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MALARIA ERADICATION PROGRAMMES IN THE EASTERN MEDITERRANEAN REGION

1. Introduction

The Eastern Mediterranean Region comprising about 170 million population among which there are approximately 50 millions inhabiting malarious areas, is anxious to implement anti-malaria programmes that aim at the eradication of this ancient scourge long known to be a decisive deterrent factor to social and economic progress in many countries of the region.

The Eighth World Health Assembly in May 1955 laid down the foundation of a global WHO objective, namely the eradication of malaria, by passing a resolution[1] that can be summarized in the following:-

1. Requests governments to intensify plans of nation-wide malaria control so that eradication may be achieved before the potential danger of the anopheline malaria vectors developing resistence to insecticides materializes.

2. Authorizes the Director-General to request the governments in whose countries malaria exists to give priority to malaria eradication projects in their requests for assistance under the United Nations Expanded Programme of Technical Assistance, and to provide the locally available sources required to achieve malaria eradication.

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[1] Resolution WHA 8.30

3. Decides that WHO should take the initiative and assume full responsibility for technical advice, co-ordination of research and resources in the implementation of a programme having its ultimate objective the world eradication of malaria.

4. Authorizes the Director-General to address appropriate appeals for financial assistance in malaria eradication to governmental and private sources, and establishes a Malaria Eradication Special Account to finance such supplies and equipment apart from minimal requirements to be provided from Regular or Technical Assistance funds, and apart from such supplies, equipment and service that cannot be provided by the governments of the countries concerned, from local resources or bilateral or multilateral agencies including UNICEF.

It is also gratifying to note that the Programme Committee of UNICEF Executive Board held in April 1955 recommended endorsement of the general proposition that UNICEF provide increased aid to enable governments to intensify their control programmes in order to achieve malaria eradication.[1]

3. Definition of malaria eradication

The eradication of malaria is a new conception in public health strategy & should not be confused with malaria control or with vector eradication.

Malaria control aims at reduction of malaria morbidity and mortality in accessible, highly endemic malarious areas of great interest from a social, political or economic viewpoint. On the other hand malaria eradication is directed to all areas where malaria transmission exists and is attained when all t plasmodial reservoir of infection in the human population is eliminated.

Vector eradication aims at the elimination of the malaria mosquito vector until the last existing female. Such an enterprise is neither economically nor technically possible except under unusual conditions, such as the historical invasion of A. gambiae in 1942 of southern Egypt with the ensuing calamities which necessitated a vector eradication campaign that was successfully carried out against the exogenous anopheles mosquito.

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[1] UNICEF Executive Board, Report of the Programme Committee, March 1955.

It has been shown in many parts of the world that if in an area, malaria transmission is stopped completely for three consecutive years, the parasite reservoirs in the human population are eliminated and freedom from malaria is maintained provided no imported malaria cases get access to the malaria-freed areas.

3. Principles of malaria eradication[1]

There are five essential principles by which an eradication programme can be achieved. These are presented in the following:

3.1. The whole area where malaria transmission exists in a country should be geographically defined and well covered by the optimum dosage of the most effective insecticide at appropriate timings of spraying cycles to supress transmission until all sources of infection are eliminated.

3.2. The progress should be under competent national direction armed with adequate legal, financial and administrative facilities to help achieve the eradication goal. It should be made clear that such a programme should not be based on ordinary economic considerations but should be regarded as a short-term investment which will give permanent dividends.

3.3. Epidemiological evaluation of the results will aim at "zero" cases as the target. This involves technical and administrative machinery for detection notification, registration and parasitological verification of all cases reported as malaria. When the "vanishing point" is approached, epidemiological investigation on each case reported positive for malaria should be made to determine when, where and how the infection occured.

3.4. There should be an epidemiological surveillance service established to search for and prevent any re-infection of the country or community, where malaria transmission is stopped and no autochthonous infections longer remain, and where spraying has been suspended or discontinued. This epidemiological surveillance service must also serve as an "epidemiological emergency" service to deal with and control any emergency situation.

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[1] "Malaria Eradication" by Dr. Carlos A. Alvaredo, Malaria Adviser, WHO Regional Office for the Americas.

3.5. International co-ordination is essential when an eradication programme undertaken in any area which includes an international frontier. This implies the following:

3.5.1. Extension of the aid of the international agencies for technical and/or economic assistance and provisions to assess results of eradication by international technical teams.

