RESEARCH COMMUNICATION

Burden of Cancer and Projections for 2016, Indian Scenario: Gaps in the Availability of Radiotherapy Treatment Facilities

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Abstract

Plausible projections of future burden of cancer in terms of incident cases and requirement of radiotherapy treatment facilities at the national and state level are useful aids in planning of cancer control activities. The present communication attempts to provide a scenario for cancer in India during the year 2001 and its likely change by 2016 for "all sites of cancer" as well for selected leading sites. Further, a study was made of: (i) the state-wise distribution of radiotherapy treatment facilities & short falls; and (ii) pattern of investment of finances through central assistance by Government of India for cancer control activities during the various plan periods. The age, sex and site-wise cancer incidence data along with populations covered by 12 Indian population based cancer registries were obtained from the eighth volume of Cancer Incidence in Five Continents (CIV-VIII) and other published reports. Pooled age sex, site specific cancer incidence rates for twelve registries were estimated by taking weighted average of these registries with respective registry population as weight. Population of the country and states according to age and sex for different calendar years viz. 2001, 2006, 2011 and 2016 were obtained from the report of Registrar General of India. Population forecasts were combined with the pooled incidence rates of cancer to estimate the number of cancer cases by age, sex and site of cancer for the above 5-yearly periods. The existing radiotherapy facilities available in the country for cancer treatment during the year 2006 was based on the published reports and updated through personal communication from the Ministry of Health of India. During the year 2001, nearly 0.80 million new cancer cases were estimated in the country and this can be expected to increase to 1.22 million by 2016 as a result of change in size and composition of population. The estimated numbers were greater for females (0.406 millions, 2001) than males (0.392 millions, 2001). Lung, esophagus, stomach, oral and pharyngeal cancers are much higher in men while in women, cancers of cervix and breast are predominant forms followed by those of oral cavity, stomach and esophagus. Considering all the sources, it was noted that during the year 2006, there were 347 teletherapy units in the country as against a requirement of 1059. The state-wise analysis of the distribution of RCCs, and radio-therapy units shows wide gaps in the availability of facilities. The existing treatment facilities for cancer control in-terms of radiotherapy and financial allocation are woefully inadequate to take care of even the present load. The only way to fight this scourge under such circumstances is to have pragmatic programmes and policies based on currently available scientific information and sound public health principles.

Key Words: Burden of cancer - teletherapy units - projections - therapy capacity gaps

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Introduction

The burden of cancer is increasing worldwide despite advances in diagnosis and treatment. Globally, the burden of new cancer cases in 2000 was estimated to be around 10.1 million, developing world contributing to 53% of this load. Rising longevity, alterations in life styles and progressive control of communicable diseases has led to emergence of cancer and non-communicable diseases as an important health problem in India and other developing countries. In India, the life expectancy at birth has steadily risen from 49.7 years in 1973 to 62.7 years in 2001, indicating a shift in demographic profile (SRS, 2006). It is expected that life expectancy of Indian population will increase to 70 years by 2021-25 (Registrar General of India, 1996). There will be a substantial rise in the proportion of elderly people (60+) in the country. In-terms of absolute numbers, the increase will be from 14 millions as recorded during the year 1971 to 113 millions in the year 2016 (SRS, 1998). Due to such changes in age structure, population would face an increase in incidence of cancers and some other non-communicable diseases, which have a higher chance of occurrence among elderly. Future health scenarios that are likely, or probable or

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merely possible can have an important role in shaping public health policy. Studies on health projections provide an indication of the strong interest shown by scientific and public-health communities in the definition and quantification of scenarios of future health (Murray and Lopez, 1997). There have, however, been few comprehensive efforts to project burden of cancer and radiotherapy treatment facilities available for cancer treatment in India.

The aim of present communication is to present about scenario of cancer in India during the year 2001 and its projections for 2016 for "all sites of cancer" and selected leading sites of cancers. It is also proposed to study (i) the state-wise distribution of radiotherapy treatment facilities & short falls, and (ii) pattern of investment of finances by Govt. of India for cancer control activities during the various plan periods.

