CHAPTER - III

SPATIAL ANALYSIS OF DISEASES

3.1 INTRODUCTION :

A) Spatial analysis of diseases (tehsilwise) :

The spatial distribution of a disease depends mainly on the physical, biological, social and economic conditions of a particular region. Hence, some diseases are found to be concentrated in specific regions and occur intermittently in that region. The investigation of the causes of spread of diseases is always done in relation to the aforesaid factors.

Here, the researcher proposes to study the distributional pattern of diseases in relation to the environmental factors in Sindhudurga district. The author has collected the data about mortality of certain diseases occuring in different tehsils and cities throughout the district. The data so collected for the period of six years from 1981-86. The study of distributional pattern of six diseases in this text will be followed by a short history and clinical features of the diseases. An attempt is also made to correlate the dependant factors wherever possible. The following six diseases have been selected for the study, whose mortality data have been collected for six years at tehsil level.

i) Diarrhoea ii) Dysentery iii) Tuberculosis
iv) Tetanus v) Cancer vi) Pneumonia

3.2 DIARRHOEA :

Diarrhoea is one of the commonest ailments of children. Probably no child escape suffering from it at one stage or other.

◉ SINDHUDURGA DISTRICT ◉

AVERAGE ANNUAL DEATH RATE DIARRHOEA

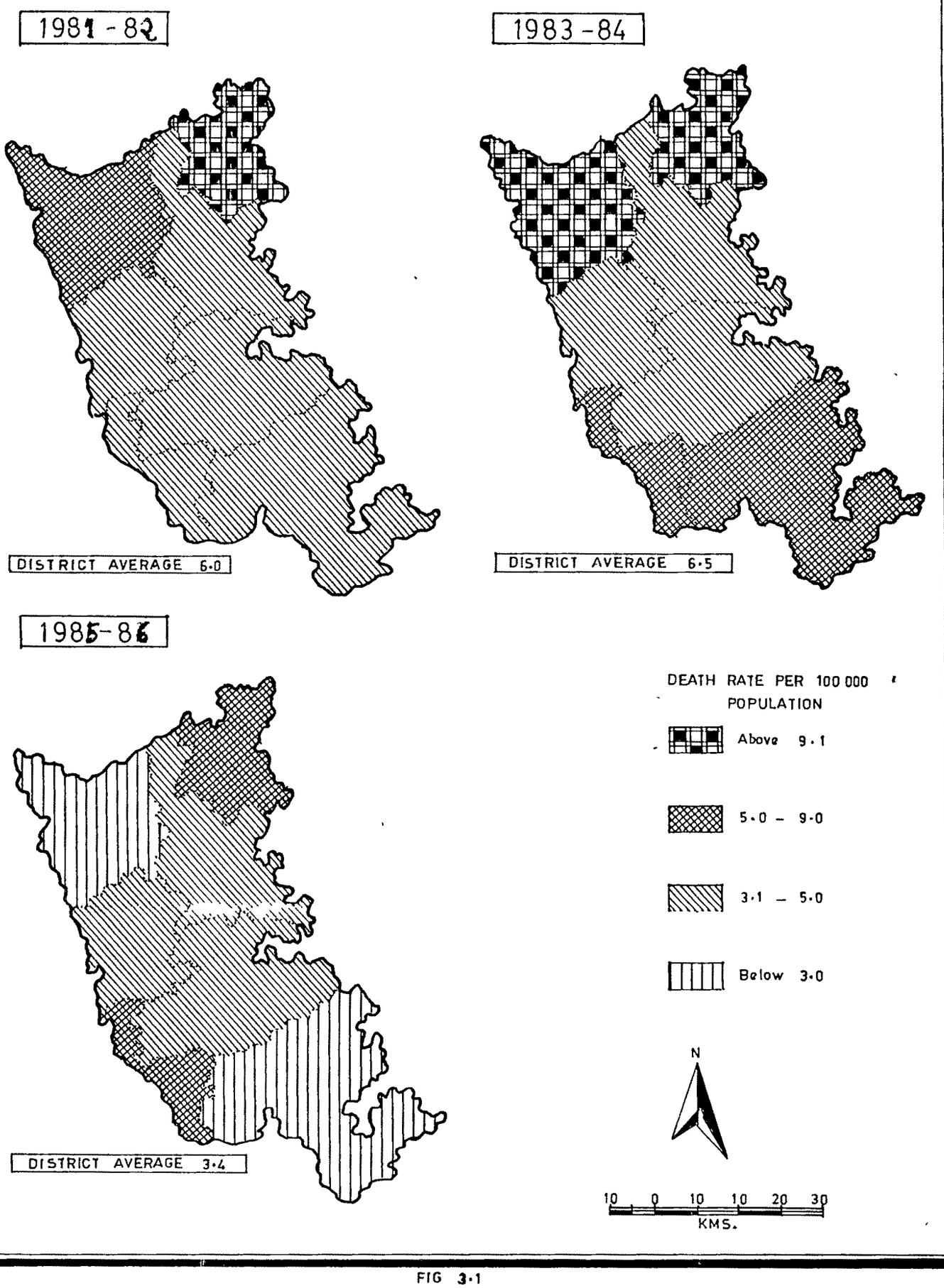

FIG 3·1

Because of socio-economic factors like poverty, ignorance and insanitary living, diarrhoea is more common in Sindhudurga district. Children of all ages suffer from diarrhoea, but it is more common among infants. Apart from the inadequancy of diet, the preparation, storage and nature of food have considerable influence on the transmission of the infection. It is generally stated that the effect of climate is less obvious in the non-infectious diarrhoea, but in the case of infectious one, the climatic factors do effect. The areas of Konkan are generally the endemic foci of diarrhoea. Use of water id directly related with the spread. Unless obtained near the source, water from rivers and streams is in general potentially dangerous.

3.2.1 Trends of Diarrhoea mortality (1981-86) :

The environmental conditions seem to be highly favourable for the proliferation of diarrhoea in Sindhudurga district. This district has large area under lowland. Surface outwash generally ends in rivers due to which the river water may get contaminated by this disease vectors. In Sindhudurga district mortality rate of diarrhoea varies from 3 to 9 per 100,000 estimated population (Fig.3.1).

a) Distributional pattern during 1981-82 :

In this period, mortality rate is high as compaired with other two periods. The district average was 6.0. The mortality map depicts three distinct regions of concentration :-

i) High mortality zone - Vaibhavwadi tehsil

ii) Medium mortality zone - Five tehsils to the south of Vaibhavwadi and Devgad

iii) Low mortality zone - Devgad tehsil

Vaibhavwadi is the tehsil where the rate is highest in the district, hence possibility of water contamination during rainy season is more due to which Diarrhoea spread might be more.

b) Distributional pattern during 1983-84 :

During this period, diarrhoea mortality rate was considerably high (district average 6.5). The mortality map shows three distinct regions of concentration :-

i) In the northern tehsils viz. Devgad and Vaibhavwadi where the mortality rate was highest i.e. above 9/100,000 population.

ii) In the southern tehsils viz. Savantwadi and Vengurla mortality rate was moderate and was ranging between 6 to 9/100,000 population.

iii) The tehsil of central part of the district namely Kankavli, Kudal and Malvan have low mortality rate as comparied to other areas.

c) Distributional pattern during 1985-86 :

During this period the diarrhoea mortality rate has decreased considerably. The average diarrhoea death rate of

the district is 3.4. The Vaibhavwadi and Vengurla tehsils have more deaths while in the large area of the district the rate is low. The water scarcity in the mountainous areas i.e. in the Vaibhavwadi tehsil show more diarrhoea deaths. The water scarcity leads to water pollution thereby causing more spread of this disease.