3.5.2. Reciprocal collaboration between countries, e.g. holding technical meetings and extending technical collaboration towards eradication along frontier areas.

3.5.3. Inter-country agreements to exchange information on activities and results (such as zones in which eradication has been achieved and reporting of new cases of malaria).

3.5.4. International arrangements for the prevention of re-infection in zones when the disease has been eradicated and where operations have been discontinued.

Urgency for the new strategy of malaria eradication

The scientific evidences accumulated from many parts of the world, regarding the development of resistance by the Anopheline malaria vectors to various synthetic hydrocarbon residual insecticides are giving concern to all interested in malaria control. These new observations would mean that these residual insecticides, whose recent advent in the malaria warfare has been giving wonderful results in controlling and even eradicating malaria from many areas of the world, would be soon losing their effectiveness. In Lebanon, evidence of such resistance has been noted in A. sacharovi which acts as an efficient malaria vector in all the northern countries of the region as well as in Turkey and Greece In the latter country the resistance of A. sacharovi to DDT appeared after six years of exposure to this insecticide. This resistance has steadily become more marked so that in numerous areas of Greece today, malaria control by DDT residual spraying is not possible.

The development of behaviouristic response to residual insecticides has been noted also in Panama with A. albimanus and in south Java with A. sundaicus. These mosquitoes, after some six years of exposure to DDT, have begun in significant numbers in some areas, to avoid DDT treated surfaces. As DDT residual spraying in practice only kills an insect that rests on a treated surface long enough (about fifteen minutes or more) to take up a lethal amount of DDT, one can imagine the consequences of a widespread development of such a behaviour characteristic, which will render all DDT residual spraying campaigns ineffective and useless. Some observations regarding the possible development of such behaviouristic change has been also noted in A. sergenti of this region.

Elsewhere, as in Venezuela, Italy, India, Pakistan and Ceylon, there is so far no evidence of any resistance or any behaviour change in the malaria vectors which still remain fully susceptible to DDT and in some cases after ten years of exposure to it.

From the above one can reasonably expect on the evidence, that in most areas DDT residual spraying will effectively kill malaria mosquitoes of a given community, season after season, for at least six years. Thus in order to eliminate the growing fear that sooner or later repeated exposure of malaria vectors to DDT or related insecticides will result in the development of strains which will either not be poisoned, or else will avoid contact with treated surfaces, all the nations' public health efforts are urgently called upon to achieve malaria eradication without any delay. The time factor is becoming a vital issue, and it is necessary to eliminate all sources of infection within five years at most, before the biological phenomena of resistance or behaviour changes develop in the mosquito malaria vector of this region or in other regions of the world.

5. Status of malaria control operations in the region

The WHO Eastern Mediterranean Region comprises countries in the Asian and African Continents between latitudes 4° to 40° north and longitudes 14° to 30°. Malaria is endemic in all these countries, and in some of them constitutes the major health problem. It has been estimated that at least one third (50 millions) of the population inhabiting the countries of the region, are living in malarious areas. Only 15 millions out of the 50 millions are being

protected by residual spraying programmes.

In the Mediterranean and Eastern part of the region, Cyprus had already reached malaria eradication without WHO help. Other countries benefiting by WHO malaria teams and receiving substantial aids by bilateral or multilateral agreements have gone far in their malaria control activities.

Iran and Lebanon have developed nation-wide anti-malaria spraying programmes. Pakistan and Syria are striving to include all the malarious areas under spraying programmes. Iraq and Jordan have laid a firm foundation in training subsidiary personnel and have succeeded in controlling malaria in the most difficult malarious areas thus paving the way for future expansion.

In the African and Southern part of the region, where the Aethiopian mosquito fauna prevails, Egypt has already developed a nation-wide anti-malaria programme and has recently developed surveillance teams to protect against the reintroduction of A. gambiae from Sudan. In Saudi Arabia a joint malaria programme has established a training centre for malaria and insect-control technicians who will be assigned later to the various areas included in the proposed future anti-malaria expansion programme. Anti-malaria programmes with international assistance are planned to start during 1956 in Ethiopia, Sudan, Somalia and Yemen.

