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Epidemiological trends of cancer morbidity at a new tertiary care Gurgaon, hospital, India

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Abstract
Background: Globally, 32.5 million people diagnosed with cancer in last 5 years, were alive at the end of 2012. Annually 14.1 million new cancer cases and 8.2 million cancer deaths are recorded throughout the world, with nearly 70% in the developing countries.
Aim: The aim of this study is to review the cancer morbidities by age, sex, cancer sites and nationalities in Fortis Memorial Research Institute (FMRI), Gurugram Haryana from January 2013 to December 2016.
Materials and Methods: This is a retrospective study of histologically confirmed cases of all cancers reported / treated at FMRI. Data was collected from various departments dealing in cancer care viz- Medical Oncology and Hematology, Radiation Oncology, Surgical Oncology, Pediatrics Hematology Oncology, Obstetrics & Gynecology Oncology, Neurosurgery, Nuclear Medicine, Radio Diagnosis and Pathology. Medical Records of cancer patients were reviewed and relevant information on diagnosis, primary site and demographic data was retrieved. All the recorded data was entered in Microsoft Excel Data Sheet. This was analyzed using SPSS 16.0 (SPSS Inc.).
Results: During the study periods a total of 63,735 cancer visits were captured from all departments, of these 52,915 (83.0%) were duplications /multiplications visits and non-malignant (benign/in-situ) and remaining 10,820 (17.0%) were new cancer cases. Out of the 10,820 new cases registered, males were 5,923 (54.7%) and females were 4,897 (45.3%) with a sex ratio of 827 females to 1000 males. A statistically significant association was seen among Indian cases and other countries cases. Most common malignancies were breast (13.2%) followed by brain & nervous system (8.8%), prostate (7.5%), lung (5.2%), Non-hodgkin's lymphoma (5.0%), ovary (3.6%), corpus uteri (2.8%), stomach (2.7%), thyroid (2.6%), colon(2.6%), bladder (2.5%), cervix (2.4%), mouth (2.4%), kidney (2.1%) and liver (2.1%).
Conclusions: There is scope and need for integrating other government hospitals, existing private health service providers and research institutions across the state for better planning of cancer control program.

Keywords: malignancies, FMRI, India, breast cancer, prostate cancer, NHL

Introduction

Globally, 32.5 million people diagnosed with cancer within the last 5 years were alive at the end of 2012 [1]. Annually 14.1 million new cancer cases and 8.2 million cancer deaths are recorded and nearly 70% of these deaths will be in developing countries [1]. The World Health Organization (WHO) reported that 12.5% of all deaths are attributable to cancer and if the trend continues, it is estimated that by 2020, 16 million new cases will be diagnosed per annum and 70% of these new cases will be in developing countries [2]. Cancer is the second most common cause of death in developed countries following cardiovascular disease. As population aging continues in many countries; cancer will remain a major health problem worldwide as elderly peoples are more susceptible to cancer [2, 3]. GLOBOCAN burden rises to 14.1 million new cases and 8.2 million cancer deaths in 2012 compared with 12.7 million new cases and 7.6 million cancer deaths in 2008 [3]. The most common cancer diagnosed worldwide is lung (1.8 million, 13%), breast (1.7 million 11.9%), and colorectal (1.4 million, 9.7%) while the most common cause of cancer deaths were lung (1.6 million, 19.4%), liver (0.8 million, 9.1%), and stomach (0.7 million, 8.8%) [3]. A projection of 19.3 million new cancer cases per year for 2025 has been predicted by GLOBOCAN 2012 [3]. Non-communicable diseases (NCDs) – including cancer, cardiovascular diseases, stroke, and diabetes, among others – are the leading contributors to the global disease burden [4]. Dinshaw *et al*. have reported over 70% of the cases report for diagnosis and treatment in advanced stages of the disease, resulting in poor survival and high mortality rates [5]. The common sites for cancer in India are oral cavity, lungs, esophagus and stomach in males and cervix, breast and oral cavity among females and this differs from the developed countries [6]. Even within India there exist variations in the prevalence and pattern of different cancers. In southern India the common cancers among male were found to be stomach, oral, esophagus and leukemia whereas females were mainly affected by cervix, breast, oral and oesophageal cancers [7, 8]. Similarly, Maiti P, Jana U, Ray A, *et al*. published a study [9] from West Bengal, an eastern state of India reporting head and neck, lungs and oral cancers as major cancers in males, whereas among female, breast cancer was leading followed by cervical and stomach cancers. In contrast,

among north Indian males, gastro intestinal tract, larynx and lung are major cancers and among females breast, cervix and lung were leading malignancies [10]. More so, the analysis from Population Based Cancer Registries (PBCRs) in the country has shown that there is significant increase in trends of mouth, liver and Non-Hodgkins Lymphoma (NHL) cancers among males over period of time [11]. These differences in the prevalence of cancers across the country could be due to diversity in gene pools as well as the environmental dynamics. The geographical differences in total and site incidences have provided clues of causative factors, especially, in separating environmental and ethnic factors from intrinsic factors. The total world incidence shows the enormous health problem caused by cancer, which is recognized as the second killer disease in humans [12]. In Japan cancer of the stomach is the most common malignant tumor in both men and women in marked contrast to other countries [13]. The high incidence of cancer of the mouth in India is well-known and has led to the identification of habit of chewing tobacco with betel nut as a risk factor[14]. There is need of obtaining more clear information on cancer epidemiology such as prevalence, incidence and risk factors in order to generate evidences for effective decision making to prevent and control the cancer epidemic in the country. There is very limited published cancer data available in the state of Haryana; sporadic studies have shown that there is increased number of cancer cases over last few years. Keeping in view the existence of diverse pattern of cancer occurrence, present study was conducted to explore the pattern and trend of cancer among the out-patients and in-patients attended FMRI to take treatment.

Background

Fortis Memorial Research Institute, Gurgaon (FMRI) started the clinical service in July 2012. The hospital is built on the foundation of "trust" and rests on the four strong pillars - talent, technology, infrastructure and service. FMRI has complete gamut of therapeutic and diagnostic technologies that are the "first" in India, in Asia and in some cases the "first" in the world too. Keeping the goal and vision in view, the hospital is the first institute in the world to have introduced radiation therapy in collaboration with the leading technology innovators Brain Lab and Elekta. The hospital also introduced the world's first digital broadband MRI – the 3-Tesla Digital MRI. It also introduced the concept of Stem Cell Lab and Open Lab in India. Hospital has full-fledged cancer services comprising departments of Medical Oncology and Haematology including Bone Marrow and Stem Cell Transplantation, Radiation Oncology and Surgical Oncology and supported by Nuclear Medicine and Palliative care.

