International Journal of Medical and Health Research
ISSN: 2454-9142, Impact Factor: RJIF 5.54
www.medicalsciencejournal.com
Volume 3; Issue 4; April 2017; Page No. 32-41

A profile of common morbidities among geriatric population attending at a new tertiary care institute

[*1] Brij Bhushan Tyagi, [2] Bidhu Kalyan Mohanti, [3] Narendra Kumar Bhardwaj, [4] Priya Tiwari, [5] Danish N, [6] Vinod Raina

[1] Manager- Cancer Registry, Department of Medical Oncology, Fortis Memorial Research Institute, Gurgaon, Haryana, India
[2] Director & Head, Department of Radiation Oncology, Fortis Memorial Research Institute, Gurgaon, Haryana, India
[3] Research Officer, Department of Medical Oncology, Fortis Memorial Research Institute, Gurgaon, Haryana, India
[4] Associate Consultant, Department of Medical Oncology, Fortis Memorial Research Institute, Gurgaon, Haryana, India
[5] Medical Officer, Department of Medical Oncology, Fortis Memorial Research Institute, Gurgaon, Haryana, India
[6] Director & Head, Department of Medical Oncology, Fortis Memorial Research Institute, Gurgaon, Haryana, India

Abstract
Background: Health problems in the geriatric age group are an important component of any healthcare delivery system. Age related changes in immune system and degenerative phenomenon renders the people in this age group susceptible to a variety of infections, neoplasms and other disabilities.
Aim: To find out the morbidity pattern among geriatric population.
Objective of this study: To identify the morbidity pattern and compare the results at international level (references) to disease burden among the geriatric population.
Materials and methods: A retrospective study was conducted amongst admitted cases from January 1st, 2014 to December 31st, 2014 at Fortis Memorial Research Institute (FMRI). Morbidity and mortality were assessed by history taking, clinical examination, and by reviewing the past records of the patients from medical record section.
Results: The total number of elderly patients ≥ 65 years were 3125. Out of the total cases, 1808 (57.9%) were males and 1317 (42.1%) were females. The leading causes of morbidity in males were chronic Ischaemic Heart Disease (7.6%) followed by Hypertension (7.1%), Lung Cancer (4.5%), Diabetes Mellitus (2.9%) and senile Cataract (2.8%). In females, leading causes of morbidity were Breast Cancer (8.4%) followed by hypertension (7.4%), Cancer of Ovary (5.0%), Gonarthrosis (4.0%) and senile Cataract (3.7%). A statistically significant association was found between males and females.
Conclusion: The study revealed that elderly were suffering from many chronic disorders. Such common comorbidities need preventive, curative and rehabilitative services. Hence, this data will enhance understanding of the health status of the elderly and morbidity pattern and it will help to prepare appropriate intervention strategies.

Keywords: chronic morbidity, geriatric, case fatality rate

1. Introduction

In India, the size of elderly population has been increasing from 5.6% in 1961 and it is projected to rise to 12.4% of population by the year 2026. At age 60 average remaining length of life was found to be about 18 years (16.7 for males, 18.9 for females) and that at age 70 was less than 12 years (10.9 for males and 12.4 for females) [1]. The absolute number of elderly in India increased from 76 million in 2001 to 100 million in 2011. As per the census 2011, the number of elderly population comprised 8.2 % of the total population [2]. The proportion of the population aged 60 and over, is also growing each year. By the year 2025, the world will host 1.2 billion people aged 60 and over, rising to 1.9 billion in 2050 [3]. An elderly person is an individual aged sixty-five years, considering that this age is consistent with retirement age in most of the countries, all over the world. In India, retirement age for most workers is 60 years for the purposes of retirement, social insurance entitlements and pensions, however, in some areas of government and private sector this age is now 65years. Old age is not a disease in itself, but the elderly are vulnerable to long term diseases of insidious onset such as cardiovascular illness, cerebrovascular accidents, cancers, diabetes, musculoskeletal and mental illnesses. They have multiple symptoms due to decline in the functioning of various body organs [4]. Health-care seeking will also probably increase [5]. So, knowledge of the situation and circumstances of the elderly population is essential to the provision of cost- effective services and the planning of strategies for intervention and care [6].

The Gurgaon district of Haryana state is surrounded by Delhi and Rajasthan. Over the past 25 years the city has undergone rapid development and construction. Gurgaon is one of Delhi's four major satellite cities and is part of the National Capital Region. It is within commuting distance of Delhi via an expressway and Delhi Metro. It is the second largest city in the Indian state of Haryana and is the industrial and financial center of Haryana. It has the 3rd highest per capita income in India after Chandigarh and Mumbai. Gurgaon is also the only Indian city to have successfully distributed electricity connections to all its households.

In 2011, Gurgaon had population of 1,514,432 of which male and female were 816,690 and 697,742 respectively, with a sex ratio of 854 females per 1000 males. There was an upward change of 73.96 percent in the population compared to population as per 2001 [7].

Fortis Memorial Research Institute, Gurgaon (FMRI) started clinical services in July 2012 and was officially inaugurated on 1st May 2013. With the goal to dispense modern tertiary

health care to the community in a compassionate, professional and distinctive way, FMRI endeavors to be the health ultimate care destination for Asia-Pacific and beyond. The institute integrates modern and traditional forms of medicine to dispense accessible and affordable health care.

1.1 Aim
To find out the morbidity pattern among geriatric population.

1.2 Objective of this study
To identify the morbidity pattern and compare the results at international level (references) to disease burden among the geriatric population.

2. Methods
2.1 Study Population
A retrospective study was conducted amongst admitted cases from January 2014 to December 2014 at FMRI. The hospital bed strength is 265. Those belonging to 65 years and above age group were considered elderly. The data entry on morbidity and mortality of all patients is routinely done by the medical records section. This data has information on socio-demographic, diagnosis, treatment, prognosis of the disease condition at discharge and cause of death etc. as recorded in the case records by the clinicians. Records of patients with missing information of demographic data and diagnosis were excluded from the study. For multiple diagnoses, morbidity with the longest duration or the final diagnosis (supported by relevant laboratory investigations) was recorded as primary illness for the patient. All the information collected was cross-checked for completeness of the data from the records available at hospital (viz- patient's admission file, reports and ward registers, etc.). The World Health Organization (WHO) standards were used for analyzing 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. [8-10] Quality control of information is maintained through the use of data processing, editing techniques, case finding audits and reviews of coded and abstracted data. Validity checks were carried out on all the variables and records with missing values and impossible codes were checked against the original files and corrected. Finally a series of checks of diagnosis versus sex and age etc. were carried out to detect the coding or typing errors.
The present study only highlights the status of different types of morbidities among elderly people in a tertiary care hospital. This is the third study in this hospital amongst admitted patients of geriatric age group with all causes of morbidity to highlights the morbidity pattern.

