ORIGINAL ARTICLE - PUBLIC HEALTH

SPATIAL AUTOCORRELATION OF BREAST CANCER INCIDENCE AND ITS RELATION WITH HUMAN DEVELOPMENT INDEX IN TAMIL NADU: AN ECOLOGICAL STUDY

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Abstract

INTRODUCTION : Breast cancer is the most common cancer in Tamil Nadu followed by cervical cancer. Spatio-ecological patterns of breast cancer incidence provide us the frame work to understand the association of various socio-economic factors in Tamil Nadu.
AIM : To find the spatial autocorrelation of breast cancer incidence in Tamil Nadu.
To find the association between breast cancer incidence and Human developmental Index in Tamil Nadu.
METHODS : Univariate Moran's I and LISA Maps were used to find spatial autocorrelation of Breast cancer Incidence in Tamil Nadu based on the data from Tamil Nadu Cancer Registry Project. Ordinary least square method was used to find the association between Breast cancer incidence and Human Development Index, Number of government oncological institutions, private oncological institutions.
RESULTS : The univariate Moran's I for Breast cancer incidence is 0.037(p<0.05). The Breast cancer incidence occurs in specific cluster. The incidence for breast cancer positively correlated with Human Developmental Index (Coeff = 29.99, P=0.021), Number of Government oncological Institution (Coeff= -1.22, P=0.00217). The Adjusted R square is 51.1% for this Model. This model explains about the 51% variability in dependent variable (crude incidence of Breast cancer) by independent variables.
CONCLUSION : The Human Development Index is the better predictor for Breast cancer incidence in Tamil Nadu. In high HDI districts Government should focus on life style modifications like strategies to reduce obesity. In low HDI districts Government should focus on increasing new Government institutions to find a greater number of new cases. Government should focus on making policies to ensure the above factors.
KEY WORDS : Breast cancer incidence, Human Developmental Index, cancer cluster

INTRODUCTION

In India breast cancer prevalence were estimated to be 2 lakhs of total cancer burden which contribute about 14% of the total cancers. Cancer breast and cancer uteri were the most common cancer among women in India.[1] In Tamil Nadu most common cancer among women is Breast cancer (Crude incidence rate = 25.5 per lakh population) followed by cervical cancer.[2] Geographic clustering of cancer helps to identify shared exposures of individuals with cancer in small areas, which will facilitate hypothesis generation about the potential role of environmental exposures or shared behaviors by the people in local areas.[3,4]

The incidence of breast cancer increases with the Human developmental index. The reason for high breast incidence was due to westernization, life style changes, age of child birth, reproductive and hormonal factors, obesity, alcohol ,smoking and at the same time there is a better opportunity for screening facilities, more health seeking behavior, good knowledge about disease.[5,6,7,8,9] So there is a relationship between Human developmental Index and Breast cancer incidence globally. In this study we analysed the cancer clustering and the relationship between Human Developmental Index of different districts and breast cancer incidence in Tamil Nadu.

SUBJECTS AND METHODS

It is a secondary data analysis of breast cancer crude incidence based on the data from Tamil Nadu Cancer Registry Project. Tamil Nadu Cancer Registry Project is a collaborative study by the Cancer Institute (W.I.A) and Department of Medical and Family Welfare, Government of Tamil Nadu, Chennai. It covered entire Tamil Nadu population of about 80million as on 2017, the highest in the world by any cancer registry.

The Human Development Index (HDI) is an average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions. The HDI for all districts in Tamil Nadu was calculated by state planning commission based on the United Nation development programme.[10]

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Univariate Moran's I was used to find the spatial autocorrelation of Breast cancer crude incidence in Tamil Nadu. Ordinary least square method was used to find the association between Human Development Index, Number of government and private oncological institutions and breast cancer incidence. The Number of government and private oncological institutions list were taken from the official website of Chief Minister's Comprehensive Health Insurance Scheme.[11] The choropleth map was generated using Q GIS 3.30.2 and Moran's I and LISA maps were created using Geo Da software.

RESULTS :

The choropleth map of Tamil Nadu was used to visualize the crude incidence rate of breast cancer, Human Developmental Index, Government and Private oncological institutes in Tamil Nadu.
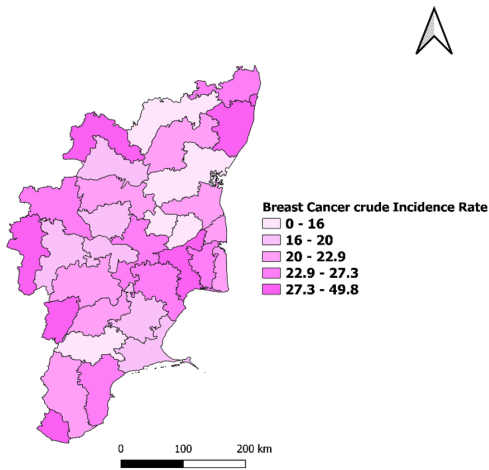

