CONCENTRATION AND PROBABILITY OF WATER BORNE DISEASES IN SARYUPAR PLAIN OF U.P.

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ABSTRACT: Physical environment has a direct impact on the health conditions and spread of diseases. In this paper, the impact of physical environment on the spread of water borne diseases is examined. The data are taken from the district health facilities like Primary Health Centres and the hospitals and dispensaries as well as the District Census Handbooks. And the concentration of a few water borne diseases, viz. conjunctivitis, malaria, dysentery, filaria, infectious hepatitis, gastro-entritis and encephalitis, and the probability of their occurrence has been worked out.

The health problem of a topical and developing country like India are predominantly a reflection of the rampant poverty prevailing here. Actually poverty is a culture in itself and this together with the tropical heat and abundant water only deteriorates the health conditions.

Disease is a result of dissonance relationship between man and environmental factors. Environmental factors constitutemainly of :

1. Physical environment

2. Biological environment and

3. Socie-economic and cultural environment.

1   PHYSICAL ENVIRONMENT

Physical environment includes -

(a) Climatic factors viz. rainfall, its spatial and temporal distribution, humidity, temperature, mean temperature, range of temperature, lowest and highest limits to the temperature.

(b) Landscape constitutes soil, its chemical composition its capability to propagate and carry pathogens, depth of soil, soil structure, depth of water table, drainage etc.

2   BIOLOGICAL ENVIRONMENT

Biological environment includes -

(a) Pathogens viz. Bacteria, viruses, protozoa, and also their viablity in the adverse conditions.

(b) The vectors of the pathogens viz. mosquitoes, flies etc. Biological evironment also includes the natural vegetation, availability of alternate host, presence and absence of the natural enemies of the vectors of the diseases. It also includes the resistance and immunity of the humans against a disease. Of late, the immunity of certain pathogens against the traditional medicines has also started taking significant dimensions.

3   SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT -

It chiefly includes.

(a) Population - its volume, density, regional variation etc.

(b) Demographic factors - age pyramid, sex ratio, rate of growth etc.

(c) Socio-economic factors - relative prosperity of the people, their awareness for sanitation, settlement patterns, availability of civic facilities.

(d) Cultural factors - They are generally closely interwoven with the socio-economic-demographic factors. These are education, family structure, dietary pattern, mode of sanitation prevailing agricultural practices, cropping patterns etc.

OBJECTIVE OF THE STUDY -

The present paper is an attempt to depict the influence of various variables of external environment, in the distribution and intensity of various types of water borne diseases in Saryupar plais of U.P. viz.

(a) To determinate the magnitude of disease

related to the environment.

(b) To delineate the areas of water borne diseases and region-alization of the water-borne diseases of the region.

THE STUDY AREA -

The Saryupar plain of U.P. (26^0 10' N to 28^0 25'N and 81^0 5' E to 84^0 25'E) embraces an area of 33,269 km^2 spread over seven districts viz. Deoria, Gorakhpur, Basti, Gonda, Baharaich, Siddarthnagar and Maharajganj. The total geographical area comes to 9.57 percent of the state and 1.008 per cent of the country.