2.2 Statistical analysis
Collected data were entered in Microsoft Excel and 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 were applied to identify important relationships between variables to determine the level of significance. A p-value of < 0.05 was considered statistically significant.

3. Results
During the year 2014, from 1st January 2014 to 31st December 2014, a total of 3125 geriatric patients were admitted in FMRI. Of this total patient population, males were 1808 (57.9%) and females were 1317 (42.1%) with males to females preponderance ratio of 1.37:1. Over all sex ratio was 728 females to 1,000 males. Out of these 3125cases, 2522 (80.7%) came from 19 Indian states; males were 1445 (57.3 %) and females were 1077 (42.7%) with a sex ratio of 745 females to 1,000 to males and the remaining 603 (19.3%) were foreign nationals coming from 33 different countries with a sex ratio of 661 females to 1,000 to males. A statistically significant association was found between males and females among the Indian, other countries and total cases. (Table 1, Fig.1).

Table 1: Distribution of geographical area of geriatric cases by sex, year-2014

Geographical area		Male	Female	Total	% (Total cases)	No. of Indian states/ other countries	Z Statistics
India	No.	1445	1077	2522	80.7	19	7.3 Stat. Sig. at (p<0.0001)
	%	57.3	42.7	100.0			
Other countries	No.	363	240	603	19.3	33	4.9 Stat. Sig. at (p<0.0001)
	%	60.2	39.8	100.0			
Total	No.	1808	1317	3125	100.0		8.7 Stat. Sig. at(p=0)
	%	57.9	42.1	100.0			

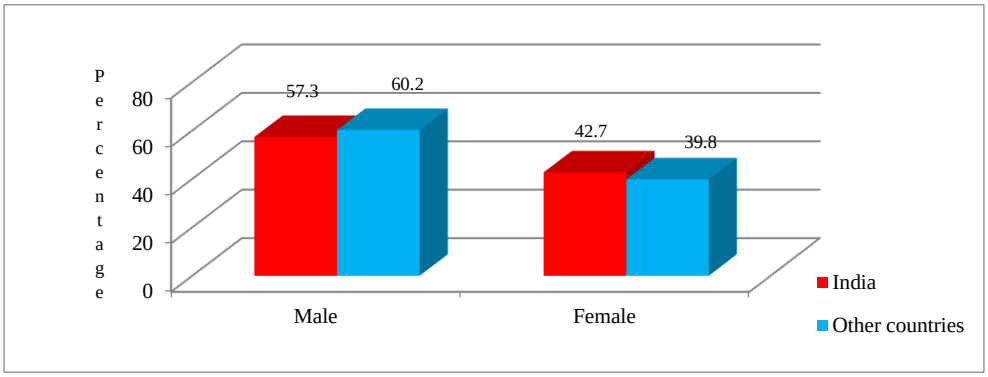

Fig 1: Percentage distribution of geographical area of geriatric cases by sex

High rates of co-morbidity present a challenge in providing care to elderly. In our findings, 53.1% had one disease, 17.9% had two diseases, 10.6% had three diseases, 8.2% had four diseases, 4.9% had five diseases while 5.4% had six or more diseases, and the number of diseases ranged from1- 9 (Table 2, Fig. 2). The number of morbidities was increasing with age.

Table 2: Distribution of co-morbidities in geriatric patients

No. of causes/ morbidities	Nos.	%
1	1658	53.1
2	561	17.9
3	330	10.6
4	256	8.2
5	152	4.9
6+	168	5.4
All cases	3125	100.0

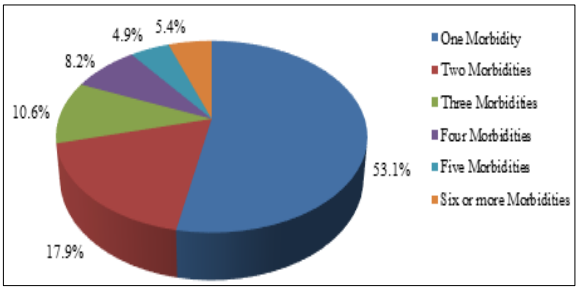

Fig 2: Percentage distribution of co- morbidities

Table 3 gives the break-up of leading number of geriatric cases registered according to place of residence of Indian states and other countries by sex. Out of the total 3125 patients; 2522 were Indian patients who came from 19 Indian states, males were 1445 (57.3%) and females were 1077 (42.7%). Majority of the patients came from nearby states Haryana (65.6%) followed by Delhi (20.7%), Uttar Pradesh (6.6%), Rajasthan (1.9%) and from far flung areas of Madhya Pradesh (1.0%), Assam (0.8%), Jammu & Kashmir (0.8%), Punjab (0.8%), Uttarakhand (0.5%) and Jharkhand (0.4%) (Fig.3); of the remaining 603 patients, who came from foreign 33 other countries, males were 363 (60.2%) and females were 240 (39.8%). The patients, of foreign origin, that came to Fortis hospital for taking treatment from countries of Iraq (60.7%) followed by Nigeria (9.5%), Congo (7.6%), Afghanistan (5.1%), Kenya (3.3%), Uzbekistan (3.0%), Somalia (1.2%), Yemen (1.2%), Oman (1.0%) and Fiji (0.8%) respectively (Fig.4).

Table 3: Leading number of cases admitted by geographical area

Rank	Indian		Other countries	
	States	%	Nationalities	%
1	Haryana	65.6	Iraq	60.7
2	Delhi	20.7	Nigeria	9.5
3	Uttar Pradesh	6.6	Congo	7.6
4	Rajasthan	1.9	Afghanistan	5.1
5	Madhya Pradesh	1.0	Kenya	3.3
6	Assam	0.8	Uzbekistan	3.0
7	Jammu & Kashmir	0.8	Somalia	1.2
8	Punjab	0.8	Yemen	1.2
9	Uttarakhand	0.5	Oman	1.0
10	Jharkhand	0.4	Fiji	0.8
Total cases		2522	Total cases	603