Materials and Methods

a) Prediction of new cancer cases for India till 2016:

i) Estimation of pooled incidence rate: The Volume VIII of cancer incidence in five continents published for the period 1993-1997 contained data for nine (9) Indian Population based cancer registries (PBCRs) viz. Ahmedabad(urban), Bangalore(urban), Chennai(urban), Delhi(urban), Mumbai(Bombay)(urban), Nagpur(urban), Karunagapally (rural), Pune (urban) and Thiruvananthapuram (rural and urban both) (Parkin, 2002). The number of cancer cases by site, sex and five-year age group for each of the registries were obtained by multiplying the age-specific-incidence rates with the respective five-year populations. In order to obtain number of cases per year in each registry, 5, divided total of five-year incident number cases in each registry for all the registries expect for Delhi, which was divided by 4, as the data were for the period 1993-1996. The respective annual number of cases thus obtained through above step, were summed-up for all the registries to get the total number of cases in each five- year age group by site and sex. Further, the annual incidence data for Barshi & Bhopal registries were estimated from the two-year period, data relating to the years 1997-1998 (NCRP, 2002). Annual incidence data of cancer was also obtained for the year 1997 from the published report of Kolkatta population based cancer registry (CNCI, 2001). The annual incidence data of the above 3 PBCRs were combined with the data of above 9 registries to get pooled annual incident number of cases of cancer for 12 registries located in different parts of the country.

The annual populations of all the above 12 registries by age and sex in the respective five- year age groups were added-up to obtain the total population for all the registries. The pooled age specific incidence rates of cancer by site, age and sex for all the twelve registries were obtained by dividing the respective pooled number of cases with the corresponding pooled population.

ii) Population of the country and of states. Population of the country and for various 15 major states of the country, according to age and sex by different quinquennial years from 2001 to 2016 were obtained from the report of population projections carried out for the country for the years 1996 to 2016 by the Registrar General of India (Registrar General of India, 1996).

iii) Estimation of incident cases of cancer. The respective age and sex- specific pooled incidence rates by site based on 12 registries were multiplied with the corresponding projected age and sex specific population figures to estimate the predicted number of cancer cases by age, sex and site for various calendar years Viz. 2001, 2006, 2011 and 2016 by site, sex and five year age groups. The projections have been carried out for the various selected sites of cancer. Estimation of incident cases have been done both at the national level as well as for the 15 major states of India which covers 95 % of the countries population.

iv) Estimation of prevalent cases of cancer. The duration of cancer disease has been assumed to be three years for estimation of prevalent cases of cancer (Dhar et al 2007). In order to obtain the prevalent number of cases of cancer the incident cases was multiplied by three.

b) Existing radiotherapy facilities available for cancer treatment

The existing radiotherapy facilities available for cancer control activities during the year 2006 was based on the published report of International Union Against Cancer (Gupta et al., 2006) and updated through personal communication from the Ministry of Health of Govt. of India.

c) Pattern of investment for cancer control activities through central assistance

Pattern of investment on health and for cancer control activities by Government of India in the various five-year plan periods was obtained through the plan documents published by the planning commission and other published reports of Central Bureau of Health Intelligence (Health information of India 2004 and National Health Profile 2006).

Assumptions: The projection of number of persons developing cancer have been done with the following assumption (i) pooled incidence rates obtained from the 12 Population Based Cancer registries represent country's incidence rate as well as for the various states of the country, (ii) age-specific cancer incidence rates for the latest available year will remain unchanged over next 15 years.

Results

National & State level estimates and projections for 2016

Incident cases (Table 1): In India, during the year 2001, nearly 0.80 million new cancer cases were estimated and this would get increased to 1.22 million by 2016 as a result of change in size and composition of population. In the country at any point of time during the year 2001, based on the above incident cases it was further estimated that nearly 2.4 million cancer cases were prevalent and

Table 1. Projected Annual Numbers of New Cancer Cases by Sex during Quinquennial Years 2001-2016

