

Panchayat Wise Cancer Mapping in Kannur District, Kerala: Using Geographical Information Systems

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Abstract

Objective: The aim of this study is to check the spatial distribution of cancer reported in a cancer centre through geographical information systems (GIS) and compare cancer reporting across a large geographical area using hospital based data.

Results & Discussion: Data from the research centre for the two years 2010 and 2011 are used for this study. Various visualization techniques, exploratory data analysis and spatial analysis were employed to map and analyze these data. Data analyses revealed the association between different factors and a significant variation across the areas.

Conclusions: This study shows the possibility of using geographic information systems successfully to investigate cancer rates. The output of this study can be used to implement different health planning policies and control the disease cancer.

Keywords

Cancer, Geographic Information Systems, Geographic Visualization, Spatial Analysis

Introduction

The mapping of disease incidence and prevalence has long been a part of public health,

Epidemiology and the study of disease in human populations (Koch, 2005). In the last decade, we have seen an explosion of interest in disease mapping, with the recent developments in advanced spatial statistics and the increasing availability of computerized geographic information system technology [1]. In this study, we focus to identify the high risk area of cancer among Kannur district, Kerala. Geographic Information System (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data. A GIS can be thought of as a system that provides spatial data entry, management, and retrieval, analysis, and visualization functions. Linking location to information is a process that applies to many aspects of business such as choosing a site, targeting a market, planning a distribution network or delivery route, drawing up sales territory and allocating resources [2]. GIS has been used by epidemiologists to investigate associations between environmental factors and the spatial distribution of cancer incidence. GIS can apply in Health related areas to identify and locate high risk areas of different disease. It would help the administration to implement different policies to control diseases. Cancer is not a notifiable disease in India and hence notification of cases is voluntary. So that the exact number of cancer cases or cancer mortality is not available. Here we targeted one district and divided the total area into panchayath and municipalities. The main objective of the study was to check the feasibility of using GIS in mapping and using the method whether it is possible to detect any particular region with high incidence of cancer. It is also attempted to find the possibility of comparing the cancer rates between panchayaths and municipalities.

Material and Methods

All cancer cases reported at Malabar Cancer Centre (MCC) in Kannur district for the years 2010 and 2011 were used for this study. This information was converted to a database file for use in the GIS software. Geocoding was performed Panchayath/Municipality wise and matched 3213 unique patient records with their respective Panchayath/Municipality. Kannur district

contains around 81 panchayaths (Local governance in Kerala) and 6 municipalities. A spatial evaluation of case series from medical records was done among the malignant cases registered at the Centre. All the maps were geo-referenced to real world coordinate system with respect to known reference point based on geographic latitude and longitude. Geographic mapping analysis was performed by using Epi Info 7 software. Epi Info 7 is a popular free software tool for public health practice. It is a public domain suite of software tools designed for the global community of public health practitioners and researchers. It provides for easy data entry form and database construction, a customized data entry experience, and data analyses with epidemiologic statistics, maps, and graphs for public health professionals who may lack an information technology background. Epi Info is used for outbreak investigations; for developing small to mid-sized disease surveillance systems; as analysis, visualization, and reporting (AVR) components of larger systems; and in the continuing education in the science of epidemiology and public health analytic methods at schools of public health around the world. We created three maps based on the three sets of data collected namely total cancer cases reported, breast and Lung cancer cases reported.

Result

Spatial distribution maps of malignant cases were plotted by using data recorded during 2010 and 2011 in the MCC cancer Registry. The first figure shows the total cancer cases reported at the centre from the Kannur district in 2010 and 2011. The second and third figures (Figure 2&3) show the breast cancer and lung cancer cases respectively from the same district. Table 2 provides the panchayath/Municipality wise and sex wise cancer cases reported at the centre. It also provides the panchayath/municipality wise breast and lung cancer reported. The nine leading sites of cancer in panchayaths and municipalities are given in table 1. In Panchayaths lung and breast are the leading sites with only 1% variation. But in municipalities breast is the leading one followed by lung with a 5% variation. It was reported 7% mouth cancer patients from panchayaths, but only 3% cases reported from municipalities. In panchayath mouth is the third leading site and cervix is the third

leading site in municipalities. In the maps the radius of the circle indicates the number of cancer cases reported from that area.