Aims

To observe the patterns of cancer morbidities by age, sex, cancer site and nationalities among the studied subjects?

Materials and Methods/Cancer Registration Methodology

A retrospective study of 4 year durations was undertaken from January, 2013 to December, 2016 in FMRI. A proforma was developed for this purpose which included demographic information like age, sex, occupation, geographical distribution, smoking history, educational background and diagnosis of the case. Malignant tumors were included and benign tumors were excluded from the study. A Hospital Based Cancer Registry (HBCR) is maintained in FMRI where all cancer patients who come to hospital are registered initially irrespective of admission to hospital, and individual case records are maintained by medical record department, which are computerized. These case records were studied retrospectively for 2013-2016 using data from cancer registry. We exported the data to Microsoft Excel data sheet for analysis. We computed the proportions for all cancers in men and women, breast, brain and nervous system, prostate, lung, non-hodgkin's lymphoma, ovary, corpus uteri, stomach, thyroid, colon, bladder and cervix cancer, mean age at diagnosis and standard deviations of the means. The World Health Organization (WHO) standards were used for analysing and comparing the data. The abstracted data is coded by using manual of International Statistical Classification of Disease and Related Health Problems, 10th Revision, Volume 1 & 2, published by the WHO, Geneva, 2010 Edition. Quality control of information is maintained through the use of data processing, editing techniques, case finding audits and reviews of coded and abstracted data. The data were checked and validated by using of quality control programs/tools for cancer registries of International Agency for Research on Cancer (IARC) for avoiding duplication and any unlikely combinations of age, sex, site and morphology and other factors in the data base. This data was compared with other cancer registries in India available in annual reports released by Indian Council of Medical Research.

Statistical Analysis

The results generated were analyzed using software Statistical Package for Social Sciences (SPSS) version 16.0. Descriptive statistical measures such as percentage, mean, and standard deviation were applied. Inferential statistical tests such as Z-test and Chi-square test were applied to identify important relationships between variables. A p-value of < 0.05 was considered statistically significant and the results are presented in form of suitable tables and figures.

Results

During the study periods a total of 63,735 cancer visits were captured from all departments. Of these 52,915 (83.0%) were duplications /multiplications visits and non-malignant (benign/in-situ) and remaining 10,820 (17.0%) were new cancer cases. Out of the 10,820 new cases registered, males were 5,923 (54.7%) and females were 4,897 (45.3%) with a sex ratio of 827 females to 1000 males. The number of cancer patients registered at FMRI has increased grossly from 1490 in 2013 to 3698 in 2016. The highest incidence of 3698 new cases was seen in 2016 followed by 3475 new cases in 2015 and the third highest incidence of 2157 new cases in 2014 [Table 1, Fig. 1].

Table 1: Number of new cancers cases registered at FMRI, Year: 2013 to 2016

Years	New Registration		
	Male	Female	Total
2013	832	658	1490
2014	1191	966	2157
2015	1887	1588	3475
2016	2013	1685	3698
Total	5923	4897	10,820
%	54.7	45.3	100.0

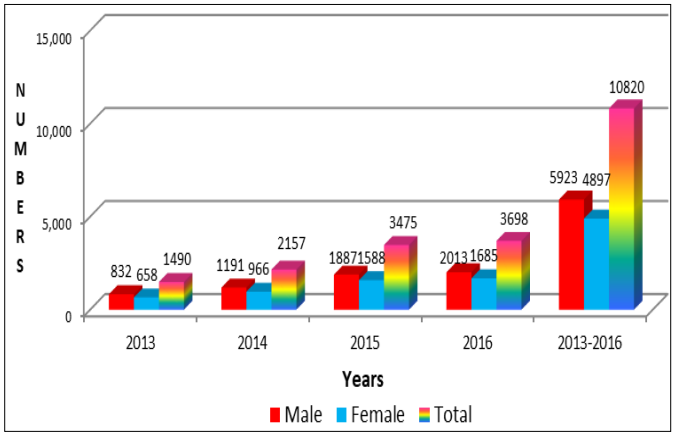

Fig 1: New patient registration, HBCR, FMRI, Years: 2013-2016

Out of 10,820 registered new cases, 7730 (67.0%) patients were from 27 Indian states, males were 4099 (53.0%) and females were 3631 (47.0%) with a sex ratio of 886 females to 1,000 males. Majority of the patients came from nearby states Haryana followed by Delhi, Uttar Pradesh, Rajasthan, Punjab, Jammu & Kashmir, Bihar, Uttarakhand, Assam and Madhya Pradesh respectively. Of the remaining 3090 (33.0%) patients were from 58 other countries, males were 1824 (59.0%) and females were 1266 (41.0%) with a sex ratio of 694 females to 1,000 males. Majority of the patients that came for taking treatment were from Iraq followed by Uzbekistan, Afghanistan, Kenya, Turkmenistan, Nigeria, Yemen, Nepal, Oman and Ethiopia respectively. A statistically significant association was seen among Indian cases and other countries cases [Table 2, Fig. 2].

Table 2: New patient registration by Geographical area and sex, years: 2013-2016

Geographical area		Male	Female	Total	%	No. of Indian States/ Other Countries	Chi Square Value
India	#	4099	3631	7730	67.0	27	32.0981 ($p < 0.05$) Statistically Significant
	%	53.0	47.0	100.0			
Other Countries	#	1824	1266	3090	33.0	58	
	%	59.0	41.0	100.0			
All Cases	#	5923	4897	10820	100.0		
	%	54.7	45.3	100.0			