India & States	Male				Female				Both			
Sites	2001	2006	2011	2016	2001	2006	2011	2016	2001	2006	2011	2016
India	391,758	447,847	512,529	587,750	405,899	471,570	546,454	631,899	797,657	919,417	1,058,984	1,219,649
Andhra Pradesh	30,306	34,909	39,999	45,722	33,430	38,783	44,702	51,293	63,735	73,692	84,701	97,015
Assam	9,032	10,410	12,104	14,174	8,705	10,432	12,522	15,022	17,737	20,843	24,626	29,196
Bihar	37,036	41,580	47,237	54,023	36,865	42,171	48,392	55,626	73,900	83,751	95,629	109,649
Gujarat	17,182	19,203	21,844	25,053	19,826	22,927	26,682	31,057	37,008	42,130	48,526	56,110
Haryana	7,609	8,363	9,488	11,023	7,361	8,471	9,878	11,614	14,970	16,834	19,365	22,638
Karnataka	20,570	23,523	26,881	30,962	22,149	25,721	29,839	68,978	42,718	49,245	56,719	99,940
Kerala	14,229	16,331	18,656	21,336	16,997	19,597	22,477	25,709	31,225	35,928	41,133	47,045
Mdhya Pradesh	29,492	32,937	37,082	42,041	31,138	35,473	40,632	46,649	60,631	68,410	77,714	88,690
Maharashtra	35,705	40,109	45,344	51,565	39,499	45,427	52,203	59,928	75,204	85,537	97,547	111,494
Orissa	14,180	15,170	17,167	18,999	15,343	16,759	19,460	22,025	29,522	31,928	36,626	41,023
Punjab	9,293	10,135	11,077	12,184	9,187	11,006	12,543	14,340	18,479	21,141	23,620	26,524
Rajasthan	19,226	22,071	25,411	29,403	19,995	23,101	26,778	31,146	39,221	45,172	52,189	60,549
Tamil Nadu	28,246	32,496	37,106	42,190	30,283	35,298	40,737	46,657	58,528	67,795	77,843	88,847
Uttar Pradesh	65,672	71,653	79,444	89,173	63,391	72,754	83,874	96,994	129,063	144,407	163,318	186,167
West Bengal	30,331	35,712	42,071	49,359	30,822	36,631	43,490	51,229	61,153	72,343	85,561	100,588

this would get increased to 3.7 millions by 2016. Based on the above estimates in 2006, in one million population there was about 860 & nearly 2,600 incident and prevalent number of cancer cases respectively while in 2016 this would become increased to nearly 1,060 and 3,200 respectively. The principle factors contributing to this projected increase are the increasing size of the population as well as proportion of elderly people in the country. Further, state-wise computation of incident cases of cancer during the various years revealed that based on age-distribution & size of population the incident number of cases varied amongst the states. States such as Uttar-Pradesh, Bihar, Maharastra and Madhya Pradesh had a large number of incident cases. Kerala had lowest number of cases. There was 1.5 fold increase in number of incident cases from 2001 to 2016 both at the national level as well as at states level.

Patterns of cancer (Table 2): The estimated cases were more for females (0.406 millions, 2001) than males (0.392 millions, 2001). Lung, esophagus, stomach, oral and pharyngeal cancers are much higher in men while in women, cancers of cervix and breast are predominant forms followed by those of oral cancers, stomach and esophagus.

State wise distribution of Regional Cancer Centers (RCCs), radiotherapy treatment facilities and shortfalls (Table 3 and 4): Curative treatment for cancer involves surgery, radiation, chemotherapy, hormone therapy or some other combination of these modalities. However, over 70% of cases in the country report for diagnostic and treatment services in advanced stages of the disease, resulting in radiotherapy as one of the main modality of treatment. The establishment of National Cancer Control Programme (NCCP) in the country has contributed to the development of 27 RCCs. Apart from providing specialized treatment (including the radiotherapy treatment) to cancer patients, these also undertake research in the field of oncology. In addition to RCCs in some of the medical colleges, oncology wings have been established which also have radiation facility for treatment of cancer cases. There are some private medical institutions, which also offer radiation treatment facilities. Considering all the sources, it is noted that there were 347 Teletherapy units (Telecobalt 258 units, Telecesium 4 units, Accelerator 85 units) and 240 Brachytherapy installations (Remote Brachytherapy 137; Manual Brachytherpy 103) in 237 centres across the country during the year 2007. The sate-wise distribution of Regional Cancer Centres, teletherapy units and brachytherapy installation in the country are shown in Table 4. The distribution shows that in some of the major populous state the availability of the Teletherapy units for cancer treatment are very scanty.