Table 1: Leading cancers in panchayats and municipalities.

site	Panchayat	Municipality
Lung	15%	11%
Breast	14%	16%
Mouth	7%	3%
Cervix Uteri	4%	6%
Tongue	4%	5%
Ovary	4%	4%
Rectum	4%	5%
Thyroid	3%	3%
Corpus uteri	2%	3%

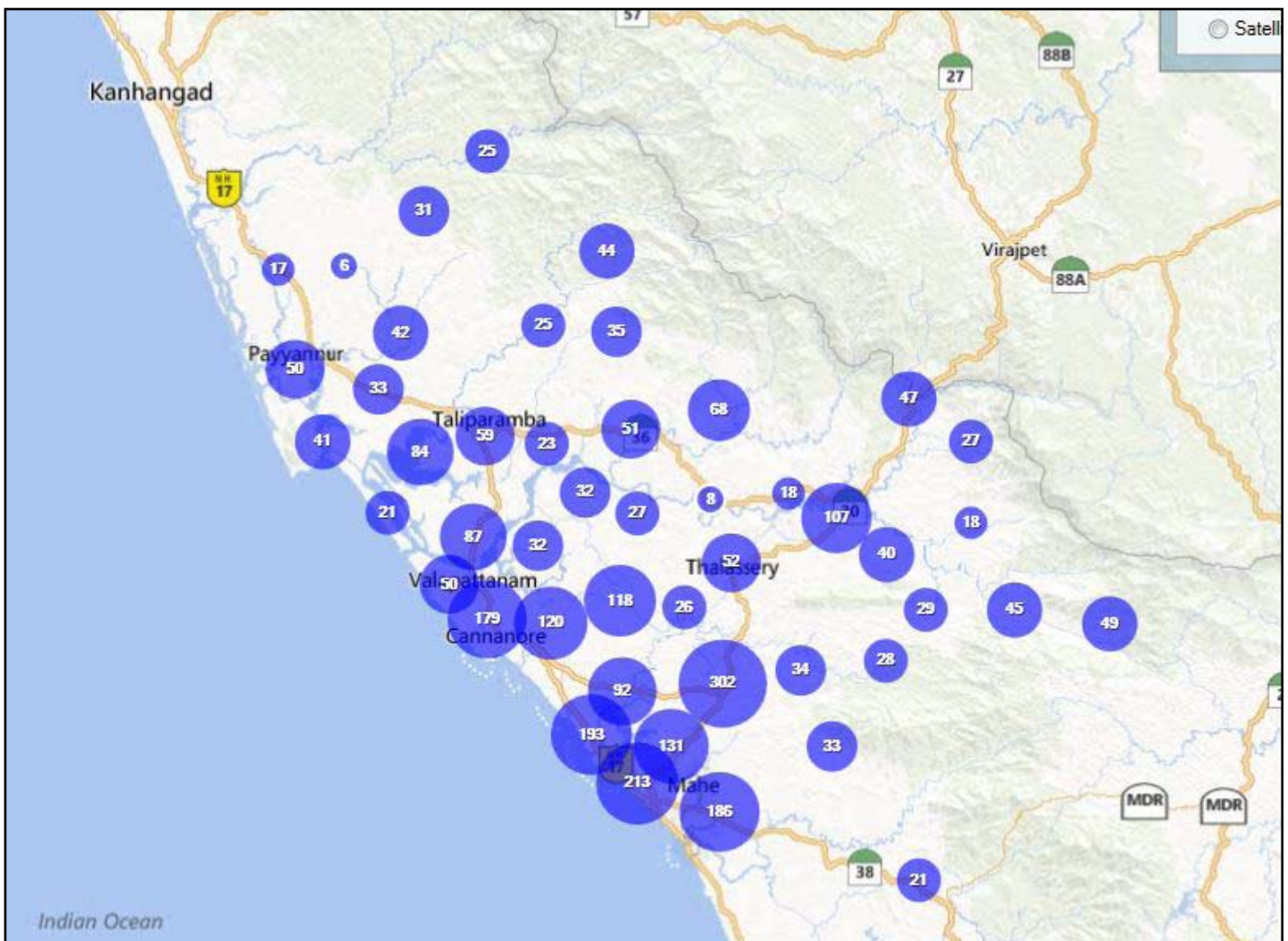


Fig.1: Total Cancer Cases reported

Table2: Panchayatwise report for cancer reported.