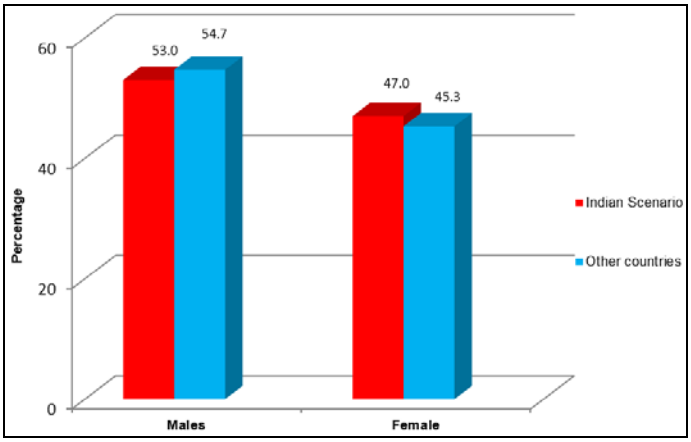

Fig 2: Percentage of cancer cases (Indian scenario with other countries) by sex

The mean age and standard deviation (SD) at diagnosis for males (52.6, 19.4) and females were (51.2, 16.6) years respectively. There was a steady rise in proportion of all cancers from age 0–10 years to 61-70 years in both sexes. The peak age incidence for males was 61-70 years accounting for 1484 (25.1%) of all male presentation followed by 51-60 years which accounted for 1250 (21.1%) patients and third highest age incidence in male was 71-80 years where 822 (13.9%) were reported. Among females, the peak age incidence was 51-60 years accounting for 1329 (27.1%) new cases followed by 61–70 years where 1060 (21.6%) new cases were reported and 41–50 years which accounted for 952 (19.4%) new cases of cancer [Table 3-5, Figure 3].

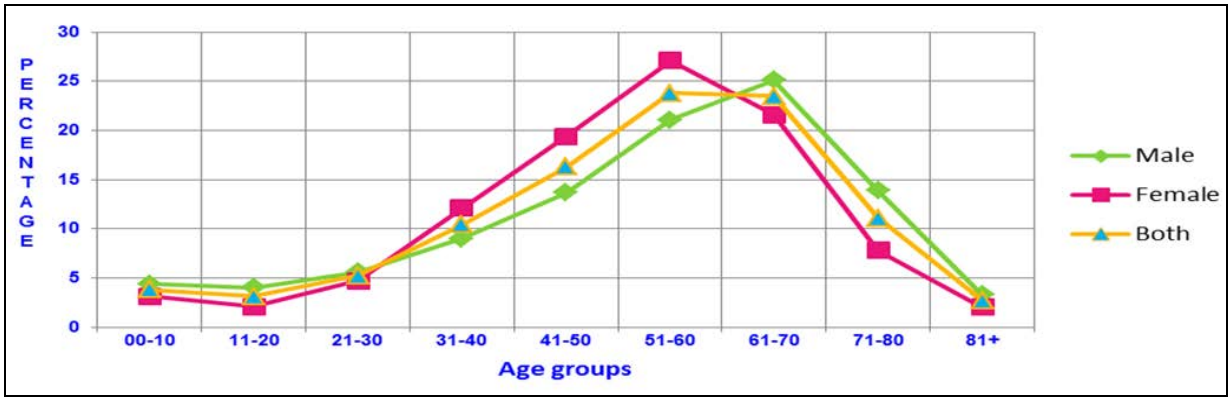

Fig 3: Age specific proportions for all cancer sites by sex

Types of cancer: Both Sexes (All Cases)

Patterns of cancer morbidities reported at FMRI showed that there is increase in number reporting of all type of cancers from 2013 – 2016. Table 3 gives the break-up of leading causes of cancer by primary site (SEER) and age among both sexes. The common types of cancer and their relative proportion of all cancers that occurred in 10,820 registered at FMRI during 2013 to 2016 are shown in the pie diagram. Cancer of female breast accounted for the largest proportion, 13.2% of all cases followed by brain & nervous system 8.8%. Next in frequency were prostate cancer (7.5%) and lung cancer (5.2%), followed in rank order by non-hodgkin's lymphoma (5.0%), female genital organ malignancies of ovary (3.6%), corpus uteri (2.8%) and cervix (2.4%), stomach (2.7%), thyroid (2.6%), colon (2.6%), bladder (2.5%), mouth (2.4%), kidney (2.1%) and liver (2.1%) [Table 3, Fig.4].

Table 3: Age-wise distribution of common Primary Site (SEER) cancers among both sexes, 2013-16

Rank	ICD.10	Site	00-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81+	Total	%	Mean Age (Yrs)	SD
1	C50	Breast	0	1	32	196	355	427	289	105	27	1432	13.2	53.1	12.802
2	C70-72	Brain, NS	116	73	107	146	173	178	112	43	4	952	8.8	39.8	20.265
3	C61	Prostate	0	0	2	1	21	127	340	273	51	815	7.5	67.4	9.156
4	C33-34	Lung	2	1	0	28	76	150	188	88	30	563	5.2	60.5	12.623
5	C82-85	NHL	22	34	31	48	75	137	118	60	21	546	5.0	21.2	19.662
6	C56	Ovary	0	5	22	43	99	105	87	25	3	389	3.6	51.8	13.649
7	C54	Corpus uteri	0	0	0	19	37	104	112	29	5	306	2.8	58.6	10.658
8	C16	Stomach	1	0	12	25	68	68	80	25	9	288	2.7	54.9	13.993
9	C73	Thyroid	3	8	39	64	64	45	47	10	5	285	2.6	45.4	16.170
10	C18	Colon	0	3	10	27	41	77	77	35	6	276	2.6	56.0	14.208
11	C67	Bladder	2	2	4	9	15	54	91	66	26	269	2.5	63.8	14.292
12	C53	Cervix	0	0	2	40	61	88	55	15	2	263	2.4	52.9	11.723
13	C03-06	Mouth	0	0	8	35	49	79	63	22	6	262	2.4	54.3	13.344
14	C64	Kidney	19	3	11	22	46	51	59	18	2	231	2.1	49.4	19.030
15	C22	Liver	4	2	5	15	38	59	67	31	4	225	2.1	56.3	14.910