1.   PHYSICAL ENVIRONMENT - This is typically a tropical region, with a fairly warm weather over most part of the year. Even in the coldest month, the minimum temperature seldom goes below 5 ^{0}C. The average temperature varies from 15 ^{0}C in winters to 35 ^{0}C in summers.
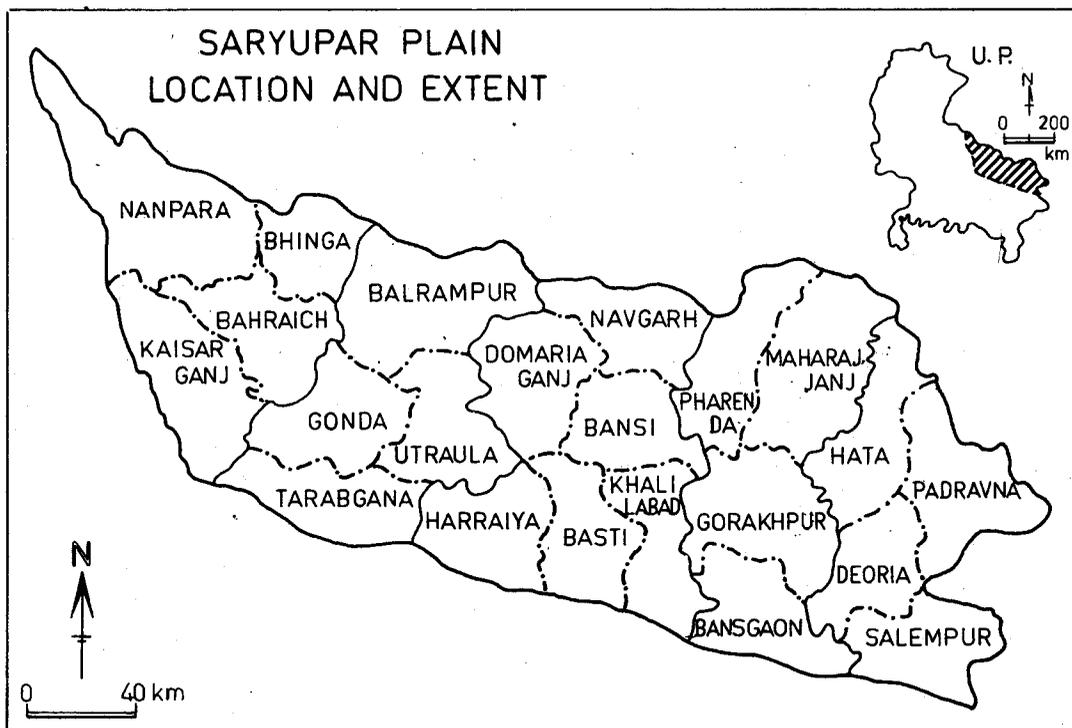

Fig.1

The rainfall is between 100 and 200 cm. Most of the rainfall occurs in monsoon months though a few showers in winters are also observed.

But perhaps the most important fact in describing the region is that these plains lie predominantly in 'Terai' of Himalayas. Excluding the southern fringes, almost all the area concerned has a poor drainage. The poor drainage together with the re-emerging tendencies of the streams has left its impression as a very large number of small and large lakes, ponds, tanks etc. Moreover, the weather here is moderately to heavily humid all through the year. It makes the situation worse as it adversely affects the comfort for the humans.

2. BIOLOGICAL ENVIRONMENT - The warm and humid climate together with a very short and mild winter serves as an ideal environmet for the propagation, multiplication and dissemiation of water borne pathogens.

Common vectors of the diseases such as mosquitoes and house flies etc. find an ideal atmosphere in the abundant, stagnant, or slowly moving water. Filth around the human settlements together with the high ambient temperature also breeds vectors within them.

Our knowledge is really very limited about the natural enemies of the disease vectors such as mosquitoes and flies, probably the natural enemies of these vectors do not exist, if they exist at all, they are definitely at low key. Thanks to the 'Anti-malaria' programmes and its subsequent failure, themosquitoes have become immune to the insecticides like D.D.T. Not much work has been done to assess the impact of insecticides on the immunities of the mosquitoes but at least this much can be safely said that the first generation insecticides are becoming generally ineffective.

Disease causing pathogens are also getting habituated of the conventional allopathic medicines. Examples can be quoted of typhoid causing bacteria Salmonella which are getting immune to the traditional medicine chloramphenicol. But this problem seems to be a global one and not specific to the region.

3. CULTURAL FACTORS - This is definitely one of the most densely populated area (Average density per sq.km.). About 90% of the population (according to 1981 census) resides in the rural areas. Owing to the poor civic facilities, most of the rural people go to open fields for defecation. The health hazards associated with the abundant surface water and high water table clearly reflects the relative intensity of the waterborne diseases of the region. In fact, it is the relative abudance of the waterborne infection which has necessitated a separate study of these diseases in the region. Most of the rural settlements are of tight nucleated nature, more or less same is the case with the urban/semi-urban settlements. Most of the civic facilities necessary to keep the hygiene are generally absent. Like the rest of India, the average diet is heavily leaned towards the cereals. Proteins and fats are usually in low profile except in a minimal upper strata of the society. Rural houses are generally earthen and with poor illumiation. The aspect of cross-vetilation is generally neglected. Keeping of the cattle with in the premises of the houses or in immediate neighbourhood further worsens the health-care conditions.