3.3 DYSENTERY :

Dysentery is a frequently common disease all over the world. It consists of passage of continuous stools with mucus and blood. Dysentery may be accompained by diarrhoea, the abdominal pain, fever and tenesmus are the common clinical features of the dysentery. On the basis of the actiological factors, the following two types of dysenteries are recognised :-

i) Bacillary Dysentery

ii) Amoebic Dysentery

i) Bacillary dysentery :

It is an infectious disease caused by the dysentery bacilli. It can be prevalent in any part of the world. It is common in the early summer and in the rainy season. Overcrowding, insanitary surrounding and chronic intestinal affections predispose to the infection. The infection is conveyed through contaminated milk, water and other food stuffs. The work of the carrier of the organism is generally done by house flies or by the fomites. This dysentery is caused by the organism : S.flexneri, S.boydi, S.sonnei, S.schmitz (Vakil,1973).

ii) Amoebic dysentery :

Amoebic dysentery results from the invasion of human intestines by an organism known as Entamoeba hystolytica, Entamoeba coli, Lodamoeba butschlii, Endolimanana and Dientamoeba fragilis. Among which entamoeba hystolytica is the important member of the group responsible for amoebic dysentery. It enters the human intestine in the form of a cyst by ingestion. After reaching the intestine, the cyst reptures to release young motile trophozoites which enters the wall of the intestines (Misra,1970).

Due to the lack of water closet facilities in the villages and in slum areas of cities, human excreta (containing cysts) is contaminated with the soil, vegetables and drinking water. Flies, by ingesting and then excreting the cysts, disseminate the infection. Waterborne epidemics may result from the contamination of drinking water by a sewer.

3.3.1 Trends of Dysentery mortality (1981-86) :

Dysentery along with it's major forms is a disease of ' Digestive category.' It is also one of the major diseases of Sindhudurga district. Water, milk and other food stuffs are heavily contaminated during rainy season, hence the deaths and even occurances are more in rainy season. In general, the pattern of mortality shows a decreasing tendency in this district.

◉SINDHUDURGA DISTRICT◉

AVERAGE ANNUAL DEATH RATE

DYSENTERY

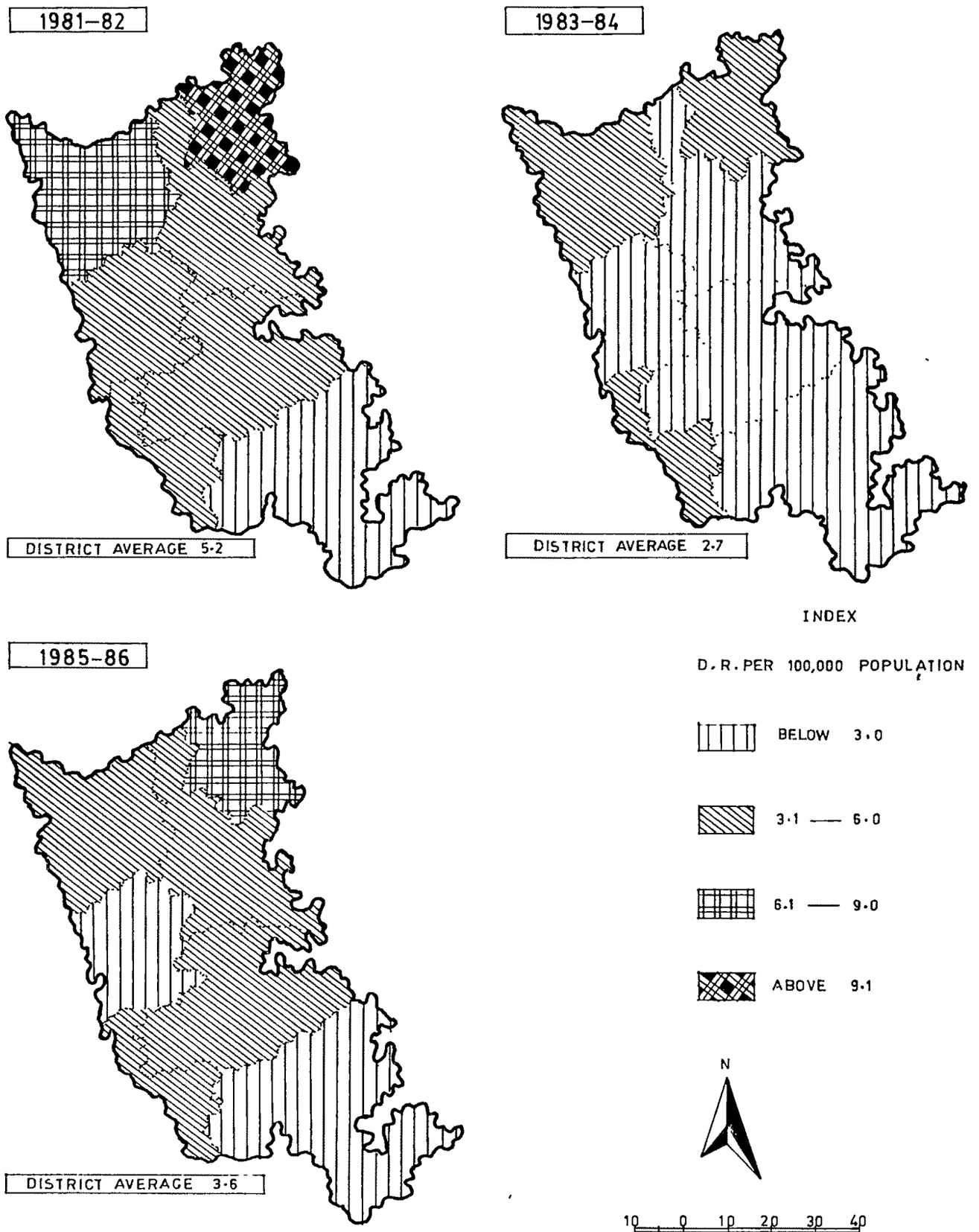

FIG. 3·2

a) Distributional pattern during 1981-82 :

The choropleth map (Fig.3.2) depicts that this disease prevails in all the tehsils of Sindhudurga. The average death rate of dysentery of the district is 5.2 per 100,000 estimated population. In Vaibhavwadi tehsil dysentery and diarrhoea, both the diseases of the digestive category show high mortality rates whose death rate is above 11.10/100,000 estimated population.

