



Incidence of Breast Cancer in Women from Agriculture based Areas of Coastal Karnataka, India: A Twenty Year Observations from a Tertiary Care Hospital

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Abstract

Global data indicates that the incidence of breast cancer is on a rise and that more women are being diagnosed with it in both developed and developing countries. In this tertiary care hospital based twenty year retrospective study (1997 to 2017), an attempt has been to understand the changing trends in incidence of breast cancer in city, town and villages in the coastal districts (Dakshina Kannada, Udupi and Uttara Kannada) of Karnataka state India. Emphasis was also placed on understanding the incidence in villages and town that are predominately agriculture based to understand the role of pesticide spraying if any on the development of cancer. The results indicate that a total of 2045 patients had been diagnosed with cancer 1997 to 2017 and that the highest incidence was in women between the age of 41 to 60 years. The incidence of breast cancer was observed to be more in the city (48.26%) followed by town (44.99) and villages (6.75). Breast cancer was slightly more in the towns/villages where agriculture was dominant (29.7 vs. 2).

Keywords: Breast cancer; Agribased; Dakshina kannada; Udupi; Uttara kannada

Introduction

The incidence of breast cancer in India has steadily increased and is expected to be the leading cause of cancer in women in the near future [1]. In addition to the various etiological factors like life style, advancing age, early menarche, late menopause, positive first relative, and late age of first birth, diet and socioeconomic status, exposure to pesticides is also shown to have a positive correlation to the incidence of breast cancer [2-5]. To further substantiate, the International Agency for Research on Cancer (IARC) has classified pesticides as carcinogens and that the farming based community to be at higher risk for acute and chronic health effects associated with pesticides [4].

Cancer patterns vary not only throughout the world but also between different population groups within the same country. Of the new cases of cancer diagnosed every year, over half are from the developing world. It is estimated that by the year 2020, over 10 million people worldwide would die of cancer every year and that 70 percent of these would be from the developing world. An epidemiological study would be prudent to determine the modifiable causes of cancer affecting in the developing countries [6]. Identifying more of the environmental risk factors for this disease could facilitate interventions to reduce the disease burden [7].

Humans can be exposed to pesticides through their occupational activity and/or environment and to further substantiate this, observations have demonstrated the ill effects of the prolonged exposure to pesticides and insecticide [8]. Organochlorine insecticides (OCs) are a class of chlorinated hydrocarbon insecticides historically used worldwide in agriculture. The International Agency for Research on Cancer (IARC) has reviewed the carcinogenicity of fifteen OCs. Of these, lindane and Pentachlorophenol (PCP) were classified as Group 1, carcinogenic to humans; Dichlorodiphenyltrichloroethane (DDT), aldrin and dieldrin as Group 2A, probably carcinogenic to humans; 2,4,6-Trichlorophenol (TCP), chlordane, chlordecone, heptachlor, Hexachlorocyclohexanes (HCH), Hexachlorobenzene (HCB), mirex, and toxaphene as Group 2B, possibly carcinogenic to humans; endrin and methoxychlor classified as Group 3, not classifiable as to their carcinogenicity to humans [10].

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Table 1: Number of breast cancer patients admitted from 1997 to August 2017.

Year	Frequency	Percent
Before 2006	92	4.5
2006	43	2.1
2007	79	3.9
2008	142	6.9
2009	118	5.8
2010	159	7.8
2011	185	9
2012	227	11.1
2013	287	14
2014	172	8.4
2015	178	8.7
2016	218	10.7
2017	145	7.1
Total	2045	100

Table 2: Stratification based on the age in breast cancer patients admitted from 1997 to August 2017.

Age Code	Frequency	Percent
Less than 30	45	2.2
31-35	96	4.7
36-40	220	10.8
41-45	331	16.2
46-50	320	15.6
51-55	317	15.5
56-60	282	13.8
61-65	190	9.3
66-70	115	5.6
More than 70	129	6.3
Total	2045	100

Previous analyses of licensed pesticide applicators in the Agricultural Health Study (AHS) found significant positive exposure-response trends for lindane and DDT use with NHL and chlordane and heptachlor use with leukemia. In a pooled analysis of Canadian and U.S. based case-control studies, self-reported ever use of DDT was significantly associated with Multiple Myeloma (MM). The strongest evidence for associations with cancer at other sites comes from case-control studies of liver and testicular cancers. DDT, Dichlorodiphenyldichloroethylene (ρ , ρ' -DDE), and β -HCH have been associated with hepatocellular carcinoma and testicular germ cell tumors have been significantly associated with prediagnostic serum DDE and chlordane metabolites. There is also evidence for significant positive associations with OC exposures and cancers of the prostate, skin (cutaneous melanoma), lung, rectum, and pancreas. An evaluation of pesticides and glioma reported no association with OCs [11]. The objective of the present study was to understand the association between incidence of breast cancer and domicile (village, town and city) in women being admitted for treatment of their breast cancer in a tertiary care hospital from January 1997 to August 2017.

Materials and Methods

This was a retrospective study, and was conducted with the

support of Hospital Medical Records at Father Muller Medical College Hospital, Mangalore from August to September 2017. The study was undertaken after approval by the Institutional Ethics Committee. All patients who were admitted as inpatients for the treatment of breast cancer from 1997 to August 2017 were included in the study. The data on the women's age, domicile were noted and entered in to the Microsoft excel. The data was further grouped as to people from agribased areas and frequency and percentage was calculated.

