

Disease intensity with the help of GIS technology in the tribal area of Nashik district, Maharashtra (India).

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Abstract

Kendal's rating co-efficient approach is used to determine the severity of diseases. In a primary health centre, illness-specific morbidity rates are translated into fractions of the sum for particular disease. On the basis of these percentages, all primary health centres are arranged in decreasing order under the heading of each disease individually, and the percentage statistics are then translated into classes, i.e., each primary health centre is assigned a category of each disease (Suryawanshi D. S 2005). Finally, all of a primary health centre's ranks are added together. The number of diseases prevalent in that primary health centre is separated by the total of grades, and the overall rating co-efficient value is calculated with help of the diseases ranking co-efficient value of primary health centre. For demarcating the disease intensity region disease ranking co-efficient values RC1, RC2, RC3.....RCn are grouped into four classes according to quartiles. These classes are high intensity, moderately higher intensity, moderate intensity and low disease intensity.

Keywords: Disease Intensity, PHC ranking, Ranking co-efficient, Relief divisions.

Introduction

The tribal residents of the designated geographic area live in forested and steep terrain with limited access. One of the major public health issues confronting these indigenous populations is sickness. The Anthropological Survey of India [1] conducted studies on the prevalence and distribution of the illness trait, which can affect up to 35% of the tribes. According to studies, the prevalence of illness traits in the nation ranges from 10 to 40%. Due to changes in disease patterns, improvements in the infrastructure for nutrition and health, the elimination and control of major killer illnesses, and socioeconomic development, India has seen a significant epidemiological transformation since gaining its independence. But despite these health advancements, self-governance has only lasted for over 60 years. Due to widespread poverty, differences in state development, gender discrimination, an ageing population, and the inability of government initiatives to address the rural-urban divide in terms of health facility supply in the public and private sectors, the burden of disease is still significant [2].

Study Region

The study area is located in the north-western part of the Nashik District. It extends from 19° 44' 57" to 20° 43' 55" north latitudes and 73° 14' 05" to 73° 06' 57" east longitudes. Study

area covers an area of 4581.98 sq. km., which is 29.40 % of the geographical area of the district. It is surrounded by Deola and Chandwad tehsil in the east and the north-east, Gujarat state in the north, Palghar districts of Maharashtra State to the south-west, Igatpuri tehsil to the south [3,4]. It consists of 05 tehsils, namely Peint, Dindori, Surgana, Kalwan and Trimabkeshwar. The population of the region is 976092. It includes 760 villages and 40 PHC in Figure 1.

Objective

The primary goal of this study is to evaluate the disease intensity in the tribal of north-western part of the Nashik District. The following objectives are kept in mind in order to achieve the study's goal.

- 1) To study the infected by diseases in the primary health centers.
- 2) To analyze the disease intensity in the study region [5].

Material, Methods & Samplings

Statistical and cartographic techniques have been used for the research work to precise conclusions. The number of diseases prevalent in that primary health centre is separated by the total of grades, and the overall rating co-efficient value is calculated using the method below.

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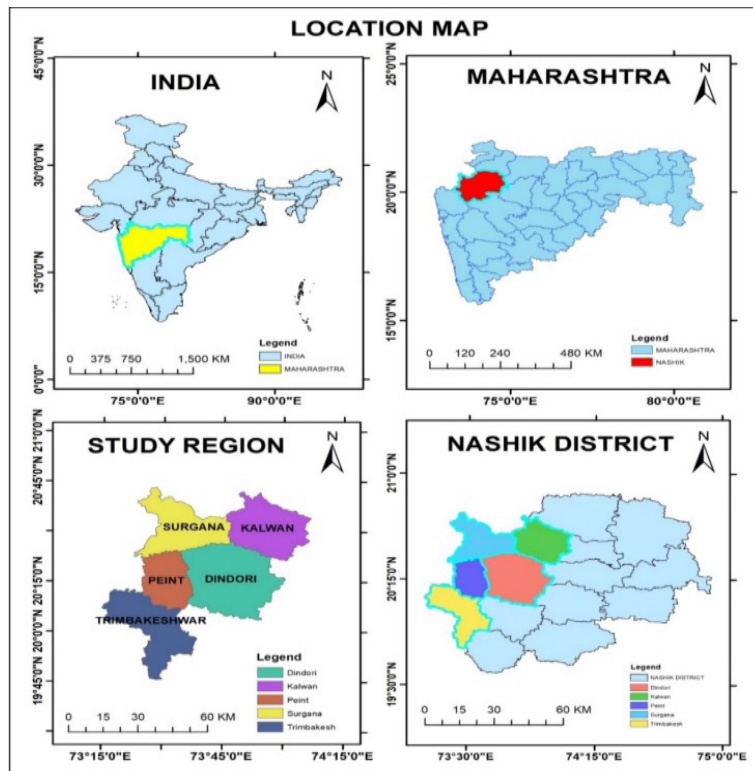