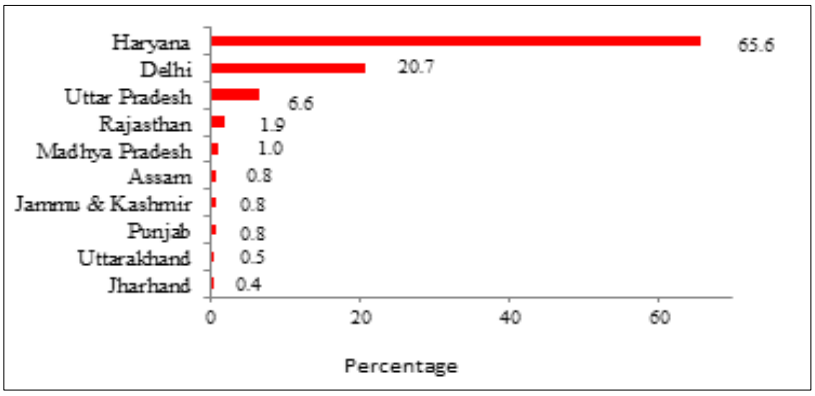

Fig 3: Leading number of cases registered from Indian states

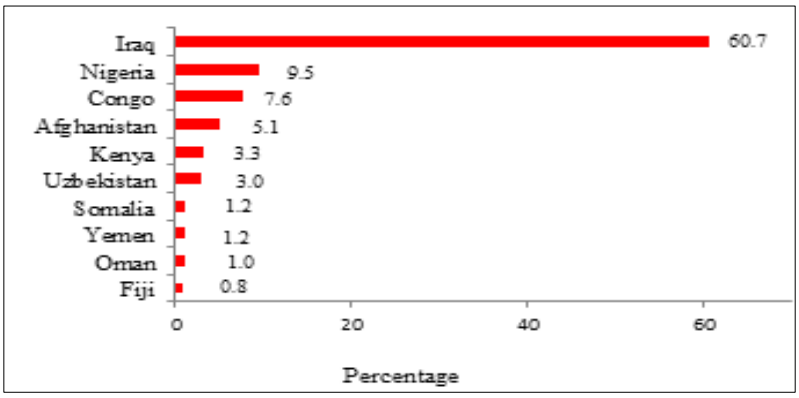

Fig 4: Leading number of cases registered from other countries

Table 4 depicts the proportion of cases by age, sex and geographical area. Fig. 5 shows the comparison of proportions between the age composition of each group among the Indian and other countries. The age specific proportions by sex were found to increase with age. It is observed that the highest percentage of morbidity among all cases were in the age group 65-69 years (40.5%) followed by the age group 70-74 (28.4%) and 75-79 (19.1%) years. The mean age of male was 72.4 years and female it was 72.3 years. A statistically significant association was found among all age groups by sex except 90+ years.

Table 4: Proportion of cases by age, sex and geographical area

Age Groups	India		Other countries		All Cases						
	Male	Female	Male	Female	Male		Female		Total		Z Statistics
	%	%	%	%	No. (Prop %)	%	No. (Prop %)	%	No.	%	
65-69	21.9	16.3	29.5	20.6	730 (0.577)	23.4	536 (0.423)	17.2	1266	42.5	5.4 Stat. Sig. at <0.0001
70-74	16.8	11.3	14.4	15.6	510 (0.574)	16.3	378 (0.426)	12.1	888	28.4	4.4 Stat. Sig. at p<0.0001
75-79	10.6	9.8	11.9	2.0	340 (0.569)	10.9	258 (0.431)	8.3	598	19.1	3.3 Stat. Sig. at p<0.0008
80-84	5.3	3.6	3.0	1.2	151 (0.606)	4.8	98 (0.394)	3.1	249	8.0	3.3 Stat. Sig. at p=0.0011
85-89	2.0	1.3	0.7	0.3	55 (0.611)	1.8	35 (0.389)	1.1	90	2.9	2.1 Stat. Sig. at =0.03981
90+	0.7	0.4	0.7	0.2	22 (0.647)	0.7	12 (0.353)	0.4	34	1.1	Not Sig
Total ages (%)	1445 (57.3)	1077 (42.7)	363 (60.2)	240 (39.8)	1808 (57.9)		1317 (42.1)		3125 (100.0)		8.7 Stat. Sig. at p=0
Mean Age	72.7	72.7	71.4	70.2	72.4		72.3				

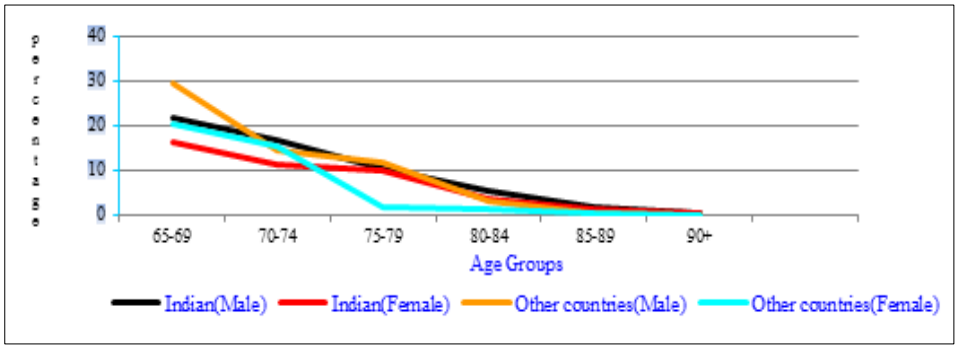

Fig 5: Age-specific proportions for all causes of morbidity among Indian states and other countries by sex

Table 5 provides the distribution of common causes of morbidities/system involved in males among Indians and other countries cases respectively. In India, disease of hypertension (ICD:I10, 8.0%) was the leading cause of morbidity followed by chronic Ischaemic Heart Disease **(**ICD:I25, 7.1%), malignant neoplasm of Bronchus and Lung (ICD:C34, 4.9%), disease of senile Cataract (ICD:H25, 3.0%), type 2 Diabetes Mellitus (ICD:E11, 2.7%), chronic Kidney disease (ICD:N18, 2.4%), secondary malignant neoplasm of respiratory and digestive organs (ICD:78, 2.2%), Multiple Myeloma and malignant Plasma cell neoplasm (ICD:C90, 2.1%), malignant neoplasm of Urinary Bladder (ICD:C67, 2.1%) and Non-Hodgkin's Lymphoma (ICD:C85, 2.1%) (Fig.6) respectively.

In male patients from other countries, chronic Ischaemic Heart Disease (ICD:I25, 9.6%) was the leading cause followed by Prostate cancer (ICD:C61, 6.9%), secondary malignant neoplasm of other and unspecified sites **(**ICD:C79, 6.3%), hyperplasia of Prostate (ICD:N40, 6.1%), other spondylopathies (ICD:M48, 5.8%), malignant neoplasm of Stomach (ICD:C16, 5.5%), disease of hypertension (ICD:I10, 3.6%), type 2 Diabetes Mellitus (ICD:E11, 3.6%), Multiple Myeloma and malignant Plasma cell neoplasm (ICD:C90, 3.0%) and malignant neoplasm of Bronchus and Lung (ICD:C34, 2.8%) (Fig. 7) respectively.

Diseases of chronic Ischaemic Heart Disease, disease of Hypertension, malignant neoplasm of Bronchus and Lung, type 2 Diabetes Mellitus and Multiple Myeloma and malig. Plasma cell neoplasms are the common leading causes of morbidity among Indians and other countries cases.