As suggested by The International Union Against Cancer that one cobalt unit is required for treatment of cancer patients for one million populations in the developing countries (Gupta et al., 2006). Based on this the actual requirement of radiotherapy installations has been estimated both at the national level as well as for the 15 major states of the country from 2001 till 2016. With an estimated population of the country of 1017, 1059, 1100 and 1142 millions during the years 2001, 2006, 2011and 2016, the actual requirement of Cobalt unit at the above rate of one teletherapy machine for one million population woks out to be 1017, 1059, 1100 and 1142 for the years 2001, 2006, 2011 and 2016 respectively. Considering the present availability of 347 units during the year 2007, there was a short fall of more than 700 teletherapy during the year 2006. The state-wise requirement based on the above requirement of one cobalt unit for one million populations,

Table 2. Incident Numbers of Cancer Cases by Site and Sex in 2001 and 2016 - National Levels

	Male		Female	
Site	2001	2016	2001	2016
Oral Cavity	42,725	65,205	22,080	35,088
Pharynx and Larynx	49,331	75,901	9,251	14,550
Oesophagus	24,936	38,536	17,511	28,165
Stomach	20,537	31,538	11,162	17,699
Lung	39,262	60,730	9,525	15,191
Breast		….	89,914	140,975
Cervix Uteri		…..	79,827	125,821
Others	214,967	315,840	166,629	254,410
Total	391,758	587,750	405,899	631,899

Table 3. State-wise Distribution of Radiotherapy Facilities all over the Country (as of 2007)

States	RT Centre	Teletherapy Teleco-balt	Telece-sium	Accelerator	Total no.	Brachytherapy Remote	Manual	Total no.	No. RCCs
Andhra Pradesh	27	26	0	6	32	15	16	32	1
Assam	8	9	0	1	10	4	1	5	1
Bihar	3	6	0	0	6	2	0	2	1
ChattisGarh	3	3	0	0	3	0	0	0	1
Delhi	13	18	0	9	27	9	3	12	1
Goa	2	2	0	0	2	0	1	1	
Gujarat	9	8	1	7	16	9	3	12	1
Harayana	4	7	0	4	11	4	1	5	1
Himachal Pradesh	1	2	0	0	2	1	1	2	1
Jammu & Kashmir	3	5	0	1	6	0	0	0	1
Jharkhand	2	3	0	0	3	1	0	1	
Karnataka	23	21	1	10	32	8	17	25	1
Kerala	15	20	0	6	26	10	6	16	1
Madhy Pradesh.	9	10	0	1	11	8	5	13	2
Manipur									1
Maharashtra	32	35	0	11	46	18	15	33	2
Meghalaya	1	1	0	0	1	0	0	0	
Mizoram	1	1	0	0	1	1	0	1	1
Orissa	5	6	0	1	7	2	1	3	1
Punjab	7	6	0	2	8	5	1	6	1
Podicherry	1	1	0	1	2	1	1	2	1
Rajasthan	7	10	0	1	11	4	4	8	1
Tamil Nadu	32	26	1	14	41	16	21	37	2
Uttar Pradesh	16	18	0	3	21	12	4	16	2
West Bengal	13	14	1	7	22	7	2	22	1
All India	237	258	4	85	347	137	103	240	27

and the short fall according to each state for the year 2006 has been worked out. It can be seen that in terms of percentages, short- fall is more than 80% in some of the highly populous states such as Uttar Pradesh, Bihar, Madhy Pradesh. The lowest shortfall was seen in the state of Kerala, Tamil Nadu and next in the order were Karnataka and Haryana. When viewed along with incident and prevalent number of cases in each state a clear geographical gap in the treatment facilities can be observed. It is not only the incident cases, which need radiation therapy, but also the prevalent cases too depending on the stage of diagnosis and other factors. The prevalent cases in each state could be three times as that of incident cases.

