Disease occurrence or non-occurrence are dependent upon a systematic integration of three factors, namely, causative, preventive and curative (Dutta & Dutta, 1985). Causative factors may be ecological, cultural, social, economic and political through which the disease occurs. Disease can be prevented by providing basic infrastructural facilities, such as supply of safe drinking water, efficient sewage and drainage facilities, administering necessary vaccines and serums, using relatively harmless chemicals to eliminate invertebrate disease carriers. The world health organisation is supporting a number of large scale disease control programmes all over the world to prevent the diseases. Curative factors are modern medical technology and education which will bring better results in curing and preventing diseases.
According to willgoose disease means lack of ease (1979). It can be anything from a cold to a cancer. In a developing country like India, diseases are predominantly reflections of poverty (Akthar and Izar, 1984). Disease mapping is one of the most meaningful yet controversial aspects of medical geography (Pyle, 1979). Gilbert (1955) opined that the great outbreaks of Cholera in the first half of the nineteenth century seem to have been the factor which first stimulated cartographic work on disease.

Jacques May produced world Atlas of diseases and the volumes on the ecology of disease are indeed the pioneering studies carried out in USA (1950). In 1963, Howe prepared the National Atlas of disease mortality in the United Kingdom. Brown used the proportional circles techniques to demonstrate the distribution of different diseases in Nigeria (1964). Learmonth well known for his medico-geographical studies in India and Pakistan reviewed the medical atlases of developed and developing countries (1972).

Discoveries can be made by basically simple, classical map correlation. Perhaps it is still true that most discoveries of vital relationships in this field have at least started in this simple way. Most spatial relationships of diseases will be multivariate. For this reason many problems of medical geography are best analysed by multiple regression of factor analytic methods (Haggett, 1965; Mc Glashan 1972).
The above mentioned studies have brought out the spatial variations in the distribution of most forms of illhealth and mortality. Disease mapping should be repeated at regular intervals. But the temporal studies are rare because, the collection of morbidity data is difficult. However the changing distribution of measles epidemic in Akron has been studied by Pyle (1976). Studies related to suicide in London show that the distribution of high rate areas have remained remarkably stable over 60 years period (Sainsbury 1955; Whitlock 1973 and Howe 1979).

With regard to spatial patterns of prevalence of diseases, Mc Glashan (1972) stated that preparation of maps illustrating areal distribution of various diseases or groups of diseases in an accurate and consistent manner is very important. Learmonth has used a variety technique, including composite maps in his work on India and Australia (1961).

The disease map will bring out the regional differences in the prevalence rate more clearly over space through time. In Karimnagar district, more than one hundred diseases are recorded. Based on the International disease classification system (WHO 1977), they have been grouped into 17 categories for the convenience of map preparation and interpretation. The seventeen categories of diseases followed in the study are given in the table 3.1.
### TABLE 3.1

**International Disease Classification System**  
(WHO. 1977)

<table>
<thead>
<tr>
<th>S.No</th>
<th>Category</th>
<th>Disease Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cases related to Bites</td>
<td>989.5</td>
</tr>
<tr>
<td>2</td>
<td>Diseases related to Blood</td>
<td>280-289</td>
</tr>
<tr>
<td>3</td>
<td>Cases related to Burns, wounds and Injuries</td>
<td>940,870,959.8</td>
</tr>
<tr>
<td>4</td>
<td>Diseases related to Cardio vascular system</td>
<td>390-398,401-438</td>
</tr>
<tr>
<td>5</td>
<td>Diseases related to Central Nervous system</td>
<td>320-359</td>
</tr>
<tr>
<td>6</td>
<td>Dental Diseases</td>
<td>520-529</td>
</tr>
<tr>
<td>7</td>
<td>Diseases related to Digestive system</td>
<td>530-579</td>
</tr>
<tr>
<td>8</td>
<td>Diseases related to Ear, Nose and Throat</td>
<td>380-389</td>
</tr>
<tr>
<td>9</td>
<td>Diseases related to Eye</td>
<td>360-379</td>
</tr>
<tr>
<td>10</td>
<td>Diseases related to Female Gential system</td>
<td>610-629</td>
</tr>
<tr>
<td>11</td>
<td>Infective diseases</td>
<td>001-009</td>
</tr>
<tr>
<td>12</td>
<td>Nutritional deficiency diseases</td>
<td>260-269</td>
</tr>
<tr>
<td>13</td>
<td>Diseases related to Respiratory system</td>
<td>480-519</td>
</tr>
<tr>
<td>14</td>
<td>Diseases related to Skeletal system</td>
<td>170-175</td>
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<tr>
<td>15</td>
<td>Diseases related to Skin</td>
<td>680</td>
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<tr>
<td>16</td>
<td>Sexually Transmitted Diseases</td>
<td>090-099</td>
</tr>
<tr>
<td>17</td>
<td>Malaria</td>
<td>084</td>
</tr>
</tbody>
</table>

