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SUSCEPTIBILITY STATUS OF MALARIA VECTORS IN INDIA

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ABSTRACT

Malaria is a disease caused by the biting of the Anopheline mosquito vectors. Vector control is the major component of the strategy for malaria control which aims to prevent parasite transmission through interventions targeting adult malaria vectors. For this, chemical, biological and mechanical methods are applied. In chemical approach of controlling malarial mosquitoes, insecticides have been used extensively for larviciding, indoor residual spraying and impregnation of bed nets in the last few decades. As a result of this, vector resistance to these insecticides have been recorded in various parts of the country and mosquitoes have developed wide spread resistance to some of these insecticides. There is need for countrywide and regular surveys for monitoring the insecticide susceptibility status of major vectors and assessing their implications on vector control activities. In India, most of the studies revealed that resistance against DDT is prevalent in most of the malaria vector species. Bye and large culicifacies and stephensi are resistant to malathion also and resistance against synthetic pyrethroid is developing. Moreover fluviatilis, minimus and annular is susceptible to malathion and deltamethrin. As the chemical molecules available for the role of insecticide are very few and invention of new molecules takes time, this is the need of time that increasing trend of resistance status of mosquitoes against the insecticides used in the vector control programme have to be minimized. There are only a few reports on the susceptibility status of the mosquitoes against various insecticides and thus more emphasis on these studies should be given.Again the appropriate use of the insecticides like rationale use with rotation of insecticides and insecticide combinations can be an effective strategy to combat this insecticide resistance.

Keywords: Malaria vector, susceptibility

1. INTRODUCTION

Malaria is a main cause of mortality and morbidity among human population of India. This disease is caused by the biting of the mosquito vectors. In India, anopheles culicifacies, anopheles stephensi, anopheles fluviatilis, anopheles minimus, anopheles dirus and anophelessundaicus are six primary and anopheles varuna, anopheles annularis, anopheles philippinensis and anophelesjeyporiensis are four secondary vectors of malaria. In addition to these, anopheles subpictus has also been reported as a potential malaria vector. Vector control is a major component of the global strategy for malaria control which aims to prevent parasite transmission mainly through interventions targeting adult Anopheline vectors. Before the Ross discovery, stagnant water was suspected to be responsible for malaria and thus management of water was the key method for vector control. Kerosene was used successfully as a larvicide during 19th century. During the first quarter of the 20th century, mosquito control was mainly done by interfering its breeding. For this, chemical, biological and mechanical means were applied. In chemical approach of controlling mosquito breeding, vegetable oil, kerosene oil, Paris green, DDT emulsion in kerosene, Chlordan, Aldrin and Dieldrin have been used as larvicides. Paris green was

successfully used as a larvicide to control mosquito population particularly in Assam.Larvivorous fishes like Gambusia and Guppy, and exposure to sunlight and shading also were used as a biological means to check mosquitoes breeding. On a small scale, some mechanical mode of control like surface drains, vertical drains and subsoil drains were alsoused. After the World War II, insecticide with residual properties; mainly DDT, was used to control mosquito populations. This mode of vector control gained much success in vector control programmes. On account of continued use of synthetic insecticides particularly DDT and BHC under malaria control programme, selection of resistant populations has occurred amongst many mosquito vector species. In India, evidence of resistance was first reported by Pal in Culexfatigans.

Ongoing strategies of vector control rely heavily on the use of safe and effective insecticides through indoor residual spraying (IRS) or insecticide-treated nets (ITNs). Pyrethroids are the only option for the treatment of mosquito nets due to their relative safety for humans at low dosage, excito-repellent properties, rapid rate of knock-down and killing effects. The regular use of these insecticides in IRS activities and impregnation of bed nets in the vector control programme had a very good impact as a transmission control measure in the beginning, but later vector resistance to these insecticides was recorded in certain parts of the country and mosquitoes have developed resistance to a varying degree depending on the use of insecticide. Anopheline mosquitoes exhibit two major mechanism of insecticide resistance: metabolic resistance and target site insensitivity. Metabolic resistance to insecticides is usually associated with enhanced levels or modifiedactivities of detoxification enzymes; esterases, Glutathione STransferase (GST), or Mixed Function Oxidases (MFO), while target site insensitivity results due to modifications in GABA receptors, or point mutations in the voltage-gated sodium channel gene, often termed as kdr (knock-down resistance).

Comprehensive knowledge of the factors underlying resistance is needed for the implementation of efficient vector control programmes including resistance management strategies. This raises the need for countrywide and regular surveys for monitoring the insecticide susceptibility status of major vectors, detecting resistance genes and assessing their implications on vector control activities. In India, the status of insecticide susceptibility of the mosquito vectors has been reviewed earlier form time to time. The present paper is an attempt to review the present insecticide susceptibility status of malaria causing mosquitoes in India based on the reports published during the last one decade.

We searched for studies in which insecticides were tested against malaria vectors in India and insecticide resistance was reported. Public data base were also searched with relevant key words. Abstracts were read and full research papers were retrievedpertaining to insecticide resistance and causes of resistance indengue vectors under review with reference to India.