Table 5: The highest % of morbidity causes (ICD.10) among Indians and other countries cases, Male

Rank	India			Other Countries			All cases		
	ICD.10	System involved	%	ICD.10	System involved	%	ICD.10	System involved	%
1	I10	Hypertension	8.0	I25	Chronic ischaemic heart disease	9.6	I25	Chronic ischaemic heart disease	7.6
2	I25	Chronic ischaemic heart disease	7.1	C61	Prostate Cancer	6.9	I10	Hypertension	7.1
3	C34	Malignant neoplasm of bronchus and lung	4.9	C79	Sec. malignant neoplasm of other and unspecified sites	6.3	C34	Malignant neoplasm of bronchus and lung	4.5
4	H25	Senile Cataract	3.0	N40	Hyperplasia of prostate	6.1	E11	Type 2 diabetes mellitus	2.9
5	E11	Type 2 diabetes mellitus	2.7	M48	Other spondylopathies	5.8	H25	Senile Cataract	2.8
6	N18	Chronic kidney disease	2.4	C16	Malignant neoplasm of Stomach	5.5	C61	Prostate Cancer	2.6
7	C78	Secondary malignant neoplasm of resp. and digestive organs	2.2	I10	Hypertension	3.6	C79	Sec. malignant neoplasm of other and unspecified sites	2.5

8	C90	Multiple Myeloma and malig. plasma cell neoplasm	2.1	E11	Type 2 diabetes mellitus	3.6	M48	Other spondylopathies	2.5
9	C67	Malignant neoplasm of Urinary Bladder	2.1	C90	Multiple Myeloma and malig. plasma cell neoplasm	3.0	N40	Hyperplasia of prostate	2.5
10	C85	Non-Hodgkin's Lymphoma	2.1	C34	Malignant neoplasm of bronchus and lung	2.8	C90	Multiple Myeloma and malig. plasma cell neoplasm	2.3
All cases			1445	All cases		363	All cases		1808

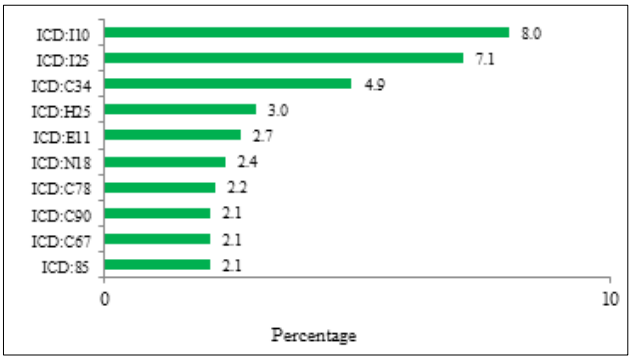

Fig 6: Ten leading causes of morbidity among Indian, Males

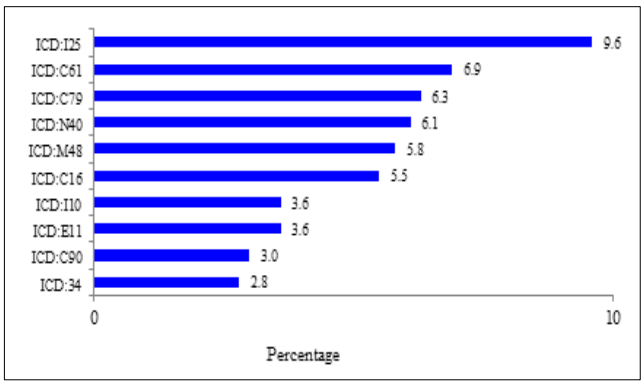

Fig 7: Ten leading causes of morbidity among other countries, Males

Table 6 depicts the distribution of common causes of morbidities/system involved in females among Indians and other countries cases respectively. In Indian cases, the highest percentage of morbidity cause among females were malignant neoplasm of Breast (C50, 8.8%) followed by Hypertension (I10, 7.5%), malignant neoplasm of Ovary (C56, 5.2%), senile Cataract (H25, 4.5%), Multiple Myeloma and malignant Plasma cell neoplasm(C90, 3.4%), type 2 Diabetes Mellitus (E11, 3.0%), chronic Ischaemic Heart Disease (ICD:I25, 3.0%) Non-Hodgkin Lymphoma (C85, 2.7%), Gonarthrosis (M17, 2.5%) and cancer of Oesophagus (C15, 2.2%) (Fig. 8) respectively.

In female patients from other countries, disease of Gonarthrosis (M17, 10.8%) was the leading cause followed by other spondylopathies (M48, 7.1%), cancer of Pancreas **(**C25, 7.1%), hypertension (I10, 6.7%), sec. malignant neoplasm of other and unspecified sites (C79, 6.7%), malignant neoplasm of Breast (C50, 6.2%), malignant neoplasm of Ovary (C56, 4.2%), cancer of Liver (C22, 3.6%), chronic Ischaemic Heart Disease (I25, 2.9%) and cancer of Gall bladder (C23, 2.5%) (Fig. 9).

Diseases of malignant neoplasm of Breast, hypertension, %), malignant neoplasm of Ovary, disease of Gonarthrosis and chronic Ischaemic Heart Disease are the common leading causes of morbidity in males among Indians and other countries cases.