The tehsil Devgad ranks second in the death rate during this period. While remaining four tehsils namely Kankavli, Kudal, Malvan and Vengurla show low rates as they ranges between 3.1 and 6.0. The rate is lowest in the Savantwadi tehsil.

b) Distributional pattern during 1983-84 :

During this period, the remarkable change is observed. The dysentery rate of the district has decreased considerably upto 2.7. Kankavli, Kudal, Malvan and Savantwadi have low death rates. Vaibhavwadi, Devgad and Vengurla have a moderate rate which ranges between 3.1 and 6.0.

c) Distributional pattern during 1985-86 :

During this period there is a steady increase in the mortality rates. In the Vaibhavwadi, the rate is highest. Except Savantwadi and Malvan, in the remaining tehsils the mortality rate has slightly increased. It may be due to the contamination of water during the rainy season. The availability of medical services is very poor in the Vaibhavwadi tehsil,

• SINDHUDURGA DISTRICT •

AVERAGE ANNUAL DEATH RATE OF

TUBERCULOSIS

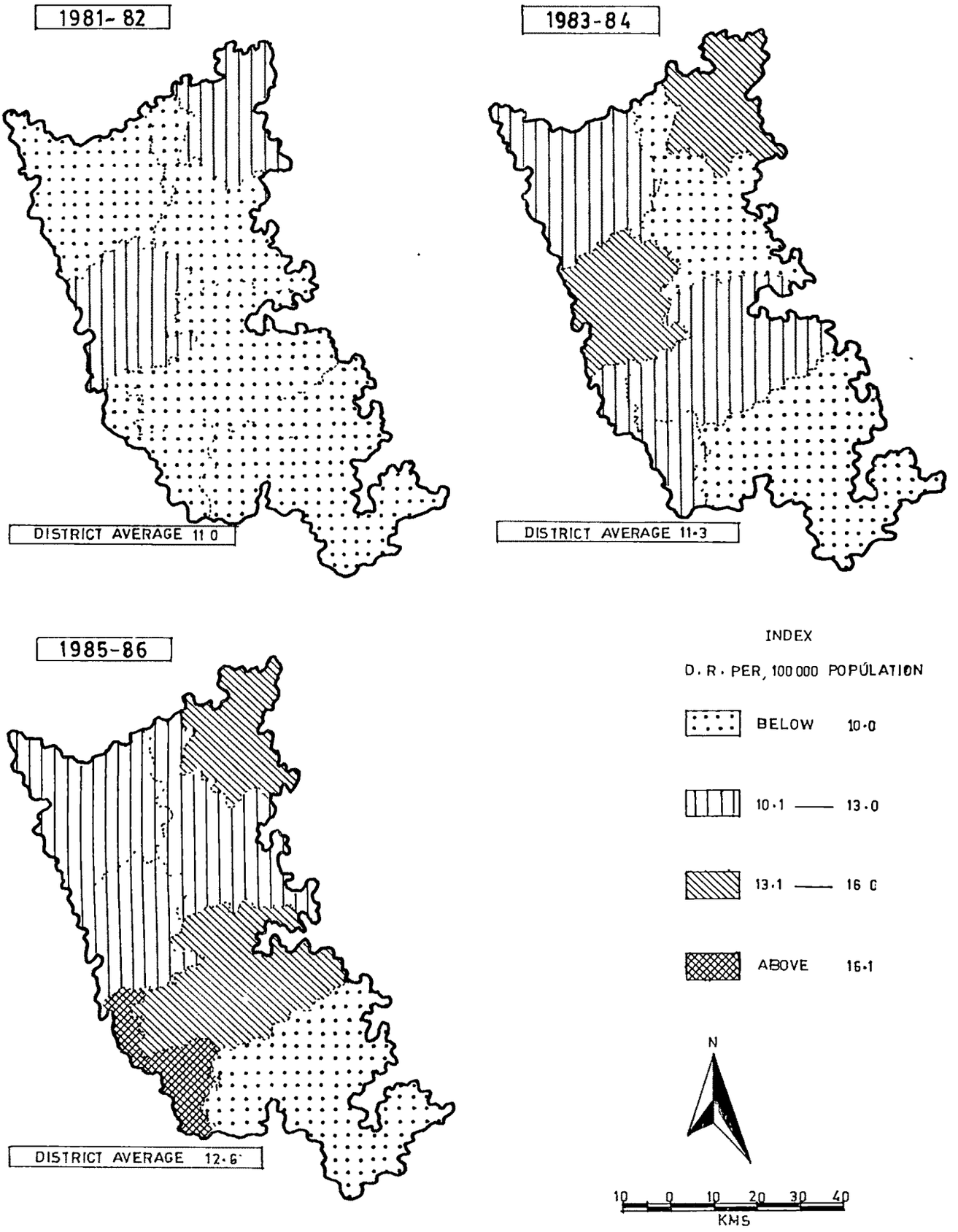

FIG. 3.3

besides water scarcity leads to water pollution which brings more deaths by dysentery in Vaibhavwadi tehsil.

3.4 TUBERCULOSIS :

Tuberculosis, commonly known as 'Raj rog' or 'Kshaya rog' is a communicable disease caused by the Tubercle bacillus. T.B. is of considerable social and economic importance in countries where it is common, because of its particular impact on men and women of working and reproductive ages. It is furious because it leads to chronic and increasing disablement. It has been referred to popularly as 'the white plage' and as 'the captain of the death of man,' (Howe,1977).

Tuberculosis can be defined as a set of symptoms in a man or an animal whose tissues have been invaded by Mycobacterium tubercules. The three types of agents namely human, bovine and avian can cause tuberculosis. The first two types can infest human and animal hosts reciprocally. The infection of human beings by avian type is relatively rare (Misra, 1970). The human type of tuberculosis is more found to be infected to lung.

3.4.1 Trends of Tuberculosis mortality (1981-86) :

Tuberculosis is one of the major diseases under study. In the ranking list, it generally stands 1st or 2nd in almost all tehsils of Sindhudurga district and has shown increasing tendency especially in rural areas (Fig.3.3).

a) Distributional pattern during 1981-82 :

During this period, the district average death rate of tuberculosis was 11.0 per 100,000 estimated population. In Vaibhavwadi and Malvan tehsils, the death rate is high as it varies between 10.1 and 13.0. In the remaining tehsils, the death rate is below 10. Tuberculosis seems to be a transported disease. Many natives of Sindhudurga are the mill workers of Bombay cotton mills. They might have transported this disease in this district.

b) Distributional pattern during 1983-84 :

During this period, there is a slight increase in the death rates. The district average is 11.3. The Vaibhavwadi and Malvan tehsils show increasing tendancy in the death rate as it ranges above 16/100,000 est. population.

c) Distributional pattern during 1985-86 :

During 1985-86, the death rate has gone still above as the average death rate is 12.3. Vengurla tehsil has the highest deaths in this period, which is 17.4. Except Savantwadi, in the remaining tehsils the rate is moderate. In Savantwadi tehsil, the mortality rate is relatively same as compared to previous years.

The increasing rate of deaths by Tuberculosis shows that in future this disease will stand as a major disease in this district. The increasing transportation linkages with Bombay, depicts

more migration of industrial workers from this area. The present day trend forecasts it's future wide spread and Tuberculosis will take more toll in future from this district.

3.5 TETANUS :

Tetanus, the major tropical infectious disease is caused by the specific infectious agent, clastridium tetani. This disease mainly spreads through soil and excreta of various animals. The common mode of entry of tetani bacilli is through a wound resulting from an injury, hence the percentage of dust in the atmosphere act as a aetiological factor. The areas of low rainfall and low humidity are the zones of tetanus occurances. In the urban areas, the deaths are generally more. The result after infection is very rapid hence quick medical care is necessary otherwise the possibility of deaths is more in the infected cases (Vakil,1973).

The occurance of the tetanus is common throughout the world, but in the agrarian countries, the incidences are higher especially in rural areas. The use of non-sterillised hospital theatres and the rusty instruments cause the Tetanus infection in the new born children and the mothers. The different types of injuries in the agricultural fields, in industries, road accidents, bare foot walking and in the vicinity of animals especially in the villages are responsible for the occurances of the infection.

In Sindhudurga, this disease is one of the major diseases as it ranks fourth in the order of importance during 1981-86.

