj/Mandals in rural areas and Women clubs/Kitty's in urban areas.

Integration of malaria with safe motherhood would go a long way to help the poor and the marginalised. Insurance schemes may be considered for malaria especially for poorer sections. This should include malaria referrals, including transportation and deaths. While malaria is predominantly a problem of the poor, failure to make early diagnosis and start early treatment could seriously affect any section as witnessed with the death of an IAS officer, whose wife was a doctor but still he died due to delay in suspecting malaria.

- At the state level the Chief Secretary may coordinate the interdepartmental activities.
- The Health Secretary will coordinate all programes within the health department.
- Wherever the Zilla Parishad system operates effectively, the Zilla Parishad / Panchayat President/Chairman may review, monitor, and coordinate various sectors for effective operation.

HOME CARE THROUGH EMPOWERMENT OF WOMEN

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HOME CARE THROUGH EMPOWERMENT OF WOMEN

Empowerment of women in countries where status of women is still low (lack of literacy, lack of authority etc.) goes a long way in giving them stature and confidence in dealing with various aspects of life.

It is in this context that we consider empowerment of women is important in being a partner in management of health care at home and making decisions in health matters, because she is pivot of caring for all the members of the family. Home care through empowerment of women precisely means providing wider knowledge to women on matters of health and disease including ability to make decisions which are respected and accepted by the family and the community. This impacts directly on early diagnosis and prompt treatment. Basically empowerment of women means

(i) Creating awareness among women through basic knowledge for prevention of Malaria and other common diseases.

(ii) Providing adequate information for identifying the seriousness of the problem and adopting simple methods to undertake Home Care within the family.

Before the women are empowered it is quite necessary to identify the different ways through which the concept of home care can be introduced. Depending upon the physio-demographic area, the women groups can be divided into different settings.

1. Rural
2. Urban slums
3. Labour colonies
4. Urban areas

Rural:

In the rural areas the women can be empowered through women members of the Panchayats or local bodies. The other spheres which hold significance in empowering women are as under:

Women organisation

Mahila Mandals

Anganwadi

Religion places/social gathering

Weakly markets

Street plays/puppet shows/other source of entertainment.

Besides this, a special health concious group can be identified. This group will include female members from Teachers, Panchayat member, Bank employees and women working in Post offices.

The women in the urban slums can be imparted knowledge through NGO/voluntary organisations and cooperative societies.

The women in the urban areas can be empowered through

- Welfare Associations
- Women development Council
- Women Clubs/Kitty
- Voluntary Organisations involving women
- Red Cross, Lions club
- Army Wives Welfare Association
- Police Wives Welfare Association

The members of these organisations are to be trained by imparting knowledge regarding Home care of Malaria who in-turn will train women at home. Their training shall include the following thrust areas.

1. Health education and awareness about malarial disease.
2. Cleanliness in and around the house including water management and disposal.
3. Other preventive measures e.g. use of bed-nets, mosquito proofing etc.
4. Knowledge and awareness about existing local health infrastructure.

HOME CARE PACKAGE

1. Fever as a symptom to be taken seriously and presumptive treatment for malaria to be given preferably after taking smear for malarial parasite
2. Symptomatic treatment like sponging, plenty of fluids, antipyretics.
3. Identification of problem/complication e.g. drowsiness, vomiting, low urine out put, convulsions which need immediate referral.

4. Pregnant women/infants & children with fever to be dealt with as emergency and full treatment to be given depending on diagnosis.

5. Chemo-prophylaxis for pregnant women especially in high endemic areas.

6. Village level volunteer women health worker. (To be trained as per UNICEF module).

Recognition of women in the society

After women receive the training, the N.G.O.s/ voluntary organisations/ Local bodies/ Panchayat should in some way honour these women so that their services are recognised which ultimately becomes an incentive for involvement of more women.

PERSONAL PROTECTION AGAINST MOSQUITO BITES

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PREAMBLE

Prevention of malaria and other mosquito-borne diseases by reducing man mosquito contact by rendering residential premises mosquito proof and through personal protection measures is a time tested community based approach.