4 INTERACTION OF THE ENVIRONMENTAL FACTORS AND THEIR EFFECT ON WATER BORNE DISEASE INTENSITY.

The most important factor affecting the pattern and intensity of water borne diseases is the abundance of surface water. This together with high water table gives an ideal environment for the propagation and dissemination of the waterborne pathogens.

In our study we have generally focussed our attention on the contamination of the surface water. Attention on the subsurface contamination is overlooked mainly because :

(1) In this region specially in the northern tracts, there is a tendency of the re-emergence or even upwelling of water and in these conditions, it is not proper to assume that pathogens have penetrated into the deep layers of the soil.

(2) Most of the drinking water is drawn from surface water and shallow wells and thus deep layers of the water stay undisturbed.

Since the climate of the region is warm for the most part of the year, it is therefore, natural to expect that pathogens multiply amazingly fast; more so because there is no scarcity of water which acts as a disseminating agent and also as a vital constituent in the physiology of the pathogens.

Mosquitoes are also a menace in this region. It is very natural, when we take a look of the climatic factors, that is typically a mosquito - malaria infested country. Stamp classified this region as of moderately to heavily endemic to Malaria .

Most of the rural settlements are quite dense. Since nearly all of them are unplanned, their amorphous growth has left little scope for the planning and construction of drains. The situation is further aggravated when we find that the natural drainage of the area, owing to low gradient, is not very good. Thus by the side of nearly every house, there is a small pool of rejected and waste water which invariably acts as a nursery of mosquitoes, flies and waterborne pathogens.

The density of population is quite high. This leaves more number of carriers at a given time and also a large number of people vulnerable to the disease infestation.

The improper human excreta disposal system further worsens the situation. Owing to a complex set of reasons, not much could be done in the past to improve the civic conditions of the settlements. People are ignorant mainly due to the lack of awareness and education level is generally quite low.

Medicare situations become further bad when we find that though the people are not much short of calories but the available protective food is spoiled by the tradition of over spicing and over cooking.

Houses are ill-designed and badly managed. They are generally helpful in making a congenial environment for the disease.

The common diseases prevalent in the region are classified as -

(a) Defiency diseases - Vitaminosis, P.C.M. Goitre, Anaemia

(b) Parasitical diseases - Malaria, Filaria Hookwarm, Asearis, Scabies, Amoebic dysentery etc.

(c) Bacterial diseases - Tetanus, T.B., Typhoid, Gastro-enteritis, Cholera, Leprosy, Dysentery, whooping cough etc.

(d) Viral diseases - Measles, Influenza, Infective hepatitis, Conjunctivitis, Encephalitis etc.

(e) Others - Cancer, diabeties, Cardio-vascular disorders, Blood Pressure disorders etc.

Since the present study is concerned with the waterborne diseases, these are already described above.

5. DATA AND METHOD - Data have been taken from the records of the patients reaching the government health facilities viz. P.H.C.s, district and other hospitals etc. through the District statistical books and census hand books, tahsil level analysis of ten years (1975-85) along with uptodate statistical facts and

figures.

But a large number of patients are treated by the private medical practitioners and still larger number of patients go untreated. Thus the data thus collected has serious shortcomings. But since we are interested in the relative magnitude of the disease infestation, and not in the absolute numbers, the data collected still serves the purpose.