• SINDHUDURGA DISTRICT •

AVERAGE ANNUAL DEATE RATE

TETANUS

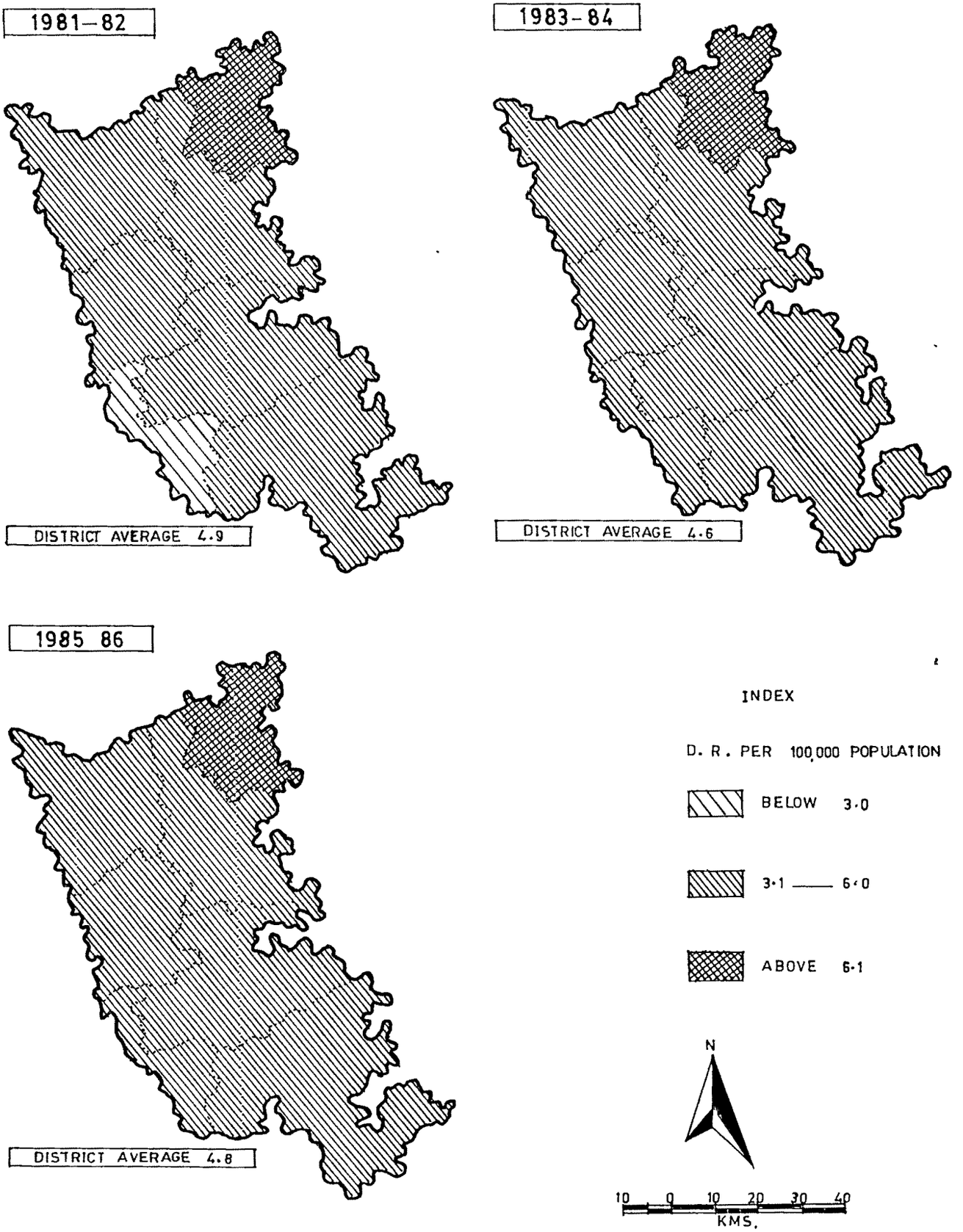

FIG. 3.4

3.5.1 Trends of Tetanus mortality (1981-86) :

Some environmental conditions seem to be highly favourable for the Tetanus infection particularly in agrarian region and vicinity of animals in this district. As the total amount of rainfall is more, the surface outwash decreases the possibility of the spread of this disease in Sindhudurga, hence the rate of Tetanus mortality is less in this district. The rate varies from 3 to 6 per 100,000 estimated population within the study period.

a) Distributional pattern during 1981-82 :

During this period, Tetanus mortality rate is almost same in all tehsils except Vaibhavwadi and Vengurla. Vaibhavwadi has a maximum Tetanus mortality which was 7.6 while Vengurla shows minimum death rate which was 2.9. The district average was 4.9.

b) Distributional pattern during 1983-84 :

During this period, the average death rate of Sindhudurga has decreased upto 4.6. In this period, eventhough the rate of Vaibhavwadi tehsil is high it has decreased upto 7.2 as compared to earlier period.

c) Distributional pattern during 1985-86 :

In this period, there is no much variations than in 1983-84. Vaibhavwadi still remains the tehsil of highest

mortality as the death rate is constant. In the remaining tehsils, the rates are almost the same.

The Vaibhavwadi is the hilly tehsil and the percentage of agrarian population is more. Possibility of injury through agricultural operations might be inviting more Tetanus cases in this tehsil.

3.6 CANCER :

The word Cancer or Malignant neoplasm is derived from Latin word 'crab' or tendancy of a tumour to spread and invade the surrounding tissues. Malignant neoplasm is the new formation of tissue (tumour) which spread and affect the nearby tissues.

Cancer is not preventable nor curable and it results into death because with the advancement of science, there is no perfect treatment on Cancer. It is generally stated that what is Cancer, we cannot treat and what we treat is not Cancer (Kothari,1978).

The real cause of Cancer is not known but if it is detected in the early stage, the possibility of curing is more but it is difficult to detect in the early stage and in latter stage, there is no perfect solution.

Cancer is not a single disease but a group of similar diseases. It affects all type of human and occurs to almost every part of the body. Cancer makes no distinction of sex,

caste, age or social standings. It is indiscriminate in its selection of victims. When infection starts, there is a process of cell multiplication, and the newly developed Cancer cells are unresponsive to the cell retraining mechanism. The tumour cells keep on multiplying until they form a fleshy mass, or a new growth, which invades the surrounding normal tissues. This abnormal uncontrolled autonomous proliferation constitutes the distinctive features of cancereous growth and only such tumours which show this character is designated as Cancer (Bhave, 1967).

Air pollution, personal habits like smoking, alcohol consumption are responsible for Cancer amongst male. The industrial pollution, adds in increasing the morbidity and mortality. Amongst the major types of Cancer, the cancers of check, tongue and mouth take more toll amongst male. The female are not directly exposed to industrial hazards, but the Cancer of breast and uterus are more common in female population.