However with the advent of DDT in the Public Health Programme, the use of erstwhile technologies/ knowledge including personal protection measures lost its significance.

In the pre DDT era, various methods utilized for personal protection were as follows:

1. Use of smoke
2. Mosquito Net
3. Mosquito Proofing of the houses
4. Use of various types of oils
5. Use of protective clothing etc.

Currently a few more options have become available such as

1. Allethrin based mats
2. Mosquito coils
3. Mosquito repellent creams/lotions
4. Vaporisers for mosquito repellency
5. Electrical Gadgets
6. Light traps
7. Ultra sonic devices
8. Insecticide treated bed nets/curtains

From a review of the currently available methods of personal protection, it has been observed that mode of action of the most of the available repellents are chemical based which in spite of safety limits, due to their prolonged use affect the community in more than one ways. Repellents used for external usage result in development of rash and other manifestations, those inducing inhalation promote acute respiratory problems. Therefore herbal based compounds viz. Neem based products like lotions, cream, mats agarbattis (Joss sticks) are considered safe.

Similarly, mosquito proofing of houses is more cost effective and sustainable. However, where this is not feasible or practical, use of insecticides treated nets (ITN) have definite advantage because treated nets not only protect the users but also offer some degree of protection to non-users.

On the basis of experience so far gained, the above mentioned measures have been found suitable for rural, urban and semi urban areas and forest areas.

Insecticide Treated Nets/curtains

From the experience gained in the usage of ITN it has been observed that to optimize the use of net the following basic information is essential.

1. Mosquito biting time and site of contact.
2. Sleeping habits/socio-behavioural practices of the communities to be protected.

It may be mentioned that none of these measures can provide absolute protection against mosquito bites and the diseases transmitted by them.

Operational aspects including delivery and cost sharing and social marketing of these measures for different ecological settings are shown in the table (Table 1).

Operationalization of use of repellents/ITN programme in different settings

The strategy for the sustainability of these methods at the community level is as follows:

1. The Programme Manager at the District Level will be overall incharge working under the preview and guidelines of District Malaria Society.
2. His/her responsibility will include the procurement, distribution, providing back up support and coordination of the IEC and other promotional activities through Media, Education, local self Govt. Institutions, NGOs, etc.
3. It is recommended that the money received from the sale of the subsidized items such as nets will be handled by the Malaria Society.
4. The monitoring mechanism should be developed according to local situation for which a committee could be set up taking representatives from the community and Malaria Society.

5. It is recommended that an annual evaluation of the programme may be conducted by a small committee with representatives of Malaria Control programme, community, NGOs, local self Govt. and experts with social science background.

6. It is recommended that during distribution and use of mosquito nets the priority should be given to the pregnant women, infants and children. The significance of protecting this vulnerable group should be highlighted through mass media and IEC activities.

7. Natural herbal repellents like Neem oil, Citronella oil, Eucalyptus oil, etc. could be encouraged in the programme. These products are under free sale in the market. Availability of these products should be ensured at all times.

Precautions in promotion and use

1. While providing and promoting products using synthetic pyrethroides the community should be made aware of their possible side effects to the users.

2. Some electrical gadgets and acaustic devices presently being marketed as mosquito repellents have been found to be of doubtful efficacy and hazardous community should be made aware about them through mass media. They may be encouraged to take up the matter with Consumer Redressal Forum. The false claim of the companies could be brought to the notice of Registering or other appropriate authority.

R & D ISSUES

1. The socio-economic and socio-cultural factors affecting the use and acceptability of various personal protection measures need to be studied by social scientists with the help of vector control specialists.

2. To evaluate the efficacy and safety for long term use of mosquito repellent devices, scientific studies need to be conducted and the results of these should be made available to the users.

3. Operational research should be the necessary component of the personal protection activities of the RBM.

A list of various options available for personal protection and their safety is given in table 2.