Figure 1. The population of the region.

$$RC_1 = \frac{Dr_1 + Dr_2 + Dr_3 + \dots + Dr_n}{N}$$

Whereas,

RC_1 = the diseases ranking co-efficient value of primary health centre 1

$Dr_1, Dr_2, Dr_3, \dots, Dr_n$ = are the ranks occupied by the primary health centre 1 for diseases $r_1, r_2, r_3, \dots, r_n$.

N = is the total number of diseases taken into consideration in a primary health centre.

For demarcating the disease intensity region disease ranking co-efficient values $RC_1, RC_2, RC_3, \dots, RC_n$ are grouped into four classes according to quartiles. These classes are given as follows.

- 1) **High Intensity:** Less than Q_1 (Less than 9.65)
- 2) **Moderately higher disease intensity:** Q_1 to Q_2 (9.65 to 14.44)
- 3) **Moderate disease intensity:** Q_2 to Q_3 (14.44 to 17.15)
- 4) **Low disease intensity:** More than Q_3 (More than 17.15)

It may be pointed out here that, the lower the ranking co-efficient values, higher the disease intensity and higher the ranking co-efficient value, the lower the disease intensity. A percentage of primary health centres categorized according to relief units and disease severity classes in order to consider the extent of disease incidence. Through the sample village survey, total of 115 villages are chosen, and 23 villages from the list of ITDP villages have randomly chosen in each tehsil. By using a probability proportional to the size of the various tribes, a total of 10 households (HHs) from each chosen village

have been covered. For this reason, households in each village are divided into groups based on tribe, and the necessary numbers of households from each tribe are included in the survey [6,7]. The poll is conducted over a 12-month period to capture seasonal change. Due to a lack of data, information on these factors at the tribal level could not be obtained directly from secondary sources, necessitating a detailed fieldwork in 115 villages and 1140 households.

Result and Discussion

Kendal's rating co-efficient approach is used to determine the severity of diseases. In a primary health centre, illness-specific morbidity rates are translated into fractions of the sum for particular disease. In the basis of these percentages, all primary health centres are arranged in decreasing order under the heading of each disease individually, and the percentage statistics are then translated into classes, i.e., each primary health centre is assigned a category of each disease. Finally, all of a primary health centre's ranks are added together [8,9]. The number of diseases prevalent in that primary health centre is separated by the total of grades, and the overall rating co-efficient value is calculated using the method. The goal of the current study was to ascertain the prevalence of illness intensity disorder among the tribal residents of the Nashik District and to calculate the disease's overall economic burden.

A study of disease ranking is highly valuable in determining the distributional pattern of disease in a given area since it gives a sense of the relative dominance of various diseases in order of importance [10]. In this study, diseases were ranked according to their relative strength, which was determined by the morbidity and infected area caused by each disease.

According to the total number of morbidity cases of hyper tension, dysentery, scabies, anemia, amoebiasis, fever, malaria, gastro, diarrhea, and malnutrition were the most common diseases in the research area. All of the diseases prevalent in the area are divided into four categories. The disorders in the first three orders are regarded as significant illnesses. Hyper tension, scabies, diabetes mellitus, malaria, diarrhea and typhoid are among the diseases covered [11, 12]. The disorders that fall into the fourth order have a moderate

level of morbidity. Intestinal disorders such as dysentery, leprosy, anemia, sickle cell, gastro and digestive diseases are among them. Other diseases account for a small percentage of morbidity cases (Table 1).