3.6.1 Trends of Cancer mortality (1981-86) :

It is true that in the Sindhudurga district, mortality of Cancer is increasing every year as the death rate is much higher. The cancer death rate varies from 12.0 to 21.1 per 100,000 estimated population during the period of study.

a) Distributional pattern during 1981-82 :

In this period, the average mortality rate of the district was 14.7. The death rate was very high in Malvan tehsil which was

SINDHUDURGA DISTRICT

AVERAGE ANNUAL DEATH RATE

CANCER

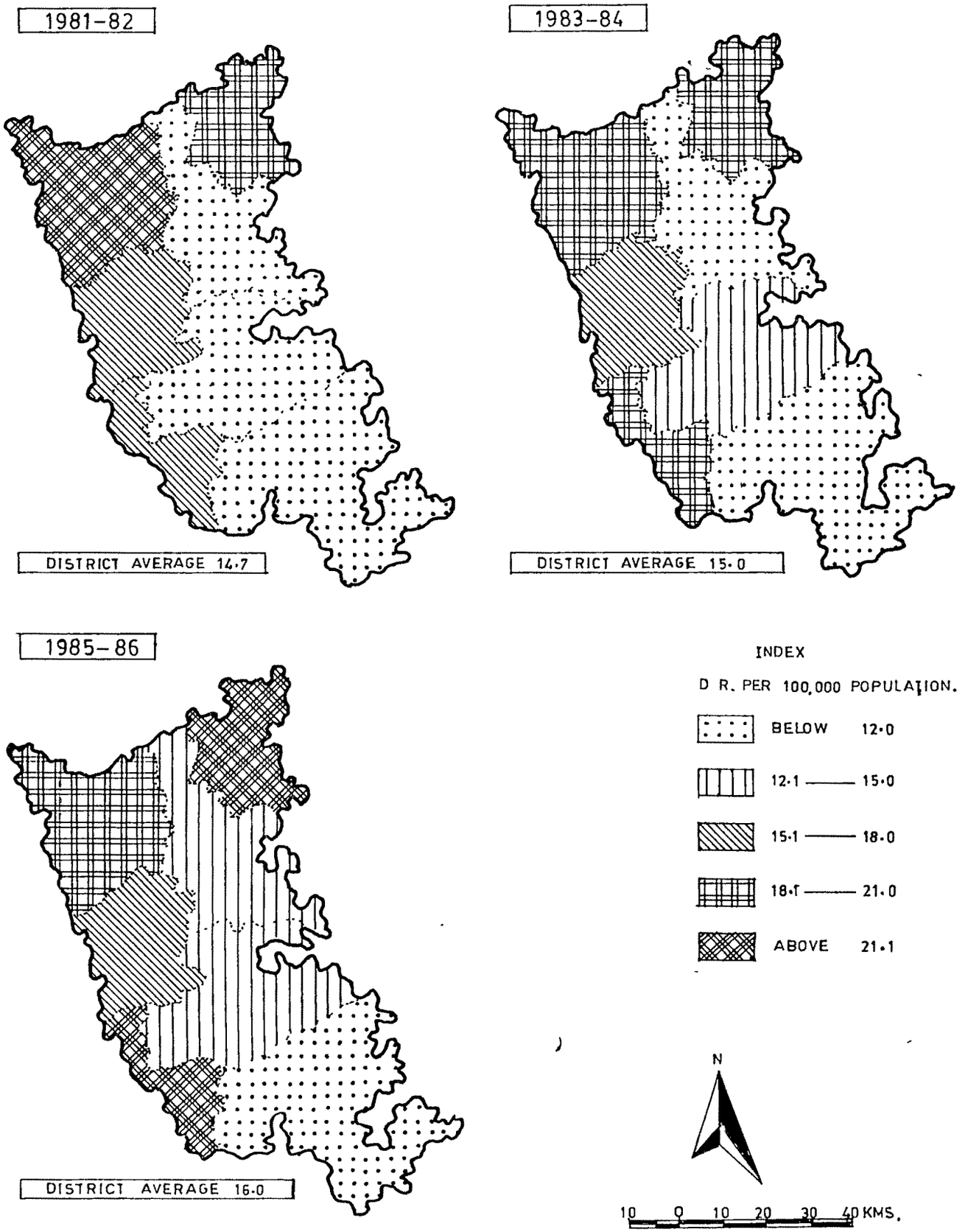

FIG. 3.5

above 21.1. But in Kudal, Kankavli and Savantwadi it was below 12.0.

b) Distributional pattern during 1983-84 :

In Vaibhavwadi, Malvan, Devgad and Vengurla tehsils the death rate was above 18.1. But in Kankavli and Savantwadi it was below 12.0. The district average has increased as compared with 1981-82 from 14.7 to 15.0.

c) Distributional pattern during 1985-86 :

The mortality rate has increased upto 16.0. Vaibhavwadi and Vengurla tehsils still show higher incidences of deaths. The death rate of Savantwadi was lowest in the district.

The industrial development in Sindhudurga is minimum as compared to other districts of the state. In spite of the minimum industrial pollution, the Cancer deaths are remarkable. This disease, like T.B. might be the transported disease from Bombay. The natives of Sindhudurga, who are the industrial workers in Bombay cotton mills might have transported this disease. A separate survey about this disease may throw more light of it's occurance in this district.

3.7 PNEUMONIA :

The disease is associated with the pain in the chest and severe breathlessness. The disease occurs at all stages but it is more frequent in early and middle adult life. The highest