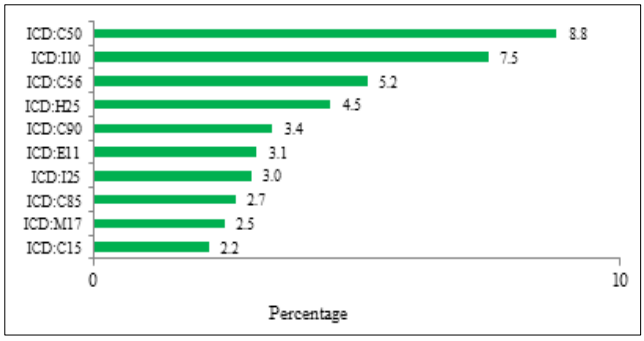

Fig 8: Ten leading causes of morbidity among Indian, Females

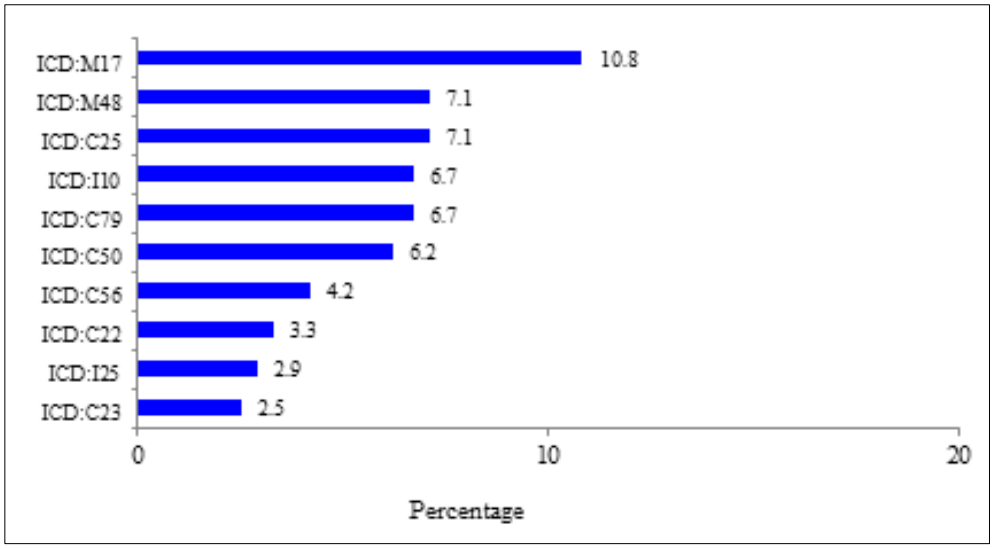

Fig 9: Ten leading causes of morbidity among other countries, Females

Table 6: The highest % of morbidity causes (ICD.10) among Indians and other countries cases, Female

Rank	India			Other Countries			All cases		
	ICD.10	System involved	%	ICD.10	System involved	%	ICD.10	System involved	%
1	C50	Malignant neoplasm of breast	8.8	M17	Gonarthrosis	10.8	C50	Malignant neoplasm of breast	8.4
2	I10	Hypertension	7.5	M48	Other spondylopathies	7.1	I10	Hypertension	7.4
3	C56	Malignant neoplasm of ovary	5.2	C25	Cancer of pancreas	7.1	C56	Malignant neoplasm of ovary	5.0
4	H25	Senile Cataract	4.5	I10	Hypertension	6.7	M17	Gonarthrosis	4.0
5	C90	Multiple Myeloma and malig. plasma cell neoplasm	3.4	C79	Sec. malignant neoplasm of other and unspecified sites	6.7	H25	Senile Cataract	3.7
6	E11	Type 2 diabetes mellitus	3.1	C50	Malignant neoplasm of breast	6.2	I25	Chronic ischaemic heart disease	3.0
7	I25	Chronic ischaemic heart disease	3.0	C56	Malignant neoplasm of ovary	4.2	C79	Sec. malignant neoplasm of other and unspecified sites	2.8
8	C85	Non-Hodgkin's Lymphoma	2.7	C22	Cancer of liver	3.3	C90	Multiple Myeloma and malig. plasma cell neoplasm	2.8
9	M17	Gonarthrosis	2.5	I25	Chronic ischaemic heart disease	2.9	E11	Type 2 diabetes mellitus	2.8
10	C15	Cancer of Oesophagus	2.2	C23	Cancer of Gall Bladder	2.5	M48	Other spondylopathies	2.4
All cases			1077	All cases		240	All cases		1317

Table 7 provides the distribution of seasonal variations among the morbidity, mortality and case fatality rate (CFR) for Indian cases and other countries. The climate in Gurgaon area cannot be differentiated into the conventional four seasons. A more practical demarcation is the winter months of December, January and February, the spring season months of March and April, the hot-dry period of May and June, the hot-wet monsoon (rainy) period of July, August and September and autumn comprising October and November. Out of the total admission (n= 3125), the high point in the frequency of morbidities was found in the hot-wet (n= 798, 25.5%) season (July: 7.4%, August: 8.9% and September: 9.2% month) followed by winter (n= 749, 24.0%) season (December: 9.1%, January: 8.0% and February: 6.9%). Overall case fatality rate was 22.7 (n=71) per 1000 population. A high case fatality rate (n=23, 42.8) was seen in the autumn season (October: 25.5, November: 60.6) and followed by spring (n= 17, 31.5) season (March: 24.2 and April: 37.8).

In Indian patients, the high point in the frequency of mortalities with case fatality rate was found in the autumn (n= 22, 40.9) season (Oct: 25.5 and November: 56.8 month) followed by spring (n= 12, 22.3) season (March: 20.2, and April: 24.1) and in other nationals the high point in the frequency of mortalities with case fatality rate was found in the spring (n= 5, 9.3) season (March: 4.0 and April: 13.7 month) followed by hot-dry (n= 1, 2.0) season (May: 3.7) per 1000 population.

Table 7: Seasonal proportion of variations in morbidity, mortality and Case Fatality Rate (CFR) per 1000 among the Indian & other countries cases

Months/ Seasonal variations	Morbidity	Mortality		
		Indian	Other countries	All
	%	CFR	CFR	CFR
December	9.1	14.1	0.0	14.1
January	8.0	4.0	0.0	4.0
February	6.9	18.6	0.0	18.6
Winter (Dec.-Feb)	***24.0[2]***	***12.0***	***0.0***	***12.0***
March	7.9	20.2	4.0	24.2
April	9.3	24.1	13.7	37.8
Spring (Mar-April)	***17.2[3]***	***22.3[2]***	***9.3[1]***	***31.5[2]***
May	8.6	11.2	3.7	14.9
June	7.5	25.8	0.0	25.8
Hot-Dry (May- June)	***16.0***	***18.0[3]***	***2.0[2]***	***20.0[3]***
July	7.4	8.7	0.0	8.7
August	8.9	21.6	0.0	21.6
September	9.2	13.8	0.0	13.8
Hot-wet (Jul-Sept.)	***25.5[1]***	***15.0***	***0.0***	***15.0***
October	8.8	25.5	0.0	25.5
November	8.4	56.8	3.8	60.6
Autumn (Oct- Nov)	***17.2***	***40.9[1]***	***1.9[3]***	***42.8[1]***
Total (Jan. - Dec.)	3125	64	7	71
%	100.0	20.5	2.2	22.7

Superscript figures (1, 2 & 3) are representing the rank order of morbidity and Case Fatality Rate (among Indians/other countries and all cases)

Table 8 shows the distribution of patients according to condition at discharge. It was found that out of the total (n= 3125) cases, 2996 patients (95.9%) were discharged/relieved/cured, 72 (2.3%) expired, 50 (1.6%) left against medical advice (LAMA) and 7 (0.2%) patients left the hospital on own risk. A statistically significant association was found between males and females among the discharge/relieved/cured and total cases.

