

URBAN MALARIA IN THE UNITED PROVINCES.

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The problem of urban malaria is a very large one and it is not possible to review all its aspects in a short paper. Therefore, a brief reference is made to some of the essential factors or features responsible for urban malaria in the United Provinces which are doubtless similar to conditions prevailing in other urban areas of India.

Details of mosquitoes, malarial parasites and figures with regard to spleen rates, etc. have been deliberately avoided as these differ from place to place and are more or less of local interest.

GENERAL REMARKS.

The United Provinces is one of the major provinces of India having a population of about 50 millions. About one-sixth of the province in the north and north-west, where it is limited by the Himalayas, is hilly and the rest is more or less flat. The province is traversed by six large rivers, three of which, viz. the Ganges, the Jumna and the Sarda, are important with reference to malaria. About half of the province comprised in the so-called Indo-Gangetic plain lies in the basins of the rivers and most of the cities and urban areas are situated in this portion.

The average rainfall of the province as a whole is about 40", most of which is derived during the period of the south-west monsoon, i.e. from June to September. The amount of precipitation in the different parts of the province varies from 20" to 80" in the year.

As in other parts of India, the population of the province is largely rural. The urban population comprises only about 10% of the total population and is largely concentrated in about 75 to 80 cities. Except the city of Cawnpore, there are practically no other big industrial concerns in the urban areas.

HOUSING CONDITIONS.

The more well-to-do and the upper middle classes in the urban areas reside in buildings generally satisfying sanitary requirements. But a large section of the population living in the outskirts of the urban areas still live in primitive conditions in bad types of houses or in huts. The centre of a town is usually less malarious than its periphery.

WATER SUPPLY AND DRAINAGE.

The large cities possess a protected water supply for drinking and domestic purposes, which is derived usually from the rivers or from deep tube-wells. In the case of small towns and notified areas, the water supply is chiefly from the wells. The drainage condition, except in highly developed urban areas, is usually defective and has not kept pace with the growth of the towns.

VITAL STATISTICS.

The crude death-rate per mille is about 25 for the whole province, while that for the towns is about 33. The birth-rate for the province is 36 and for the towns 46. The malarial death-rate for the whole province is about 14, while for the towns it is about 6. The percentage of malarial deaths to total deaths in the whole province is about 70. These figures, as you all know, are not very accurate but they certainly indicate that a large percentage of deaths is attributable to malaria.

URBAN MALARIA.

Urban malaria may be broadly divided into two groups as follows : (1) Natural Causes, and (2) Man-made.

1. *Natural Causes* :—(a) This may be due to urban areas growing in the midst of a malarious zone where meteorological and other conditions are favourable for the propagation of malaria. This type of malaria is chiefly noticeable in the cities of the Tarai or the foothill regions which are surrounded by extensive forests and where the rainfall is heavy, viz. Pilibhit, Haldwani, Bareilly and some other towns.

(b) Another natural cause for malaria may be due to the drying up of the rivers on which cities are situated or due to changes in the courses of rivers. An example of this is the town of Moradabad. A portion of the town of Moradabad bordering on the river Ram Ganga became highly malarious, due to the river changing its course, leaving behind a shallow stagnant stream breeding *A. culicifacies* profusely. The solution of this problem was providential as, after a certain number of years, the river returned to its original bed with the result that malaria has practically disappeared now. There are similar examples in other places where towns have become very malarious owing to either the drying up of rivers or changes in the courses of rivers.

(c) Periodical outbreaks of malaria due to excessive rainfall and flooding.

2. *Man-made Malaria* :—(a) Malaria due to proximity to irrigation canals and raising of wet crops, viz. sugarcane and rice cultivation.

(b) Malaria due to defective railway systems by blocking up natural drainage or by creating borrow-pits, excavations, etc., which become formidable sources of mosquito breeding. The railway areas of Moradabad, Moghul Sarai, Laksar, Dhampur, etc. are examples of this.

(c) Malaria due to ill-planned cities in which the city grows haphazardly leaving behind excavations, borrow-pits, tanks, etc. without any drainage system.

(d) Malaria due to breeding in wells. This chiefly happens when wells which were once in frequent use are given up due to the introduction of pipe-water supply. *A. stephensi*, a very efficient malaria carrier, finds a very suitable breeding ground in these wells. This has happened in Delhi, Lucknow and Kosi Kalan (a small town near Delhi) and other places.

