

RESEARCH COMMUNICATION

Epidemiological Distribution and Incidence of Different Cancers in Kashmir Valley-2002-2006

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Abstract

There are no population-based data available on cancer pattern in Kashmir and our study is the first kind which represents the trend in cancer pattern in the valley. The source of our data were cancer patients registered in the Department of Radiation Oncology, Sheri-Kashmir Institute of Medical Sciences, Srinagar, and Department of Radiation Oncology, SMHS, Srinagar during the period Jan 2002 to Dec 2006. These are leading medical centres in the valley and draw most all of cancer patients from all over Kashmir for treatment. During the period a total of 6,943 cases were registered of which 4,345 were males and 2,598 were females. The age standardized incidence rates were 34.9 per 100,000 for males and 24.8 per 100,000 for females. Oesophagus was the leading site of cancer in both sexes (male ASR 11.2; female ASR 8.3) followed by lung (ASR 6.5), brain (ASR 2.2) and head and neck (ASR 2.2) in males and breast (ASR 5.2), skin (ASR 1.6) and rectum (ASR 0.95) in females. The incidence of cervical cancer in females and prostate cancer in males was lower in Kashmir as compared to other Indian registries. Overall cancer incidence was significantly lower and cancer patterns were markedly different in Kashmir. The observed cancer pattern indicates that awareness campaigns, life style and dietary habit changes, tobacco-control measures and early detection of breast cancer are very important for cancer control in this population.

Keywords: Cancer incidence data - Kashmir - India

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Introduction

In 2008, an estimated 12.4 million new cancer cases and 7.6 million deaths from cancer have occurred worldwide and more than 60% of the deaths occurred in less-developed countries. And this global cancer burden continues to rise wherein the new global cases are estimated to jump to 27 million and global cancer deaths are projected to increase to 17.5 million deaths in 2050 (Boyle & Levin 2008). To combat this ever increasing cancer epidemic cost effectively, it is essential to assess the geographical cancer burden and the variations in different regions on the basis of risk. Cancer incidence data provide important information on the risk of different cancers, independent of prognosis that plays an important role in planning the strategies for cancer prevention and early detection. Risk assessment is available for developed countries but the precise burden of cancer and risk assessment statistics are scarce for the developing countries.

Kashmir which is one of the three provinces (Kashmir, Jammu, and Ladakh) of the Jammu and Kashmir State

(India) is located at an altitude of 1800-2400 m above sea level. Kashmir has a non-migrant pure ethnic population who have special social, personal, and dietary habits. The valley has witnessed a tremendous increase in the incidence and occurrence of cancer in its unexplored ethnic population. However, we don't have any recent and much population based data available from the valley. Hence in this study, we have attempted to examine the epidemiological distribution of different cancer types in Kashmir. This is the first kind of study which represents the trend in cancer pattern throughout the valley.

Materials and Methods

Data Sources

This study is based on the records of cancer patients registered in the Department of Radiation Oncology, Sheri-Kashmir Institute of Medical Sciences, Srinagar, and Department of Radiation Oncology, SMHS, Srinagar. All the patients who are diagnosed of cancer and come to these hospitals for further treatment are registered in the registration section of these departments. These are

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leading medical centres in the valley and draw almost all of cancer patients from all over Kashmir except the one who go outside valley for treatment. Although some of the patients report to district hospitals, but they are also finally referred to these specialist hospitals for treatment. Thus our study almost covers all the cancer cases of the valley except the Death Certificate Only cases (DCO's). DCO's cases were not included in our study as the actual date of incidence could not be traced for most of these cases.

The patient's records were screened for information on the nature and distribution of all forms of cancer reported to the department between January 2002 and December 2006. Records of patients from outside the valley of Kashmir were excluded from the study. The mean annual frequencies of all cancer types were worked out and tabulated by sex. The main forms of cancer were identified separately for men and women as well as collectively.

Statistical methods

The results are presented as incidence rates of cases by age, sex, site, crude rate, age specific incidence rates and age standardized incidence rates. The data on annual population of Kashmir region by 5-year age group and sex for the period 2002–2006 was provided by Population Research Centre, University of Kashmir. The annual populations during the study period of 2002–2006 were cumulated for calculation of measures of incidence. All incidence rates were expressed as average annual ones per 100,000 persons. The total population during 2002-06 was 28672263. The sex ratio in Kashmir is 918 females per 1,000 males.