Table 8: Distribution of inpatients according to condition at discharge (Indian and other countries)

Condition at discharge	Male	Female	Total		Z-statistic
	No. (Prop %)	No. (Prop %)	No.	%	
Discharge/Relieved	1732 (0.579)	1264 (0.422)	2996	95.9	8.4 Stat. sig. (p<0.0001)
Expired	42 (0.583)	30 (0.417)	72	2.3	1.4 Not sig.
Left Against Medical Advice	31 (0.620)	19 (0.380)	50	1.6	1.7 Not Sig.
Left on own risk	3 (0.429)	4 (0.571)	7	0.2	0.4 Not Sig.
Total	1808 (0.579)	1317 (0421)	3125	100.0	8.7 Stat. sig. (p=0)

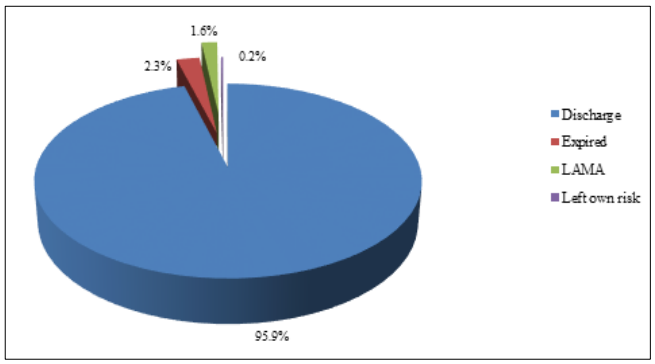

Fig 9: Percentage distribution of patients at condition of discharge

4. Discussion

Present study showed that 57.9 percent of the study subjects were males and 42.1 percent were females. Majority of the subjects 68.9% of the elderly were found in the age group 65 to 74 years, with males and females contributing 39.7% and 29.2% respectively.

In a similar studies conducted by Anjali and Aarti *et al*. (2006) [11], Rajan S.I (2006) [12] and Eun-kyung W, Changsu H *et al*. Ansan Geriatric cohort study in South Korea (2007) [13] reported similar age distribution. The sex ratio was found to be 728 females per 1000 males in the present study; the finding was lesser than the findings of the National Family Health Survey- III (2005-2006) [14].

Co-morbidity is common in elderly persons and is associated with more rapid declines in health status and a greater likelihood of disability. High rates of co-morbidity present a challenge in providing care to elderly. In our finding, 53.1% had one disease, 17.9% had two diseases, 10.6% had three diseases, 8.2% had four diseases, 4.9% had five diseases while (5.4%) had six or more diseases and ranged from 1-9 diseases. The numbers of morbidities were increasing with age. Study conducted in Saudi Arabia, 11% of elderly group had one morbidity and 89% had two or more morbidity distributed as following: Two chronic diseases experienced by 16.5%, three conditions by 21.8% and four or more conditions by 50.7% of the elderly population. The number of elderly morbid conditions ranged from 1-7 diseases and this number of morbidities increasing with advanced age [15]. Doghether *et al*., [16] reported that 56 % of elderly had two or more diseases the less prevalence of morbidities in this study may be that previous studies were in a geriatric home or in primary health care not a rural community. Also; a high rates of co-morbidity present a challenge in providing care to elderly [17, 20].

Results of the current study showed that diseases of chronic Ischaemic Heart Disease (ICD:I25) was more encountered among males (7.6%) compared to females (3.0%), gender differences may result from biological differences obesity or confounding effect, this may be due to other socio-demographic, comorbidity factor. A systematic review showed that overall worldwide prevalence of hypertension, showed no significant gender difference [21] and finding was similar [22]. Results from the National Community Based Survey in the Saudi Arabia revealed that male gender was a risk factor of ischaemic heart disease [23] this difference may be due to differences in the age group or the type of the target population.

The current study showed that second cause of morbidity was disease Hypertension (ICD: I10) which was encountered more among females (8.4%) compared to males (7.1%). Study conducted by Mohamed A. Al-Modeer *et al.* [22]. had reported hypertension was the most common among the morbidities and is also found to be more prevalent among males than females. Worldwide prevalence of hypertension however, showed no significant gender difference [21].

Results of the study showed that disease of Diabetes Mellitus (ICD: E11) is more common in both sexes and it is more among males (2.9%) compared to females (2.8%). Diabetes is one of the growing health problems in the elderly population in the world and in the Middle East region in general and Saudi Arabia in particular [24–27]. Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease [28, 29]. In 2000, India (31.7 million) topped the world with the highest number of people with Diabetes Mellitus followed by China (20.8 million) with the United States (17.7 million) in second and third place respectively. According to Wild *et al.* [30] the prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030 with a maximum increase in India. It is predicted that by 2030 Diabetes Mellitus may afflict up to 79.4 million individuals in India, while China (42.3 million) and the United States (30.3 million) will also see significant increases in those affected by the disease [30, 31].

We found a higher incidence of senile Cataract (ICD: H25) in females (3.7%) compared with males (2.8%). Many studies worldwide have reported a higher prevalence of cataract among women [32, 33, 34]. Our results suggest that the higher rates of cataract in women in our study are not explained solely by differential access to health care, but may be due to other factors such as higher levels of exposures to risk factors such as biomass cooking fuels or intrinsic differences such as hormonal factors. Several other studies examining the incidence of cataract have also reported higher rates among women than men. [35, 36]

Result of the current study showed that incidence of Multiple Myeloma and malignant Plasma Cell Neoplasm (ICD: C90) among females (2.8%) are more compared to males (2.3%). Also, incidence of secondary malignant neoplasms of other and unspecified sites (ICD: C79) in females (2.8%) are more compared with males (2.5%). Multiple Myeloma is not uncommon it accounts for 1% of all neoplastic disorders, 10%

of haematological malignancies in whites and 20 % of all haematological malignancies in African Americans [37]. In India, the incidence varies from 0.3-1.9/100,000 for females [38]. Secondary malignant neoplasm of other and unspecified sites covered the second malignancy of lip, oral cavity and pharynx, bone, breast and female genital organs, male genital organs, urinary organs, nervous system and endocrine glands and related structures.

Results of the study showed that diseases of the other spondylopathies (ICD: M48) ranked as the eighth (2.5%) in males and the tenth (2.4%) in females. Diseases of the other malignant neoplasm of bronchus and lung (ICD: C34) ranked as the third (4.5%) in males. Currently, lung cancer is a major health problem. It is estimated 0.22 million new cases of lung cancer were diagnosed and 0.16 million mortalities occurred due to the disease in 2010[39]. Lung cancer is the most common fatal cancer in males and females, and is predicted to account for 29% of all male and 26% of all female cancer-related mortalities [39]. Due to increasing life expectancy and the increased risk of cancer with aging, lung cancer is common in elderly individuals. More than half of lung cancer cases are diagnosed in patients aged >65 years [40-42].