Pattern of investment on Health and for Cancer Control Activities through central assistance (Table 5): The cancer control programme was initiated in the country in 1975-76 as a centrally funded sector. It was renamed as the National Cancer Control Programme (NCCP) in 1985. This scheme continued during the further plan periods. As regards financial allocation in the sixth plan (1980-85), a total of Rupees 115 million [2.3 million US dollars] was allocated for cancer control, which was 0.57 percent

Table 4. Projected India Population of the Country and the Major 15 States, and Requirement of Teletherapy Units and Short-falls of Installations in each State

	Projected Population (in thousands)				Requirement of radiotherapy installations				Short fall in 2006
	2001	2006	2011	2016	2001	2006	2011	2016	
India	1,017,544	1,058,589	1,099,996	1,142,066	1,018	1,059	1,100	1,142	712
Andhra Pradesh.	76,773	78,899	81,047	83,109	77	79	81	83	47
Assam	26,588	27,564	28,581	29,562	27	28	29	30	18
Bihar	102,425	107,256	111,734	117,083	102	107	112	117	101
Gujarat	49,196	50,941	52,761	54,467	49	51	53	54	35
Harayana	20,204	21,012	21,872	22,692	20	21	22	23	10
Karnataka	52,919	54,631	56,424	58,066	53	55	56	58	23
Kerala	32,606	33,455	34,272	35,012	33	33	34	35	7
Madhy Pradesh	81,670	85,487	89,095	93,230	82	85	89	93	74
Maharashtra	92,314	94,956	97,701	100,222	92	95	98	100	49
Orissa	36,158	36,808	37,452	38,455	36	37	37	38	30
Punjab	23,369	24,329	25,367	26,064	23	24	25	26	16
Rajasthan	54,508	57,122	59,655	62,518	55	57	60	63	46
Tamil Nadu	62,400	63,740	65,165	66,396	62	64	65	66	23
Uttar Pradesh	175,626	185,614	195,497	207,199	176	186	195	207	165
West Bengal	79,993	82,623	85,367	88,023	80	83	85	88	61

Table 5. Pattern of Central Allocation (Total for the Country & Union MOHFW) Investment on Health by Government of India (Plan outlays)

Period	Total Plan Investment[1]	Health Sector Outlay[2]	Health Sector %[1]	Allocation for Cancer Control Outlay	Allocation for Cancer Control %[2]
VI (1980-85)	21,858.3	405.0	1.85	115 (2.3)	0.57
VII (1985-90)	43,745.8	737.7	1.68	200 (4.0)	0.54
VIII (1992-97)	86,820.0	1,516.4	1.75	800 (16.0)	1.10
IX (1997-02)	171,840.0	3,963.7	2.31	1,900 (38.0)	0.96
X (2002-07)	296,826.3	6,204.1	2.09	2,850 (57.0)	0.92

Millions of US dollars(one dollar equal to approx 50 Indian rupees)

of total health sector outlay. This was increased to Rupees 200 millions [4.0 million US dollars] in the seventh plan period (1985-90) (0.54 per-cent of health sector outlay) and Rupees 800 millions [16.0 million US dollars] (1.1 percent of health sector outlay) in 8th five year- plan period, i.e. annually 160 millions of rupees [3.2 million US dollars]. During sixth and seventh plan periods-financial assistance was provided for the establishment and maintenance of Regional Cancer Centres (RCCs) and early detection of cancer. During the eight five- plan period (1992-97) emphasis was on prevention, early detection of cancer and augmentation of treatment facilities in the country. During the IX plan period (1997-2002) the allocation for cancer control activity was Rupees 1900 millions [38 million US dollars] and it worked to be 0.96% of the health sector out lay. Further, during Xth plan period (2002-2007) the allocation for cancer control programme was 2,850 millions (annually 570 million rupees) [57 million US dollars or annually10.14 million US dollars], which worked to be 0.92% of health sector outlay. Assuming the prevalence of cancer to be around 2.7 million cases annually, and even if the entire amount of rupees of 570 million rupees [10.14 million US dollars] was spent for curative purpose only, the amount spent per cancer case in the country during the year 2006 works to be Rupees 211 per case per year [4.22 US dollars], which is extremely meager. However, the budget allocation by center under cancer control activities includes the budget for several activities including the budget for maintenance of RCCs.