ELIMINATION OF BREEDING PLACES IN AND AROUND HOUSES

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Preamble:

Mosquito can be effectively controlled by eliminating breeding habitats as much as possible. There is a great role for the people residing in and outside the houses. For this, active participation of community is necessary.

The possible breeding grounds (indoor and outdoor) and actions required to eliminate mosquito breeding are shown in table 3.

ROLL BACK MALARIA : A COMPONENT OF HEALTHY CITY / TOWN / VILLAGE

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A large number of malaria cases are being reported from urban and rural parts of the affected countries. Though a malaria control organisation has been established in towns and cities having population of more than 40,000 in India,the infrastructure has not kept pace with the urban growth particularly in the urban slums. Therefore, control of malaria should be included as an important component of "Healthy city/town and village" project of WHO.

The concept of "Healthy city/town/village" includes provision of basic amenities, adequate supply of water, proper disposal of solid wastes and excreta. In addition, system to collect information on all communicable diseases including malaria, establishment of disease prevention units, rehabilitation of slum-dwellers into resettlement colonies also contribute significantly to the development of healthy cities, towns and villages.

Though a large number of mosquitogenic conditions exist in cities, towns and villages, the following conditions should be taken care on priority in developing "healthy

cities/towns/villages" project. (Refer to table for action needed and agencies to be involved).

1. Improper open drainage system.
2. Indiscriminate throwing and collection of solid waste at dumping sites.
3. Water collection around water supply system due to missing taps and leaking and broken pipes.
4. Choked nullah/storm drains.
5. Water storage for construction purpose.
6. Ponds, tanks and wells.
7. Inadequate sewerage disposal and treatment.
8. Water collection in containers, plastic items, tyres, coconut shells, discarded materials etc.
9. Storage of water for animals.
10. Ditches on both sides of roads and rail tracks.
11. Ornamental water collection in gardens.
12. Tree cavities and grooves.
13. Man-holes and vent pipes.
14. Lack of community awareness of above factors and conditions.

Agencies and Partners:

In order to tackle these problems, there is need to build up partnership with private agencies, industries (CII), non-government organisations and community self-help groups and community based organisations under the leadership of local body, e.g. panchayats, municipal committees etc.

Malaria control organisation should have active liasion with local authorities eg. Municipal Corporations, public health engineering deptt., PWD, Irrigation etc. Strengthening of Inter-sectoral coordination is utmost important to combat mosquitogenic conditions in urban and rural areas.

Legislative measures

Building bye-laws should be implemented. Some simple technologies like using scrubber for vent pipes, locking of manhole covers and overhead tanks etc are to be identified and implemented.

MONITORING OF HEALTHY CITY/VILLAGE

Competition between mohalla & lanes of villages & towns and cities having most sanitary and healthy conditions could be a good method to improve malaria control.

Organisations maintaining and involved in the sanitary and environmental up-gradation programme should be rewarded and recognised.

The healthy citytown/village should achieve decline in malaria cases as one of the parameters of success. Cities/villages should be given incentives for achieving malaria control. More stress should be given on environmental management rather than on use of synthetic insecticides. Activities of NGO's, social groups should also be monitored and their credibility assessed. It must be ensured that 2-3% of the budget on construction should be spent on preventive anti-malaria activities and while choosing site for house construction, areas with less mosquitogenic potential should be selected.

India has more than 3000 towns having population of more than 5000, but no anti-malaria programme has been developed for these areas. In absence of proper planning of a national programme, the gains in malaria control will not be possible.

The concept of "biovillages" being promoted will not be a viable without including a health component particularly for prevention of malaria.

Malaria control through environmental & engineering methods should be an important part of Engineering and architect courses so that the design of buildings, roads etc. does not lead to malariogenic conditions. (Table 4).