Results

The results include the data on women diagnosed with breast cancer from January 1997 to August 2017. A total of 2045 patients had enrolled for their treatment during the study period. (Table 1), indicates that the incidence of cancer from 1997 to 2005 was less. The probable reason for this can be attributed to the fact that the hospital where the study was done did not have an oncology centre till 2006. A highest incidence of admission with breast cancer (14%) was recorded in the year 2013. The (Table 2) indicates that the highest incidence of breast cancer was detected in women between the 41 to 60 years of age. The incidence of breast cancer was observed to be more in the city (48.26%) followed by town (44.99) and villages (6.75) (Table 3). The other important observation was that the incidence in breast cancer was slightly more in the villages where agriculture was foremost occupation (29.7 vs. 25.8%) (Table 4).

Discussion

Agriculture plays a major role in Indian economy with majority of the population resides at villages. Pesticides find its rampant use in the villages owing to its role in regulating vector borne diseases and damage to crops. A growing number of well-designed epidemiological and molecular studies provide substantial evidence that the pesticides used in agricultural, commercial, and home and garden applications are associated with excess cancer risk [9].

Pesticides have received particular attention in relation to breast cancer risk because of their ubiquity and because of the ability of certain pesticides to induce mammary tumors in animal models related to breast cancer etiology. The apparent endocrine-disrupting effects of some pesticides have raised particular concerns because of the hormonal nature of many known risk factors for breast cancer. Much research on pesticides and breast cancer has focused specifically on organochlorine insecticides because, in part, of their endocrine-disrupting activity; however, various classes of less-studied

Table 3: Stratification based on the domicile of in breast cancer patients admitted from 1997 to August 2017.

Domicile	Frequency	Percent
Village	138	6.75
Town	920	44.99
City	910	48.26
Total	2045	100

Table 4: The incidence in breast cancer was slightly more in the villages that were agribased.

	Frequency	Percent
Areas that have agriculture as a dominant occupation	607	29.7
Areas that are not agribased	528	25.82
City	910	48.26
Total	2045	100

insecticides and other pesticides also exhibit such activity [12,13].

The public is exposed to insecticides and other pesticides, generally at low levels (CDC 2009), through the widespread use of these chemicals in agriculture and through their use in homes, yards, and public spaces. Women who are engaged in agricultural work or who reside in agricultural areas are likely to experience higher exposures to a greater range of pesticides [14,15]. Such agricultural exposures can be direct, resulting from a woman's handling of pesticides (i.e., mixing, applying, or both), or they can be indirect, resulting from working in fields containing pesticide residues. Other indirect pesticide exposures may result from spray drift, contaminated drinking water, or handling of items contaminated in or near areas of pesticide application [7]. Breast cancer is the most common cancer among women and is the leading cause of cancer death among women 35-54 years of age [16,17].

The incidence of breast cancer is low in India, but rising [18]. Breast cancer is the most cancer of urban Indian women and the second in the rural women after cervical cancer. The incidence of this disease has been consistently increasing, and it is estimated it has risen by 50% between 1965 and 1985 [19]. The rise in incidence of 0.5-2% per annum has been seen across all regions of India and in all age groups but more so in the younger age groups (< 45 years) [19].

The result from the present study indicates that women between the 41 to 60 years of age were being diagnosed with breast cancer in more number. Earlier reports have indicated that breast cancer has been reported to develop a decade earlier in Indian patients compared to their western counterparts. While majority of breast cancer patients in western countries are postmenopausal and in their 60s and 70s, in India, premenopausal patients constitute about 50% of all patients [20]. More than 80% of Indian patients are younger than 60 years of age. The average age of patients in [21] hospital-based cancer registries ranged from 44.2 years in Dibrugarh, 46.8 years in Delhi, 47 years in Jaipur, to 49.6 years in Bangalore and Chennai.

The average age of breast cancer patients has been reported to be 50-53 years in various population-based studies done in different parts of the country [22]. A significant proportion of Indian breast cancer patients are younger than 35 years of age. This proportion varies between 11% [23] to 26% [20]. Young age has been associated with larger tumor size, higher number of metastatic lymph nodes, poorer tumor grade, low rates of hormone receptor-positive status, earlier and more frequent loco regional recurrences, and poorer overall survival [24,25].

The second most important observation of this study is that the incidence of breast cancer was more in people of the cities and town than in village. Several studies have investigated the relationship between rurality and cancer. One of the most important findings is that rural residents are generally diagnosed at a later stage and have decreased survival rates as opposed to their urban counterparts [26,27]. This has been shown for many types of cancer in both developed and developing countries, including colorectal, breast and prostate adenocarcinomas [28-30]. Health disparities have been observed between rural and urban regions around the world. Several risk factors have been described as potential drivers of this epidemiological polarization. Access to health care, including distance from medical facilities, physician-to-population ratio, availability of cancer detection technologies and screening methods constitute some of the most important aspects of social deprivation

and rurality [31, 32]. The third most important observation of this study is that the incidence of breast cancer was more in people the incidence of breast cancer was marginally more in people living in the villages where agriculture is predominant occupation.

Conclusion

These results indicate that the incidence of breast cancer was more in women between 41 to 60 years; living in cities and town and to be marginally more in people living in villages where agriculture is predominant and pesticides are sprayed. These results indicate that on a comparative note the incidence of breast cancer was marginally more in people living in agribased villages than in areas where it is not sprayed.

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