6. CONCENTRATION OF THE WATER-BORNE DISEASES - In order to find out the concentration of different diseases based on ten years data (1975-85) the method suggested by Siddiqui (1985) has been adopted in this study. For this all twenty two tahsils of the region have been divided into different categories. The concentration for each disease has been worked out by the following formula.
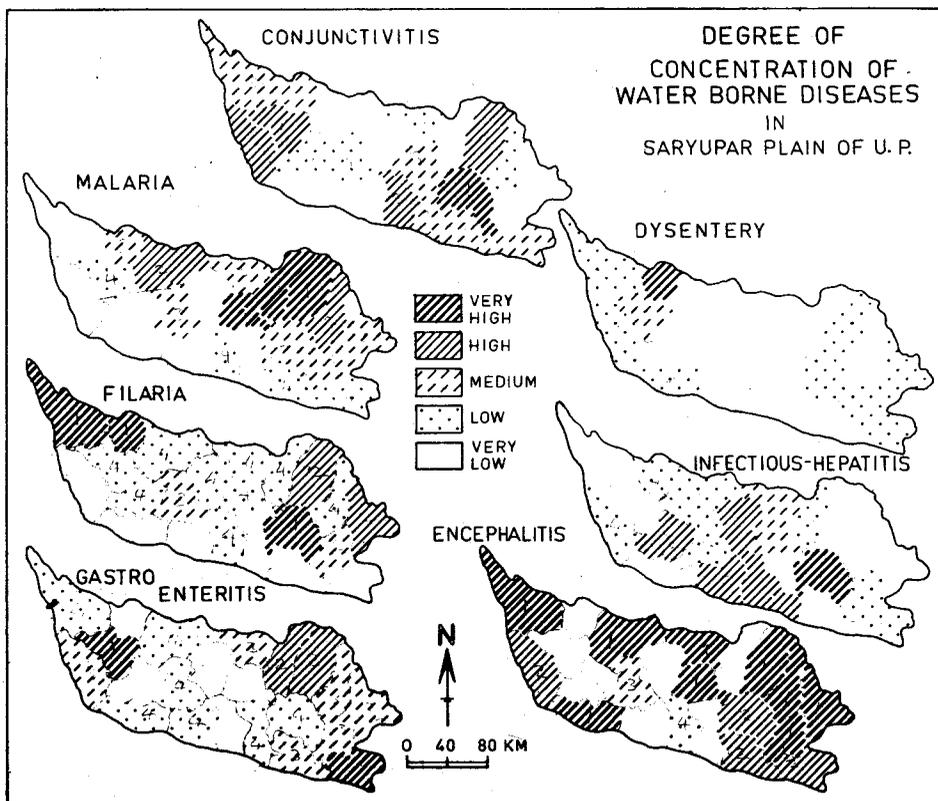
$$I = \frac{d}{s}$$

I = Index of concentration for any disease in tahsil.

d = Incidence of a particular disease as a percentage of total diseases for the tahsil.

s = Total for a particular disease of Saryupar region as a percentage of total diseases for the region.

The results showing the concentration of water-borne diseases are shown in Figure 2.

1. Malaria - it is a widespread disease in the northern part of the region. Pharenda, Maharajaganj and Bansi tahsils show very high degree of concentration while Khalilabad, Gonda Tarabganj tahsils show very low concentration. The higher concentra-

CONJUNCTIVITIS

MALARIA

DYSENTERY

DEGREE OF
CONCENTRATION OF
WATER BORNE DISEASES
IN
SARYUPAR PLAIN OF U. P.

VERY HIGH
HIGH
MEDIUM
LOW
VERY LOW

FILARIA

INFECTIOUS-HEPATITIS

ENCEPHALITIS

GASTRO ENTERITIS

N

0 40 80 KM

tion are due to hot and wet climate where ideal conditions obtain for mosquito breeding.

2. Filaria - Northern tahsils of western part of the region show Very high degree of concentration whereas most of southern tahsils have very low concentration index. Hot humid climate is main factor for the spread of disease.

3. Gastro-enteritis - It is a bacterial disease which is found all over the region. Baharaich, Salempur, Pharenda and Maharajgaj tahsils have very high degree of concentration of the disease,. Water pollution, water logging in flood affected areas, food poisoning and flies are the main responsible factors for the spread of the disease.