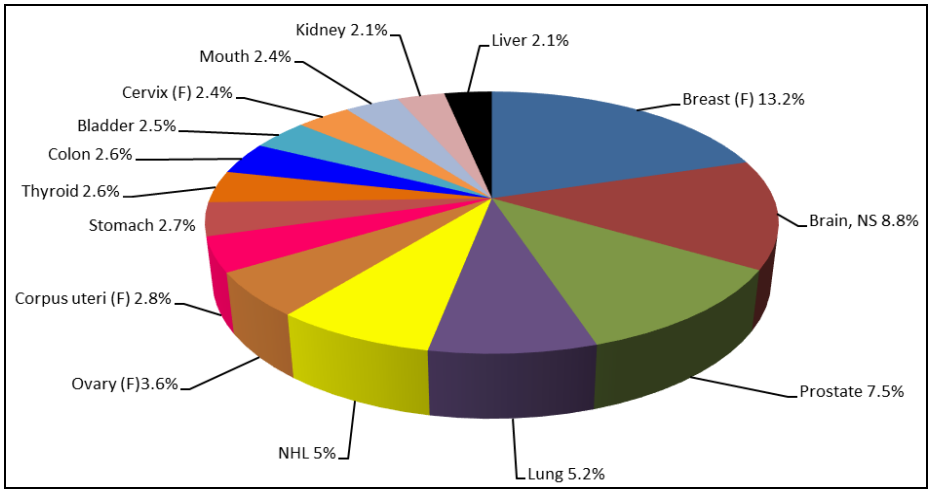

Fig 4: Common Cancer in both sexes by Primary Site (SEER), 2013-2016

Males

Table 4 depicts the distribution of most primary site of cancers by age among males. According to gender wise, out of the all registered (10,820) new males cancer cases males were 54.7% and females were 45.3% with a sex ratio of 827 females to 1000 males. The distribution of the most frequent type of cancers and their relative proportion of all cancers that occurred in 5923 (54.7%) are shown in the pie diagram.

Cancer of prostate accounted for the largest proportion (13.8%) among all males, with brain & nervous system alone accounting (11.0%) followed in rank order by lung cancer (7.2%). Next in frequency were cancer of non-hodgkin's lymphoma (5.8%), bladder (3.7%), mouth (3.6%), stomach (3.3%), colon (3.2%), kidney (3.0%), tongue (2.8%), liver (2.8%), bone (2.6%), hodgkin's disease (2.5%), rectum (2.5%) and multiple myeloma (2.4%) respectively [Table 4, Fig. 5].

Table 4: Age-wise distribution of common Primary Site (SEER) cancers among Males, 2013-2016

Rank	ICD.10	Site	00-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81+	Total	%	Mean Age (Yrs)	SD
1	C61	Prostate	0	0	2	1	21	127	340	273	51	815	13.8	67.4	9.156
2	C70-72	Brain, NS	78	52	72	103	126	116	74	27	4	652	11.0	39.6	20.114
3	C33-34	Lung	2	1	0	21	47	121	141	69	25	427	7.2	60.9	12.740
4	C82-85	NHL	15	24	18	25	52	79	76	36	19	344	5.8	51.4	20.352
5	C67	Bladder	2	2	4	4	13	46	74	53	20	218	3.7	63.7	14.387
6	C03-06	Mouth	0	0	8	33	41	62	48	17	3	212	3.6	53.1	13.428
7	C16	Stomach	0	0	5	17	40	48	59	17	9	195	3.3	56.6	13.548
8	C18	Colon	0	2	8	20	28	51	46	28	4	187	3.2	55.8	14.755
9	C64	Kidney	17	3	5	15	38	38	46	16	1	179	3.0	49.5	19.549
10	C01-02	Tongue	0	0	11	18	31	39	39	23	5	166	2.8	55.0	15.136
11	C22	Liver	2	2	5	11	22	44	48	25	4	163	2.8	57.0	15.119
12	C40-41	Bone	18	51	31	18	21	10	5	0	0	154	2.6	26.5	15.998
13	C81	Hodgkins D	19	20	31	43	15	6	9	2	2	147	2.5	31.2	17.802
14	C19-20	Rectum	0	1	9	14	25	45	35	14	3	146	2.5	54.2	14.264
15	C90	Multiple Myeloma	0	0	2	9	20	42	42	20	5	140	2.4	58.8	12.607

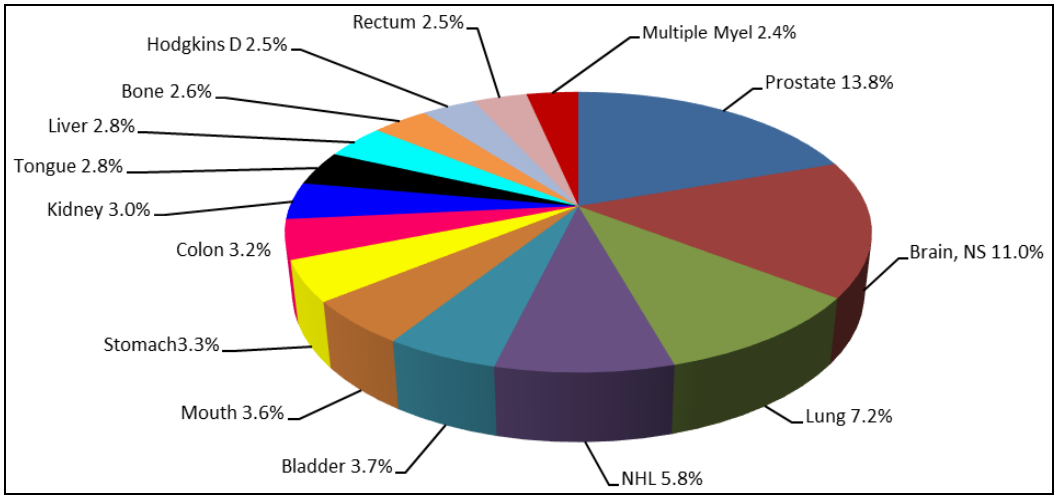

Fig 5: Common Cancer in Males by Primary Site (SEER), 2013-2016

Females

Table 5 depicts the distribution of most frequent primary site of cancers by age among females. Breast cancer accounted for the largest proportion (28.7%) of all cases followed by ovary alone accounting (7.9%). Next in frequency were corpus uteri cancer (6.2%) followed in rank order by brain & nervous system (6.1%), cervix (5.4%), Non-hodgkin's lymphoma (4.1%), thyroid (3.3%), lung (2.8%), gallbladder cancer (2.0%), connective and soft tissue sarcomas (1.9%), stomach cancer (1.9%), lymphoid leukemia (1.9%), colon (1.8%), oesophagus cancer (1.7%) and multiple myeloma 1.6%) [Table5, Fig. 6].