(e) Malaria due to proximity to big lime and brick kilns and excavations. This type of malaria is chiefly found in the outskirts of towns where the poor population mostly live under insanitary housing conditions close to the breeding grounds.

(f) Malaria due to lack of co-ordination between different bodies responsible for urban sanitation in a particular area, viz. Municipal Board, District Board, Cantonment and Railway area, the notified area, Improvement Trust, etc. In such cases what happens is that each department or committee only takes measures in respect of the area under its control without any regard to its neighbouring or immediate area outside its control. It frequently happens that Improvement Trust, Railway or the Cantonments, while improving their own areas, let the drainage of that area flow without any regard into the Municipal or District Board areas.

(g) Malaria may be due to domestic causes. This is chiefly due to breeding in house cellars, chaubachas, garden fountain, garden 'hauzes', broken tins and receptacles, and for this the primary responsibility rests on the house-owners themselves. This is the type of malaria which is least noticed by any community.

(h) Malaria due to ill-developed industrial centres in urban areas. Big mills like sugarcane crushing mills are now cropping up in different parts of the province in proximity to urban areas, and in this connection there is a large wastage of water, which flows into the surrounding low-lying areas and gives rise to mosquito breeding and consequent malaria.

(i) Malaria due to aggregation of labour in urban areas in connection with big engineering projects, viz. canals, roads, railways, etc.

GENERAL.

The urban malaria in the United Provinces is generally of an endemic nature and regional epidemics of malaria which occur in the Punjab periodically are practically unknown. (In the year 1908 some of the western towns of the United Provinces suffered heavily from malaria which was more or less a prolongation of the fulminant epidemic of malaria in the Punjab, and again in the summer of 1929 an epidemic of malaria occurred in the city of Lucknow due to the sudden breeding of *A. culicifacies* in the Gumti river and *A. stephensi* in the wells all over the town.) There is, however, the usual rise of spring

malaria in the endemic cities from March to May when the most prevalent species of parasite is *P. vivax*. During the autumn months from September to November there is a more marked rise in malaria when *P. falciparum* is the predominant species. The distribution of quartan parasites is strictly limited. The principal anopheline mosquitoes found in urban areas are : *A. culicifacies*, *A. annularis*, *A. pallidus*, *A. splendidus*, *A. barbirostris*, *A. fluviatilis* and *A. subpictus*. Of these *A. culicifacies*, which principally breeds in irrigation channels, river edges, kuchha drains, borrow-pits and tanks, and *A. stephensi*, which chiefly breeds in wells, are the mosquitoes which have been frequently reported as responsible for transmission of malaria in urban areas.

It may be interesting to note that considerable improvements have been effected in certain towns as a result of antimalarial measures, viz. by stopping irrigation, sugarcane and rice cultivation within a 1 mile radius of the outskirts of the municipality. The spleen rate of Saharanpur has fallen from 79% to about 10%. In Moradabad by improvement of drainage and filling borrow-pits the spleen rate has been reduced from 45% to 6.6%. In Nagina by stopping extensive irrigation and draining tanks and filling excavations and borrow-pits, the spleen rate has fallen from 78 to 15%. In this connection it is necessary to stress that malaria investigations and remedial measures should not only be confined to the limits of the urban areas but to an area at least within a mile all round it, so that all the breeding grounds are suitably dealt with as mosquitoes do not respect territorial boundaries. It cannot also be too forcibly impressed that the prevalence of malaria in urban areas to a very large extent is determined by the activities of man, and in many cases is due to a deliberate neglect of elementary sanitary precautions and provisions in town planning or by over-irrigation or increased distribution of water in particular localities.

Urban malaria in most cases is essentially a problem of sound sanitation and can be reduced in most towns and cities in India by co-ordination of activities between different departments concerned for urban sanitation with the co-operation of the public. Suitable antimalarial bye-laws should be made which should be vigorously enforced to achieve any result. If any campaign against malaria in urban areas is to be popular, it must be remembered that the aim, although primarily it should include measures specifically against anopheline mosquitoes, should, however, also include measures against other mosquitoes so that people may immediately appreciate the benefits of an anti-mosquito campaign and thus help in financing the schemes. Further, as funds permit permanent measures should be carried out to reduce the recurring cost on antimalarial measures.