2. ANOPHELES CULICIFACIES-

Culicifacies is the most prevalent malaria vector species foundthroughout the rural plain areas in India. It is primarily a zoophagicspecies. , which is a complex of five sibling species namely A BC D and E. The entire sibling (except B) is efficient vectors in different areas of the country, while B isa poor vector species. Initially indoor residual spraying withDDT was used for the control of this species. But gradually Culicifacies has developed resistance against DDT and it was thefirst mosquito species to develop resistance against this insecticide. Now Culicifacies is resistant to DDT in almost all parts ofthe country.

3. ANOPHELES FLUVIATILIS

Anopheles fluviatilisis responsible for malaria transmission of about 15% of new cases annually in hilly and foot hill regions of Odisha, Madhya Pradesh, Uttarakhand and Chhattisgarh. As per NVBDCP reports up to 1997, it was resistant to DDT in 11 districts from 8 states. **Anopheles fluviatilis**was found susceptible to DDT in Odisha. But recently from Koderma and Gumla district of Jharkhand, Singh et al.reported resistance against DDT in these mosquitoes. **Anopheles fluviatilis** has been found susceptible to malathion and syntheticpyrethroids in most of the studied areas.

4. ANOPHELES ANNULARIS-

Anopheles Annularis, a secondary malaria vector in certain parts of India,is a complex of two sibling species A and B. It has been foundesistant to DDT as well as dieldrin /HCH from most parts of India.Though An. annularis is susceptible to malathion, fenitrothion anddeltamethrin, Das et al. (2000) reported 100% susceptible againstDDT in Bihar. However, Singh et al. (2010) found 45.9%mortality against DDT in Jharkhand showing resistant to DDT,but in both the studies this species was reported to be susceptible tomalathion as well as deltamethrin. Recently in Gadchiroli, sometolerance against malathion and deltamethrin has been reported bySingh et al. (2012). The susceptibility status of other malaria vector species viz., Anopheles sundaicus, Anophelesdirus, Anopheles vruna and Anopheles philippinensis prevalent inthe country by and large remain unchanged as there are no reportson insecticide susceptibility status published during the past decadeas per our knowledge.

***5*- ANOPHELES STEPHENSI-**

Anopheles*stephensi*is an important malaria vector in urban areas of India.It has predilection for breeding in man-made breeding places. SoIRS is not used for its control in vector control programme in urbanareas. However, it has developed resistance to DDT, malathion anddieldrin in many areas of the country. This resistance may bedue to use of these insecticides in IRS activity by NVBDCP inrural areas. In Manglore city of Karnataka, it has been foundresistant to malathion, but susceptible to DDT and permethrin.

Resistance to DDT was reported in Kerala, Rajasthan and Gujaratand Madhya Pradesh. Tikar*et al*. (2011)reported 38.46-100% mortality in *An. stephensi*against malathion and 90-100%mortality against deltamethrin, showing a variable degree ofresistance against malathion and deltamethrin. Bansal and Singhhowever showed 100% susceptibility against syntheticpyrethroids like deltamethrin in Rajasthan.

CONCLUSION-

Most of the studies revealed that resistance against DDT isprevalent in most of the malaria vector species.Even inanophelesminimus, which was considered to be susceptible to thisinsecticide, resistance against DDT has started to develop. Bye andlarge, culicifacies and An. stephensi are resistant to malathionalso but resistance against synthetic pyrethroid is developing. Fluviatilis, An. minimus and An. annularis are more or lesssusceptible to malathion and deltamethrin. As the chemicalmolecules available for the role of insecticide are very few andinvention of new molecules takes time, this is the need of time thatincreasing trend of resistance status of mosquitoes against theinsecticides used in the vector control programme have to beminimized. In past ten years, researcher’s focus on this aspect hasbeen low. There are only a few studies on the susceptibility statusof the mosquitoes against various insecticides. So it is the time thatemphasis on these studies should be given. Again the appropriateuse of the insecticides like rationale use with rotation ofinsecticides and insecticides combinations can be an effectivestrategy to combat this insecticide resistance.

REFERENCES

1- Dash A.P., Valecha N., Anvikar A.R., Kumar A. Malaria inIndia: Challenges and opportunities. J Biosci 2008;33:583-592.

2- Ray A.P., Narasimham MVVL, Kondrashin AV. MalariaResearch in India-review of relevant references (1900-1987). PfCP/Directorate of NMEP/WHO/SIDA, Delhi,1989.

3- Pillai M.K.K. Vector resistance to insecticides. Proc NatAcadScInd 1996; 68(B):77-97.

4- Subbarao S.K. Anopheles species complex in South EastAsian Region. WHO SEARO, Delhi, 1998, 1-82.

5- Singh O.P., Raghavendra K., Nanda N., Mittal P.K., SubbaraoS.K. Pyrethroid resistance in Anopheles culicifacies