**Spatial patterns of cases related to Bites**

Snake bite, Scorpion bite, rat bite, dog bite, cat bite and other insect stings are included in this group. The bite or sting is characterised by a wound or puncture made by animals or insects.
About 37,515 cases of bites are reported in Karimnagar district during the year 1999. Very high prevalence (>1000) of bites is noticed in 6 mandals, such as Dharmapuri (1626), Manakondur (1275), Husnabad (1187), Ramadugu (1164), Bimadevera Palli (1021) and Ibrahim Patnam (1014). In 17 mandals, mostly belong to northern half of the district, high concentration (750-1000) of bites cases is observed. Moderate prevalence (500-750) of bites is registered in 28.6 percent of the mandals mostly confined to south-eastern and north western parts of the district. In 8 mandals spread over here and there, low concentration (250-500) of bites and in the remaining 9 mandals mostly located in South-Western corner of the district, very low (<250) cases of bites are recorded (Fig3.1)

**Spatial patterns of Blood diseases**

The diseases included under this category are Aneamia of Pregnancy and anemia of other than iron deficiency like deficiency of folic acid and anaemia due to iron deficiency.

In Karimnagar district, about 99,628 cases are recorded in the year 1999 under this category. The disease prevalence is very high (>4000) in 7 mandals such as Karimnagar (4699), Boinapalli (4488), Vemalawada (4416), Husnabad (4348), Konaraopet (4222), Kathalapur (4092) and Siricilla(4000). In Elkathurthi, Dharmapuri, Chendurthi, Odelu, Dharmaram and Velgatoor mandals 3000-4000 cases of blood diseases are noticed. In 7 mandals situated mostly in eastern part of the district, moderate concentration (2000-3000) is observed. In about 41
KARIMNAGAR DISTRICT
SPATIAL PATTERNS OF BLOOD DISEASES - 1999

Fig. 3.2
percent and 23 percent mandals spread all over the district (Fig 3.2), low (1000-2000) and very low (<1000) concentration of blood diseases are registered, respectively. Poverty, lack of care and poor dietary habits may considered as reasons for the occurrence of blood diseases in the district.

Spatial patterns of cases related to Burns, Wounds and Injuries

Injury to tissues caused by the contact with heat, flame, chemicals, electricity or radiation is known as a Burn. Bodily injury caused by physical means, with disruption of the normal continuity of structure is called a wound. An injury is a harm or hurt. In this category, the type of cases included are external and internal injuries including the nerves, open wounds and injuries of blood Vessels, burns, fractures, dislocation of bones, sprains and all types of accidental falls and suicidal attempts.

The total number of cases related to Burns, Wounds and Injuries in Karimnagar district are 28,630. Karimnagar mandal recorded highest number of cases (1838) followed by Mutharam (M.pur) (1775), Dharmaram (1736), Julapalli (1442), Manthani (1346), Mutharam (1236), Malharrao (1142), Kathalapur (1075) and Mahadevapur (1043). Most of these mandals belong to eastern projection and central part of the district. High concentration of these cases (750-1000) is found in three mandals, namely Kataram, Sultanabad and Pegadapalli. In 11 mandals spread all over the district moderate prevalence is registered. About 21 percent and 37.5 percent of the mandals, mostly confined to western and
KARIMNAGAR DISTRICT
SPATIAL PATTERNS OF CASES RELATED TO BURNS, WOUNDS AND INJURIES - 1999

LEGEND
(No. of Cases)

> 1000
750 - 1000
500 - 750
250 - 500
< 250

Fig. 3.3
southern parts of the district (Fig 3.3), low (250-500) to very low (<250) cases are observed.

