

Research Articles

Received on: 03-07-2014
Accepted on: 19-08-2014
Published on: 15-10-2014

Corresponding Author:

Mr. Vijay C R*

Department of Epidemiology & Biostatistics
Kidwai Memorial Institute of Oncology
Dr.M.H. Mari gowda Road, Bangalore – 560029
Ph(o): +91 80 26094022, Ph(M): +91
9741063100



*Email Id- vijuforstat@gmail.com

gopalakrishnappa@yahoo.com

Trends in Prostate cancer incidence in Bangalore, India

Vijay C R¹, Gopalakrishnappa B R¹, Ramesh C¹, Krishna Reddy K V¹, Vijayakumar M²

ABSTRACT

Prostate cancer has emerged as the most frequent cancer amongst men in world and also in Asian countries including India, with incidence increasing rapidly over the past two decades. Incidence has been drastically increasing in the all Indian Urban Registries, although in a few Registries with very significant increasing trend (Bangalore, Bhopal, Chennai, Delhi and Kamrup). We analyzed a 25 years Population Based Cancer Registry Data at Kidwai memorial institute of oncology (KMIO) for comparison with other registries used national cancer registry report (NCRP).

Material and methods: Prostate cancer cases were drawn from Bangalore population-based cancer registry locating at Kidwai memorial Institute of Oncology started in 1982 under national cancer Registry Programme funded by Indian Council of Medical Research. Time trends in sex- and age-standardised cancer incidence rates were analysed by using statistical tools like Joinpoint and Annual parentage Change (APC) over the study period.

Results: Prostate cancer being most emerging site with 157.7 relative percentage change by combining first three years of registry started to recent years. Age-standardised prostate cancer incidence rates increased. A significant increased trend over the study period observed a considerable variability in the magnitude of the annual increase approximately 6.5% in Bangalore from 1996 onwards.

Key-words: Prostate Cancer, Prostate cancer trend, comparison of prostate cancer trend in Asia, Recent Prostate cancer trend in Bangalore

Cite this article as:

Vijay C R, Gopalakrishnappa B R, Ramesh C¹, Krishna Reddy K V, Vijayakumar M, Trends in Prostate cancer incidence in Bangalore, India, Asian Journal of Pharmaceutical Technology & Innovation, 02 (08); 2014.

1 Department of Epidemiology & Biostatistics, Kidwai Memorial Institute of Oncology, Dr.M.H. Mari gowda Road, Bangalore – 560029

2 Department of Surgical Oncology, Kidwai Memorial Institute of Oncology, Dr.M.H. Mari gowda Road, Bangalore – 560029

Introduction

Prostate cancer is the second most frequently diagnosed cancer and the sixth leading cause of cancer death among men worldwide, with 914,000 new cases and 258,000 deaths estimated to occur in 2008. More than half of these cases and deaths are expected to occur in more developed countries. Incidence rates (per 100,000) vary by nearly 50-fold worldwide, ranging from 3.9 in India to 178.8 in U.S. Generally, the highest rates are recorded in North America, Oceania, and Northern and Western Europe, whereas the lowest rates are found in Asia and North Africa¹.

In contrast to the prostate cancer incidence and mortality trends in western countries, rates are increasing in some Asian and Eastern European countries, such as Japan, Singapore, and Poland, where PSA testing is not commonly used. The increase in these countries is thought to reflect westernization, including increased consumption of animal fat, obesity, and physical inactivity¹. Hence to see trends in this developing area is an important to take various control measures like developed countries. India is one of the developing countries, in India Bangalore is a growing metropolitan city and situated in southern part of India and it is well known as a hub for India's information technology and it is among the top ten preferred entrepreneurial locations in the world². Due to Influence of above factors westernization and changes in food habits are dramatically happened in this city of Bangalore³.

Changes in cancer pattern are often studied with regard to rank of leading sites, variation in age adjusted rates of sites over the time or with the help of time trends. However, these methods do not quantify the changes in relation to overall changes that occurred in the total cancer cases over the period of time. An alternative approach is therefore necessary, particularly to identify emerging new cancers⁴.