Table 5: Age-wise distribution of common Primary Site (SEER) cancers among Females, 2013-2016

Rank	ICD.10	Site	00-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81+	Total	%	Mean Age (Yrs)	SD
1	C50	Breast	0	1	32	194	353	422	279	98	27	1406	28.7	53.0	12.765
2	C56	Ovary	0	5	22	43	99	105	87	25	3	389	7.9	51.8	13.649
3	C54	Corpus uteri	0	0	0	19	37	104	112	29	5	306	6.2	58.6	10.658
4	C70-72	Brain, NS	38	21	35	43	47	62	38	16	0	300	6.1	40.3	20.616
5	C53	Cervix	0	0	2	40	61	88	55	15	2	263	5.4	52.9	11.723

6	C82-85	NHL	7	10	13	23	23	58	42	24	2	202	4.1	50.7	18.468
7	C73	Thyroid	2	4	23	38	37	24	26	2	5	161	3.3	44.9	16.278
8	C33-34	Lung	0	0	0	7	29	29	47	19	5	136	2.8	59.2	12.205
9	C23-24	Gallbladder	0	0	1	4	21	32	26	11	4	99	2.0	57.8	12.125
10	C47+49	Conn. & ST	6	5	15	16	16	22	9	4	2	95	1.9	42.4	18.918
11	C16	Stomach	1	0	7	8	28	20	21	8	0	93	1.9	51.4	14.344
12	C91	Lymph leuk	55	9	6	4	2	5	5	4	3	93	1.9	20.9	24.638
13	C18	Colon	0	1	2	7	13	26	31	7	2	89	1.8	56.6	13.047
14	C15	Oesophagus	0	0	1	5	12	27	23	12	4	84	1.7	59.0	12.717
15	C90	Multiple Myeloma	0	0	0	2	9	31	23	12	2	79	1.6	60.1	10.4885

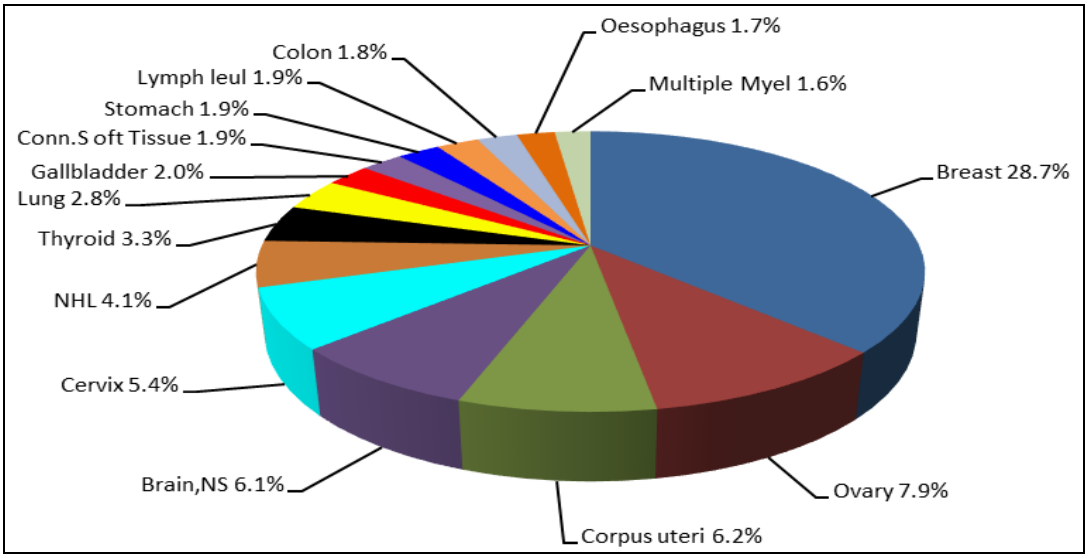

Fig 6: Common Cancer in females by Primary Site (SEER), 2013-2016

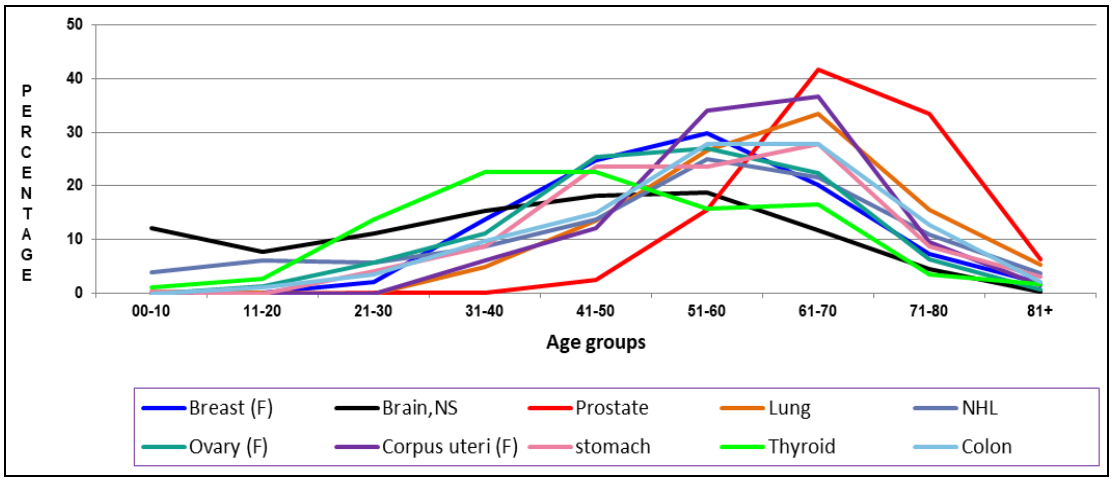

Fig 7: Age specific proportions for commonest cancer sites among both sexes

Discussion

Present study showed that 54.7 percent of the study subjects were males and 45.3 percent were females, study added evidence of disparate trends in the incidence of various sites of cancer by age and tumour location was defined in Fig.7. Cancer incidences are rising worldwide. It is estimated that by 2020, 16 million new cases will be diagnosed per annum out of which 70% will be in developing countries.[2] The prevalence of cancer varies in different geographical areas and according to different population groups. The common risk factors are classified as non-modifiable (genetic susceptibility and aging) and modifiable risk factors (tobacco, lifestyle, infectious agents, diet and physical activities. In India, cancer has become one of the five leading causes of death. It is estimated, that there are nearly 2 - 2.5 million cancer cases at any given point of time. Current proportion suggest that total cancer burden in India for all sites of cancer, will be double by 2026 because of increasing longevity, greater exposure to environmental carcinogens, continued use of tobacco and deteriorating life style. Combining the incidence of all cancers in both sexes worldwide, lung cancer is leading type of cancer followed by breast. In developing countries, the sequence is

different with the most common being lung (11.5%) followed by stomach (10.6%), breast (8.8%), and liver (8.8%). Age is the single most common risk factors for cancer[1]. Tobacco, alcohol, diet, reproductive and sexual behaviour, occupation, pollution, industrial products, medicines, genetic predisposition, and geographical factors are the other important factors. Data from population based registries under National Cancer Registry Program (NCRP) in India indicate that the leading sites of cancer are oral cavity followed by lungs, esophagus and stomach amongst women in India. In male population oral and oesophageal cancers are the highest in the world and cancers of colorectal and prostate are lowest. A significant variation of cancer sites has been reported due to life style, personal dietary habits, past history of illness and consumption of tobacco as the leading cause of cancers in India [7, 11, 14, 16].