The reasons for this type of cases may be due to increased and unorganised transportation, absence of proper safety measures in the mines, naxal activities, dowry deaths, lack of knowledge about the usage of agricultural machinery, pesticides and insecticides, improper handling of stoves and electrical appliances, illiteracy etc.

**Spatial patterns of Diseases related to Cardio-Vascular system**

The cases included in this category are diseases pertaining to the heart and blood vessels, such as hypertension, chest pain and heart attack were taken for the study. The total number of cases reported in this category are 31,041 in Karimnagar district during the study period. Karimnagar mandal registered highest number (1552) of cases in the district followed by Ramadugu (1536), Choppadandi (1274), Bejjanki (1262) and Husnabad (1131). In about 14 mandals, mainly confined to central and eastern projection of the district (Fig 3.4), high prevalence of (750-1000) Cardio-Vascular diseases is noticed. Moderate occurrence (500-750) is found in about 20 percent of the mandals, spread all over the district. Low (250-500) to very low(<250) concentration is found in 7 and 19 mandals of the district, respectively. The reasons for the prevalence of Cardio-Vascular diseases in the district may be attributed to smoking, fat stuffed food and tensions in the daily life.
SPATIAL PATTERNS OF DISEASES RELATED TO CARDIOVASCULAR SYSTEM - 1999

Fig. 3.4
Fig. 3.5

KARIMNAGAR DISTRICT
SPATIAL PATTERNS OF DISEASES RELATED TO CENTRAL NERVOUS SYSTEM - 1999
Spatial patterns of diseases related to Central Nervous System

The diseases related to brain, spinal cord and nerves such as headache, giddiness, epilepsy, meningitis, paralysis, neuritis and mental disorders are included under this category.

A total number of 18,254 cases are recorded in Karimnagar district during the study period. The mandal with very high prevalence of CNS diseases is Kamalapur (1065). High concentration (750-1000) is observed in Kataram (843) and Ramadugu (834). In seven mandals situated in eastern projection and central part of the district moderate prevalence (500-750) is reported. In about 82 percent of the mandals i.e 22 and 24 mandals of the district, low (250-500) to very low (<250) occurrence of CNS diseases is appeared respectively (Fig3.5). Heridity and obesity may be considered as reasons for most of the CNS related diseases (Fig 3.5).

Spatial patterns of Dental diseases

Diseases associated with teeth are known as dental diseases. Dental caries, dental abscess, toothache and dental fluorosis are the type of diseases included in this group.

During the study period, about 31,643 cases are reported under this category in Karimnagar district. Very high prevalence (>1000) of dental diseases is emerged in 7 mandals with maximum in Jammikunta (1478) mandal. The other mandals are Karimnagar (1394), Bejjanki (1264), Kesavapatnam (1260),
Saidapur (1167), Choppadandi (1164) and Manakondur (1132). In six mandals located here and there, high concentration (750-1000) of dental diseases are occurred. Moderate prevalence is reported in about 40 percent of the mandals (500-750). In 9 mandals low occurrence (250-500) and in the remaining 15 mandals, mostly concentrated in western part of the district, very low prevalence (< 250) of dental diseases is registered.

**Spatial patterns of diseases related to Ear, Nose and Throat**

The diseases included in this category are acute and chronic otitis media, foreign body car, adenoids and tonsillitis, pharyngitis and sinusitis. In Karimnagar district about 42,682 cases are reported during the study period. Karimnagar mandal recorded highest number of ENT cases (2389) in the district. The other mandals which come under very high prevalence (>2000) of ENT diseases are Jammikunta (2249), Huzarabad (2142) Mutharam(M.pur) (2141) and Manakondur (2091). High occurrence (1500-2000) is found in Choppadandi (1976), Ramadugu (1742) and Bejjanki (1644) mandals. In about seven mandals confined to South-Eastern part of the district, moderate concentration (1000-1500) of ENT diseases is noticed. Low (500-1000) and very low (<500) cases are observed in 37.5 percent and 35.7 percent of the mandals respectively. These mandals are spread all over the district (Fig 3.7).