Materials and Methods

Population based cancer registration in Bangalore urban agglomeration begins in 1981 under the national cancer registry programme of India, sponsored by Indian council of medical research, the registry is part of Kidwai Memorial Institute of Oncology which is recognised as a regional cancer center, registry covers an area of 191sq.kms at the inception and at present it is expanded to 741sq.Kmswith 7.5 million population. Cancer registration is carried out by active case finding method. Social investigator from the registry visits various sources which include death registration units to identify the morbidity and mortality cases. These incidence cases were matched with morbidity cases. The primary sites and morphology are coded using international classification of disease for oncology (ICD-0). The data are entered into computer and further range, consistency, family, unlikely and duplicates and matching work are carried out by using PBCRDM software developed by national cancer registry programme (Indian Council of Medical Research).

The data are reported using the International classification of diseases, tenth Revision (ICD-10) codes for old cases appropriate transformation was made by using IARC tool for conversion software provided by IARC. The data from registry revived every year in Annual Revive meeting conducted by National cancer registry programme. For comparison with other registry we utilized the NCRP reports (1982-2009).

The incidence cases for 3 years are mainly pooled to adjust for the possible fluctuations in the number of cases, likely to occur, from one single year to another single year. Changes in incidence cases over the two period of time, the relative percentage change in the site with time are taken to identify the emerging new cancer cases over the period of time. Relative Change=% RC= $[(b-a)/a]*100$ where a=Number of incidence cases for base year 1982-1984 and b=incidence cases for the year 2007-2009⁴.

For numerator, Prostate cancer (ICD-10=C61) cases were classified according to five year age group. The different distribution method⁵ for estimating the calendar year wise population by five year age group has been used as denominator. This was based on census data of 1981, 1991 and 2001.

Age adjusted incidence rates were calculated using mid-period population figures annually and using direct method with world standard population. First to describe the observed time trend without assuming any particular functional form; second, to know the pattern of time trend using the moving average⁶; third attempt we used joinpoint regression analysis to identify points where a statistically significant change over time in linear slope of the trend occurred ⁷. In joinpoint analysis, the best-fitting points where the rate changes significantly (increase or decrease) are chosen. The analysis starts with the minimum number of joinpoints, and tests whether one or more joinpoints are statistically and an annual percentage change (APC) is computed for each of those trends by means of generalised linear models assuming a Poisson distribution. Significant changes include changes in direction or in the rate of increase or decrease. Joinpoint analyses were performed using the 'Joinpoint' software from the Surveillance Research Program of the US National Cancer Institute.

Results

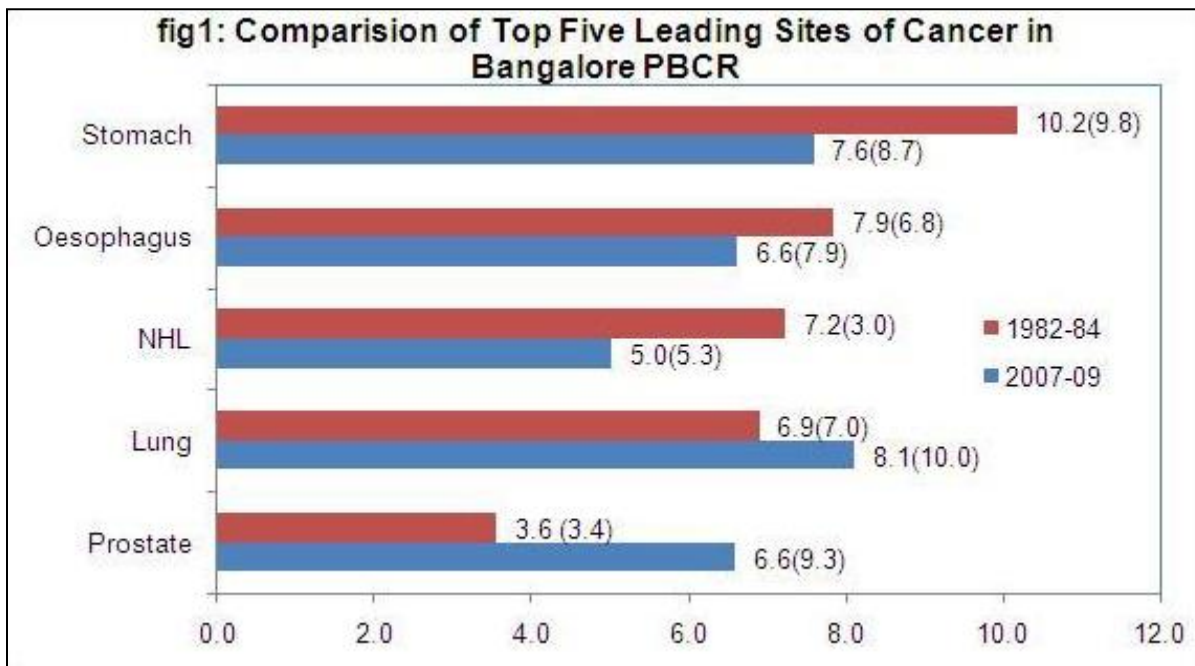
From the year 1982 to 2009, a total number of 104328 cases were registered in Population based cancer registry, Bangalore with 47742 (5.1%) males and 2450 cases diagnosed as prostate cancer cases, over two third of cancer cases (67.3%) were adenocarcinomas 16.5% were carcinomas (the majority of which were not otherwise specified) and 16.2% were described as malignant neoplasms, not otherwise specified. The details are presented in table (1). The crude rate, age adjusted incidence rates of all- sites (113.3) and prostate cancer (9.27) for the year 2007-2009 (table 1). The relative percentage change for the period 1982-1984 and 2007-2009 was 514%, this change statistically significant at 95% confidence limit (table 1).