Breast

In our study, breast cancer was the overall most common cancer in females (28.7%). The mean age and standard deviation (SD) of diagnosis was 53.0 (12.8) years. We found that the breast cancer cases increased by twofold from 2013 to 2016 (209 to 464). A high proportion (13.2%) of breast cancer was observed in women of all cancer cases and in the aged group of 31-70 years constituted a proportion 88.5%. Breast cancer is the most common cancer in women in India and accounts for 27% of all cancers in women [1, 15]. The incidence rates of breast cancer in India begin to rise in the early thirties and peak at ages 50-64 years. Overall, 1 in 28 women is likely to develop breast cancer during her lifetime. In urban areas, 1 in 22 women develops breast cancer during her lifetime as compared to rural areas where 1 in 60 women develops breast cancer in her lifetime [7]. Factors as marital status, location (urban/rural), breast feeding, waist to hip ratio, low parity, obesity, alcohol consumption, tobacco chewing, smoking, lack of exercise, diet, environmental factors were major risk factors in India leading to increasing incidence cancer; however, the reason for high incidence of breast cancer in younger women are not well known.

Brain & nervous system

Our study showed that brain & nervous system was the second leading site of cancer in both sexes (males: 11.0%, females: 6.1%). We found that the brain & nervous system cancer cases increased by twofold from 2013 to 2016 (152 to 310). The mean age and standard deviation (SD) of diagnosis for cancer of brain, nervous system for both sexes was 39.8 (20.3) years. Around 8.8 % of all tumors of brain and nervous system, 63.4% of CNS cases were observed in the aged group of 21-60 years. Tumors of the central nervous system (CNS) constitute 1–2% of all malignancies [1]. The incidence of central nervous system (CNS) tumors in India ranges from 5 to 10 per 100,000 populations with an increasing trend and accounts for 2% of malignancies. Incidence rates are higher for men; in particular, malignant brain tumors occur more frequently in males while the benign meningioma occurs predominantly in females [17]. However, CNS malignancies arguably have the most varied manifestations among all cancer sites. Among CNS neoplasms, gliomas are the most common tumors. In paediatric patients, both gliomas and medulloblastoma are common tumors. It is well known that geographical, genetic, and phenotype differences in populations can alter the incidence, natural history, behaviour, and response to the treatment of cancers [17, 21].

Prostate

The recent study showed the prostate cancer was the overall most common cancer in men (13.8%). The mean age and standard deviation (SD) of diagnosis for prostate cancer in men was 67.4 (9.2) years. We found that the prostate cancer cases increased by more than six-fold from 2013 to 2016 (53 to 364). Age is one of the strongest risk factors for prostate cancer, with around 7.5% of all cases diagnosed cases estimated proportions of prostate cancer were 90.8% in those aged of 51-80 years. Prostate is the second leading site of cancer among males in large Indian cities like Delhi, Kolkata, Pune and Thiruvananthapuram, third leading site of cancer in cities like Bangalore and Mumbai and it is among the top ten leading sites of cancers in the rest of the population based cancer registries (PBCRs) of India. The incidence rates of this cancer are constantly and rapidly increasing in all the PBRCs. It usually affects men in age group of 65+ years. However, recently there has been an increase in reports of cancer in younger men in the age group of 35-44 and 55-64 residing in metropolitan cities. Old age, obesity, improper diet, and genetic alterations have been identified as some of the main contributing factors towards increased incidence of prostate cancer. The cancer projection data shows that the number of cases will become doubled by 2020 [1, 11]. Delhi Cancer registry shows cancer of the prostate is the second most frequently diagnosed cancer among men in Delhi accounting for about 6.78% of all malignancies (2008–2009) [21, 22].

Lung

The present study showed the proportion of lung cancer (5.2%) occupied the fourth rank among both sexes (males: 7.2%, females: 2.8%). We found that the lung cancer cases increased by 59% from 2013 to 2016 (101 to 161). The mean age and standard deviation (SD) of diagnosis for lung cancer cases for both sexes was 60.5 (12.6) years. In our study with around 5.2% of all lung cancer diagnosed in men and women cases estimated proportions of lung. Lung cancer is the second most common cancer after breast cancer and kills more people than any other cancer. Tobacco smoking is the main cause of lung cancer and about 80-90% of lung cancers can be attributed to it. It accounts for 13 per cent of all new cancer cases and 19 per cent of cancer related deaths worldwide. There were 1.8 million new lung cancer cases estimated to occur in 2012 [1]. In India, lung cancer constitutes 6.9 per cent of all new cancer cases and 9.3 per cent of all cancer related deaths in both sexes; it is the commonest cancer and cause of cancer related mortality in men, with the highest reported incidences from Mizoram in both males and females. The time trends of lung cancer show a significant rise in Delhi, Chennai and Bengaluru in both sexes [12]. The incidence and pattern of lung cancer differ as per geographic region and ethnicity and largely reflect the prevalence and pattern of smoking. The overall 5-year survival rate of lung cancer is dismal with approximately 15 per cent in developed countries and 5 per cent in developing countries [23].

Non-hodgkin's lymphoma

In our study the proportion of Non-hodgkin's lymphoma (5.0%) occupied fifth rank (males: 5.8%, females: 4.1 %). We found that the non-hodgkin's lymphoma cases increased by twofold from 2013 to 2016 (91 to 170). The mean age and standard deviation (SD) of diagnosis for Non-hodgkin's lymphoma cases for both sexes was 21.2 (19.7) years. The high proportion of NHL were observed in the aged group of 41- 70 years and constituted 60.4 %.The incidence rates of NHL have been raising in India like in other parts of the world. The burden of NHL for India was estimated to have an incidence rate of 2.2/100,000 (23,801 new cases) and a mortality rate of 1.5/100,000 (16,597 deaths) [11] within the country, the incidence of NHL is higher in urban areas compared to rural registries. The incidence of all haematological cancers is highest in Delhi (capital of India), followed by Mumbai, and lowest in Barshi (rural-based cancer registry) [1], the rural and urban populations are different with regard to environmental and socioeconomic factors. Urban cities in India, especially Delhi and Mumbai, are industrialized and fairly populated. The socioeconomic status of people is higher, and dietary habits and lifestyle tend to tilt toward western styles. In rural areas, on the other hand, people stick to traditional eating habits and lifestyle. These factors may be responsible for the relative differences in the incidence of lympho-hemopoietic malignancies in the urban versus rural population [24].