Annexure I

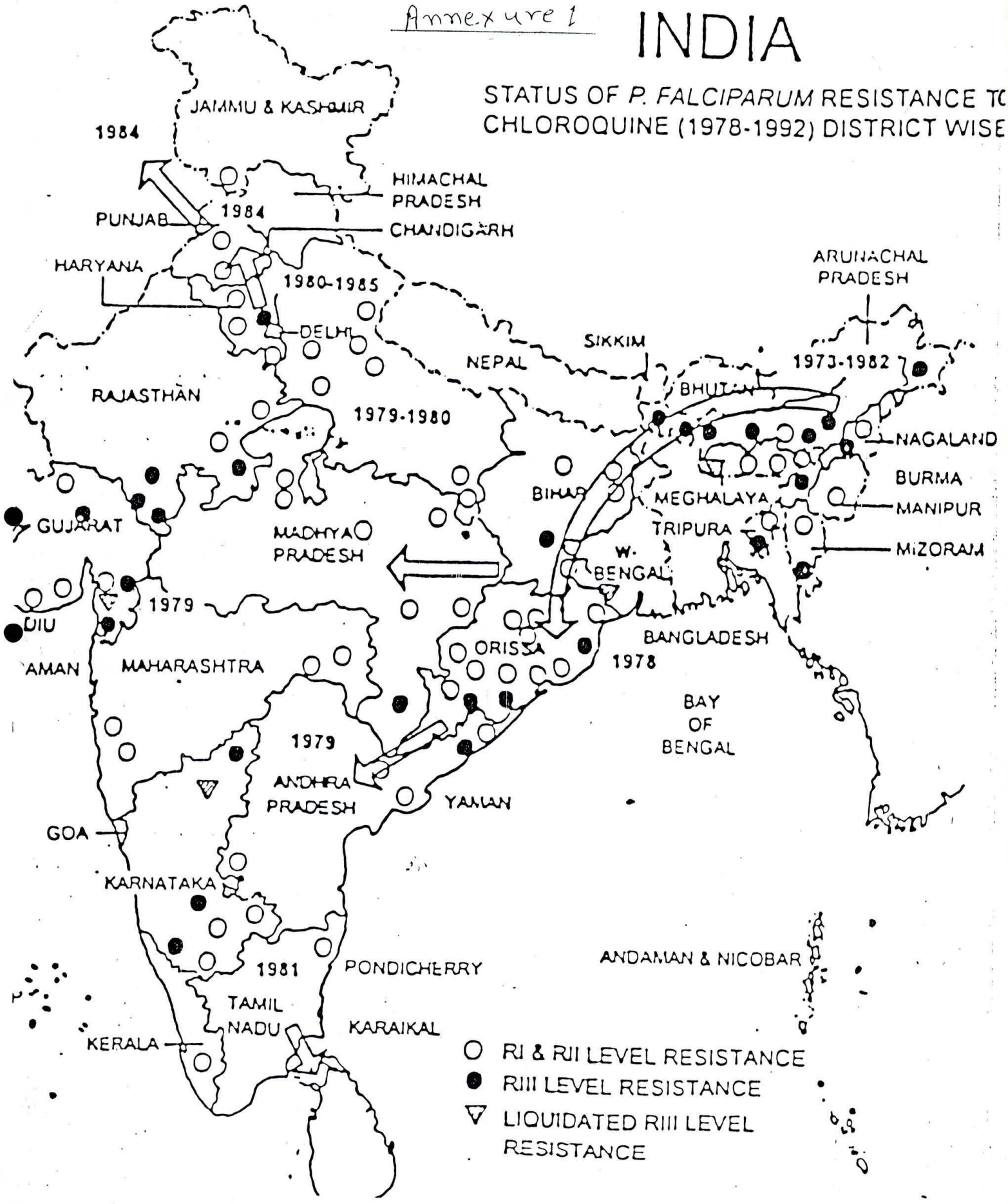
INDIA
STATUS OF P. FALCIPARUM RESISTANCE TO CHLOROQUINE (1978-1992) DISTRICT WISE
JAMMU & KASHMIR
1984
HIMACHAL PRADESH
PUNJAB
1984
CHANDIGARH
HARYANA
1980-1985
DELHI
ARUNACHAL PRADESH
SIKKIM
NEPAL
1973-1982
BHUTAN
RAJASTHAN
1979-1980
NAGALAND
BURMA
BIHAR
MEGHALAYA
MANIPUR
TRIPURA
GUJARAT
MADHYA PRADESH
MIZORAM
W. BENGAL
1979
DIU
BANGLADESH
ORISSA
1978
MAHARASHTRA
BAY OF BENGAL
1979
ANDHRA PRADESH
YANAM
GOA
KARNATAKA
1981
PONDICHERRY
ANDAMAN & NICOBAR
TAMIL NADU
KARAIKAL
KERALA
RI & RII LEVEL RESISTANCE
RIII LEVEL RESISTANCE
LIQUIDATED RIII LEVEL RESISTANCE

