

RESEARCH COMMUNICATION

An Alternative Approach to Study the Changes in the Cancer Pattern of Men in India (1988-2005)

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Abstract

Background: 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 cancers. **Methods:** The cancer incidence data of various sites for men, over the periods 1988-90 and 2003-05 in India, for five urban registries namely Bangalore, Bhopal, Chennai, Delhi and Mumbai, functioning under the network of National Cancer Registry Programme (ICMR), formed the sources of data for the present analysis. Changes in incidence cases by various cancer sites for men are assessed by calculating the differences in incidence cases over the two period of time. Based on the contribution of each site to total change, the ten most leading sites are identified separately for each registry. The relative changes in the sites with time are taken to identify the most emerging new cancer cases over the period of time. **Results:** The pooled cancer cases for men among five urban registries increased from 30042 cases in 1988-90 to 46946 cases in 2003-05 registering an increase of about 55.8%. The lowest percentage of increase is observed in the registry of Mumbai (25.6%) and the maximum in Bhopal (96.4%). Based on the pooled figures of five urban registries, the lung cancer contributed the maximum % change (9.7%), followed by cancer of prostate (9.2%), mouth (7.5%), tongue (5.9%) and NHL (5.9%). Based on the pooled figures and the relative changes, the emerging new cancers are prostate (140%), liver (112%) and mouth (95%). The % change by sites and the emerging new cancers varied between the registries.

Keywords: Cancer pattern - changes - alternative approach - emerging cancers

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Introduction

The registered numbers of overall cancer cases in selected five urban registries of India have been shown to be rising (Takiar and Vijay, 2010) and changes for many body sites in India have been documented (Murthy et al, 2008; NCRP 2009; Takiar and Srivastava, 2008; Yeole, 2007; 2008a; 2008b; 2008c, 2008d).

The changes in the cancer pattern are often studied with the help of changes in the rank of leading sites, changes in the Age Adjusted Rates of the 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 was therefore used to assess the changes in cancer pattern of women in relation to overall changes in time and reported (Takiar and Vijay, 2010). In the present communication, using the same alternative approach, an attempt is made to present the changes in cancer pattern of men in India.

Materials and Methods

The cancer incidence data of various sites for men, over the periods 1988-90 and 2003-05 in India, for five urban Population Based Cancer Registries (PBCRs) namely Bangalore, Bhopal, Chennai, Delhi and Mumbai, functioning under the network of National Cancer Registry Programme (ICMR), formed the sources of data for the present analysis. 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. The changes in incidence cases by various cancer sites for men are assessed by calculating the differences in incidence cases over the two period of time. Based on the contribution of each site to total change, the ten most leading sites are identified separately for each registry. The relative changes in the sites with time are taken to identify the most emerging new cancer cases over the period of time. In terms of formulae
Change = (b-a);

% Change = % C = [(b-a)/ (B-A)]* 100;

Relative Change = % RC = [(b-a)/a]*100 Where
 a = No. of incidence cases for the period 1988-90 for the site 'X' of cancer; b = No. of incidence cases for the period 2003-05 for the site 'X' of cancer; A = No. of incidence cases for the period 1988-90 for All sites of cancer; B = No. of incidence cases for the period 2003-05 for All sites of cancer.

Results

The number of cancer cases covered by different PBCRs and periods are shown in Table 1. The pooled cancer cases for men among five urban registries increased from 30042 cases in 1988-90 to 46946 cases in 2003-05, registering an increase of 16904 cases over the period of time. The change in the cancer cases ranged from 803 cases in PBCR of Bhopal to 8341 cases in PBCR of Delhi. The overall percentage change during the period is 55.8% while the lowest percentage of increase is observed in the registry of Mumbai (25.6%) and the maximum in Bhopal (96.4%).