Table1: Summary Statistics-Bangalore PBCR-(1982-2009)

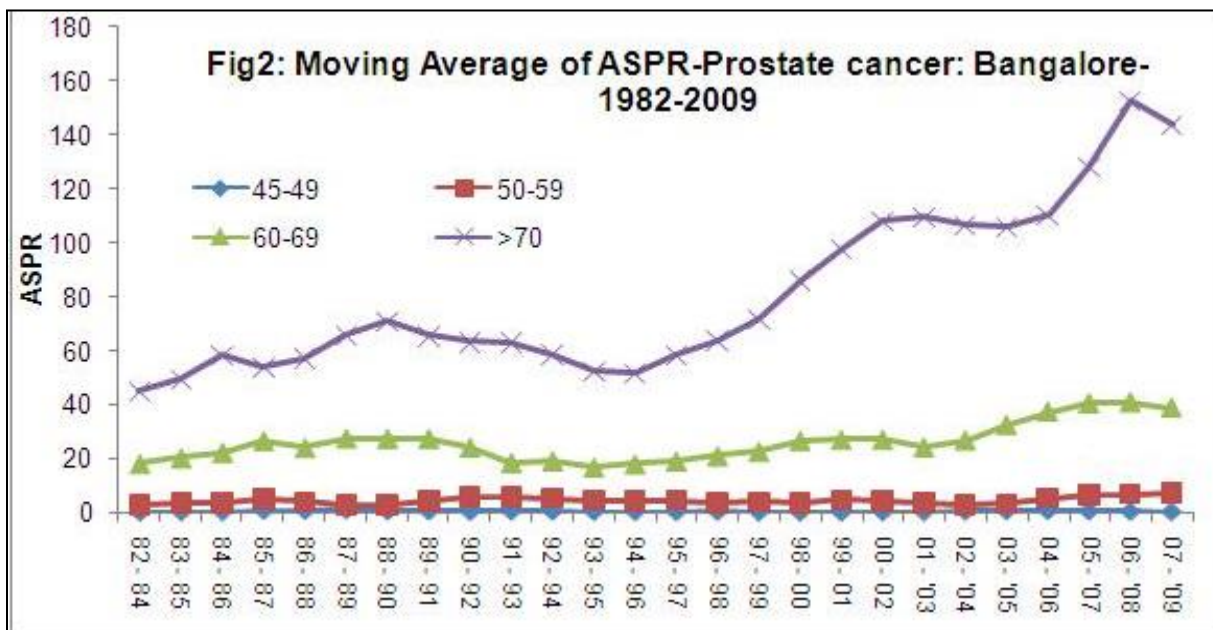
Cancer Incidence	All Sites-Male			Prostate		
	1982-2009	1982-1984	2007-2009	1982-2009	1982-1984	2007-2009
Cases	47742	6161	15874	2450	92	565
Population	74165026	5368568	11354951	74165026	5368568	11354951
Crude Rate	64.37	114.76	139.80	3.30	1.71	4.98
AAR	97.83	85.17	113.3	6.05	3.44	9.27
Relative % Change		157.7			514.1	
P-value					0.00	

Fig1 gives the leading sites from 2007-2009 and compared with first three years of registry established, the numbers given in the parenthesis indicates AAR Lung was predominant site with AAR 6.13 followed by stomach (8.8),oesophagus(7.9), prostate (9.3) and non Hodgkin's lymphoma (5.03). All other sites excluding prostate cancer within five leading sites during the year 1982-1984.Now prostate cancer occupying third position.