The Table 2 and Figure 2 show that diseases are more intense in areas over 400 to 500 meters in altitude. Figure 2 show that the ranking co-efficient in the tribal region is smaller, implying that disease incidence is higher in these areas. Diseases of a

Table 1. Tribal Tehsil of Nashik District: PHC wise disease rank intensity and ranking of PHC according to ranking Co-efficient.

PHC	Hyper Tension	Scabies	Diabetes Mellitus	Malaria	Typhoid	Diarrhea	Dysentery	Gastro	Leprosy	Gastritis	Anemia	Fungus	Sickle Cell	Fever	Malnutrition	Asthma	Amoebiasis	Hepatitis	Pneumonia	TB	Delivery	BP	RTA	UTI	Alcohol	Dengue	Sum of Ranks	Number of Disease	Rank of Co-efficient value	Ranks
Kulwandi	-	26	20	12	6	1	-	17	27.5	-	34	-	23	-	4	-	-	-	-	-	23	27	-	-	-	10	230.5	13	17.73	8
Jogmodi	21	35	28	22	13	21	10	13	15	-	-	-	5	-	9	2	1	-	-	-	22	25	-	-	4	-	246	16	15.38	18
Kumbhale	1	32	-	-	27.5	29	25	25	32	-	33	22	8	21	23	-	-	8	-	14	26	-	-	-	-	-	326.5	15	21.77	3
Ambe	12	19	13	2	4	24	-	-	-	-	23	-	-	-	5	5	19	-	-	13	1	13.5	1	-	-	-	154.5	14	11.04	36
Karanjali	30	33	21	21	-	16	-	8	22	-	31.5	4	2	2	16	-	-	-	-	-	-	20.5	-	13	-	-	240	14	17.14	10
Bhuawan	23	25	29	33	1	-	20	22	18	-	12.5	-	-	4	13.5	1	3	-	-	12	-	15.5	-	-	-	6.5	239	16	14.94	20
Kohar	-	34	30	1	22	14	12	18	21	8	35	-	11	16	20	6	17	-	-	-	3	-	10	12	3	-	293	19	15.42	17
Peint (RH)	-	7	-	14	11	26	7	11	24	3	16	19	-	-	-	9	11	6	3	-	-	-	18	-	-	3	181	17	10.65	38
Talegaon	8	16	6	27	9	-	8	-	16	-	21	-	-	20	31	21	-	2	-	-	4	-	20	1	-	-	210	15	14	28
Ware	5	40	2	25	-	27	13	26	29	-	-	17	13	-	35	-	-	11	-	2	5	19	-	8	12	-	289	17	17	12
Varkhede	26	1	-	23	12	31	22	14	25	5	29	-	-	18	37	7	9	-	-	-	15.5	-	14	-	-	-	288.5	16	18.03	6
Umrle	18	24	11	30	-	5	9	10	12	-	15	18	21	8	36	-	2	1	-	11	-	18	-	-	5	-	254	18	14.11	27
Nanashi	-	10	-	-	3	17	3	1	-	2	25	-	-	v	30	-	-	-	-	-	13	7	-	-	-	-	111	10	11.1	35
Nigdol	27	36	-	9	-	-	1	-	9	1	3	-	9	10	38	23	14	-	-	1	-	-	17	-	-	-	198	14	14.14	26
Mohadi	6	4	1	35	27.5	19	27	27	31	-	30	-	-	-	42	-	-	4	-	-	-	24	-	5	11	2	295.5	16	18.47	4
Pandhane	-	17.5	24	7	7.5	11.5	4.5	-	17	-	8	10	4	-	34	-	20	-	-	-	15.5	-	9	-	-	-	189.5	14	13.54	31
Khedgaon	31	2	-	20	10	25	32	16	27.5	6	-	-	-	-	39	24	15	-	5	3	-	-	-	-	-	-	255.5	14	18.25	5
Kochargaon	33	-	27	28	32	30	33	-	-	-	31.5	-	24	6	41	-	-	7	11	-	24.5	26	-	10.5	13	-	377.5	16	23.59	1