The number of cases covered by the leading sites, period, their % and % relative changes for the PBCR of Bangalore is shown in Table 2. The overall increase (change) in the number of cases, over the period 1988-90 to 2003-05, is 2710. Among these, the maximum change is due to lung cancer cases (274) which constituted about 10.1% of the total changed cases. This is followed by the change in stomach cases (8.8%) followed by prostate (7.8%), liver (6.0%) and brain and nervous system (6.0%). The relative changes over the period are observed to be

Table 1. No. of Male Cases Covered by Registry area, Period and Percentage Change

| Registry Area | 2003-05 (b) | 1988-90 (a) | Change (b-a) | %Change (b-a)*100/a |
|---------------|-------------|-------------|--------------|---------------------|
| Bangalore | 6,725 | 4,015 | 2,710 | 67.5 |
| Bhopal | 1,636 | 833 | 803 | 96.4 |
| Chennai | 6,656 | 523 | 2,133 | 47.2 |
| Delhi | 17,611 | 9,270 | 8,341 | 90.0 |
| Mumbai | 14,318 | 11,401 | 2,917 | 25.6 |
| Pooled | 46,946 | 30,042 | 16,904 | 55.8 |

Table 2. Number of Male Cases Covered by Period , % Change and % Relative Change - Bangalore

| ICD | Site | 2003 - 05(b) | 1988 -90(a) | Change (b-a) | % C | % RC |
|-----------|-----------------------|--------------|-------------|--------------|------|-------|
| C33-34 | Lung etc. | 564 | 290 | 274 | 10.1 | 94.5 |
| C16 | Stomach | 603 | 365 | 238 | 8.8 | 65.2 |
| C61 | Prostate | 380 | 169 | 211 | 7.8 | 124.9 |
| C22 | Liver | 271 | 109 | 162 | 6.0 | 148.6 |
| C70-72 | Brain, Nervous System | 317 | 155 | 162 | 6.0 | 104.5 |
| C82-85,96 | NHL | 306 | 164 | 142 | 5.2 | 86.6 |
| C15 | Oesophagus | 460 | 321 | 139 | 5.1 | 43.3 |
| C18 | Colon | 218 | 95 | 123 | 4.5 | 129.5 |
| C90 | Multiple Myeloma | 131 | 17 | 114 | 4.2 | 670.6 |
| C92-94 | Myeloid Leukaemia | 198 | 100 | 98 | 3.6 | 98.0 |
| | All sites | 6,725 | 4,015 | 2,710 | 100 | 67.5 |

maximum in multiple myeloma (670.6%) followed by the cancer of liver (148.6%) and colon (129.5%). These can be termed as the emerging cancers among men in PBCR of Bangalore.

For the PBCR of Bhopal (Table 3), the rise in the number of cases is 803. Of these, the maximum contribution is due to mouth cancer cases (12.6%) followed by the sites of lung (10.2%), tongue (8.5%), larynx (5.7%) and prostate (4.5%). The relative changes over the period are observed to be maximum for the site of bladder (300%), followed by secondary lymph nodes (300%) and gall bladder (260%). These sites can be termed

Table 3. Number of Male Cases Covered by Period , % Change and % Relative Change - Bhopal

| ICD | Site | 2003 - 05(b) | 1988 -90(a) | Change (b-a) | % C | % RC |
|--------|------------------|--------------|-------------|--------------|-------|-------|
| C03-06 | Mouth | 158 | 57 | 101 | 12.6 | 177.2 |
| C33-34 | Lung etc. | 173 | 91 | 82 | 10.2 | 90.1 |
| C01-02 | Tongue | 158 | 90 | 68 | 8.5 | 75.6 |
| C32 | Larynx | 76 | 30 | 46 | 5.7 | 153.3 |
| C61 | Prostate | 67 | 31 | 36 | 4.5 | 116.1 |
| C15 | Oesophagus | 92 | 62 | 30 | 3.7 | 48.4 |
| C67 | Bladder | 40 | 10 | 30 | 3.7 | 300.0 |
| C77 | Sec Lymph Nodes | 40 | 10 | 30 | 3.7 | 300.0 |
| C18 | Colon | 41 | 14 | 27 | 3.4 | 192.9 |
| C23-24 | Gallbladder etc. | 36 | 10 | 26 | 3.2 | 260.0 |
| | All sites | 1,636 | 833 | 803 | 100.0 | 96.4 |