Results

During the period under review that is from 2002 to 2006, 6943 new cases were registered in Kashmir valley, which gives an average of 1389 new cases per annum. Of these new cases, 4345 were males and 2598 were females indicating a male female ratio of 1.67: 1.0. The number of cases by site, age group, percentage, crude rates and ASR's for males and females are given in Tables 1 and 2, respectively.

In males, oesophageal cancer (oesophagus and GE junction) was the most commonly reported malignancy (30.9% of all cases, ASR 11.2) followed by lung (17.9% of all cases, ASR 6.5), brain (7.0% of all cases, ASR 2.2), head and neck (6.4% of all cases, ASR 2.2), skin (5.4% of all cases, ASR 1.9) and stomach (5.2% of all cases, ASR 1.8). The crude rate for all sites combined was 29 per 100,000 and 34.9 ASR per 100,000 for males.

Oesophageal cancer (32.8%, ASR 8.3) was the most frequently reported malignancy in females followed by breast (22.8%, ASR 5.2), skin (6.2%, ASR 1.6), rectum (4.2% ASR 0.95), brain (4.2%, ASR 0.9) and lung (4.1% ASR 1.1). The crude and age adjusted (world population) incidence rates for females were 19.2 per 100,000 and 24.8 per 100,000 respectively. Oesophageal and lung cancer alone contributes about 45% of total cases in males whereas in females esophageal and breast cancer contribute more than 50% of the cases. Overall in both the sexes, oesophageal is the leading cancer followed by lung and breast cancers in the valley

In cancer types common to both the sexes, the proportion in the men exceeds that in women in almost all types of cancer tobacco-related cancers, i.e., head & neck (oral cavity, pharynx and larynx) and lung constituted 24% of the total male cancers, while in females they accounted for only 7.6% of the cases. Our results clearly indicate that cancer occurs mostly at older ages as only

Table 1. Incidence Cases, Rates by Site and Age group, Relative Frequencies (%), Average Annual Crude Incidence Rates (CR) and Age-Standardized Incidence Rates (ASR) in Males in Kashmir, 2002-2006

Site	0-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+	Total	%age	CR	ASR
Oesophagus	x	x	32	126	302	448	199	44	7	1,158	26.7	7.7	9.7
Lung	x	4	15	123	210	267	127	29	2	777	17.9	5.2	6.5
GE Junction	x	x	4	16	50	71	38	3	x	182	4.2	1.2	1.5
Skin	x	4	7	29	61	71	39	20	2	233	5.4	1.6	1.9
Prostrate	x	x	x	2	5	27	19	6	1	60	1.38	0.4	0.5
Rectum	1	31	20	31	42	57	12	3	x	197	4.5	1.3	1.5
Stomach	x	5	17	35	69	67	25	7	x	225	5.2	1.5	1.8
Colon	x	6	14	17	31	29	16	x	x	113	2.6	0.8	0.9
Testis	4	7	22	27	10	6	5	x	x	81	1.9	0.5	0.6
Urinary Bladder	x	x	3	9	12	21	11	3	2	61	1.4	0.4	0.5
Thyroid	1	2	5	7	11	19	2	x	x	47	1.1	0.3	0.4
Bone & Soft tissue	18	16	16	13	13	9	4	x	x	89	2.0	0.6	0.6
Eye	10	3	3	x	7	3	x	x	x	26	0.6	0.2	0.2
Brain	53	49	57	55	51	34	6	x	x	305	7.0	2.0	2.2
Breast	x	x	5	9	13	11	7	4	x	49	1.1	0.3	0.4
Multiple myeloma	x	x	5	7	20	21	4	x	x	57	1.3	0.4	0.5
Gall bladder	2	1	1	4	12	3	x	x	x	23	0.53	0.2	0.2
Renal	7	2	x	12	14	13	4	x	x	52	1.2	0.4	0.5
Muscle	5	1	5	9	7	2	3	x	x	32	0.74	0.2	0.2
Head & Neck	10	6	29	57	57	69	25	15	9	277	6.4	1.8	2.2
Lymphomas	49	42	30	49	27	36	7	4	x	244	5.6	1.6	1.7
Others & Unspecified	2	4	6	14	21	7	3	x	x	54	1.2	0.4	0.4
Total	162	183	296	651	1045	1291	556	138	23	4,345	100.0	29.0	34.9