The mosquito malaria vectors of the different countries of the region fall under three distinct faunas, namely, (1) Palearctic (A. sacharovi, A. maculipennis, A. claviger, A. superpictus and A. stephensi), (2) Aethiopian (A. pharoensis, A. gambiae, A. funestus and A. sergenti), (3) Oriental (A. minimus, A. philippinensis and A. sundaicus). Evidence of the development of DDT resistance by any of the above vectors was noted only in A. sacharovi in a small area north of Lebanon. The Jordan valley DDT-residual spraying programme did not stop malaria transmission completely due to the local habits of the people in sleeping outside the sprayed premises, and the habits of the malaria vector A. sergenti in preferring caves and crevices in hills as daytime resting places. Elsewhere residual spraying programmes especially those carried out in the north and eastern part of this region are successfully reducing malaria transmission. There are still technical problems

confronting the anti-malaria programmes to be carried out in the countries sharing an Ethiopian fauna, and it is hoped that the internationally-aided programmes starting soon in Somalia and Yemen, as well as the discussions and resolutions of the African Regional Malaria Conference to be held in November 1955 will contribute to the solution of some of these problems.

It is worthwhile to note that the Pakistan Anti-Malaria Conference held in Karachi in January 1955, after considering the progress already made in the field of malaria control in all the provinces, agreed that the objective of the malaria control programme should be the eradication of malaria from the country in a period of five years, and felt confident that this objective is feasible. This decision calls for the National Malaria Control Programme to receive high priority in the five-year plan in order to eradicate malaria from 30 million inhabitants living now in malarious areas.

6. Feasibility of malaria eradication in countries of the region

No vain hopes are being entertained of expecting ~~the simultaneous~~ eradication of malaria from all the countries of the region within a specific period of time. The important point is that once a campaign has been started with DDT, it should be completed as soon as possible because the Anopheles might build up a resistance not only to DDT but also to the group of chlorinated hydrocarbons. It is perfectly possible for a country to proceed by stages, eradicating the disease first in one area, establishing a surveillance team to maintain its freedom from malaria, and proceeding to other areas until eradication involves the whole country.

The planning of country-wide or inter-country eradication programmes needs prior investigations regarding the financial resources, availability of malaria service and trained national personnel in the country, and assurance that DDT residual spraying campaigns can successfully eliminate malaria from large areas. Pilot spraying programmes that operated in Pakistan, Iran, Lebanon, Syria, Iraq and Jordan (excluding the Jordan Valley) showed conclusively that DDT residual spraying is the most economical, practical and effective method for controlling malaria in these countries. These countries adjoin each other, share the fact that malaria constitutes a major health problem and all are experiencing

the fear that their mosquito malaria vectors might soon develop resistance to DDT, especially as their DDT campaigns have been in operation for some years, and evidence of the development of resistance has already been noted in one of their main malaria vectors, namely, A. sacharovi.

For these reasons, it is suggested that these countries, namely: Pakistan, Iran, Iraq, Syria, Jordan, Israel and Lebanon should receive priority in consideration regarding the feasibility of a WHO-coordinated inter-country plan of malaria eradication in the region. A malaria consultant from WHO HQ visited Pakistan early this year and is scheduled during September and October to visit, together with the malaria adviser of the region, the other northern adjoining countries. His mission will be to investigate the feasibility of malaria eradication in each country and to draw an inter-country plan of operation. It is hoped that his comprehensive report will be submitted to the Seventeenth Session of the Executive Board in January 1956. The technical aspect of such a programme will also be discussed in an inter-regional conference for the European and Eastern Mediterranean Region to be held in Athens in June 1956.

The fact that an eradication programme will be studied for the block of northern countries of the region, as a result of their geographical proximity, and the previously mentioned common factors shared by all, does not mean that other countries of the region will be excluded from the eradication planning. In the pre-DDT days, Cyprus with half a million population could eradicate malaria over a period of five years at a per capita cost of 40 U.S. cents. No fresh cases of malaria have been reported since 1949. Egypt had already reached its point of malaria control without WHO assistance, and complete malaria eradication will need a last decisive push. In countries sharing the Aethiopian fauna including Saudi Arabia, Yemen, Sudan, Ethiopia and Somalia, joint pilot control projects are operating or being planned to operate during 1956. Such projects will boost the training of national personnel, stimulate the establishment of a malaria service, and try to solve the peculiar difficulties connected with malaria control in each of these countries. In this way future nation-wide anti-malaria campaigns can be started which could be successfully merged ultimately into an inter-country plan of malaria eradication.