Table 1

Operational Areas	Cost sharing/social marketing	Promotional strategy	Delivery outlets/ system
Ethnic Tribes	Differential subsidy to promote equity	IEC (Tribal welfare/ Develop. Authority)	Tribal Councils Panchayat, Dept of Forest,NGOs
Non-Tribal Rural Areas	-do-	IEC, Health Camps, Exhibitions, Media (Indoor and Out-Door Programme) School Health Education, Religious gatherings, NGOs	Panchayat (Loca self Govt.)/FTD DDC, PDS, Sanitary Mart/ Unit, PHC, Anganwadi, NGOs
Urban population	Social Marketing	IEC, Media, Interpersonal Contacts, School Education, Exhibitions, Cable TV Spots, Cinema slides, NGOs	Social Marketin Govt. should exempt sales tax on the sale of ne as incentive for Promotion of its Use
Semi-urban areas and Labour Hutments/ Slums	Social Marketing/Differential Subsidy to promote equity	-do-	Slum develop-Ment Authority, PDS, Welfare Organisations, NGOs
Development Projects	Mandatory provision of supply of curtains/nets to migrant labour	State legislation through Ministry of Labour/Health	Employers
Social/Religious Gathering/Fares	Cream, Lotions, Nets	Religious preaching, condition for permission to hold such gatherings by local self Govt. when applicable	Local Self Govt./ Organisers

Table 2: Various options for personal protection and their likely side-effects.

Personal Protection Options	Active Ingradient/ Principal	Likely side effects
Allethrin Based Mats	Synthetic pyrethroids	Respiratory / eye problem including asthma, itching, Headache, Rashes,etc.
Mosquito coils	Herbal/Synthetic Pyrethroids	-do-
Mosquito repellent creams	Herbal/chemical	Skin irritation or rashes
Vaporisers	Synthetic Pyrethroids	Respiratory disorder, escalation of eyes, itching headache, rashes
Electrical Gadgets (Electrocuters)	Electrocution	Nil
Ultrasonic devices	Sound waves	Headache and hearing impairment
Light Traps	Light attraction	Nil
Insecticide Treated Nets	Synthetic pyrethroides	Skin irritation
Insecticide Treated Curtains	-do-	-do
Mosquito proofing/ Window screening	Mechanical Barrier/ EFFC	Nil
Neem oil	Natural compounds	Nil
Lotions (DEET, DMP)	Chemical	Skin irritation
Euclyptus oil	Natural oils	Nil
Citronella oil	-do-(saturated oil)	Nil
Protective clothing	Mechanical Barrier	Nil

Note:Effective protection by these repellent except treated mosquito net/curtain and house proofing varies from 1-4 hours in the field in different seasons. The effectiveness also varies against different mosquito species. All the repellents are more effective against Anopheles (Malaria vectors) than culex (filaria and J.E. Mosquitoes) and Aedes (Dengue vector).