Prostate cancer incidence rates have been increasing over the years (Figure 1.). The largest increase has been in men aged >70+ the relative % change shows 61.6% by averaging five year age specific rates 1982-1886 and 2005-2009. The rapid increase from the 1994 onwards for the above age group followed by 40-49 age groups showed 53.4%, broad age groups 50-59 and 60-69 exhibited 44.1% and 48.9% changes in the age specific trends are showed in fig2.



* The value given in parenthesis is AAR/100,000



Join point regression graph (i.e. the points in which rates changed significantly) showed that the model is one segment that is prostate cancer increased significantly after 1996 onwards until 2009. The APCs (Annual Percent Change) indicate the magnitude of the trend for each segment or time period from 1982 to 1996 shows 0.7% annual changes observed, the result found to be insignificant, after 1996 annual

percentage change shows 6.5 percent with significant increasing trend. The detailed APC values and confidence intervals are shown in table 2 and fig3.

Table2: Joinpoint Regression prostate Cancer Bangalore (1982-2009)

Segment	Lower Endpoint	Upper Endpoint	APC	Lower CI	Upper CI
1	1982	1996	0.7	-1.9	3.4
2	1996	2009	6.5*	3.5	9.7

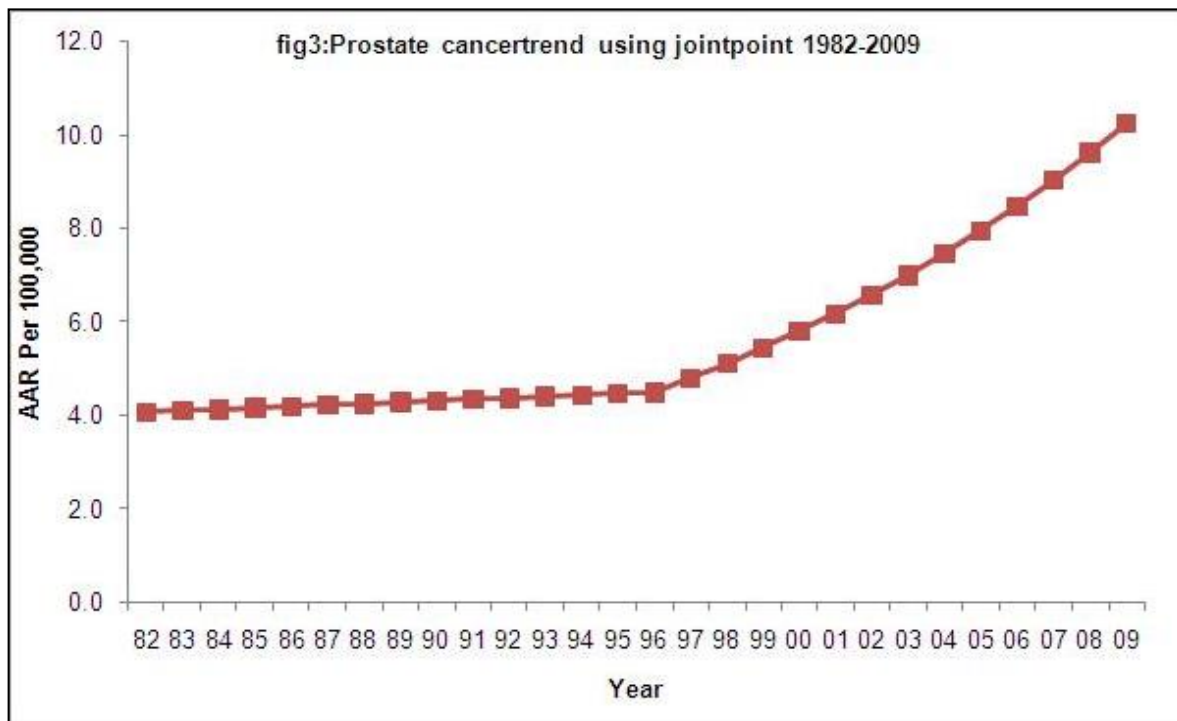
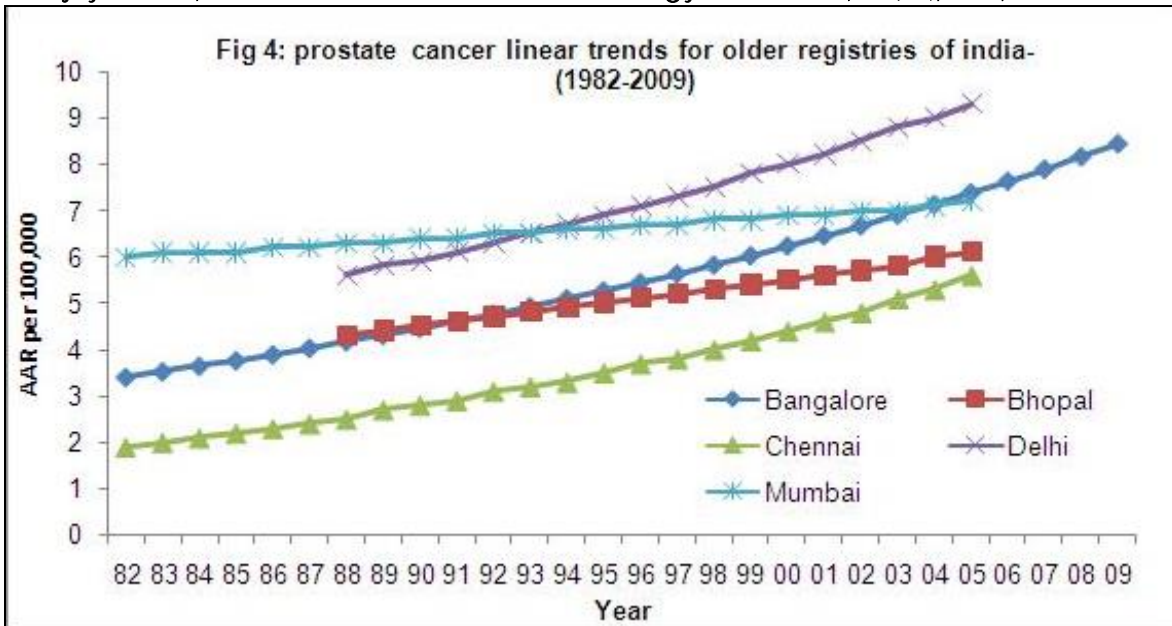


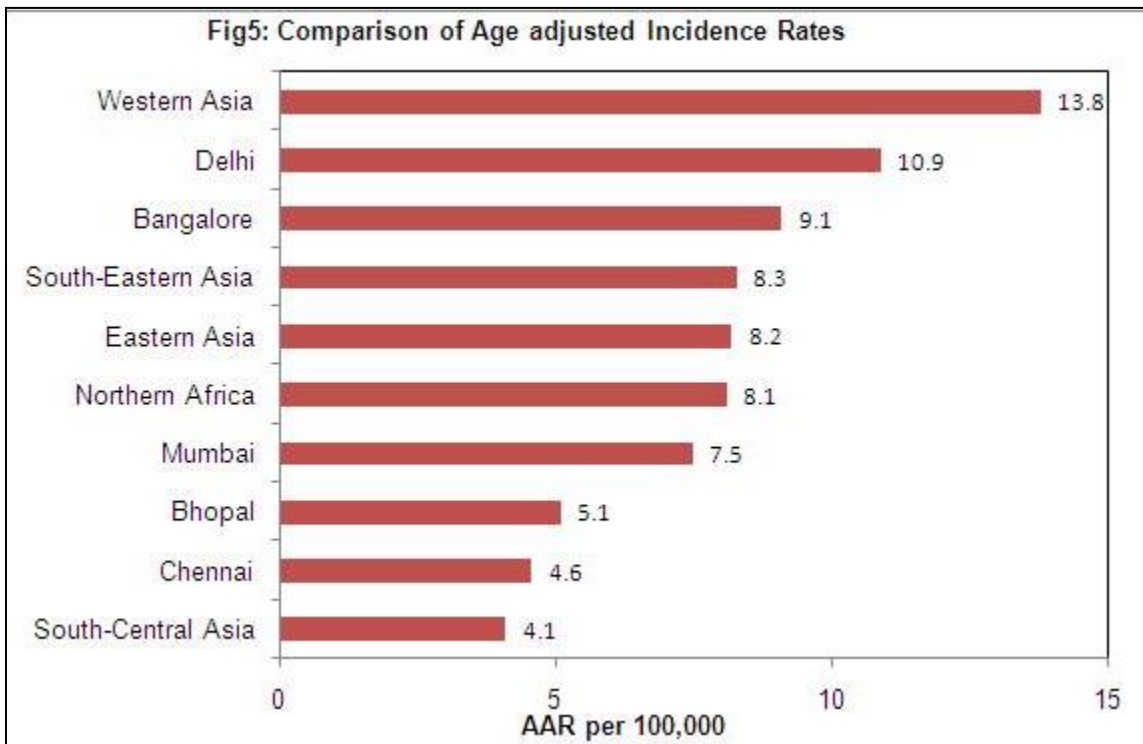
Fig 4 and table3 shows trends in prostate cancer of urban cancer registries in India. All the urban registries showing positively increasing trend except Bhopal. The annual percentage and p-value are given in table3. For comparison with other registry data is obtained through ICMR published cancer trend report.