4. Dysentery - It is most common disease of tarai region and Saryupar plain of U.P. Soil pollution and improper disposal of sewage water or poor knowledge of eating habits are the factors responsible for the disease.

5. Infectious hepatitis - Very high degree of concentration is found in Gorakhpur, Dumariyaganj, Basti, Khalilabad, Harraiya and Gonda tahsils. Due to lack of poor hospital facilities many cases are not reported in the northern belt. So the concentration is very low in the northern tahsils of the region.

6. Conjunctivitis - It is an infectious disease and its concentration is very high in Gorakhpur and Maharajganj tahsils due to unhygienic living conditions.

7. Encephalitis - Eastern part of the Saryupar plain is mostly affected by this disease. Northern belt of tarai region shows very high concentration. Mosquito plays an important role in spreading the disease. Humid and hot climate produces favour-

able conditions for breeding of mosquitoes and thus ten tehsils of the region show very high degree of concentration of the disease.

PROBABILITY OF WATERBORNE DISEASES IN THE REGION

Composite index of disease probability -

An analysis of spatial distribution of various indices of disease probability in Saryupar plain presents interesting regional contracts in all indices. But a general idea about the total disease probability cannot be formulated through the above study. Construction of composite index with the help of twelve indicators (Appendix-1) has been worked out to show the probability of the occurrence of diseases. The coefficient of composite index is always positive and ranges from 0 - 1. The higher value of coefficient of composite to index reveals high level of disease probability in the region and the lower value of coefficient shows less disease probability of the region (Appendix - 2).

LEVEL OF DISEASE PROBABILITY

The level of disease probability in the form of coefficient of composite index is shown in Fig. - 3 (Appendix 2) Fig.2 shows that out of 22 tahsils 14 tahsils record the value of coefficient of disease probability more than .5. It shows that 63.63 per cent of tahsils have more disease probability.

It is obvious from Fig.3 that Nanpara, Bhinga, Naugarh, Maharajganj tahsils have very high diseases probability (CC1>.6) due to their climatic condition and poor economic condition. Tahsils of Balrampur, Utraula, Dumariyaganj, Bansi, Pharenda, Hata, and Padrauna have CCi (.4-.6) a high disease probability due to lack of poor medical facilities and poor economic conditions. Gorakhpur, Deoria, Baharaich, Gonda, Basti, Khaliabad, Harraiya, tahsils have