• SINDHUDURGA DISTRICT •

AVERAGE ANNUAL DEATH RATE

PNEUMONIA

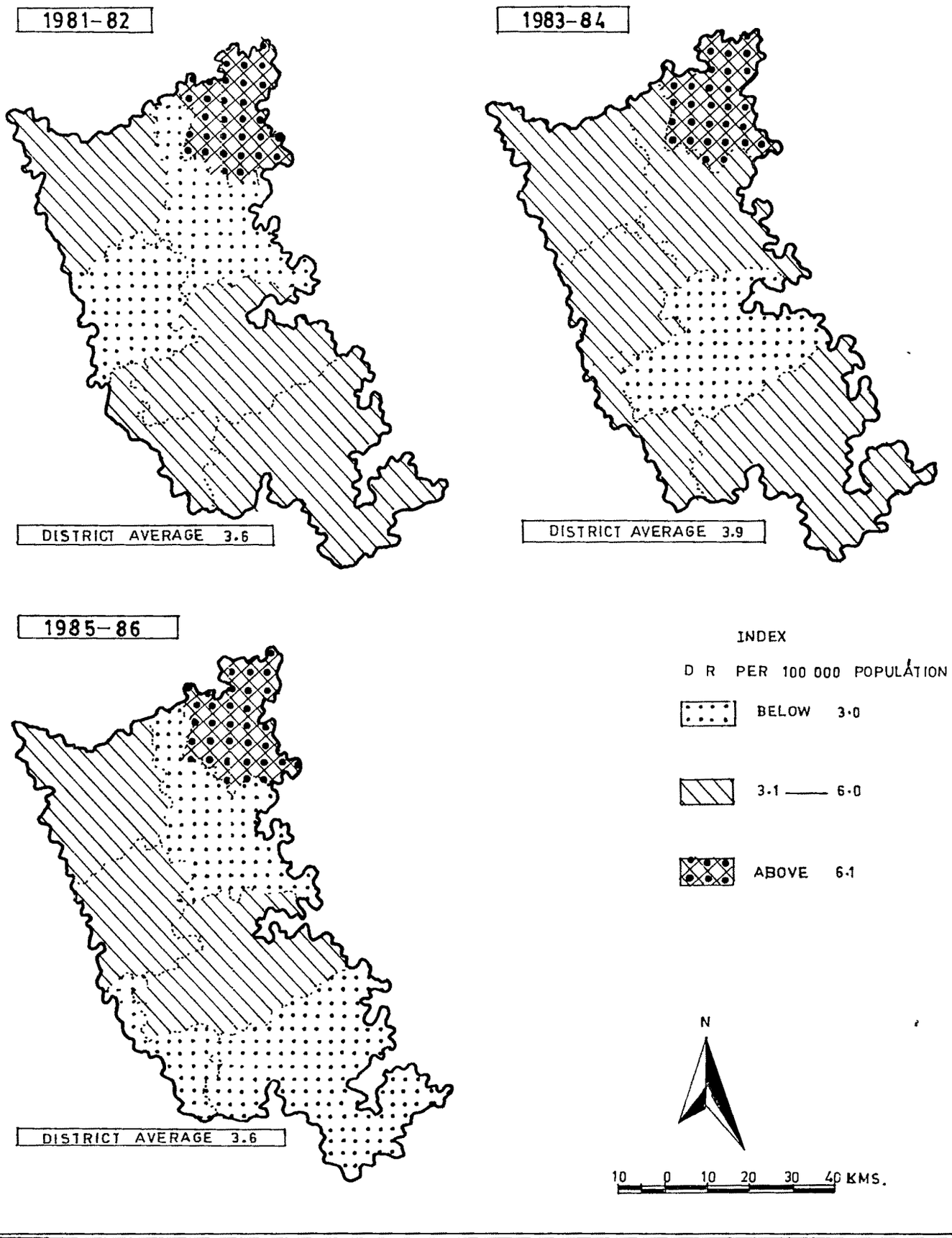

FIG. 3.6

incidences are in winter season. It is usually sporadic, as the mode of spread is being by droplet infection. The clinical diagnosis are more related to environmental disorder especially to the atmospheric pollution (Vakil,1973). The disorders are commonly associated with atmospheric pollutants and thus to be aggravated by them include chronic bronchitis, pneumonia, lung cancer and asbestosis.

3.7.1 Trends of Pneumonia mortality (1981-86) :

In Sindhudurga, it is not a major disease as it ranks sixth. The physical as well as socio-cultural factors are not much favourable for the Pneumonia spread as mortality rates vary between 3 and 6 per 100,000 estimated population.

a) Distributional pattern during 1981-82 :

During this period, the average mortality rate was 3.6 (Fig.3.6). Vaibhavwadi tehsil gives more toll by Pneumonia as the rate is 6.2. In the other tehsils, the deaths are less.

b) Distributional pattern during 1983-84 :

The district average has decreased upto 3.9. The Vaibhavwadi show higher incidences. On the coastal areas, the deaths are less as compared to hilly regions.

c) Distributional pattern during 1985-86 :

The district average death rate has decreased slightly as compared to earlier period. The Vaibhavwadi still remains

◉ SINDHUDURGA DISTRICT ◉

AVERAGE ANNUAL DEATH RATE

ALL DISEASES

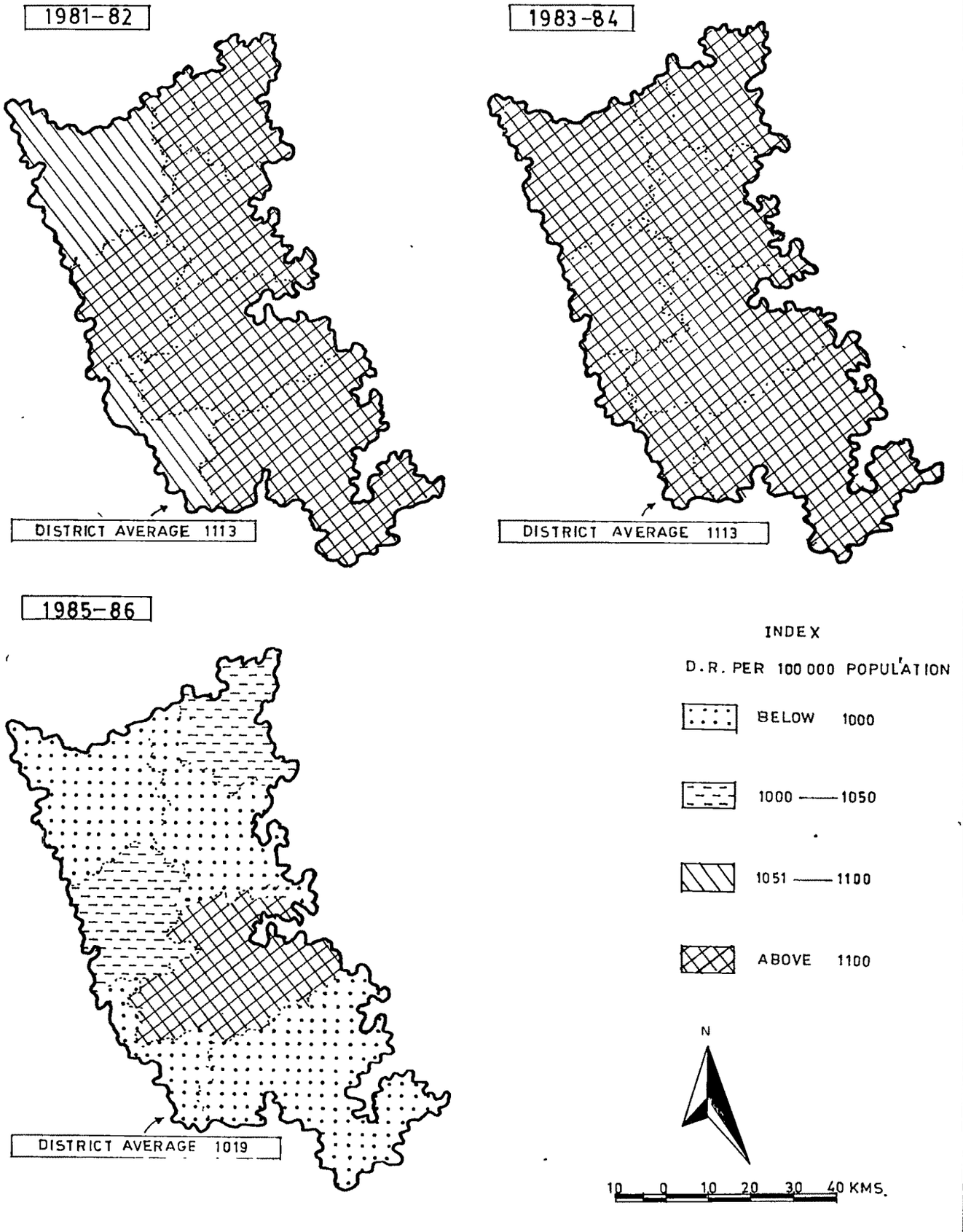

FIG. 3.7

as the tehsil of higher mortality. The tehsil in the plain show moderate to low intensity.

It may be stated that Pneumonia is not a dominant disease of the district. The industrial development is minimum and the atmospheric pollution is at the minimum level, hence Pneumonia is not of major intensity. The reasons for high prevalence at Vaibhavwadi needs to be tested separately.

B) Spatial analysis of diseases (citywise) :

The effect of socio-economic factors on the incidence of disease in the urban areas is more than the villages. The man made factors play a major role in the distributional pattern of diseases in the cities. The data of mortality of four major diseases i.e. Pneumonia,,Cancer, Tetanus and T.B. have been collected for 6 years and the rates are calculated and are shown in Fig.3.8 to 3.10.