Table 4. Number of Male Cases Covered by Period , % Change and % Relative Change - Chennai

| ICD | Site | 2003 - 05(b) | 1988 -90(a) | Change (b-a) | % C | % RC |
|-----------|-----------------------|--------------|-------------|--------------|------|-------|
| C33-34 | Lung etc. | 701 | 449 | 252 | 11.8 | 56.1 |
| C61 | Prostate | 279 | 95 | 184 | 8.6 | 193.7 |
| C01-02 | Tongue | 360 | 215 | 145 | 6.8 | 67.4 |
| C82-85,96 | NHL | 272 | 170 | 102 | 4.8 | 60.0 |
| C32 | Larynx | 286 | 189 | 97 | 4.5 | 51.3 |
| C19-20 | Rectum | 220 | 125 | 95 | 4.5 | 76.0 |
| C16 | Stomach | 666 | 574 | 92 | 4.3 | 16.0 |
| C70-72 | Brain, Nervous System | 204 | 112 | 92 | 4.3 | 82.1 |
| C15 | Oesophagus | 452 | 365 | 87 | 4.1 | 23.8 |
| C67 | Bladder | 186 | 102 | 84 | 3.9 | 82.4 |
| | All sites | 6,656 | 4,523 | 2133 | 100 | 47.2 |

Table 5. Number of Male Cases Covered by Period , % Change and % Relative Change - Delhi

| ICD | Site | 2003 - 05(b) | 1988 -90(a) | Change (b-a) | % C | % RC |
|-----------|-----------------------|--------------|-------------|--------------|-------|-------|
| C33-34 | Lung etc. | 1793 | 821 | 972 | 11.7 | 118.4 |
| C61 | Prostate | 1105 | 349 | 756 | 9.1 | 216.6 |
| C01-02 | Tongue | 978 | 447 | 531 | 6.4 | 118.8 |
| C03-06 | Mouth | 779 | 254 | 525 | 6.3 | 206.7 |
| C82-85,96 | NHL | 874 | 429 | 445 | 5.3 | 103.7 |
| C32 | Larynx | 1098 | 660 | 438 | 5.3 | 66.4 |
| C67 | Bladder | 823 | 396 | 427 | 5.1 | 107.8 |
| C70-72 | Brain, Nervous System | 781 | 398 | 383 | 4.6 | 96.2 |
| C23-24 | Gallbladder etc. | 519 | 163 | 356 | 4.3 | 218.4 |
| C40-41 | Bone | 445 | 177 | 268 | 3.2 | 151.4 |
| | All sites | 17,611 | 9270 | 8341 | 100.0 | 90.0 |

as the emerging sites of cancer among men in PBCR of Bhopal.

For the PBCR of Chennai (Table 4), the rise in the number of cases is 2,133. Of these, the maximum contribution is due to lung cancer (11.8%), prostate (8.6%), tongue (6.8%), NHL (4.8%) and larynx (4.5%). Based on the relative changes, the emerging cancers are prostate (193.7%), bladder (82.4%) and brain and nervous system (82.1%).

For the PBCR of Delhi (Table 5), the rise in the number of cases is 8,341. Of these, the maximum contribution is due to lung (11.7%), prostate (9.1%), tongue (6.4%), mouth (6.3%) and NHL (5.3%). Based on the relative changes, the emerging new cancers are gallbladder (218.4%), prostate (216.8%) and mouth (206.7%).

For the PBCR of Mumbai (Table 6), the rise in the number of cases is 2,917. Of these, the maximum contribution is due to mouth (17.1%), prostate (12.3%), liver (10.2%), NHL (9.6%) and brain and nervous system (8.4%). Based on the relative changes, the emerging new cancers are liver (101.7%), pancreas (94.6%) and mouth (80.7%).

For the pooled cases of PBCR (Table 7), the rise in the number of cases is 16,904. Of these, the maximum contribution is due to lung cancer (9.7%), prostate (9.2%), mouth (7.5%), tongue (5.9%) and NHL (5.9%). Based on the relative changes, the emerging new cancers are prostate (140.1%), liver (111.9%) and mouth (95.3%).