Table 2. Incidence Cases, Rates by Site and Age group, Relative Frequencies (%), Average Annual Crude Incidence Rates (CR) and Age-Standardized Incidence Rates (ASR) in Females in Kashmir, 2002-2006

Site	0-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+	Total	%age	CR	ASR
Oesophagus	1	6	33	141	273	223	97	25	2	801	30.8	5.9	7.8
Breast	x	22	125	192	152	73	25	4	x	593	22.8	4.3	5.2
Lung	x	x	7	22	24	33	15	5	x	106	4.1	0.8	1.1
Skin	x	8	7	23	44	53	17	6	2	160	6.2	1.2	1.6
GE Junction	1	3	4	9	18	9	7	1	x	52	2.0	0.4	0.5
Rectum	x	20	19	27	24	17	3	x	x	110	4.2	0.8	0.95
Stomach	x	x	6	5	22	14	11	3	x	61	2.3	0.5	1.0
Colon	1	4	7	13	17	16	3	x	x	61	2.3	0.5	0.6
Cervix	x	x	12	26	15	33	2	6	x	94	3.6	0.7	0.9
Urinary Bladder	x	x	3	4	8	5	x	x	x	20	0.8	0.2	0.2
Thyroid	4	4	8	5	1	3	4	x	x	29	1.1	0.2	0.2
Bone & Soft tissue	16	12	6	6	8	5	3	x	x	56	2.2	0.4	0.5
Eye	11	x	x	2	3	x	x	x	x	16	0.6	0.1	0.1
Brain	13	20	24	11	28	9	3	x	x	108	4.2	0.8	0.9
Multiple Myeloma	x	x	3	7	11	19	x	x	x	40	1.5	0.3	0.4
Gall Bladder	1	1	4	14	14	4	2	x	x	40	1.5	0.3	0.5
Renal	4	1	3	4	11	8	2	x	x	33	1.3	0.2	0.5
Muscle	8	x	2	3	5	2	x	x	x	20	0.8	0.1	0.2
Head & Neck	5	4	4	21	22	25	6	3	x	90	3.5	0.7	0.8
Lymphomas	6	19	12	9	10	9	3	x	x	68	2.6	0.5	0.6
Others & unspecified	2	5	6	8	12	4	2	1	x	40	1.5	0.3	0.3
Total	73	129	295	552	722	564	205	54	4	2598	100	19.2	24.8

3.4% of the total number of cancer cases registered, were falling in the age group of less than 20 years, although this age group accounts for a good percentage of the total population. The overall percentage of new cancer cases was more in the age group of 50-70 years as compared to other age groups in both sexes. In male children, the most prominent cancer was brain followed by lymphomas and bone & soft tissue; whereas in female children, bone & soft tissue is the leading site followed by brain and eye cancers.

Figure 1 show the age-specific incidence rate curves for all sites in males and females. In males there is a steady increase up to 50 years age group and then sharp increase in the age group of 50-70 which is followed by progressive decrease in the older age groups (70+). Whereas in females, the rates increase steadily up to the age of 70 years and then falls in the older age groups. Figure IIa shows the age-specific curves for esophagus, lung, brain, head and neck, stomach and skin in males and Figure IIb the equivalent curves for oesophagus, breast,

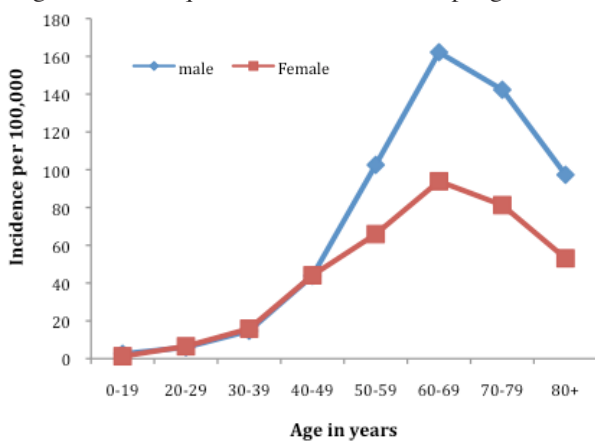


Figure 1. Age-specific Total Cancer Incidence Rates per 100 000

skin, rectum, brain and lungs in females.