Our study showed that cancer of breast (ICD: C50, 8.4%) was the leading cause of morbidity and cancer of Ovary (ICD: C56, 5.0%) occupied the third rank in females. Breast cancer is the most common diagnosed malignancy in women worldwide (22%) and in India (18.5%) it ranks second to cervical cancer. The burden of breast cancer is increasing in both developed and developing countries; the peak occurrence of breast cancer in developed countries is above the age of 50 whereas in India it is above the age of 40 [43]. Breast cancer is the most common cancer in women worldwide, with nearly 1.7 million new cases diagnosed in 2012 (second most common cancer overall). This represents about 12% of all new cancer cases and 25% of all cancers in women [44]. Ovarian cancer is the seventh most common cancer in women worldwide (18 most common cancer overall), with 0.24 million new cases diagnosed in 2012. [44] Ovarian cancer is the sixth most common cancer (age standardized incidence rate: 6.6/100,000) and the seventh leading cause of cancer deaths (age standardized mortality rate: 4.0/100,000) among women worldwide [45]. In most of the population-based cancer registries in India, ovarian cancer is the third leading site of cancer among women, trailing behind cervix and breast cancer. The age-adjusted incidence rates of ovarian cancer vary between 5.4 and 8.0 per 100,000 populations in different parts of the country [46]. According to a study conducted among cancer patients by Tyagi BB, B K Mohanti *et al*. [47] breast cancer (31.5%) was the leading cause.

The present study showed that high point in the frequency of morbidities was found in the hot-wet (25.5%) season (July: 7.4%, August: 8.9% and September: 9.2% month) followed by winter (24.0%) season (December: 9.1%, January: 8.0% and February: 6.9%). Also, high point in the case fatality rate (CFR) was found in the autumn (42.8%) season (Oct: 25.5%, Nov.: 60.6% month) followed by spring (31.5%) season (March: 24.2%, April: 37.8%). A study conducted by Sharma *et al*. [48] had reported that most cases of Acute Diarrhoeal Diseases (ADD) (38.89%) and pulmonary tuberculosis (4.68%) in summer, and typhoid (1.57%) and viral hepatitis (1.23%) in the monsoon season. Several other studies reveled that most episodes occurred during late monsoon season. Another study from central India has reported severe anemias requiring blood transfusion as the most common cause of hospitalization in Sickle Cell Disease (SCD) children [49]. Maximum hospitalizations were seen during the late monsoon and early post monsoon season (August-October). This finding was similar to previous reports from India [50, 51].

The present study shows that 95.9% patients that were discharged/ relieved or cured. A statistically significant association was found between the sexes. Similar results were also reported by Tyagi BB *et al.* [52-54].

5. Strengths of the Study

In FMRI, no study had been reported so far to assess morbidity & quality of life of geriatric population. Further, it was a retrospective study which showed the true picture of geriatric population in urban area.

5.1 Future Directions of the Study

There is a need to carry out extensive multicentric studies involving both rural and urban areas to identify all the risk factors precipitating morbidities in elderly age, so that preventive program becomes more successful in India. Not only the array of socio-demographic, socio-economic, and environmental factors along with the health-seeking behaviour, but also other physiological and behavioural risk factors need to be explored for effective control of morbidities in elderly age. We hope to replicate the study further with larger population in whole of the state.

6. Acknowledgement

The authors express their thanks to the staff of the Medical Record Section for their constant assistance in retrieving the relevant case files and to Mr Sujeet Singh (DEO) Cancer Registry, Fortis Memorial Research Institute Gurgaon

7. Declaration of Conflicting Interests

The authors declare that there are no potential conflicts of interest with respect to the research, authorship and /or publication of this article.

7.1 Funding

The authors received no financial support for the research, authorship and/or publication of this article**.**

8. References

1. Situation analysis of elderly in India. Central Statistics Office Ministry of Statistics & Programme Implementation Government of India, 2011. [Last accessed on 2016 December 21] Available from: http://mospi.nic.in/sites/default/files/publication_reports/elderly_in_india.pdf
2. Census of India. Office of the Registrar General & Census Commissioner, India. 2011. [Last accessed on 2016 December 21]. Available from: http://www.censusindia.gov.in/vital_statistics/SRS_Report/9Chap%202%20-%202011.pdf
3. World Population Prospects: The 2002 Revision, Highlights. New York: United Nations Population Division, 2003. (ESA/P/WP. 180).
4. Prakash R, Choudhary SK, Singh US. A Study of Morbidity Pattern among Geriatric Population in An