AREA	Male		Female		Total	Breast		Lung	
	#	%	#	%		#	%	#	%
THALASSERY MUNICIPALITY	96	45%	117	55%	213	39	8.7%	19	4.1%
KUTHUPARAMBA MUNICIPALITY	55	60%	37	40%	92	13	2.9%	8	1.7%
EDAKKAD	44	50%	44	50%	88	15	3.3%	14	3.0%
KANNUR MUNICIPALITY	50	59%	35	41%	85	16	3.6%	13	2.8%
KEEZHUR CHAVASSERY	48	59%	34	41%	82	8	1.8%	11	2.4%
PANOOR	29	43%	39	57%	68	12	2.7%	8	1.7%
ERANHOLI	34	52%	32	48%	66	13	2.9%	7	1.5%
KADIRUR	39	60%	26	40%	65	5	1.1%	10	2.2%
DHARMADAM	33	52%	30	48%	63	8	1.8%	6	1.3%
KUNNOTHPARAMBA	35	56%	27	44%	62	5	1.1%	8	1.7%
PINARAYI	35	56%	27	44%	62	10	2.2%	14	3.0%
THALIPARAMBU MINICIPALITY	33	56%	26	44%	59	3	0.7%	6	1.3%
CHOCKLI	27	47%	31	53%	58	10	2.2%	5	1.1%
CHIRAKKAL	23	40%	34	60%	57	12	2.7%	7	1.5%
MANGATTIDAM	24	44%	31	56%	55	9	2.0%	8	1.7%
VENGAD	29	55%	24	45%	53	5	1.1%	5	1.1%
MATTANNUR MUNICIPALITY	26	50%	26	50%	52	8	1.8%	9	1.9%
AZHIKODE	21	42%	29	58%	50	11	2.4%	8	1.7%
ANJARAKANDY	30	61%	19	39%	49	5	1.1%	8	1.7%
ELAYAVOOR	26	53%	23	47%	49	9	2.0%	6	1.3%
PAYAM	25	53%	22	47%	47	6	1.3%	7	1.5%
ALAKKODE	31	70%	13	30%	44	7	1.6%	8	1.7%
NADUVIL	23	53%	20	47%	43	7	1.6%	6	1.3%
MUZHAPPILANGAD	18	43%	24	57%	42	7	1.6%	7	1.5%
CHENGALAYI	23	56%	18	44%	41	6	1.3%	10	2.2%
KALLIASSERY	22	54%	19	46%	41	5	1.1%	5	1.1%
PATTIAM	19	48%	21	53%	40	5	1.1%	3	0.6%
PAYYANNUR MUNICIPALITY	20	51%	19	49%	39	6	1.3%	5	1.1%
CHERUKUNNU	22	58%	16	42%	38	3	0.7%	6	1.3%
PAPPINISSERY	13	34%	25	66%	38	8	1.8%	4	0.9%
KOODALI	25	68%	12	32%	37	4	0.9%	7	1.5%
CHEMBILODE	20	56%	16	44%	36	5	1.1%	8	1.7%
MALUR	17	49%	18	51%	35	6	1.3%	6	1.3%
CHELORA	15	43%	20	57%	35	7	1.6%	4	0.9%
CHITTARIPARAMBA	22	65%	12	35%	34	5	1.1%	5	1.1%
KOTTAYAM	22	65%	12	35%	34	5	1.1%	5	1.1%
THRIPPANGOTTUR	20	61%	13	39%	33	0	0.0%	10	2.2%
MAYYIL	18	56%	14	44%	32	2	0.4%	7	1.5%
EZHOME	15	47%	17	53%	32	11	2.4%	2	0.4%
KELAKAM	19	61%	12	39%	31	5	1.1%	5	1.1%
PERINGOME-VAYAKKARA	17	55%	14	45%	31	2	0.4%	6	1.3%
MUNDERI	16	52%	15	48%	31	4	0.9%	6	1.3%
PERALASSERY	13	43%	17	57%	30	3	0.7%	4	0.9%
KOLACHERI	22	76%	7	24%	29	1	0.2%	5	1.1%
KOTTIYOOR	18	62%	11	38%	29	1	0.2%	4	0.9%
PANNIYANNUR	16	55%	13	45%	29	5	1.1%	5	1.1%
PERAVOOR	12	41%	17	59%	29	6	1.3%	3	0.6%