Dindori (RH)	2	38	3	36	30	28	21	28	30	12	20	23	18	19	40	16	27	-	-	-	21	-	16	-	-	-	428	19	22.53	2
Borgaon	14	11	16	19	-	8	23	9	-	-	7	8	19	-	19	22	6	-	-	9	-	20.5	19	-	-	-	229.5	16	14.34	24
Umbarthan	20	37	8	34	17	-	-	-	5	14	5	-	7	17	8	-	8	16	10	-	18	28	-	15	-	-	267	17	15.71	15
Barhe	24	31	9	31	25	20	28	20	4	15	-	15	-	5	17	20	-	-	-	-	-	-	-	-	9	6.5	279.5	16	17.47	9
Mani	28	29	-	37	31	6	19	23	7	-	6	16	3	-	2	-	4	14	13	-	7	22.5	8	6	-	-	281.5	19	14.82	21
Mankhed	-	17.5	14	-	14	-	4.5	-	3	11	22	14	-	1	1	13	-	-	-	5	-	-	-	9	6	-	135	14	9.64	40
Bubali	7	22	-	6	15	4	-	5	-	-	-	-	20	-	3	10	-	-	9	-	12	1	-	-	-	1	115	13	8.85	41
Surgana (RH)	3	41	5	29	29	-	36	-	26	19	28	2	25	3	32.5	17	7	17	-	-	14	-	2	14	8	-	357.5	20	17.88	7
Jaidar	-	14	18	5	-	3	-	4	10	-	1	-	-	12	26.5	-	24	15	8	-	20	6	-	-	-	-	166.5	14	11.89	33
Dalwat	9	23	12	32	-	-	14	-	-	7	19	3	1	-	32.5	18	-	-	-	-	-	17	6	-	-	5	198.5	14	14.18	25
Tirhol	25	39	-	8	2	18	2	6	14	13	-	13	-	22	29	-	25	12	-	15	24.5	22.5	-	-	-	-	290	17	17.06	11
Kanashi	17	5	10	-	16	-	6	3	-	-	24	-	-	-	13.5	-	-	-	2	6	-	10.5	-	-	-	-	113	11	10.27	39
Nandori	16	20	-	11	-	2	26	-	8	18	11	5	15	-	21	-	22	10	-	-	17	-	15	-	-	-	217	15	14.47	22
Umbargavhan	-	9	15	3	7.5	11.5	30	2	23	-	17	-	-	15	24	19	26	-	-	-	-	4.5	-	-	10	-	216.5	15	14.43	23
Otur	4	-	-	4	5	-	15.5	-	-	-	10	1	10	-	22	3.5	-	-	-	-	8.5	13.5	7	-	-	-	104	12	8.67	42
Mokhbhanga	-	27	26	17	26	22	24	21	1	10	-	9	-	9	26.5	-	21	18	7	7	-	15.5	-	16	7	9	319	20	15.95	14
Navi Bej	13	12	7	-	23	7	17	-	-	9	4	-	17	-	18	12	16	-	-	-	6	-	13	4	-	-	178	15	11.87	34
Abhona (RH)	29	30	17	15	-	15	-	19	19	16	27	12	16	7	11	8	23	13	4	-	8.5	3	12	-	-	-	304.5	20	15.23	19
Amboli	15	15	19	13	33	13	29	15	6	-	-	11	22	-	25	-	18	9	-	-	19	12	4	-	2	-	280	18	15.56	16
Chinchohal	19	13	23	24	18.5	-	34	12	-	21	18	-	12	14	10	3.5	-	5	6	10	-	8	-	7	-	8	266	19	14	29
Shirasgaon	32	6	25	16	18.5	10	-	7	11	-	-	6	-	-	12	-	12	-	12	-	10	4.5	-	3	-	-	185	15	12.33	32
Thanapada	10	28	-	26	24	9	18	-	20	20	12.5	7	6	-	7	14	10	-	-	8	-	10.5	5	-	-	-	235	17	13.82	30
Rohile	-	3	-	18	-	-	31	-	2	-	2	-	-	13	15	-	-	3	1	16	11	2	-	2	1	-	120	14	8.57	43
Girnare	11	8	4	10	21	-	15.5	-	-	4	26	21	-	-	6	15	13	-	-	-	2	-	3	-	-	4	163.5	15	10.9	37
Trimbak	22	21	22	-	20	23	35	-	13	17	9	20	14	11	28	11	5	-	-	4	-	9	11	10.5	-	-	305.5	19	16.08	13

Table 2. Tribal Tehsil of Nashik District: Disease Intensity According to Relief Divisions (Figures in %).