Ovary

Our study showed that cancer of ovary was the second leading cause of morbidity among females (7.9%). We found that the ovary cancer cases increased by more than three-fold from 2013 to 2016 (42 to 147). Ovarian cancer proportions (74.8%) are highest in women aged 41-70 years. The mean age and standard deviation (SD) of diagnosis for breast cancers in women was 51.8 (13.7) years. According to Globocon 2012 estimate[1], more than 50% cases of ovarian neoplasm diagnosed in Indian female in 2015 will be after the sixth decade, though it includes not only epithelial but also other histopathological types. Gynaecologic cancers include cervical cancer, ovarian cancer, uterine/endometrial cancer, vaginal cancer and vulva cancer. They form a huge burden of morbidity and mortality around the world. Data available from various centers worldwide are indicative of vast regional variability in incidence, common sites of occurrence, age and stage of presentation. Cancer cervix is one of the common gynaecologic malignancies and is the major cause of cancer mortality among Indian women [25, 26].

Corpus uteri

The present study findings showed the cancer of corpus uteri (6.2%) was the third leading cause of morbidity. We found that the cancer of corpus uteri cases increased by four-fold from 2013 to 2016 (29 to 112). The great majority (92.2%) of cases of uterine cancer are diagnosed in women aged over 41-80 years. The mean age and standard deviation (SD) of diagnosis for cancer of corpus uteri in women was 58.6 (10.7) years. Endometrial cancer risk has been associated with age at menarche, age at menopause, parity, age at first and last birth, time since last birth and use of oral contraceptives. Endometrial cancer is the most common gynaecologic malignancy in western women [1]. Worldwide, there are a nearly 12.7 million new cancer cases and 7.6 million cancer deaths occurred in 2008 [1]. In India, there are 0.88 million cancer cases with an incidence rate (ASR) of 105.5 per 100,000 in women. The incidence of endometrial cancer cases are very low in India; the highest being observed in Bangalore (ASR=4.2) and in Delhi (ASR=4.3), while in Mumbai it was 2.8 per 100,000. Whereas rates in developing countries and Japan are four to five times lower. In India, the rates are as low as 4.3 per 100,000 [27]. Its annual incidence is estimated at 10–20 per 100,000 women and it is increasing [28, 29]. Approximately, 75% of cases are diagnosed at an early stage with a tumor confined to the uterine corpus [1].

Stomach

The present study findings showed the proportion of stomach cancer among both sexes was 2.7% (Males: 3.3%, females: 1.9%). We found that the stomach cancer cases increased by three-fold from 2013 to 2016 (37 to 101). The high proportion (83.7%) of gastric cancer was observed in the aged group of 31- 70 years. The mean age and standard deviation (SD) of diagnosis for stomach cancers among both sexes were 54.9 (14.0) years. Gastric cancer is the fifth most common cancer among males and seventh most common cancer among females in India [30]. However; its incidence rates in different geographical regions are distinctly varied. The incidence of gastric cancer in India is low compared to developed countries, though there are certain geographical areas (Southern part and north-eastern states of country) where the incidence is comparable to high-incidence areas of world. There is a worldwide variation in the incidence of gastric cancer. A high incidence of gastric cancer has been reported from Southeast Asia, most commonly from Japan, China, and South Korea [31]. The incidence of gastric cancer in India is overall less compared to the worldwide incidence. The age-adjusted rate (AAR) of gastric cancer among urban registries in India is (3.0-13.2) compared to the worldwide AAR (4.1-95.5) [32-35]. Worldwide and more so in the developed world, there has been a decline in the incidence of gastric cancer and this has been attributed to improved food hygiene, sanitation, and food preservation techniques. However, this declining trend has not been seen in certain parts of India.

Thyroid

Thyroid cancer cases increased by three-fold from 2013 to 2016 (29 to 95). The present study findings showed the proportion of thyroid cancer among both sexes was 2.6% (Males: 2.1%, females: 3.3%). The mean age and standard deviation (SD) of diagnosis for thyroid cancers among both sexes were 45.4 (16.2) years. Thyroid cancer is the most common endocrine cancer (approximately 1.0% -1.5% of all new cancers diagnosed each year in the USA[36], and its incidence has continuously increased in the last three decades all over the world. Thyroid cancer is the fifth most common cancer in women [37], and in Italy, it is the second most frequent cancer in women below 45 years of age[38]. Only in few countries (Norway, Sweden) thyroid cancer incidence is decreased [39].

Limitations

This study was a hospital based study and hence, does not represent the true rate of events in the general population. Further hospital-based and community-based cohort studies are recommended in order to further explore the highlights of morbidity pattern in the general population.

Conclusion

The present study only highlights the status of different types of cancer morbidities in a tertiary care hospital. This is the first study amongst admitted/OPD patients with all causes of cancer morbidity to highlights the morbidity pattern. The overall incidence of cancer in Gurgaon shows an increasing trend and the number of cancers diagnosed/treated at FMRI is expected to tripled between the period 2013 and 2016.