PARIYARAM	19	68%	9	32%	28	0	0.0%	8	1.7%
KUTTIATTUR	16	57%	12	43%	28	1	0.2%	4	0.9%
MADAYI	12	43%	16	57%	28	4	0.9%	1	0.2%
KOLAYAD	11	39%	17	61%	28	5	1.1%	3	0.6%
KARIYAD	14	52%	13	48%	27	4	0.9%	2	0.4%
AYYANKUNNU	12	44%	15	56%	27	4	0.9%	4	0.9%
NARATH	12	46%	14	54%	26	6	1.3%	5	1.1%
KEEZHALLUR	11	42%	15	58%	26	4	0.9%	5	1.1%
CHAPPARAPADAVU	13	52%	12	48%	25	3	0.7%	3	0.6%
ERUVESY	13	52%	12	48%	25	3	0.7%	1	0.2%
CHERUPUZHA	12	48%	13	52%	25	5	1.1%	2	0.4%
ULIKKAL	10	40%	15	60%	25	7	1.6%	5	1.1%
MUZHAKKUNNU	15	65%	8	35%	23	2	0.4%	5	1.1%
KURUMATHOOR	13	57%	10	43%	23	2	0.4%	4	0.9%
PAYYAVOOR	13	57%	10	43%	23	5	1.1%	6	1.3%
IRIKKUR	13	59%	9	41%	22	0	0.0%	6	1.3%
ERAMAM KUTTUR	9	41%	13	59%	22	4	0.9%	3	0.6%
MOKERI	15	71%	6	29%	21	2	0.4%	6	1.3%
MATTOOL	11	52%	10	48%	21	2	0.4%	4	0.9%
KADANNAPPALLY PANAPPUZHA	18	90%	2	10%	20	0	0.0%	6	1.3%
PERINGALAM	14	70%	6	30%	20	3	0.7%	3	0.6%
SREEKANDAPURAM	12	60%	8	40%	20	1	0.2%	3	0.6%
KOTTIYUR	8	40%	12	60%	20	3	0.7%	2	0.4%
PALLIKKUNNU	10	53%	9	47%	19	4	0.9%	1	0.2%
ARALAM	12	67%	6	33%	18	0	0.0%	1	0.2%
PADIYOOR	10	56%	8	44%	18	1	0.2%	2	0.4%
KARIVELLUR PERALAM	13	76%	4	24%	17	2	0.4%	3	0.6%
KADAMBOOR	11	69%	5	31%	16	1	0.2%	6	1.3%
NEW MAHE	9	56%	7	44%	16	4	0.9%	3	0.6%
THILLANKERI	9	56%	7	44%	16	1	0.2%	3	0.6%
KANICHAR	11	79%	3	21%	14	0	0.0%	2	0.4%
PATTUVAM	7	50%	7	50%	14	0	0.0%	2	0.4%
RAMANTHALI	7	50%	7	50%	14	1	0.2%	2	0.4%
KANNAPURAM	4	31%	9	69%	13	3	0.7%	2	0.4%
PUZHATHI	7	58%	5	42%	12	2	0.4%	2	0.4%
KUNHIMANGALAM	8	73%	3	27%	11	0	0.0%	1	0.2%
MALAPPATTAM	5	50%	5	50%	10	4	0.9%	0	0.0%
UDAYAGIRI	7	78%	2	22%	9	1	0.2%	1	0.2%
CHERUTHAZHAM	4	44%	5	56%	9	0	0.0%	0	0.0%
VALAPATTANAM	6	75%	2	25%	8	1	0.2%	1	0.2%
PALLIKKUNNU	5	71%	2	29%	7	2	0.4%	0	0.0%
CHELERY	3	43%	4	57%	7	3	0.7%	2	0.4%
PERINGATHUR	3	43%	4	57%	7	0	0.0%	2	0.4%
KODIYERI	4	67%	2	33%	6	2	0.4%	1	0.2%
KANKOL ALAPPADAMB	3	50%	3	50%	6	0	0.0%	0	0.0%
PANNIYANNUR	1	50%	1	50%	2	0	0.0%	1	0.2%
KOODALI	0	0%	1	100%	1	0	0.0%	0	0.0%
CHUNGAKKUNNU	0	0%	1	100%	1	0	0.0%	0	0.0%
THILLANGERI	0	0%	1	100%	1	0	0.0%	0	0.0%