Table 3 compares the age-standardized incidence rates for common sites in Kashmir with the registries reported from India in males and females (Curado et al, 2007; Sen et al., 2002; Manoharan et al., 2009; Manoharan et al.,

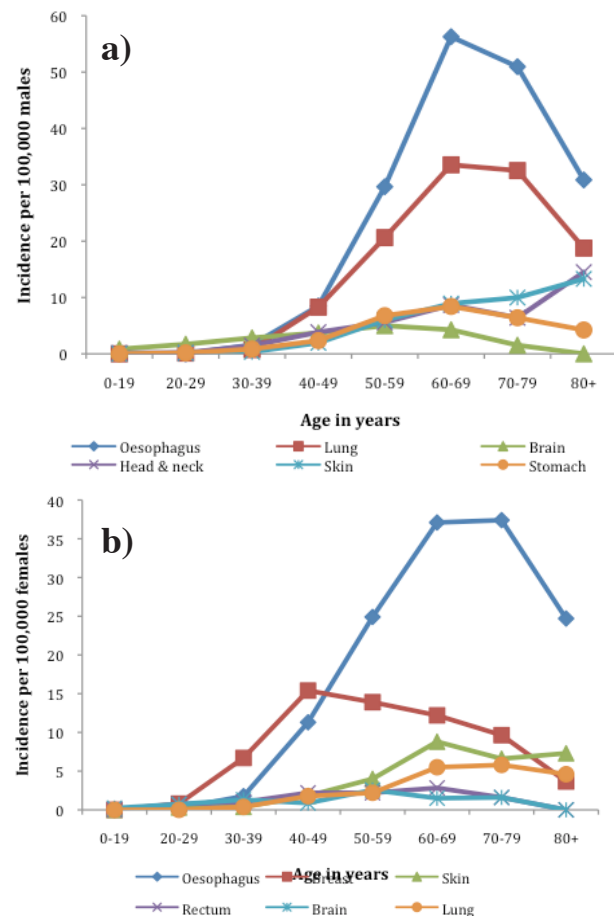


Figure 2. Age-specific Major Cancer Incidence Rates per 100 000 in a) Males and b) Females

Table 3. Age Standardized Incidence Rates (per 100,000) for Common Sites in Kashmir and other Indian Registries

Site	Kashmir	Chennai	Kolkata	Delhi		Mumbai	Poona	Nagpur	Trivandrum	Karunagapally
				Rural	Urban					
Males										
Oesophagus	11.2	9.1	4.5	2.7	4.9	6.7	6.1	8.7	3.5	8.3
Lung	6.5	10.8	18.7	13.8	10.7	9.7	6.2	7.5	9.9	21.3
Brain	2.2	3	2.0	1.7	4	3.7	3.6	3.0	2.9	3.7
Head & Neck	2.2	21.9	20.3	16	25	22.2	19.5	23.5	23.3	22.3
Prostate	0.5	3.9	5.3	1.8	9	6.9	6.4	3.0	5.6	4.4
Females										
Oesophagus	8.3	5.4	3.5	2.6	3.1	3.4	5.0	5.7	0.9	2.0
Breast	5.2	26.5	25.1	7.8	30.0	26.9	24.4	27.4	24.6	16.0
Rectum	0.95	1.4	2.0	0.6	1.8	1.4	2.4	1.8	2.2	1.4
Brain	0.9	2.1	1.5	1.5	2.4	2.8	1.9	2.6	2.2	1.9
Lung	1.1	2.6	4.9	1.0	3.4	3.1	3.0	2.4	1.7	2.3
Cervix	0.9	28.0	9.4	10.3	17.5	14.5	17.3	18.4	9.4	10.6

2010). Among males as well as females, Kashmir reports the highest incidence of oesophageal cancer cases in India. Compared to other Indian cancer registries, the incidence of cervical cancer in females and prostate cancer in males is lower in Kashmir.