3.8 TRENDS OF MORTALITY PATTERN OF SAVANTWADI CITY :

The Fig. 3.8 shows the death rate of 4 diseases selected for study. In the Savantwadi city, Cancer is the major disease which is constantly occuring with increasing trend. The average mortality rate is 90/-100,000 estimated population. Tuberculosis is the disease of third rank and shows the increasing tendancy during study period. During 1983-86, the rate has increased from

◉ SAVANTWADI — CITY ◉

CAUSE SPECIFIC DEATH RATE

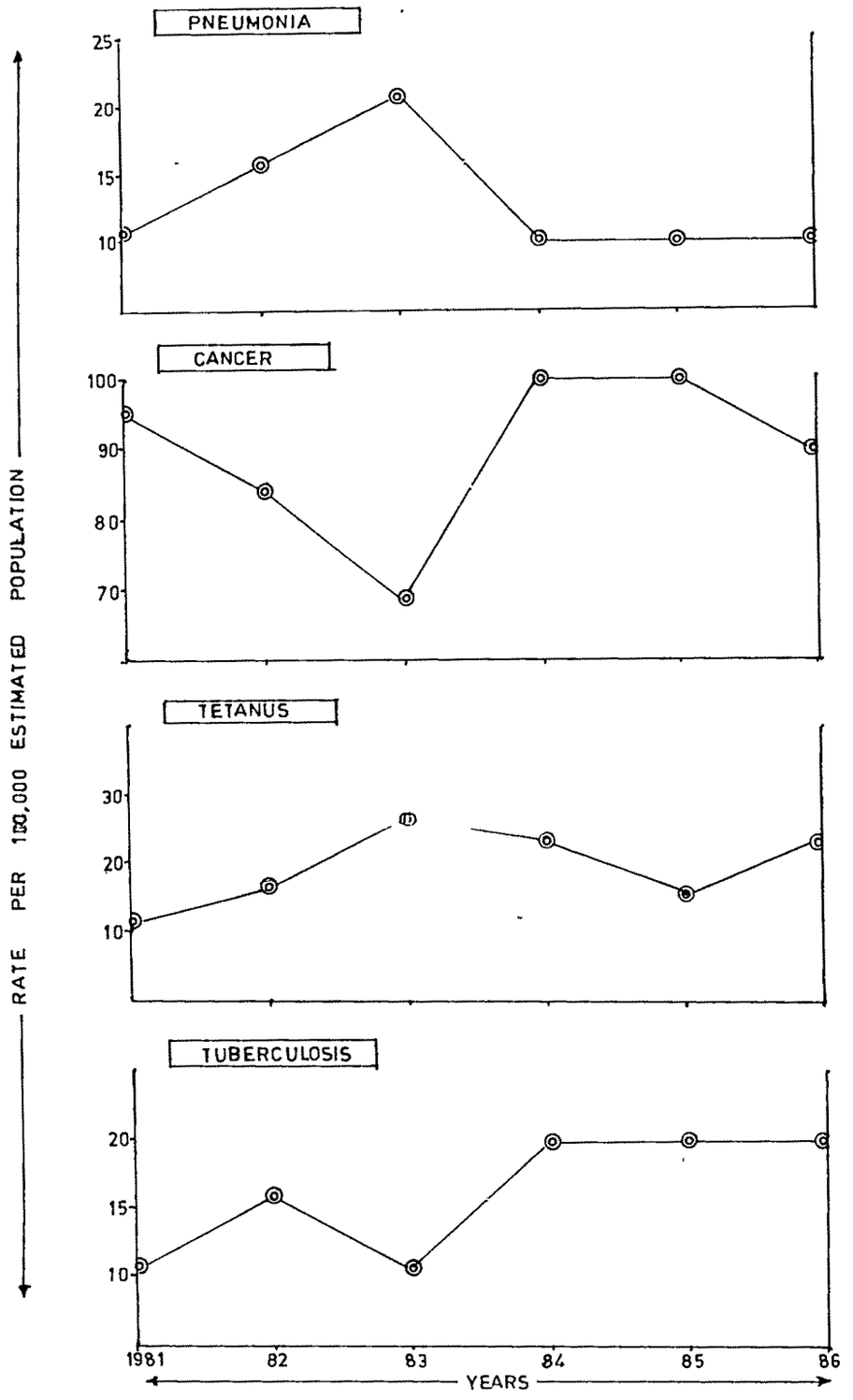

FIG. 3-8

◉ MALVAN CITY ◉

CAUSE SPECIFIC DEATH RATE

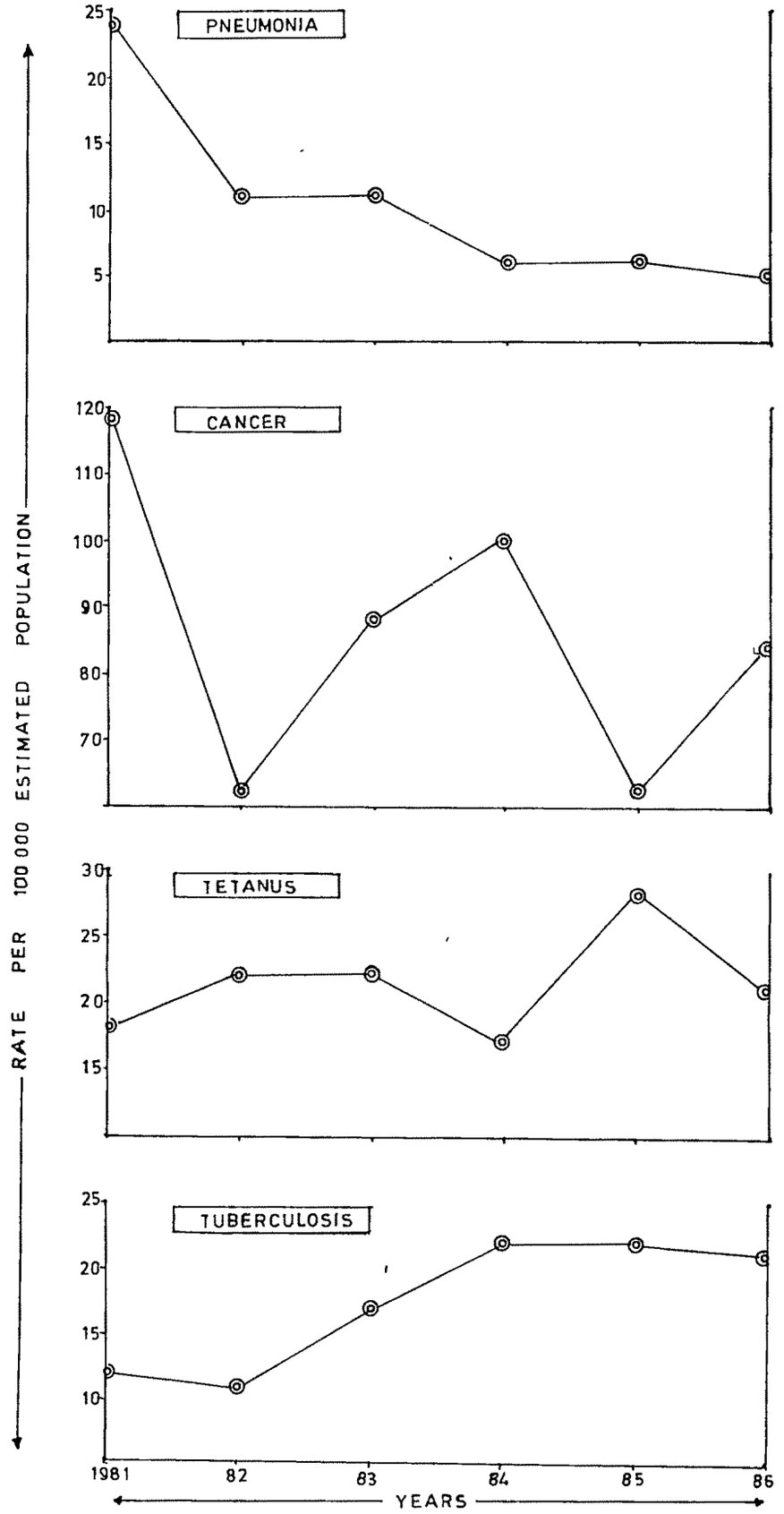

FIG. 3.9

10 to 20 per 100,000 estimated population. Tetanus ranks second in the city and the death rate increases very slowly as the mortality rate is more than 25 per 100,000 estimated population. Pneumonia shows decreasing tendancy. It is sporadic and it's mortality rates are also very low.