Discussion

It is well known that life styles, age composition of the population and total population size are determinants of cancer magnitude. These factors gradually changed in the developed world; as a result cancer has become one of the greater killer diseases. Several models have been attempted in the developed countries to predict the cancer situation in the years to come by using registry data. The precision of the estimates is made more accurate by taking into account the effect of age, period, trend and ecological data.

In the developing countries the problems are more complex and different from the developed countries. For example, India entered into 'population explosion' era in 1920's and after 1940s mortality rates started falling. In 1980s a very large cohort born in 1940s have already entered into 'cancer prone' age. The problem is more vexed when society is undergoing a rapid change in life styles especially when tobacco consumption may be on increase. This is likely to initiate an epidemic of cancers in the midst of already existing heavy load of communicable diseases. In order to plan and develop control measures an accurate estimation of cancer load is essential. Unlike in developed countries we are handicapped because of paucity of essential data to be utilized for making projections with a better degree of precision. Authentic data on cancer incidence for different regions is available only from 1982 when the Indian Council of Medical Research initiated national cancer registry programme. In addition to this, a few of the cancer centers started there own population based registries. These registries routinely undertake various exercises to ensure that the data they collect and process is of high quality. A through check of data is also done before tabulation. It has been reported that the data collected by the Indian population- based registries are both complete and reliable (NCRP, 2001 and Parkin 2002).

Estimation of projection of cancer for the entire country has been done by selecting registries on the basis of availability of published data, stability of registry and location. The present estimates have been based on the data from average incidence rate of cancer from 12 Population Based Cancer Registries only, although presently there are 21 PBCRs in the country. Detailed published data needed for the present exercise was not available for the corresponding period from Ambilikai and Aurangabad registries. Besides this, the six registries in the Northeast region and the Ahmedabad rural registry were established recently only and are still in the stabilization stage. Thus, the data of the registries that has accrued over the years is essentially that of selected urban centers and only two are rural registries that cover a part of districts in states of Mahareastra and Kerala. Therefore, the present estimates may not represent a true picture of the estimates of the burden of cancer for the entire country as 70% of the population of India reside in rural areas. Nonetheless, the present exercise provides some idea about the incident number of cases at the national level. The scientists at the ICMR have carried out limited exercises and these figures vary from 700-900 new cancers cases (per one million population) in India every Year (Nandakumar and Swaminathan, 2006).

Estimation of the population at the country and state level was based on the population estimates provided by the Government of India for the various periods. The technical group on population projections constituted by the planning commission of government of India, carried-out the population projections by age & sex for the 15 major states and at the country level only which constituted 95.9% of the 1991 population of India. The remaining 10 smaller states and 7 union territories constituted only 4.14% of the population of India. Due to certain reasons, the population of these states/ Union Territories as a whole was projected (RGI, 1996). For these smaller states and union territories, the projection of the population was not attempted by five year age group. Hence the present communication made the projection of incident cases of

cancer for the 15 major states of India as well at country level for which the population projections were available by 5-year age groups.

In addition to age, there is enough evidence to show that cancer share with major key risk factors such as tobacco use (smoking or chewing), unhealthy dietary habits, physical inactivity, alcohol use, infections and behavioral risk factors (Murthy and Mathew, 2004). The interactive, additive and synergistic effects of these factors are responsible for a number of cancer cases and untimely death. Tobacco is the single most important risk factor for cancer. In addition to above, increasing trends in cancer incidence have also been noted for several other cancers such as colon, rectum, gall bladder, lung, breast, ovary, prostate, brain and leukemia (Murthy, 2008).

The present projections carried-out have not made any adjustments for possible increase in-prevalence in the tobacco habit nor for increasing trends in the incidence of cancers. When, suitable adjustments will be made for increasing tobacco habits as well as for increasing trends in the incidence of cancers, the estimates may get further increased. However, the present estimates (without consideration of possible increase in risk factors) do indicate that existing treatment facilities need to be substantially increased to combat this deadly disease.

In the country, under government sector there are 27 Regional Cancer Research and Treatment centers. In addition to this, support is provided by the government of India for establishment of Oncology wings in different medical colleges for the treatment of cancer cases. Total of 347 teletherapy installations existed in 2006 as against a requirement of 1059. Most of the populous states in India are without or with very minimum specialized cancer centers. It may also be mentioned that about 60 to 80 percent of our cancer patients report at a late stage where radiotherapy is the main mode of treatment often for palliation. The present state-wise analysis of the distribution of RCCs, and radio-therapy centers shows wide gaps in the availability of facilities.