Table 6. Number of Male Cases Covered by Period , % Change and % Relative Change - Mumbai

| ICD | Site | 2003 - 05(b) | 1988 -90(a) | Change (b-a) | % C | % RC |
|-----------|--------------------------|-----------------|----------------|-----------------|--------|---------|
| CC03-06 | Mouth | 1117 | 618 | 499 | 17.1 | 80.7 |
| C61 | Prostate | 820 | 460 | 360 | 12.3 | 78.3 |
| C22 | Liver | 589 | 292 | 297 | 10.2 | 101.7 |
| C82-85,96 | NHL | 682 | 401 | 281 | 9.6 | 70.1 |
| C70-72 | Brain, Nervous System | 598 | 353 | 245 | 8.4 | 69.4 |
| C67 | Bladder | 502 | 314 | 188 | 6.4 | 59.9 |
| C01-02 | Tongue | 734 | 569 | 165 | 5.7 | 29.0 |
| C25 | Pancreas | 327 | 168 | 159 | 5.5 | 94.6 |
| C18 | Colon | 463 | 313 | 150 | 5.1 | 47.9 |
| C19-20 | Rectum | 410 | 261 | 149 | 5.1 | 57.1 |
| All sites | | 14,318 | 11,401 | 2917 | 100.0 | 25.6 |

Table 7. Number of Male Cases Covered by Period , % Change and % Relative Change - Pooled

| ICD | Site | 2003 - 05(b) | 1988 -90(a) | Change (b-a) | % C | % RC |
|-----------|--------------------------|-----------------|----------------|-----------------|--------|---------|
| CC33-34 | Lung etc. | 4,423 | 2,780 | 1,643 | 9.7 | 59.1 |
| C61 | Prostate | 2,651 | 1,104 | 1,547 | 9.2 | 140.1 |
| C03-06 | Mouth | 2,596 | 1,329 | 1,267 | 7.5 | 95.3 |
| C01-02 | Tongue | 2,454 | 1,458 | 996 | 5.9 | 68.3 |
| C82-85,96 | NHL | 2,176 | 1,181 | 995 | 5.9 | 84.3 |
| C70-72 | Brain, Nervous System | 1,942 | 1,036 | 906 | 5.4 | 87.5 |
| C67 | Bladder | 1,732 | 933 | 799 | 4.7 | 85.6 |
| C22 | Liver | 1,437 | 678 | 759 | 4.5 | 111.9 |
| C32 | Larynx | 2,466 | 1,723 | 743 | 4.4 | 43.1 |
| C18 | Colon | 1,273 | 653 | 620 | 3.7 | 94.9 |
| All sites | | 46,946 | 30,042 | 16,904 | 100.0 | 56.3 |

Discussion

It is evident that the number of cases covered by different PBCRs is on rise. The rise is shown to be ranging from 25.6% in Mumbai PBCR to 96.4% in Bhopal. The lung cancer is found to be the leading contributor to changes over the years in the PBCR of Bangalore (10.1%), Chennai (11.8%) and Delhi (11.7%). For the PBCR of Bhopal and Mumbai, the mouth cancer is the leading site contributing to 12.6% and 17.1% of total changes, respectively. Prostate cancer is another common site of cancer which contributed significantly to changes and ranked 2nd in terms of contribution to total changes in the registry of Chennai, Delhi and Mumbai and ranked 3rd and 5th in the registry of Bangalore and Bhopal respectively. Tongue cancer also figured in top 5 sites contributing to changes in the registry of Bhopal, Chennai and Delhi.

Based on the data provided in tables, liver cancer can be claimed as one of the emerging cancers in the PBCR of Bangalore and Mumbai while Prostate cancer can be claimed as an one of the emerging cancers in the PBCRs of Chennai, Delhi and Mumbai. Gall bladder is another site of cancer which can be claimed as emerging cancer in the registries of Delhi and Bhopal. Thus registries showed variation with respect to their emerging cancers. However, based on the pooled data of all the registries, it can be claimed that the top three emerging cancers in India are prostate, liver and mouth.

The approach described thus gives us an alternative approach to study the changes in the cancer pattern. It is to be noted that this type of analysis totally depends upon the number of cases rather than on rates on two selected points of time. The knowledge of estimated population figures for inter-census years is also not needed in the present type of analysis.

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