Urban Area of Udaipur Rajasthan, Indian Journal of Community Medicine. 2004; XXIX(1):35-40.
5. Gijsen R, Hoeymans N, Schellevis FG, Ruwaard D, Satariano WA, van den Bos. GA. Causes and Consequences of comorbidity: A review. Journal of Clinical Epidemiology. 2001; 54:661-74.
6. Abolfotouh MA, Daffallah AA, Khan MY, Khattab MS, Abdulmoneim I. Psychosocial assessment of geriatric subjects in Abha City, Saudi Arabia. East Mediterr Health J. 2001; 7(3):481-491.
7. Census of India (2011) Gurgaon Population Census data 2011. [Last accessed on 2016 December 21] Available from: http://www.census2011.co.in/census/ district/225-gurgaon.html
8. International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Tabular List World Health Organization, Geneva, Switzerland. 2010, 1.
9. International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Instruction Manual, World Health Organization, Geneva, Switzerland, 2010, 2.
10. International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Alphabetical Index, World Health Organization, Geneva, Switzerland, 2010, 3.
11. Anjali R, Aarti K. Living conditions of Elderly in India: An overview based on nationwide data. Indian Journal of Gerontology. 2006; 20:250-63.
12. Rajan SI. Centre for Enquiry into Health and Allied Themes. Population Ageing and Health in India, 2006. Available from http://www.cehat.org/humanrights/rajan.pdf.
13. Eun-kyung W, Changsu H, Sangmee AJ, Min KP, Sungsoo K, Eunkyung K, *et al*. Morbidity and related factors among elderly people in South Korea: results from the Ansan Geriatric (AGE) cohort study. BMC Public Health. 2007; 7:10.
14. National Family Health Survey, India. NFHS- 3 Tamilnadu Publications. 2005 available from: http://www.rchiips.org/nfhs/NFHS-3%20Data/TamilNadu_report.pdf
15. AL–Doghether MH, AL–Megbil TI. Determinants of prescribing for the elderly in primary health care. Middle East Journal of Family Medicine. 2004; 2(1):1-5.
16. Bani IA. Prevalence and related risk factors of Essential Hypertension in Jazan region, Saudi Arabia. Sudanese J Public Health. 2011; 6:45-50.
17. Fillenbaum GG. Comorbidity of five chronic health conditions in elderly community residents: determinants and impact on mortality. Journal of Gerontology a Biol Sci Med Sci. 2000; 55:84-9.
18. Grau L, Kovner C. Comorbidity, Age, and Hospital Use among Elderly Medicare Patients. Journal of Aging and Health. 1991; 3:352-67.
19. Ibrahim NK, Ghabrah TM, Qadi M. Morbidity profile of elderly attended/admitted in Jeddah health facilities, Saudi Arabia. Bull High Inst Public Health. 2005; 35:173-90.
20. Jennifer L, Wolff MH, Starfield B. Prevalence, Expenditures, and Complications of Multiple Chronic Conditions in the Elderly. Archives of Internal Medicine. 2002; 162:2269-76.
21. Kearney P, Whelton M, Reynolds K, Muntner P. Global burden of hypertension: analysis of worldwide data. Lancet. 2005; 365:217-23.
22. Mohamed A. Al-Modeer, Noha S. Hassanien, Chauky M. Jabloun. Profile of morbidity among elderly at home health care service in Southern Saudi Arabia, Journal of Family & Community Medicine. 2013; 20(1):53-57. Doi: 10.4103/2230-8229.108187
23. Al-Nozha MM, Arafah MR, Al-Mazrou YY, Al-Maatouq MA, Khan NB, Khalil MZ, *et al*. Coronary artery disease in Saudi Arabia. Saudi Med J. 2004; 25:1165-71.
24. Ahmed A. Review on the prevalence of Diabetic Foot and its Risk Factors in Saudi Arabia. Middle East J Middle East J Family Med. 2009; 7:29-34.
25. Hossain P, Kawar B, El Nahas M. Obesity and Diabetes in the Developing World- A Growing Challenge. The New England Journal of Medicine. 2007; 356:213-5.
26. Chang J, Malik V, Jia W, Kadowaki T, Yajnik C, Hoyoor K, *et al*. Diabetes in Asia, Epidemiology, Risk factors and pathophysiology. The Journal of the American Medical Association. 2009; 301:2129-40.
27. Mokdad A, Ford E, Bowman B, Dietz W, Vinicor F, Bales V, *et al*. Prevalence of obesity, Diabetes, and Obesity related health risk factors. The Journal of the American Medical Association. 2003; 289:76-9.
28. Joshi SR, Parikh RM. India - diabetes capital of the world: now heading towards hypertension. J Assoc Physicians India. 2007; 55:323-4.
29. Kumar A, Goel MK, Jain RB, Khanna P, Chaudhary V. India towards diabetes control: Key issues. Australas Med J. 2013; 6(10):524-31.
30. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes-estimates for the year 2000 and projections for 2030. Diabetes Care. 2004; 27(3):1047-53.
31. Whiting Dr, Guariguata L, Weil C, Shawj. IDF Diabetes atlas: Global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract. 2011; 94:311-21.
32. Eye Diseases Prevalence Research Group Prevalence of cataract and pseudophakia/aphakia among adults in the United States. Arch Ophthalmology. 2004; 122:487-494.
33. Krishnaiah S, Vilas K, Shamanna BR. Smoking and its association with cataract: results of the Andhra Pradesh eye disease study from India. Invest Ophthalmology Vis Sci. 2005; 46:58-65.
34. Lewallen S, Mousa A, Bassett K, Courtright P. Cataract surgical coverage remains lower in women. Br J Ophthalmology. 2009; 93:295-298.
35. Klein BE, Klein R, Lee KE, Gangnon RE. Incidence of age-related cataract over a 15-year interval: the Beaver Dam Eye Study. Ophthalmology. 2008; 115:477-482.
36. Kanthan GL, Wang JJ, Rochtchina E. Ten-year incidence of age-related cataract and cataract surgery in an older Australian population: the Blue Mountains Eye Study. Ophthalmology. 2008; 115:808-814.
37. National Cancer Registry Programme. Consolidated report of Population Based Cancer Registries 1990-1996, Indian Council of Medical Research, New Delhi, 2001.

38. Waternose J, Muir C, m Mack T, Fowell J, Wn clan SL, (eds) Cancer Incidence in Five Continents, Lyon IARC Scientific Publications. 1987, 779-785.
39. Jemal A, Siegel R, Xu J, Ward E. Cancer statistics, 2010. CA Cancer J Clin. 2010; 60:277-300.
40. Makrantonakis PD, Galani E, Harper PG. Non-small cell lung cancer in the elderly. Oncologist. 2004; 9:556-560.
41. Maione P, Rossi A, Sacco PC, *et al*. Treating advanced non-small cell lung cancer in the elderly. Med Oncol. 2010; 2:251-260.
42. Owonikoko TK, Ragin CC, Belani CP, *et al*. Lung cancer in elderly patients: an analysis of the surveillance, epidemiology, and end results database. J Clin Oncol. 2007; 25:5570-5577.
43. Population based cancer registries consolidated report (1990-96) [Last accessed on 2016. Available from: http://www.icmr.nic.in/ncrp/pbcr.pdf.
44. Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C, Rebelo M, *et al*. GLOBOCAN, Cancer Incidence and Mortality Worldwide: IARC Cancer Base No. 11. Lyon, France: International Agency for Research on Cancer. 2012-2014, 1. Available from: http://globocan.iarc.fr, accessed on 28/12/2016
45. Parkin DM, Bray F, Ferlay J, Pisani P. Global cancer statistics, 2002. CA Cancer J Clin. 2005; 55:74-108.
46. Consolidated Report of Population Based Cancer Registries 2001-2004. National Cancer Registry Program. Indian Council of Medical Research. Bangalore, 2006.
47. Tyagi BB, Mohanti BK, Kabra V, Munshi A, Bhardwaj NK, Sahai SK, *et al*. Morbidity Patterns in Oncology Patients at FMRI, Gurgaon: A Hospital Based Study at a New Tertiary Care Institute; American Journal of Cancer Epidemiology and Prevention. 2015; 3:8-22.
48. Sharma MK, Bhatnagar T, Goel NK, Verma A, Swami HM. Operationalisation of surveillance of communicable diseases in Chandigarh. J Commun Dis. 2005; 37:197-202.
49. Patel AB, Athvale AM. Sickle cell disease in central India. Indian J Pediatric. 2004; 71:789-93.
50. Mohanty D, Mukherjee MB. Sickle cell disease in India. Curr Opin Hematology. 2002; 9:117-22.
51. Dash BP, Das RK. Age, sex and seasonal variations of sickle cell disorder cases in Orissa. J Hum Ecol. 1998; 9:281-4.
52. Tyagi BB, Aswal RS, Haroon AS. Morbidity Patterns amongst Hospitalized Patients in a Secondary Care Hospital of Dehradun, Uttarakhand State, India. HSOA Journal of General Practice and Medical Diag. USA. 2015; 1(1):1-10.
53. Tyagi BB, Haroon AS, Negi VK, Bhardwaj NK. Morbidity patterns amongst hospitalized Children in a secondary care hospital of Uttarakhand, India. Int J Community Med Public Health. 2016; 3:837-44.
54. Tyagi Brij Bhushan, Bidhu Kalyan Mohanti, Nandini Hazarika, Vinod Raina. An epidemiological study on morbidity patterns amongst hospitalized children in a new tertiary care hospital of Gurgaon, India. Int Journal of Medical and Health Research. 2016; 2(11):06-14.