**Spatial patterns of Eye diseases**

Diseases like conjunctivitis, cataract, glaucoma and other eye infections are considered for this category. The total number of cases recorded in Karimnagar
KARIMNAGAR DISTRICT
SPATIAL PATTERNS OF DISEASES RELATED TO EAR, NOSE AND THROAT - 1999

Fig. 3.7
SPATIAL PATTERNS OF EYE DISEASES - 1999

KARIMNAGAR DISTRICT

LEGEND
(No. of Cases)

> 2000
1500 - 2000
1000 - 1500
500 - 1000
< 500

Fig. 3.8
district during the study period are 42,688. Very high occurrence (>2000) of eye diseases are found in Kamalapur (2593) and Mutharam (M.pur) (2222) mandals. In 7 mandals, such as Korutla, Bhimadeverapalli, Saidapur, Kesavapatnam, Bejjanki, Manakondur and Boinapalli, high concentration (1500-2000) is appeared. Moderate prevalence (1000-1500) of eye diseases is confined to 7 mandals, situated here and there. In the remaining 71 percent of mandals i.e., in 20 mandals each, low (500-1000) and very low concentration (<500) of eye diseases is noticed (Fig 3.8).

Spatial patterns of diseases related to Digestive system

Dyspepsia, vomiting, constipation, acute gastroenteritis, cholera, dysentery, gastritis, peptic ulcer, appendicitis, hernia, piles, amoebiasis, ascariasis and other intestinal parasitic infections are grouped under this category.

A total number of 57,853 cases are surfaced up in Karimnagar district during the year 1999. More than 2000 cases are noticed in 6 mandals, namely Ramadugu (2192), Husnabad (2168), Kesavapatnam (2132), Choppadandi (2120), Karimnagar (2054) and Elkathurthi (2024). In another six mandals, high concentration (1500-2000) of digestive system diseases is observed. Moderate concentration (1000-1500) is reported in 27 percent of the mandals, mostly confined to eastern projection and North-Western corner of the district. Nearly 30 percent of the mandals experienced low (500-1000) and 21 percent of the mandals very low prevalence in the district. These mandals are spread all over
SPATIAL PATTERNS OF DISEASES RELATED TO DIGESTIVE SYSTEM - 1999

Fig. 3.9
the district (Fig 3.9). Absence of protected water supply, poor living environment, 
unhygienic habits, crowded habitation, usage of more chillies may be precipitated 
as the causes for the occurrence of diseases related to digestive system.

Spatial patterns of diseases related to Female genital system.

In this group, abortion, incomplete abortion, amenorrhoea other than 
pregnancy, dysmenorrhoea, menorrhagia, prolapsed uterus, vaginitis and 
leucorrhoea are included for the study of female genital diseases.

In Karimnagar district about 43,860 cases are reported during the study 
period. Ramadugu (2106) and Huzarabad (2075) are observed as very high 
prevalence mandals. High occurrence (1500-2000) is found in four mandals such 
as Choppadandi, Kodimial, Metpalli and Korutla. Nearly 14 percent of mandals 
experienced moderate cases (1000-1500). In 24 mandals low concentration 
(500-1000) and in the remaining one-third mandals very low concentration (< 
500) of female genital diseases is reported (Fig 3.10). Illiteracy, early marriages, 
repeated pregnancy etc., can be considered as the reasons for the emergence of 
these diseases.

Spatial patterns of Infectious diseases

Infectious diseases can be transmitted from one person to another. This 
may occur by direct physical contact, by common handling of an object that has 
picked up infective Micro-organisms through a disease carrier or by spread of 
infected droplets. Infection is known as "Invasion of the body by harmful
Fig. 3.10

KARIMNAGAR DISTRICT

SPATIAL PATTERNS OF DISEASES RELATED TO FEMALE GENITAL SYSTEM - 1999

LEGEND
(No. of Cases)

- > 2000
- 1500 - 2000
- 1000 - 1500
- 500 - 1000
- < 500

Fig. 3.10

KARIMNAGAR DISTRICT

SPATIAL PATTERNS OF DISEASES RELATED TO FEMALE GENITAL SYSTEM - 1999
Pathogens are of different kinds such as fungi, protozoa, viruses, bacteria etc. They may also airborne, waterborne and dustborne.