Table3: Linear trend of Prostate Cancer: All Old PBCR (1982-2005)

Cancer Incidence	Bangalore*	Chennai	Delhi	Mumbai	Bhopal
AAR	9.10	4.57	10.90	7.53	5.11
AS Rate - 95% LCL	8.19	4.04	10.19	7.02	3.99
AS Rate - 95% UCL	10.00	5.10	11.61	8.04	6.23



The international comparison of age adjusted rates of 2006-2008 are given in fig 5 indicates that western Asia , Delhi and Bangalore urban registries are observed high rates in prostate cancer compare to south eastern Asia, Eastern Asia , north Africa and Mumbai registry the details are given in same fig.



Discussion

Prostate cancer is the second most frequently diagnosed cancer and the sixth leading cause of cancer death among men worldwide, with 914,000 new cases and 258,000 deaths wstimated to occur in 2008 ⁸. More than half of these cases and deaths are expected to occur in more developed countries ⁸. Incidence rates (per 100,000) vary by nearly 50-fold worldwide, ranging from 3.9 in India to 178.8 in U.S. The prostate cancer found to be higher in Bangalore registry after kamrup and Delhi among all Indian registries, the age adjusted rate (9.27) exceeds it may be due to urbanization many researchers already stated prostate cancer incidence was more in urban compare to rural area⁹. A significant relative percentage changes in prostate cancer trend (514%) from 1982-2009, prostate Cancer exhibited maximum emerging site in Bangalore urban registry.

Among males prostate cancer is the third common cancer in the Bangalore (2007-2009), accounting for 7% of all new cases of cancer in males. During the first four year of the registry started prostate was not within first five leading site but in recent year prostate cancer occupying leading position after lung and stomach cancer. The national cancer Registry programme reported that stomach cancer shows decreasing trend ^{10, 11}, hence in upcoming year cancer prostate may be replaced with stomach cancer.

Prostate cancer incidence is strongly related to age, with the highest incidence rates being in older men. In Bangalore from 2007 and 2009, on an average 75% of cases was diagnosed in men aged 65 years and over, only 1% was diagnosed below 50 years of age. This result exactly similar to United Kingdom cancer statistics ¹². The age distribution of prostate cancer cases has changed over time: in 1982-1984, 68% of cases were diagnosed in men aged 65 and above, compared with 75% in 2008-2010. This may because largely due to the late diagnosis, lack of awareness. The above result contrary with developed countries. In the united kingdom from 1975-1984 and 2008-2010 prostate cancer was decreased by 10% aged above 65year due to various screening programmes which are helpful in early diagnosis such as transurethral resection of the prostate (TURP) and more recently, the use of prostate specific antigen (PSA) testing¹².