The direct linkages of Savantwadi city with Bombay result in the occurance of Cancer and T.B. in this city. The increasing trend of deaths forecasts it's possible gravity in future. The special efforts must be made to control these diseases of this city.

3.9 TRENDS OF MORTALITY PATTERN OF MALVAN CITY :

Like Savantwadi, the Cancer is the major disease of Malvan city. The death rate of Cancer of Malvan city fluctuates every year as the average D.R. is 90/100,000 estimated population (Fig.3.9). The highest death rate was 120 and it was noted in the year 1981. Tetanus ranks second and shows the increasing tendancy. Tuberculosis is the disease of third rank and every year, the number of deaths are increasing. Pneumonia is the disease, exception to other diseases, as the rates are decreasing successively. The decline of Pneumonia is sharp as rate has varied from 25 to 5/100,000 estimated population within six years. The special efforts may be made to control deaths by Cancer and Tuberculosis of this city.

◉ VENGURLA CITY ◉

CAUSE SPECIFIC DEATH RATE

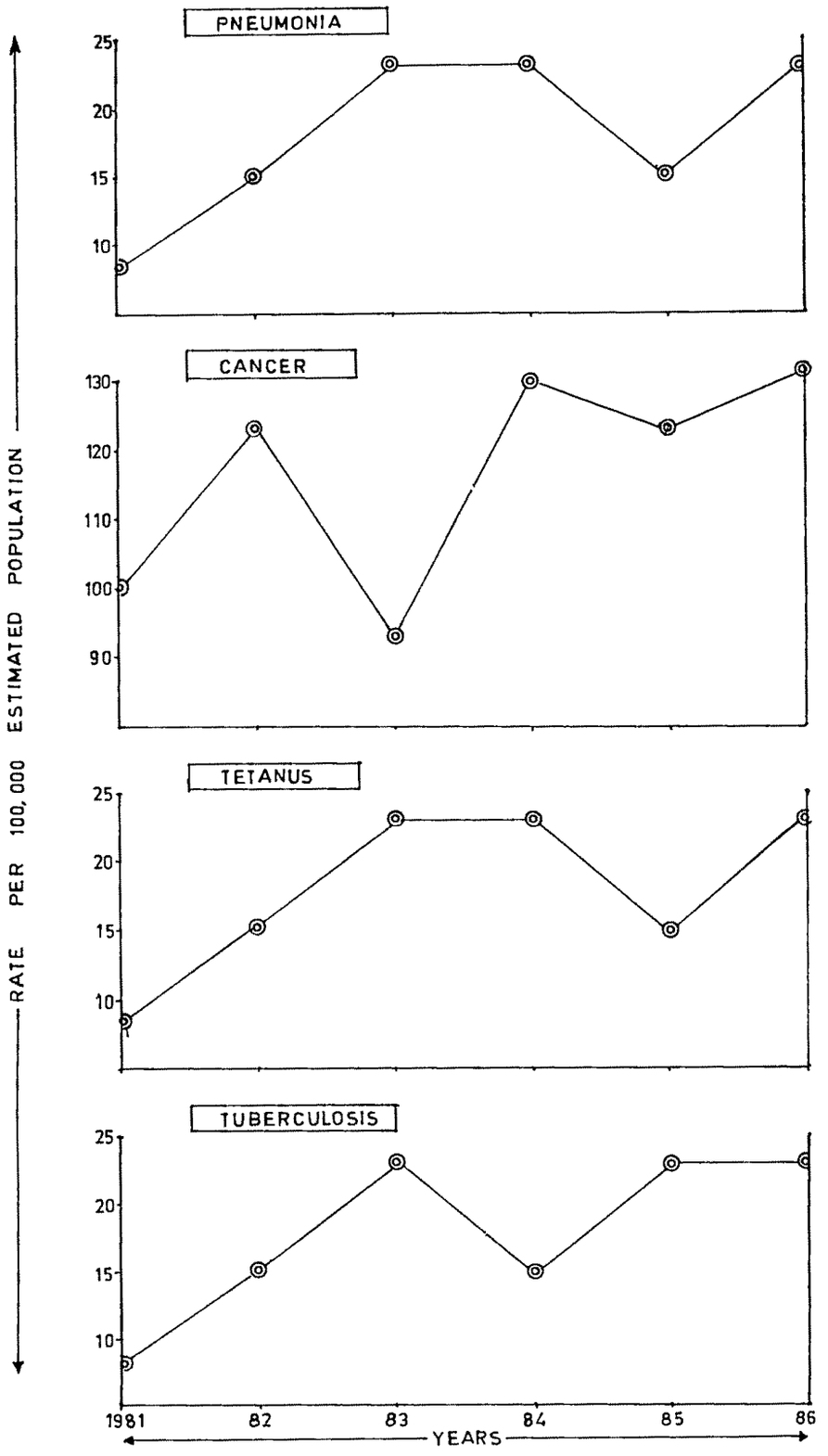

FIG. 3.10

3.10 TRENDS OF MORTALITY PATTERN OF VENGURLA CITY :

Fig.3.10 shows that deaths due to Cancer rank top in the death list of Vengurla city. The deaths by Cancer in Vengurla city are highest in the urban areas of the district as the death rate was 130/100,000 during 1984. The Pneumonia, Tuberculosis and Tetanus also show the increasing intensity and are the dominant diseases of this city. The general mortality pattern shows the increasing trend of all the four diseases. The special attention should be paid to check the Cancer mortality in Vengurla city.

3.11 CONCLUSION :

The spatio-temporal analysis of major diseases at tehsil and city level show remarkable features in the district. It is true that physical factors play the major role in the distribution of waterborne diseases. The Dysentery and Diarrhoea are the diseases of decreasing intensity, still their prevalence in the district is remarkably uneven. The hilly Vaibhavwadi tehsil give maximum toll by these diseases. The prevalence of these diseases is more in rainy season. The water pollution during rainy season may be the cause of their spread. The effect of socio-cultural factors on the incidences of Tuberculosis, Tetanus, Cancer and Pneumonia is positively noted in Sindhudurga. The Cancer and Tuberculosis show the increasing tendancy and there is a fear of it's higher occurances in the future. The developed transportation linkages between Bombay and this district result in spreading

these diseases. Tuberculosis spread is more in the coastal districts. The agricultural activities of this district might be responsible for Tetanus spread in the city. The industrial development in Sindhudurga is minimum as compared to other districts of the state. In spite of the minimum industrial pollution, the Cancer deaths are remarkable. The disease like T.B. might be the transported disease from Bombay city. The migration to and fro Bombay to this district is responsible for it's wide spread. Pneumonia, the disease of respiratory disorder, is not more prevalent as the industrial pollution is minimum.

In sum, it may be stated that the physical and socio-cultural factors do play major role in the distribution of diseases in the Sindhudurga district.

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