Discussion

This study on the incidence pattern of different types of cancer was conducted on an ethnic population and almost all of the patients report either to the SMHS Hospital or Sher-i-Kashmir Institute of Medical Sciences, except the few numbers that go outside valley for treatment. The public acceptance of allopathic treatment is high and no alternative therapies such as homeopathy and ayurvedic exist in the valley. A well-flourished network of investigative laboratories at district and sub-district level is present and a good referral system between these health centres and the specialist institutions primarily involved in treating this disorder exists.

In Kashmir, oesophageal cancer is the most predominant cancer present in males as well as females. This cancer by far exceeds the frequency of other cancers in both the sexes contributing about 30% to the total number of cancer cases in Kashmir. The preponderance of oesophageal cancer can be ascribed to the life style and local dietary habits among Kashmiris as various epidemiological studies in regions of the world with high incidences of oesophageal cancer have substantiated the important role of these two in the incidence pattern of oesophago-gastric cancer (Malhotra 1967; Kmet & Mahboubi 1972; Warwick 1973; Yang 1980; Siddiqi & Preussmann 1989). The most important specific food habit in Kashmir is the frequent consumption of hot salt tea by local inhabitants, more so during the winter months when the temperature falls to subzero levels. The salt tea is prepared traditionally in a specially designed copper vessel called a 'samawar'. The samawar consists of a central smoke stack with a perforated base (fed with live charcoal) mounted on a stand and a surrounding jacket for boiling the salt tea infusion. The tea is prepared by brewing green tea leaves (not grown in Kashmir) in sodium bicarbonate until a thick red brown-colored extract is obtained. The extract is diluted with water and then milk and salt are added. The tea is customarily served boiling hot and is

consumed with or without snacks. The components of salted tea like sodium bicarbonate and common salt, a well known irritant of gastric epithelium (Correa, 1987) are believed to be the chief suspects causing oesophageal cancer.

Another specific dietary habit which is very particular to Kashmiri population is the practice of drying raw food stuffs in open sun and this dried food is stored and later on consumed in the winter months (Siddiqi & Preussmann 1989). Studies have shown that these foods contain significant amounts of N-nitroso compounds (Tricker et al., 1988). In addition, other Kashmiri food items contributing substantial amount of N-nitroso compounds include salt tea, dried fish, vegetables especially Brassica oleracea (haak), red chillies, and spice cake (wur) (Siddiqi et al., 1988; 1990). In addition, salt tea showed the formation of high amounts of N-nitrosopipercolic acid with several unidentified non-volatile N-nitroso compounds on nitrosation of tea extracts under conditions simulating the fasting human stomach (Siddiqi et al., 1988).

Lung cancer ranks next to esophageal cancer in males in the valley. Its association with smoking has been substantiated by innumerable studies, some of which have also established a dose response relationship, in terms of the number of cigarettes smoked per day and the risk of developing lung cancer (Arya et al., 1991; Charles 1991; Peter 1993). Case control studies conducted in places like Kerela (Sankarnarayanan et al., 1994), Bhopal (Dikshit & kanhere 2000) and Chandigarh (Gupta et al., 2001) reported a high risk of lung cancer among bidi and cigarette smokers showing a direct link between the two. A case control study from Chandigarh also suggested that environmental smoke exposure may be a strong risk factor for lung cancer in India (Rapiti et al., 1999). Smoking is popular throughout India, where besides cigarettes, pipes and cigars; it takes various indigenous forms such as bidi, hookah, and chilam. In Kashmir, besides cigarette smoking, which is mainly practised in urban and semi-urban localities, the most popular form is hubble bubble (hukkah) whereby the smoke is inhaled after it is cooled and filtered by passing through water placed in an earthen container and is largely responsible for passive smoking of other family members, especially during winter months. Smoking in the valley is a male pastime, the women do not

generally smoke. That is the why we can clearly see the preponderance of lung cancer in males as compared to the females. The relatively higher prevalence of oesophageal cancer in the men may also result from the additional influence of smoking. While in developed countries, such as the USA, lung cancer is a leading cause of death in both sexes (Jemal et al., 2002), it is mostly a disease of men in India, as is also shown in this study.

Brain cancer is the third common site of cancer in males in Kashmir accounting for 7% of all cancer cases. This cancer was found to be more common in the male children accounting for 17.4% of total cases in the age group of 0-20 and more than 50% at 0-40 years.