Relief Division	No. of PHC	Higher intensity Less than Q1	Moderately high (Q1-Q2)	Moderate Intensity (Q2-Q3)	Low Intensity (More than Q3)
300 to 400 m.	04	-	75	25	-
400 to 500 m.	07	14.28	14.28	42.85	28.57
500 to 600 m.	04	-	25	50	25
600 to 700 m.	18	11.11	33.33	22.22	33.33
More than 700 m.	10	10	50	40	-

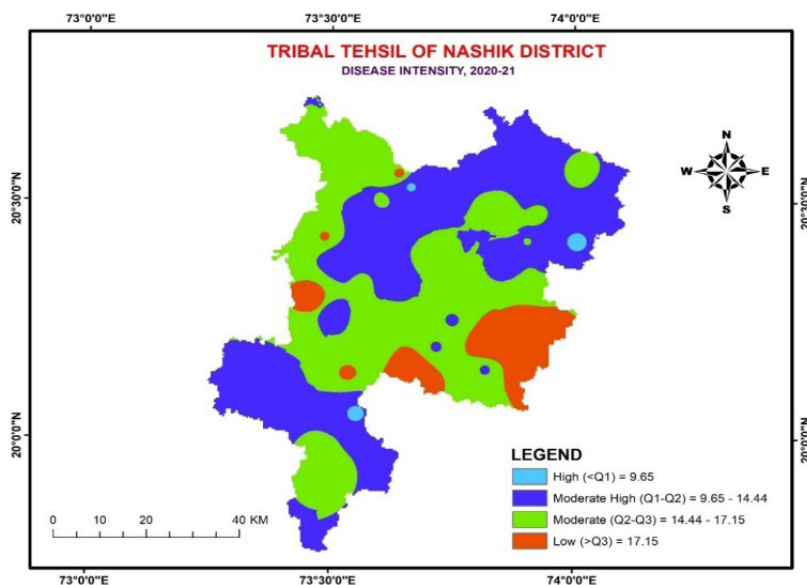


Figure 2. The ranking co-efficient in the tribal region.

large incidence can often be seen in high-lying regions with an altitude of 600 to 700 meters. Around a quarter of the disease severity is in this region [13]. The More than 700 m. altitudinal area often suffers from high intensity illness, according to a 10% rating co-efficient. This indicates that this area has a large prevalence of diseases. Since the current area is upland or mountainous in nature, disease incidence seems to be somewhat consistent. This explains why diseases are bound to strike the tribal areas of Nashik district.

The Varkhede and khedgaon primary health center’s service area is located in a lower altitudinal region, with a higher concentration of population, a high degree of crowding, and an unhygienic way of life, all of which contribute to the spread of contagious diseases such as scabies. Nigdol and Nanashi receive a significantly higher amount of rainfall [14,15]. As a result, the occurrence of dysentery is clearly increased in this primary health center. Tirhol and Mankhed, on the other hand, are located in a high mountainous area. The area was meant to be densely forested, but due to illegal deforestation, it has become barren, causing an ecological imbalance. Fever may develop in the affected area as a result of the disease.

The region is primarily affected by intestinal infectious disorders such as diarrhea, typhoid, gastro, and amoebiasis. Amoebiasis is found in every corner of the world and is one of the most common health concerns among tribal people in the research region, with a much higher incidence rate. The reasons for the high occurrence rate of amoebiasis in these locations are clear: contaminated water, tribals’ unclean habits, ingestion of raw vegetables and meals, and so on [16].

Conclusion

The measure of illness intensity aids in determining the degree of disease prevalence in a given location. The intensity of diseases in the studied region is often high due to unfavorable physio-socio-economic variables. The illness intensity explanation demonstrates that the study area is prone to a variety of diseases. They are also classified according to how much of the world they infect. According to this classification, hyper tension, scabies, diabetes mellitus, and malaria are more common in areas with a population of more than 36%. More than 30% of the area is infected with typhoid, dysentery, diarrhea and gastro. Other diseases that cover less than 30% of the overall geographical region may also be considered important. These ailments include anemia, fungus, sickle cell, malnutrition and asthma problems. Those diseases are span less than half of the study area, while not widespread; have concentrated impacts in a few pockets.

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