For the present study, the group of diseases included are Cholera, Typhoid, smallpox, filariosis, rickettes, influenza, polio, mumps and other viral and bacterial infections.

Nearly, 84,520 cases are reported in the district during the year 1999. Surprisingly, in 15 mandals very high (>2000) prevalence of infectious diseases is observed. They are Kamalapur, Karimnagar, Manakondur, Husnabad, Elkathurthi, Kesavapatnam, Saidapur, Bimadevarapalli, Vemalawada, Boinapalli, Peddapalli, Ramagundam, Kamanpur, Sulthanbad and Mutharam(M.pur). High concentration of 1500-2000 cases of infectious diseases is appeared in eight mandals, namely srirampur, Odelu, Velgatoor, Bejjanki, Raikal, Kodimial, Gollapalli and Metpalli. In one-fourth of mandals, moderate prevalence (1000-1500) is registered. These mandals are situated, mostly in the eastern projection and central part of the district (Fig 3.11). Nearly in 14 percent and 20 percent of the mandals, mostly belong to western half of the district, low (500-1000) and very low (<500) occurrence of infectious disease are recorded, respectively. Unprotected supply of drinking water, poor sanitation, very bad house surroundings, congested living, dust pollution etc., may be the reasons for the outbreak of infectious diseases.
KARIMNAGAR DISTRICT
SPATIAL PATTERNS OF INFECTIVE DISEASES - 1999

LEGEND
(No. of Cases)
- > 2000
- 1500 - 2000
- 1000 - 1500
- 500 - 1000
- < 500

Fig. 3.11
Spatial patterns of Nutritional deficiency diseases

The nutritional deficiency diseases included in this category are vitamin-A deficiency, Beri-beri, glossitis, stomatitis, gingivitis and malnutrition. The total number of cases registered in the district are 95,506 during the study period. Here also more mandals i.e., 24 mandals are exposed to very high occurrence (>2000) of nutritional deficiency diseases. There are situated mostly in central part and western part of the district with highest number of cases in Velgatoor (3684), Karimnagar (3525) and Boinapalli (3182) mandals. High prevalence (1500-2000) is found in 9 mandals such as Ramagundam, Mahadevpur, Kataram Husnabad, Kohed, Kesavapatnam, Saidapur, Pegadapalli and Bimadevarapalli. In one-fourth of the mandals, moderate concentration (1000-1500) of nutritional deficiency diseases is surfaced up. Only in Peddapalli and Chigurumamidi mandals low (500-1000) prevalence is noticed and in the remaining seven mandals, very low (<500) cases of nutritional deficiency diseases are appeared (Fig 3.12). The reasons for the concentration of these diseases may be attributed to poverty, lack of balanced diet, anaemia etc.

Spatial patterns of diseases related to Respiratory system

The diseases included under this category are upper respiratory infections, bronchitis, chronic bronchitis, pulmonary tuberculosis bronchial asthma and other related disorders.

It is noticed that in Karimnagar district about 61,161 cases are registered under this category during the study period. Nearly 30 percent of the mandals
SPATIAL PATTERNS OF NUTRITIONAL DEFICIENCY DISEASES - 1999

Fig. 3.12

LEGEND
(No of Cases)

> 2000
1500 - 2000
1000 - 1500
500 - 1000
< 500

KARIMNAGAR DISTRICT
experienced very high prevalence (>2000) of respiratory disorders. They are Vemalawada, Kamalapur, Karimnagar, Boinapalli, Ramagundam, Sulthanbad, Dharmaram, Julapalli, Manthani, Mutharam(M.pur), Thimmapur, Bejjanki, Elkathurthi, Jagtial, Kodimial, Pegadapalli and Korutla mandals. High concentration (1500-2000) is observed in 11 mandals. Major share of mandals (one-third mandals) are experienced moderate occurrence (1000-1500) of respiratory diseases (Fig 3.13). In six mandals such as Gambhiraopet, Mustabad, Chendurthi, Inbrahimpatnam, Mallapur and Saidapur low (500-1000) and in the rest of the three mandals, namely Maidpalli, Kohed and Yellaeddipeta, very low (<500) prevalence of respiratory diseases is reported. All together in Karimnagar district, most of the mandals are experienced more than 1000 cases of respiratory diseases.