Table 3

Type of Breeding Habitat	Action required	Type of mosquitoes breed
Cemented/Earthen pots/ Cistern	-Empty out the water once in 7 days -Cover with wire mesh/ cloth when not in use - Use tight fitting lids	Mainly Anophles, Culex and Aedes
Flower vases/excess water collection on flower pots	-Change/empty out the water once in 7 days	Aedes
Cooler/Air conditioners	-Change the water once in 7 days -Observe a dry day in a week (scrub dry)	Aedes, Culex and Anopheles
Water meter chamber	-Proper sealing -Leak proofing	-do-
Wells		
In-use wells	-use larvivorous fishes -Cover when not in use or screen with net	Anopheles and Culex
-Unused wells	-Hermetical sealing -Use EPS beads -Use crude oil -Use Larvivorous fish	Mainly Culex
Overhead Tanks (OHT)	-Use mosquito proof tanks -Hermetical sealing/tight lids -Make OHT accessible for inspection -Demolish the discarded one completely	Mainly Anopheles
Underground Tanks/Sumps	-Cover the lid tightly -Use larvivorous fish	Anopheles and Culex

Tap pits	-Should be discouraged as far as possible -Make a small hole at bottom to drain out -Avoid leaking taps -Use biolarvicides	-do-
Cess pits/pools	-make soakage pits -periodical draining/channelize them to one major pool for better management -Use larvicides like Fenthion -Recycle the water for kitchen garden -Cleaning of edges	mainly Culex
House Drain	-Regular cleaning -Making soakage pits	-do-
Unused tyres/discarded tins/bottles/solid wastes	-Store the tyre under a shade -Destroy all discarded bottles/tins etc.	Mainly Aedes
Coconut shells	-All the coconut shells should cut into four quarters	-do-
Septic tanks	-Cover vent pipes with mosquito nets or put plastic scrubber to cap -Cement sealing/plastering the cracks and crevices	Mainly in Armigeres
Water collection on Sun shades/window shades	-Drain out the water mainly in rainy season	Mainly Anopheles

It is important to have effective IEC programmes to motivate/mobilize the community to be aware and take part in controlling the mosquito breeding.

TABLE 4

Healthy cities/towns-villages : Mosquitogenic conditions, Actions needed and Agencies Involved

Mosquitogenic conditions	Action required	Responsible agency	Partners
*Drainage system	- covered drainage system with gradient -Soakage pits: in villages & slums	Municipal corporation Local bodies	- Community participation for soakage pits
*Solid waste dumping	:Big cities:conversion of garbage to manure & garbage to power Small cities/towns: cover by thick layer of earth Industrial wastes management	Municipal Corp.	CII/Industries
*Water leakage/collection from supply system	.Maintenance of supply system . Taps in place	"	.Monitoring by local persons/ Organisations
*Choked nullah/storm drains with stagnant water	.deweeding, de-silting to make them operational	Public works Department (PWD)	-
*Water storage and collection at construction sites	.Treatment of water with Larvicides .Filling up of ditches after completion of construction .Effective application and implementation of building bye-laws/mosquito control bye-laws	Municipal Corporation Larvicides provision by Malaria deptt.	Contractors/ Builders/ owners of sites
*Ponds,tanks and wells	.In the ponds use bio-larvicide and on wells, use mosquito proofing by wire-gauze	PWD	- Community volunteers
*Sewerage disposal and treatment	.System should be operational and functional .Facility expansion vis-a-vis population growth	Public health engineering	-

*Discarded materials including tyres	.Facilities for adequate disposal of discarded and waste materials	-	Individual responsibility
*Storage of water for animals	.cleaned regularly	-	-do- village panchayat, NGOs
*Ditches on both sides of roads and rail tracks	.Earth-levelling/ connecting with natural drainage system or use larvicide	Public health Engineering	-
*Ornamental water collection/Flower pots	.Biological control (eg. Fish release)		Institutional and Individual responsibility
*Tree cavities/grooves	.Treated during rainy and post-rainy season .Making holes at the base of tree cavity/Filling with sand	.Malaria deptt. Horticulture deptt.	
*Man-holes and vent-pipes	.Man hole-covers in place preferably cement-made (no monetary gain for theft) wire-meshing (mosquito-proofing) with size of hole less than 1.5 mm	Municipal Corp.	
*Awareness of community	.Strengthening of IEC activities using audio-visual Aids	IEC cell of health deptt.	NGO' local agencies Social groups Mass media School teachers and students

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