7. Executive Summary

Introduction

Public health is a public good. Select government health departments at all levels from central to state, from metro-urban-rural necessarily have the chief and central responsibility for protecting, maintaining and improving public health. This responsibility includes prevention and control of communicable and non-communicable diseases particularly in this century the cancer – a chronic disease that will affect all sectors of the society. Adverse effects of modern lifestyle and economic policies on welfare and health have become more evident in this century particularly following the economic crisis that began in the second half of the first decade in developed-developing-underdeveloped countries. As a result, WHO assessed the alarming situation throughout the world and are now becoming more inclined to accept their central responsibility for the protection of the public especially from cancer. Medical approaches will remain essential to screen for, to detect and to treat diseases but, by their nature, cannot deal with the underlying and basic social, economic and environmental, causes of diseases such as cancer. The present study, focuses on breast cancer – a major cancer for women in Southern parts of Karnataka.

Background

Breast cancer is now the most common cancer in metropolitan cities and second most common in the rural areas. Recently, Bangalore of Karnataka state has documented the highest breast cancer incidence and is known as the Breast Cancer Capital of India. Breast cancer is a nonexistent entity for a majority of population till a near and dear one suffers from it. Health care is not a priority and even in cities screening for cancer is an “alien” word. Naturally, this results in most women present only when symptomatic (usually Stages 3 and 4). So, the breast cancer patients do not tend to survive for longer time as their western counterparts. These above mention points, are directing into one necessity screening for breast cancer. In the absence of a nationwide cancer registration system, sporadic epidemiological study does provide additional useful information on risk areas and risk groups for targeting screening interventions and every region has its own unique pattern of cancer. Thus, the study is a knowledge exploration of breast
cancer using the spatio-temporal modelling and intelligent techniques for better policy generation and decision making for control of breast cancer in Southern Karnataka.

**Data and Methodology**

Data for the present study was collected retrospectively from major cancer hospitals in Southern Karnataka (Chamrajnagar, Hassan, Kodagu, Mandya and Mysore). A total of 1090 Breast cancer incidences were collected and details of socio-demographic and clinical details were noted. The cancer data with address were geocoded using Trimble Juno SA handheld DGPS for Mysore city and remaining Latitude and Longitude values were collected from the respective district NRDMS centre. This data were imported to ArcGIS for preparation of thematic maps. Risk factors associated with breast cancer were modelled using SPSS software. High end statistical models like General Linear Model, Probability Mapping and Age Adjusted Breast Cancer Incidence rate were coupled into GIS environment and were used to assess risk areas and risk factors to make a decision for breast cancer care and support. The data were checked for errors and non erroneous data were re-entered according to needs and specifications of each chapter in Section 5.0

**Results**

The present study has been undertaken to assess the status of breast cancer in Southern Karnataka using appropriate spatial and statistical modelling approaches.

In Section 5.1, the geo coded spatial breast cancer distribution thematic map was prepared based on the retrospective breast cancer incidence data along with female population data obtained from 2011 Census. In the second part of Section 5.1, the temporal changes of breast cancer incidence maps were prepared. Both maps highlighted high risk regions spatially and temporally.

In Section 5.2, we introduced a multivariate statistical technique (multinomial logistic regression to enumerate the risk factors which are responsible for the occurrence of breast cancer in this region based on the socio-economic status (Income groups) and rest as independent variables (Table 5.2.6). The results are encouraging and revealed that age, educational status, family, parity, occupation plays a significant role for breast cancer incidences. The results of
Multinomial logistic regression were incorporated in ArcGIS and breast cancer risk maps for different socio-economic groups of southern Karnataka was prepared. This approach adopted in the present study revealed that there exists an Urban-Rural and Socio-Economic disparity in breast cancer occurrences and may be applied to any region but the results are restricted to Southern Karnataka only.

In Section 5.3, an Age Adjusted Breast Cancer Incidence map for Mysore district of southern Karnataka was prepared as a map. Breast cancer occurs during the onset of menopause i.e. between the age group 45 to 49 years in India, with the aim to identify the location of same age group individuals for every one lakh population. The result highlights the age standardization for Mysore district and most of the cases are reported (i.e. 83.5%) in Mysore region. Validation of specific age groups call for more regional and age base surveys to support our study.

In Section 5.4, General Linear Model was attempted to predict the age at risk for different socio-economic factors (Table 5.4.1) and to generate a breast cancer risk variation map. Statistical software STATGRAPH was used to develop the General Linear Model and results were incorporated in ArcGIS software and interpolation techniques like Kriging were applied. The age at risk and its geographical variation depicted more insightful conclusions to breast cancer visualisation.

In the final section, Section 5.5 Probability Mapping method was done using ‘R’ software and the results were used in the prediction and forecasting the probability of breast cancer for small regions in the study area using regional counts. Probability map visualises the areas as high moderate and low risk of breast cancer based on the small area estimates and rates calculated for Southern Karnataka.

Conclusion

From the overall study, it is observed that Breast cancer incidence increased gradually with time. Under the influence of socio economic variables the specific age at risk for women also decreased with time. The cancer risk variation in accordance with the age of diagnosis or incidence is possibly more continuous for younger age groups than the older women. It is believed that cancer risk varies more continuously than the cancer incidence rate and that spatial
regression revealed relatively strong socio economic influences when compared with the incidence alone. Also the proximity of higher socio economic groups with the urban zones was observed in the reported populations. The spatial cancer models were determined and validated for the inclusive risk of social economic variable on the age at risk for the urban -rural gradient. The models are based on the non- homogeneous nature of the cancer data. It is demonstrated that the risk tends to vary according to the inclusion of more socio economic variable and the age at risk tends to vary accordingly. The small area estimates studied through probability mapping methods display the more statistical significant high moderate and low risk areas. The work shown in our study presents the spatial distribution of breast cancer in the study area, Southern Karnataka, the influence of socio economic factors on the population and the age of individual through which prediction of the future risk patterns were uncovered.

The methodology can be further used for a thorough understanding of an epidemiological surveillance system particularly in this region and can be extended to other parts of India and the world. The results would further strengthen health and disease surveillance and provide valuable additional information to Universal Health Care System.