Poverty, low vitality, over-crowding, faulty nutrition, social customs like purdah, repeated pregnancy and child marriage, lack of timely and adequate medical aid and poor sanitation are some of the reasons responsible for the occurrence of respiratory diseases.

Spatial patterns of diseases related to Musculo skeletal system

Diseases related to bones of limbs, thoracic, pelvic and pectoral girdles are known as musculo-skeletal diseases. Arthritis, degenerative joint diseases, bone tumours, spondylitis, rheumatoid arthritis and fractures are included in this group. About 81,478 cases are found in Karimnagar district. Most of the mandals i.e., 21 mandals are exposed to very high (>2000) occurrence of
musculo-skeletal diseases in the district. These mandals are mostly belong to southern part of the district. Saidapur reported highest number of cases (2946) followed by Ellanthakunta, Konaraopet, Srirampur, Ramagundam, Kamanpur, Sulthanbad, Karimnagar, Manakondur, Thimmapur, Bejjanki, Ramadugu, Choppadandi, Husnabad, Jammikunta, Kamalapur, Elkathurthi, Kesavapatnam, Bimadevarapalli, Dharmapuri and Ibrahimpatnam mandals. High (1500-2000) concentration is observed in 9 mandals. And in about 29 percent of the mandals, spread all over the district moderate concentration of 1000-1500 cases is appeared. Here also major share of the mandals have reported more than 1000 cases of musculo-skeletal diseases (Fig 3.14). Low (500-1000) prevalence is registered in only six mandals and very low (<500) prevalence in the remaining 11 mandals of the district.

Spatial patterns of Skin Diseases

The type of diseases included in this group are dermatitis, allergic dermatitis, impetigo, itching, scabies, urticaria and abscess. During the study period, about 81,478 cases are recorded in Karimnager district under skin diseases. Husnabad reported highest number of cases (2370) in the district. The other mandals which come under very high concentration of skin diseases are Manakondur, Ramadugu, Kamalapur, Dharmapuri, Sarangapur, Metpalli, Peddapalli, Sulthanbad, Velgatoor, Dharmaram, and Julapalli. High concentration is (1500-2000) observed in 30 percent of the mandals, spread all over the district. In another 12 mandals moderate occurrence (1000-1500) is appeared. Low (500-1000) prevalence is found in 9 mandals, situated here and there (Fig 3.15).
SPATIAL PATTERNS OF DISEASES RELATED TO SKELETAL SYSTEM - 1999

LEGEND
(No. of Cases)

> 2000
1500 - 2000
1000 - 1500
500 - 1000
< 500

Fig. 3.14
KARIMNAGAR DISTRICT

SPATIAL PATTERNS OF SKIN DISEASES - 1999

LEGEND
(No of Cases)

> 2000
1500 - 2000
1000 - 1500
500 - 1000
< 500

Fig. 3.15
In the remaining six mandals namely Thimmapur, Jagtial, Ibrahimpatnam, Siricilla, Ellanthakunta and Mustabad, very low (<500) prevalence of skin diseases is experienced. It is inferred that most of the mandals are exposed to more than 1000 cases of skin diseases in the district. It is on account of widespread poverty and insanitary living conditions.

Spatial patterns of Sexually Transmitted Diseases

These are communicable diseases of sexual diffusion. Syphilis, gonorrhea and other venereal diseases are included under this group. During the year 1999, about 6,669 cases of sexually transmitted diseases are reported in Karimnagar district. Very high concentration (>200) is observed in four mandals i.e., Karimnagar (232) Elkathurthi (225), Ramadugu (224) and Kesavapatnam (212). In about 10 mandals high prevalence of STD cases (150-200), mostly confined to South-eastern part of the district. Moderate occurrence (100-150) is appeared in 21 mandals, which are spread all over the district. Nearly one-fourth of the mandals experienced low (50-100) prevalence and in the remaining seven mandals very low (<50) prevalence of STD cases is surfaced up (Fig 3.16).
KARIMNAGAR DISTRICT
SPATIAL PATTERNS OF SEXUALLY TRANSMITTED DISEASES - 1999

LEGEND
(No. of Cases)

> 200
150 - 200
100 - 150
50 - 100
< 50

Fig. 3.16