Saryupar Plain
Of U.P.
PROBABILIBY OF WATER BORNE
DISEASES

INDEX

LEVEL OF DISEASE
PROBABILITY VALUE OF DI

LOW - < .5
MODERATE .5 — .74
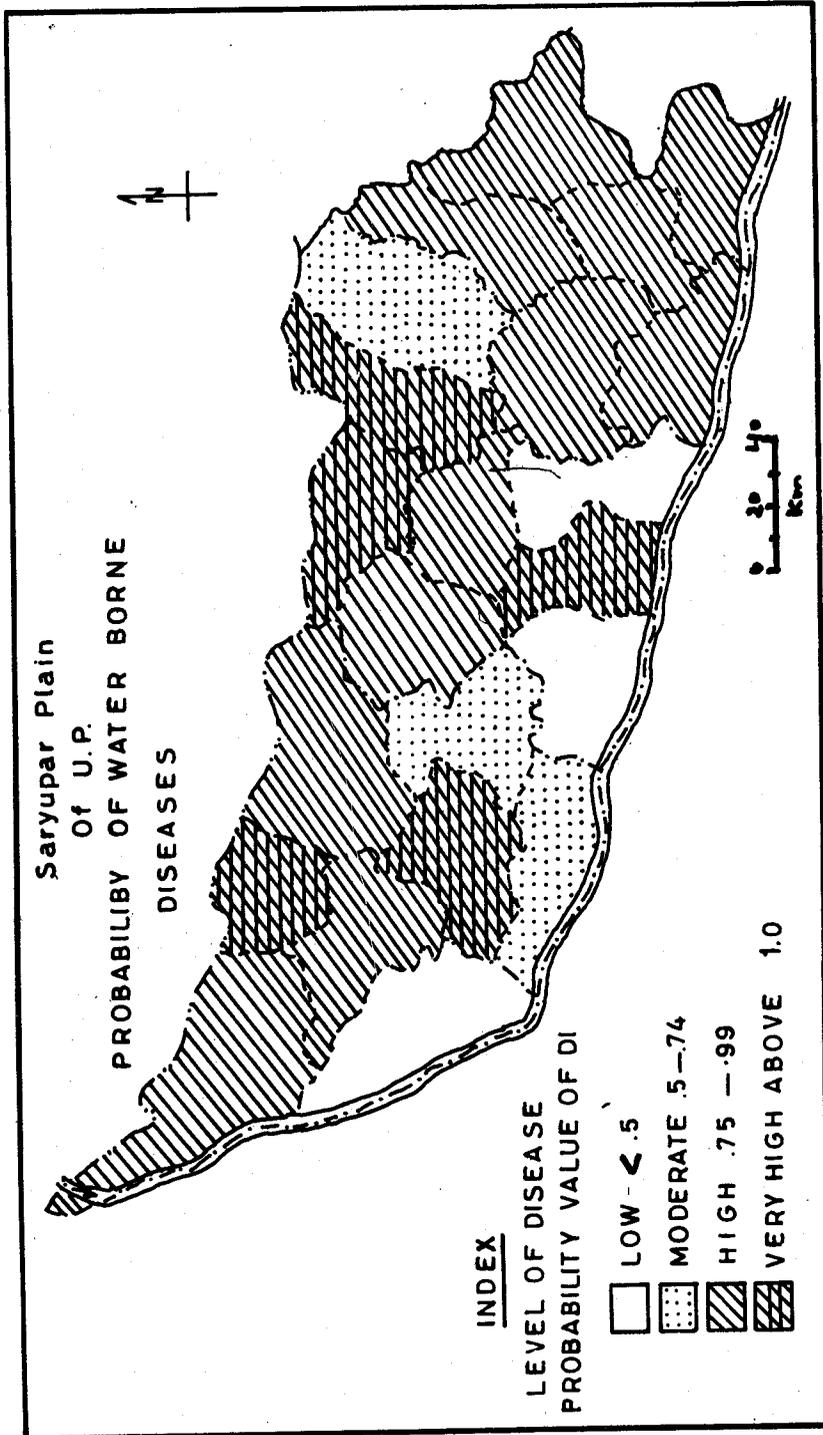HIGH .75 — .99
VERY HIGH ABOVE 1.0

FIG. 3

medium (.2-.4) disease probability due to the availability of proper infrastructure and health care. Salempur, Bansgaon, Tarabganj and Kaisarganj have low (.2) probability. Due to high population density, in spite of high productivity the region has high nutrition density which is an indication of lower health standard of the general people.

APPENDIX 1

Physical cultural and medical variables which are used in taxonomic method to find out the Disease Probability in the region.

1. Rainfall

2. Flood affected area

3. Post monsoon rise in water table

4. Nutrition density

5. Caloric intake

6. Dysentery cases

7. Conjunctivities

8. Encephalitis

9. Malaria cases

10. Filaria cases

11. Gastro Enteritis

12. Infectious hepatitis

APPENDIX - 2

		C. J. O.	CCI
1.	Nanpara	.35	.65
2.	Bhinga	.25	.75
3.	Bahraich	.26	.34
4.	Kaisarganj	.88	.12
5.	Kahliabad	.62	.38
6.	Basti	.65	.35
7.	Bansi	.41	.59
8.	Harraiya	.62	.38
9.	Naugarh	.33	.67
10.	Dumariyaganj	.40	.60
11.	Hata	.54	.46
12.	Padrauna	.41	.59
13.	Deoria	.66	.34
14.	Salempur	.81	.19
15.	Balrampur	.40	.60
16.	Utraula	.53	.47
17.	Gonda	.65	.35
18.	Tarabganj	.80	.20
19.	Pharenda	.28	.72
20.	Maharajganj	.18	.82
21.	Gorakhpur	.79	.21
22.	Bhansgaon	.91	.09

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