Substantial increases in incidence have been reported in recent years for many countries around the world, including the UK. Much of the increase in incidence both UK and in many other countries worldwide can be attributed to incidental detection of prostate cancers following TURP and PSA testing. ^{13, 14}

Prostate cancer incidence rates have increased in Bangalore registry with more than two folds between 1982-1984 and 2007-2009. The significant increase in early 1995s (0.7 APC between 1982-1995) and after 1996s (6.5* Annual Percentage Change between 1996-2009). The same trend follows in all urban registries of India except Bhopal¹⁵.

Prostate cancer incidence trends in Scotland, the US, Australia, Northern Ireland and the Republic of Ireland indicate that increased detection through TURP and PSA testing is implicated in the apparent increases in incidence in those countries. It is estimated that 75% of US men aged 50 years and older have had a PSA test.²³ In Europe; the level of population screening is much lower, with published estimates of 10-20 % ¹⁶⁻²⁰.

Since prostate cancer trends significantly increasing in Bangaluru also same trend observed in other metropolitan cities in India, like other countries hence, awareness and early detection by screening are required.

References

1. Cancer Epidemiol Biomarkers Prev 2010;19:1893-1907. Published OnlineFirst July 20, 2010. Ahmedi Jemal, Melissa M. Center, Carol DeSantis, et al.
2. Data were provided by Wikipedia about Bangalore, 2012. <http://en.wikipedia.org/wiki/Bangalore>
3. Finkelstein, Joanne. "Rich Food: McDonald's and Modern Life." Resisting McDonaldization. Ed. Barry Smart. London: Sage, 1999, pp. 70-82.
4. Takiar R, Vijay C R (2010). An alternative approach to study the changes in the cancer pattern of women in India (1988-2005). Asian Pac J Cancer Prev, 11, 1253-56.
7. Kim H-J, Fay MP, Feuer EJ, Midthune DN. Permutation tests for joinpoint regression with applications to cancer rates. Stat Med 2000; 19: 335-351. [CrossRef Medline Web of Science](#)
8. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. GLOBOCAN 2008, Cancer incidence and mortality worldwide: IARC CancerBase No. 10 [Internet]. Lyon (France): IARC; 2010,
9. Z Obertova¹, C Brown¹, M Holmes², R Lawrenson¹ Prostate cancer incidence and mortality in rural men- a systematic review of the literature the International electronic journal of rural and remote health 12: 2039. (Online) 2012.
10. Time trends in Cancer Incidence Rates 1982-2010; National Cancer Registry Programme (ICMR), Bangalore, 2009.
11. BR Gopalakrishnappa, Vijay C R et.al (2013). Trends in Oesophagus and Stomach Cancer Incidence in India (1982-2009). The Gulf Journal of Oncology, 13, 43-49.
12. Data were provided by the Cancer United kingdom, 2010. <http://www.cancerresearchuk.org/cancer-info/cancerstats/types/prostate/incidence/uk-prostate-cancer-incidence-statistics>
13. Bray F, Lortet-Tieulent J, Ferlay J, et al. [Prostate cancer incidence and mortality trends in 37 European countries: an overview](#). Eur J Cancer 2010; 46:3040-52.
14. Quinn M, Babb P. [Patterns and trends in prostate cancer incidence, survival, prevalence and mortality. Part I: international comparison](#). BJU Int 2002; 90:162-73.
15. Time trends in Cancer Incidence Rates 1982-2005; National Cancer Registry Programme (ICMR), Bangalore, 2009.
16. Potosky A, Kessler L, Gridley G, et al. [Rise in Prostatic Cancer Incidence Associated with Increased Use of Transurethral Resection](#) JNCI 1990; 82: 1624-1627.
17. Potosky A, Miller BA, Albertsen PC, et al. [The Role of Increasing Detection in the Rising Incidence of Prostate Cancer](#) JAMA 1995; 273; 548-552
18. Threlfall T, English D, and Rouse I. [Prostate Cancer in Western Australia: trends in incidence and mortality from 1985 to 1996](#) MJA 1998; 169: 21-24.
19. Smith DP, Supramaniam R, Marshall VR, et al. [Prostate cancer and prostate-specific antigen testing in New South Wales](#). Med J Aust 2008 15;189(6):315-8.
20. Carsin AE, Drummond FJ, Black A, et al. Impact of PSA testing and prostatic biopsy on cancer incidence and mortality: comparative study between the Republic of Ireland and Northern Ireland. Cancer Causes Control 2010;21(9):1523-31.