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References

1. Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C, *et al*. GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC Cancer Base No 11. Lyon, France: International Agency for Research on Cancer, 2013. Available from: http://www.globocan.iarc.fr. [Last accessed on 23rd September 2018].
2. World Health Organization & International Union against Cancer. Global action against cancer, Updated ed. Geneva: World Health Organization, 2005. http://www.who.int/iris/handle/10665/43203[Last accessed on 23rd September 2018].
3. Jedy-Agba E, Curado MP, Ogunbiyi O, Oga E, Fabowale T, Igbinoba F, *et al*. Cancer Incidence in Nigeria: A report from population-based cancer registries. Cancer Epidemiol, 2012; 36:e271-8.
4. R Lozano, M Naghavi, K Foreman, S Lim, K Shibuya, V Aboyans, *et al*. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010, Lancet. 2012; 380(9859):2095-2128.
5. Dinshaw K, Rao D, Ganesh B. Tata Memorial Hospital Cancer Registry Annual Report. Mumbai, India, 1999.
6. Rao Y, Gupta S, Agrawal S. National cancer control program: current status and strategies. Fifty years of cancer control in India. Director General of Health Services, MOHFW, Government of India. 2002; 41-7.
7. National Cancer Registry Programme (ICMR), Bangalore, 2001. Consolidated Report of the Population based cancer registries, 1990-1996. Available at http://www. ncdirindia.org/NCRP/Annual_Reports.aspx [Last accessed on 24th September 2018]
8. Jagnnatha G, Hiremath S. Oral Cancer Prevalence and assessment of various risk factors among Oral cancer patients attending Kidwai Memorial institute of oncology-An epidemiological study, 2005. Retrieved from http://hdl.handle. net/123456789/2652 [Last accessed on 23rd August 2018]
9. Maiti P, Jana U, Ray A, *et al*. Patterns of cancer occurrence in different regions of west Bengal- a hospital based study, J Indian Med Assoc. 2012; 110:445-8.
10. Sharma MK, Gour N, Pandey A, Wallia D, Kislay D. Epidemiological trends of cancer morbidity at a government medical college hospital, Chandigarh, India. Asian Pac J Cancer Prev. 2012; 13:3061-4.
11. National Cancer Registry Programme (ICMR), Bangalore. Time trends in cancer incidence rates 1982-2010, 2013. Available at http://www. ncdirindia.org/NCRP/Annual _Reports. aspx [Last accessed on 24th September 2018].
12. Tominaga S. Cancer incidence in Japanese in Japan, Hawaii, and western United States. National Cancer Institute monograph. 1985; 69:83-92.
13. Gupta PC. Mouth cancer in India: A new epidemic? J Indian Med Assoc. 1999; 97:370-3.
14. ICMR, Development of an Atlas of Cancer in India, A project of national Cancer Registry Programme. (n.d.). Retrieved from http://www.ncrpindia.org/Cancer_Atlas_India/map. htm [Last accessed on 24th September 2018].
15. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. Int J Cancer. 2010; 127:2893-917.
16. Three Year Report of Population Based Cancer Registries 2012-2014. Indian Council of Medical Research (ICMR), Bangalore, India 2016. Available at http://www. ncdirindia.org/ NCRP/ Annual_ Reports.aspx
17. McLendon RE, Rosenblum MK, Darell D. Bigner Russell and Rubinstein's Pathology of Tumors of the Nervous System. 7th Ed. New York: CRC Press, 2006.
18. Wen PY, Kesari S. Malignant gliomas in adults. New England Journal of Med. 2008; 359:492-507.
19. Thakkar JP, Dolecek TA, Horbinski C, Ostrom QT, Lightner DD, Barnholtz-Sloan JS, *et al*. Epidemiologic and molecular prognostic review of glioblastoma. Cancer Epidemiol Biomarkers Prev. 2014; 23:1985-96.
20. Schwartzbaum JA, Fisher JL, Aldape KD, Wrensch M. Epidemiology and molecular pathology of glioma. Nat Clin Pract Neurol. 2006; 2:494-503.
21. Raina Vinod, Tyagi BB, Manoharan N. Dr. BRA. Institute Rotary Cancer Hospital, AIIMS; New Delhi: 2001–2003. Population based Cancer Registry.
22. Verma Kusum, Tyagi BB. Dr. BRA Institute Rotary Cancer Hospital, AIIMS; New Delhi: 1998–1999. Population Based Cancer Registry.
23. Parkin DM, Bray F, Ferlay J, Pisani P. Global cancer statistics, 2002. CA Cancer J Clin. 2005; 55:74-108.
24. Bhutani M, Kumar L, Kochupillai V. Lympho-hemopoietic malignancies in India. Med Oncology 2002; 19:141-150.
25. Shanta V, Krishnamurthi S, Gajalakshmi CK, Swaminathan R, Ravichandran K. Epidemiology of cancer of the cervix: global and national perspective. J

Indian Med Assoc. 2000; 98:49-52.
26. Pal SK, Mittal B. Improving cancer care in India: prospects and challenges. Asian Pac J Cancer Prev. 2004; 5:226-8.
27. Balasubramaniam G, Sushama S, Rasika B, Mahantshetty U. "Hospital-based study of endometrial cancer survival in Mumbai, India," Asian Pacific Journal of Cancer Prevention. 2013; 14(2):977-980.
28. Prat J, Gallardo A, Cuatrecasas M, Catasús L. "Endometrial carcinoma: pathology and genetics," Pathology. 2007; 39(1)72-87.
29. Shu J, S Fang J, Teichman PG, Xing L, Huang H. "Endometrial carcinoma tumorigenesis and pharmacotherapy research," Minerva Endocrinologica. 2012; 37(2):117-132.
30. V Rao DN, Ganesh B. Estimate of cancer incidence in India in 1991. Indian J Cancer. 1998; 35:10-8.
31. Alberts SR, Cervantes A, van de Velde CJ. Gastric cancer: Epidemiology, pathology and treatment. Ann Oncol. 2003; 14:ii31-6.
32. Pavithran K, Doval DC, Pandey KK. Gastric cancer in India. Gastric Cancer. 2002; 5:240-3.
33. Yeole BB. Trends in cancer incidence in esophagus, stomach, colon, rectum and liver in males in India. Asian Pac J Cancer Prev. 2008; 9:97-100.
34. Satyanarayana L, Asthana S. Life time risk for development of ten major cancers in India and its trends over the years 1982 to 2000. Indian J Med Sci. 2008; 62:35-44.
35. Rastogi T, Devesa S, Mangtani P, Mathew A, Cooper N, Kao R *et al*. Cancer incidence rates among South Asians in four geographic regions: India, Singapore, UK and US. Int J Epidemiol. 2008; 37:147-60.
36. Curado MP, Edwards B, Shin HR *et al*. Cancer Incidence in Five Continents, of IARC Scientific Publications, No. 160, IARC, Lyon, France, 2007, vol 9.
37. Jemal A, Siegel R, Xu J, Ward E. "Cancer statistics, 2010," CA: A Cancer Journal for Clinicians. 2010; 60(5):277-300.
38. Dal Maso L, Lise M, Zambon P *et al*. "Incidence of thyroid cancer in Italy, 1991–2005: time trends and age-period-cohort effects," Annals of Oncology. 2011; 22(4):957-963.
39. Kilfoy BA, Zheng T, Holford TR *et al*. "International patterns and trends in thyroid cancer incidence, 1973–2002," Cancer Causes and Control. 2009; 20(5):525-531.