Discussion

The purpose of this publication is to assist health authority by providing a reference document that focuses on digital mapping aspect when conducting health related projects and planning. People have used maps for centuries to represent their data and other correlated factors. Maps are used to show locations, distances, directions and the size of areas. Maps also display geographic relationships, differences, clusters, patterns, and disease accumulated areas. Now maps are indispensable tool for academic and research activities. GIS now plays a key role in disease data dissemination and in the analysis of the data. In this study we plotted the total cancer cases reported in 2010 and 2011 from Kannur district in area wise. The total area under Kannur district was divided into panchayath and municipalities on non-overlapping basis. Panchayats are more rural while compared with municipalities. Kerala Panchayat Raj Act & The Kerala Municipality Act in the year 1994 laid the provision of a three tier system of Panchayat for the first time in the village, block and district level in the rural areas and one tier system of urban local government such as Municipality in the less urbanized areas or Municipal Corporation in the more urbanized areas. Local Governments were vested with the powers and responsibilities of economic development and social justice in their respective areas. Panchayats and the Municipalities altogether constitute the Local Government System of Kerala state in the Indian federal system [http://en.wikipedia.org/wiki/Local_governance_in_Kerala]. In the present study we considered panchayath as rural and municipalities as urban areas and the comparison has been done based on rural and urban areas. According to the output of this study it was clear that in urban areas cancer cases were more compared with rural areas. It supported that that lifestyle, habits and environmental interventions are the main risk factors of the disease cancer. Primary prevention through lifestyle and environmental interventions might offer the best option for reducing the large and increasing burden of cancers worldwide. Policies and programs to implement such interventions depend on reliable and comparable analyses of the effect of risk factors for cancer at the population level [3]. Factors that contribute to regional differences in the types or burden of cancer include regional variations in the prevalence of major risk factors, availability and use of medical practices such as cancer screening, availability and quality of treatment, and age structure [4]. The type of cancer and the staging of cancer will reflect to a certain extent, some basic characteristics of the society. There was a huge variation between rural areas and urban areas on the food habits of people. Urban people are more associated with fast food systems while compared with rural. Our study showed that the number of cancer cases reported from urban areas was different from that of rural areas. Such disparities would reflect regional differences in the prevalence, life style and environmental factors. Therefore different policies should be adopted in different areas to control cancer. In urban areas, the prevalence of lung cancer, breast cancer and cervix cancer were the leading cancers. While in rural areas Lung, Breast and Mouth was the leading sites of cancer.

Conclusions

The outcomes of this study have produced a map showing the geographical distribution of cancer reported at a cancer research Centre in Kannur district. These maps have also provide the spatial variations on cancer reported. According to the results of this study, environmental factors as well as life style could also be responsible

for incidence of cancer. This study strongly recommended the need of health oriented programs aiming to lowering the cancer risk.

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