It is really a big question from where and when the resources can be obtained to meet the short fall of more than these 700 teletherapy machines as of 2006 and would get further increased. The cost of imported equipment of cobalt units and linear accelerators and Brachytherapy machines are major problems in making cancer treatment equitable to all. Perhaps, local manufacturing of equipment with cheaper and innovative designs will go a long way in reducing the cost.

The actual funding is hardly in keeping with the real risks of cancer. In order to implement and establish cancer control measures for a comprehensive cancer care more and more financial resources are required. However, the budget sanctioned through central assistance for cancer control activities is not only meant for therapeutic requirements and pain relief but also includes for (a) secondary prevention strategy, (iv) primary prevention programme and to maintain RCCs and the (v) coordinating units. Thus, the allocation of funds should be judicious and need-based.

The states like Kerala and Tamil Nadu have a lower percentage of short-fall of radiotherapy equipments because of several innovative development of cancer control strategies. The RCCs, medical Colleges and district programmes need to be strengthened with necessary equipment and training of manpower to fulfill the objectives of NCCP.

Even if the age specific cancer incidence rates remain unchanged, large increase in absolute number of cancer cases in the next one and half decade of the present century is already programmed due to aging of population in the developing countries. With the increasing longevity, the proportion of Indian population in the cancer age will increase substantially. It is envisaged that in years to come cancer morbidity and cancer mortality would rise disproportionately to population increase and therefore strengthen /augmenting the existing diagnostic/ management facilities along with primary prevention of tobacco related cancers should be initiated as early as possible. Prevention of cancers through reduction of tobacco use should be an important strategy of National cancer Control Programme of India. Cancer screening facilities should also be initiated so that leading cancer sites like cervix; breast & oral can be detected at early stages or at pre-cancerous stage. The district cancer control programme, which has been initiated with the objectives of providing health education, early case detection, and prevention and pain relief measures, has not resulted in substantial and productive activity.

High numbers of cancers of lung, prostate, ovary, oesophagus, stomach, gallbladder (in certain areas), indicate need for augmented research efforts to identify effective screening tools. Incorporating screening activities into peripheral health infrastructure would effectively change the shift of clinical staging to left when less extensive surgical procedures could be attempted. Establishment of adequate treatment guidelines that can effectively be carried out at different levels (district hospitals, teaching hospitals, specialized hospitals etc.) would also help in reduction of mortality due to cancer. Over the next two decades it is expected that there will be a substantial increase in the prevalence of cancers because of increasing longevity, greater exposure to environmental carcinogens due to industrialization, pollution, use of fossil fuels, wide variety of chemical agents in the industry, agriculture and continued use of tobacco.

In short, reduction of cancer morbidity by 2020 would be an unrealistic goal, unless drastic measures are taken for its holistic control. Reduction of mortality through early detection/ down staging could still be expected to a limited extent. The present estimates highlight that existing treatment facilities are woefully inadequate to combat this deadly disease.

In conclusion, cancer is becoming an important public health issue and to tackle it would need immediate and major inputs from various agencies. The absolute number of cancer patients is increasing rapidly due to growth in size of the population. More than 800,000 new cases were present during the year 2001 and would get increased to 1220,000 by 2016. It is a huge burden. The existing treatment facilities for cancer control in-terms of radiotherapy and financial allocation are woefully inadequate to take care of even the present load. In a

country like India where more than 80% of the patients report to cancer care facilities in advanced stages of disease and where there are geographic disparities in treatment facilities, it is only natural that a lot of patients will be in incurable stages and that nothing more than measures to improve the quality of life of such patients and their families can be done. The only way to fight this scourge under such circumstances is to have pragmatic programme and policies based on currently available scientific information and sound public health principles. The programme should necessarily have components for education and containing training for health care workers. Primary prevention is the real hope for reducing lung cancer morbidity and mortality. Public education and training of the health care workers also form important components of this programme. Alternative methods of screening through visual inspection of cervix, clinical examination of breast and oral self examination are more helpful especially for developing countries.

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