7. Cost and benefits of malaria eradication programmes

It is anticipated that out of the 50 million inhabitants living in malarious areas in the region, it will be feasible to reach a provisional target for malaria eradication in areas inhabited by 40 millions within five years and maintain it by surveillance for a further five years.

The stages which an eradication programme passes through and which affects its costs can be summarized in the following:

7.1. First stage: Total coverage spraying of areas aiming at malaria eradication. Such coverage should achieve full interruption of malaria transmission during the second year of operation.

7.2. Second stage: Suspension of spraying in any suitable area that has been completely sprayed for at least four years. In the fourth year, appropriate surveillance and treatment of traced cases are to be undertaken provided that the infant parasite rate has been negative in the second, third and fourth years. The epidemiological surveillance teams have to operate for at least three more years and preferably five years.

7.3. Third stage: Maintenance of the eradication status. This can be entrusted to the general health services of each country without international aid.

The cost of the spraying operations conducted in the countries of the region averages $0.20 per capita per year. In order to meet the increased cost of eradication, 10 per cent should be added to this average per capita cost. The cost of surveillance and treatment per capita is calculated as 40 per cent of the average per capita cost of spraying.

The following table[1] shows the proposed targets (of the population to be protected in the region) and the estimated cost involved year after year.

	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Millions to be protected by spraying alone	14	14	20	25	30	25	20	15	10	..	..
Millions protected by spraying or by surveillance	14	15	20	25	30	40	40	40	40	40	..
Cost of spraying operations (in millions of dollars)	2.8	3	4	5	6	5	4	3	2	..	..
Total cost of operation including 10% for eradication and 40% for surveillance (in millions of dollars)	2.8	3.3	4.4	5.5	6.6	6.7	6	5.3	4.6	3.2	2

[1] Document AS/P&B/10, 3 May 1955

It is known that about 48 per cent of the cost of operations goes for insecticide, spraying equipment and transport. It is fortunate enough that today there are several sources of funds available for social and economic improvement. Apart from WHO, other agencies of the United Nations like FAO, Technical Assistance and UNICEF have an interest in eradicating malaria from the world. There may be also sources of contributions from other bilateral and multilateral governmental agencies as well as non-governmental organizations or private concerns interested in offering services or funds to the eradication programmes. The governments of countries where malaria continues to be a problem, should be stimulat to provide the necessary resources to the extent possible for eradication of malar in their own countries.

The social and economic benefits following malaria eradication are a foregon conclusion. The planning for the eradication of malaria, known to be a major caus of morbidity, infant mortality, and general physical and mental debility, can be safely based on self-evident humane considerations. The economic benefits resulting from the abolition of malaria sickness and death will certainly make the eradication effort the best short-term investment. The benefits of substituting malaria eradication programmes for routine malaria control derive from the fact that the former will be self-limiting, whereas the latter is repetitive, goes indefinitely, and ultimately destroys the most effective and economic method ever known in malaria warfare.

CONCLUSIONS

(a) The urgency of implementing an accelerated programme in the region having as its objective malaria eradication within five years is clearly indicated because of the fear that the mosquito malaria vectors may become resistant to DDT if the attack is prolonged. If this should happen, any future eradication campaign would be unreasonably costly and even impossible.

(b) The priority for planning an inter-country eradication programme in the region will be given to countries adjoining each other and sharing common factors that yield themselves to a feasible eradication programme. These will tentatively include Pakistan, Iran, Iraq, Syria, Jordan, Israel and Lebanon.

(c) Member countries with established anti-malaria services and nation-wide programme should make every effort to push these programmes towards the eradication goal. Other countries starting pilot eradication projects should pave the way towards the same.

(d) Considering the principles of malaria eradication, international co-ordination of work is regarded as basic. This implies the extension of technical and material help by international agencies, reciprocal collaboration between countries through technical malaria conferences, and inter-country and international agreements to exchange information and prevent re-infection. The role of the regional office in coordinating the eradication work is stressed.

(e) Inter-regional co-ordination in malaria eradication projects should be sought for under WHO technical leadership through conferences and committees.

(f) The representatives of Member countries realizing the overall social and economic gains of malaria eradication programmes should recommend to governments to tap the internal and external resources to finance such programmes, and contribute to the WHO Malaria Eradication Special Account established by the resolution of the Eighth World Health Assembly.