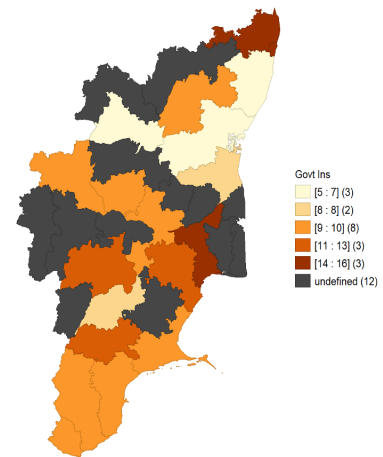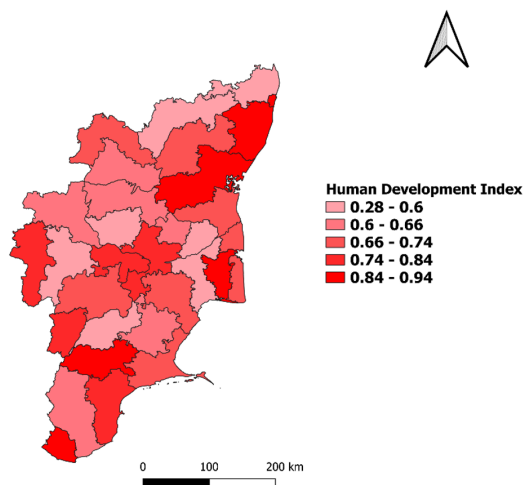*Figure 1: Breast cancer crude Incidence rate in Tamil Nadu*

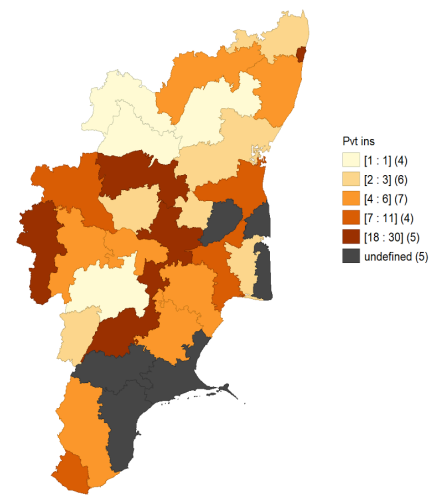*Figure 3: Government Oncological Institutions in Tamil Nadu*

Figure 4: Private Oncological Institutions In Tamil Nadu

The univariate Moran's I for Breast cancer incidence is 0.037(p<0.05) (Fig 5). The Breast cancer incidence occurs in specific cluster. The incidence for breast cancer positively correlated with Human Developmental Index (Coeff = 29.99, P-0.021), Number of Government oncological Institution (Coeff= -1.22, P=0.00217). The R square is 60.9%,Adjusted R square is 51.1% for this Model (Table 1). This model explains about the 51% variability in dependent variable (crude incidence of breast cancer) by independent variables.
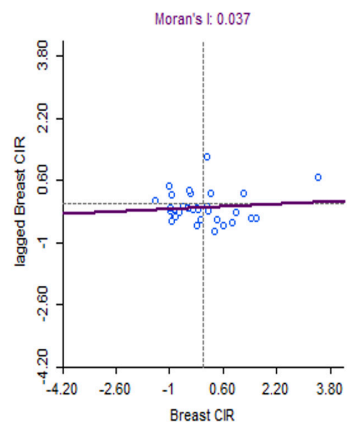

Figure 5: Moran's Scatter plot for spatial clustering of breast cancer incidence

Table 1: Ordinary least square regression

Variable	Coefficient	P-value
HDI	29.9979	0.02165
Govt Institutions	1.22459	0.02172
Private Institutions	0.35773	0.12829

DISCUSSION

The breast cancer incidence in Tamil Nadu occurs in specific clusters. The districts with high Breast cancer incidence were surrounded by other districts having high Breast cancer incidence. The Breast cancer incidence was positively associated with Human Development Index. This result suggests that districts with high cancer incidence on average have neighbours with high Human Development Index. If the HDI of district high means there is a better health service utilization, good knowledge about the disease and better standard of living. So, people in the districts with high HDI utilize breast cancer screening, early approach to the health facilities for treatment and at the same time they were predisposed to sedentary life style, obesity which are considered as the risk factors for the breast cancer. The breast cancer incidence is positively associated with the number of government institutions, this shows that the Government institutions are actively participating in finding case through proper screening.

CONCLUSION

The Human Development Index is the better predictor for Breast cancer incidence in Tamil Nadu. In high HDI districts Government should focus on life style modifications like strategies to reduce obesity. In low HDI districts Government should focus on increasing new Government institutions to find a greater number of new cases. Government should focus on making policies to ensure the above factors.

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