Breast cancer, the most frequent cancer of women in the world is the second leading site of cancer in females in Kashmir. It constituted about 23% of all cancers in women whereas in males, it is hardly found to occur and just contributes 1% of all cancers. Overall in both males and females, it is the second most common cancer present in the valley. On comparing the incident cases of breast cancer in different age groups, it is clearly seen that the early onset cases (0-40 age group) contribute about 25% of the total number of breast cancer cases in females. Although the disease is mainly postmenopausal in western population, but the picture in Kashmir is no different than the rest of the country where the burden of breast cancer due to early onset cases is increasing at an alarming rate. Though the etiology of breast cancer in India has not been widely studied, case-control studies from Mumbai (Rao et al., 1994) and Chennai (Gajalakshmi & Shanta 1991) have identified null parity, early menarche, late age at marriage and late age at pregnancy as risk factors.

Tobacco-associated head and neck cancers (tongue, mouth, oropharynx, hypopharynx and larynx) constituted about 6.4% of the total male cancers in Kashmir. Tobacco chewing and smoking have been identified as the major risk factors for these cancers in India (Dikshit & Kanhere 2000; Sankaranarayanan et al., 1989; Nanadakumar et al., 1990). Case-control studies from Mumbai (Rao et al., 1999) and Thiruvananthapuram (Sankaranarayanan et al., 1998) have shown that smoking was significant risk factors for the cancer of larynx. Apart from consumption of alcohol and smoking, a case-control study conducted in Delhi had reported that consumption of betel leaf with tobacco as well as preference for spices and fried foods emerged as risk factors for laryngeal cancer, apart from consumption of alcohol and smoking (Kapil et al., 2005). The prevalent chewing habits involve use of betel quid (betel leaf with tobacco, areca nut, lime), gutkha (dried mixture of betel quid and tobacco sold in attractive), mawa and zarda (flavoured tobacco) or khaini (crude form of dried ground tobacco with lime). However there is a very low prevalence of tobacco chewing habit in Kashmir compared to other regions in India. This can be one of the reasons that the incidence of head & neck cancer is low in Kashmir as compared to other Indian cancer registries. Tobacco control measures and early detection have been advocated to prevent oral and other head and neck cancers.

The higher frequency of skin cancer in men as well as women is perhaps caused by the greater exposure to the sun that they receive especially while farming.

Additionally, studies have shown that the use of firepot, (kangri) an ingenious mode of providing warmth during extreme cold conditions in the valley also contribute towards skin cancer in the valley (Imtiaz 2010).

Interestingly, our resulting are showing a different pattern of cancer in Kashmiri women population, the frequency of cervical cancer being very low which is quite contrary to the pattern in rest of the country where cervical cancer is the second leading cancer in females after breast cancer (ICMR 2001). This change in pattern and the lower rate of cervical cancer which is just 3.6% can be attributed to the practice of universal circumcision, prevalent in the majority community of Kashmir.

Another important observation is the low incidence of prostate cancer in Kashmir compared to other registries reported from India. The combination of genetic and environmental factors can be responsible for these large disparities between the high and low risk groups (Hsing et al., 2000). Age, race and a family history of prostate cancer are the only well established risk factors for prostate cancer (Standard et al., 1998).

The sex differentiation was exceedingly significant in breast and tobacco associated cancers. The former was excessively present in females whereas latter was present in males. Though, this difference in occurrence of tobacco associated cancers can be attributed to smoking habit in men, however in case of breast cancer, its distribution can be attributed to anatomical and physiological differences.

The pattern observed from the analysis of the available data provides comprehensive information on cancer occurrence in the valley and these results will help to evaluate a cancer control program in this region. In conclusion, our study has shown that in Kashmir valley oesophageal cancer is the leading cancer in both males as well as females, followed by lung cancer in males and breast cancer in females. So, counselling, awareness campaigns, change of dietary habits and life style are the primary measures to be taken to prevent this oesophageal cancer epidemic in the valley. Additionally, the primary prevention of lung and other tobacco related cancers by implementation of strict tobacco control measures are important. Early detection of breast cancer should be encouraged in women through health education and prompting early diagnosis. Procedures like physical examination of the breast may prove to be useful early diagnostic tool in this context.

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