
Trends in tuberculosis mortality rates in Goa (1991-2001)*MS Kulkarni*, FS Vaz*, DD Motghare*, AM Ferreira****Abstract**

In the present study, the trends of tuberculosis (TB) mortality rate from 1991-2001 and its differentials were analyzed. Projections for TB-mortality rate for the year 2015 were also made. The study was based on retrospective data of registered deaths in the state of Goa during the decade 1991-2001. The data was analyzed using cause specific mortality rate due to tuberculosis and Standardized Mortality Ratio (SMR). TB-mortality rate for the year 2015 was predicted by fitting exponential curve. The trends of TB-mortality rate revealed a declining trend during the decade 1991-2001. TB-mortality rate was found to be higher among males and urban residents. The standard mortality ratio indicated a 16.1 percent decline in the mortality rate due to tuberculosis by the year 2001 compared to the year 1991.

Key words: Tuberculosis, Mortality, Trends

Introduction

Tuberculosis (TB) continues to be a major public health problem world wide, with about 8 million people developing tuberculosis and about 1.7 million people dying of this disease every year¹. The problem of tuberculosis is more acute in developing countries including India with this country accounting for 20 percent of the global incidence of TB and mortality. The Millennium Development Goals (MDGs) aim to halve the TB prevalence and mortality rates between 1990 and 2015².

Goa is a western coastal State of India with a population of about 13.5 lakhs as per census 2001³. It is one of the best performing states in the country in terms of health and demographic

indicators, comparable to several developed countries⁴. The present study was conducted to study the trends in TB-mortality rates in Goa during the decade 1991-2001 and the likely scenario in the year 2015 if the same trend continued. TB-Mortality rate provides a useful health indicator for monitoring progress of TB control programme and Standardized Mortality Ratio (SMR) is particularly useful for evaluating the efficiency of the programme.

The completeness and accuracy of mortality data in developing countries is very low⁵. However, in the state of Goa, the civil registration system is complete (almost 100%), as the centuries old tradition of church based vital events registration system existed in the state under the Portuguese rule. About 90% of deaths are medically certified, since majority of deaths occur in Hospitals/ Medical Institutions or are attended by Registered Medical Practitioners. Even in rural areas, 75-80 percent of deaths were medically certified⁶.

Objectives

- i. To study the trends of tuberculosis mortality rate during the period 1991-2001 and its differentials due to gender and residence.
- ii. To predict the tuberculosis mortality for the year 2015.

Material and Methods

The present study was carried out using a retrospective study design, based on annual reports of registration of deaths in the State of Goa, for the period 1991-2001. The causes of deaths were classified according to International Classification of Disease (ICD-9) for the period 1991- 1998 and ICD-10 for the period 1999

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onwards⁷. The code used for cause of death due to TB under ICD-10 was A15 to A19. The classification of the deaths according to ICD classification was done by the trained Research Assistants in the Office of the Chief Registrar of Birth and Deaths, Department of Planning and Statistics, Panaji. They were counter-checked for accuracy of coding by Directorate of Census, Ministry of Home Affairs, New Delhi. The mortality data was reliable, since nearly 90 percent of the deaths were certified by Registered Medical Practitioners and quality of data can be gauged by the fact that cause of death due to symptoms, signs and ill defined conditions was 10-14 percent, as against 10-12 percent reported in developed countries⁸. The mid-year populations for the period 1992-2000 were projected on the basis of census population of Goa for the year 1991 and 2001.

Statistical Methods

The data was analyzed using cause specific mortality rate and standardized mortality ratio⁹ (SMR). The SMR for the year 2001 was calculated to measure the change in TB-mortality rate for year 2001 compared to the year 1991. The SMR was computed as the ratio of number of observed TB deaths in 2001 to the expected TB deaths in the population in 2001, assuming the population experiences the age specific TB death rates of the year 1991. TB-mortality rate was projected for the year 2015 by fitting trend using exponential curve model.

Results

TB mortality rate in Goa showed an overall decreasing trend from 1991 to 2001 (table 1). It showed an upward trend till 1994 and then a marked fall from the year 1995 onwards. The exponential curve revealed that, TB-mortality declined by about 3.2 percent during the decade 1991 to 2001. If this trend continues, the predicted TB-mortality rate for the year 2015 would be 13.4 per 100 000 population. The trends in TB-mortality rate by fitting exponential curve were found significant.

Table 2 shows the trends of TB-mortality rate according to gender. The mortality rate was consistently higher for male than females. Mortality rate declined among males during 1991-2001, however such decline was not found among females. If this trend continues, the predicted TB-mortality rate for the year 2015 would be 19.7 per 100 000 males and 5.8 per 100 000 females.

Table 3 shows the trends of TB-mortality rate according to place of residence. The level of TB-mortality rate was higher in urban areas compared to rural areas. A substantial fall in the TB-mortality rate was observed in urban areas but no such change was found in rural areas during the study period. If this trend continues, the predicted TB-mortality rate for the year 2015 would be 8.5 per 100 000 population in urban area and 24.57 per 100 000 population in rural area.

Table 4 shows the SMR as the ratio of total observed TB deaths in 2001 to the total number of TB deaths that would have been expected to occur in 2001 if the study population for the year 2001 had experienced TB-mortality rates of 1991. The SMR for the year 2001 was 83.9%. Thus SMR indicates that there was 16.1 percent decline in the TB-mortality in the State of Goa in the year 2001 compared to the year 1991.

Discussion

TB-mortality rate in the State of Goa was much less than the mortality rate observed at the national level during 1991-2001. TB-mortality rate in India was 45 per 100 000 population in 1990 and 33 per 100 000 population in 2003¹. In Mexico, TB-mortality decreased by 6.7 percent annually between 1990 and 1998¹⁰, where as in the present study the TB-mortality declined annually by 3.2 percent during the period 1991- 2001. TB-mortality showed an increasing tendency during the beginning of the decade and then showed decline. It is remarkable in the sense that, India's Revised

National Tuberculosis Control programme was introduced on a pilot basis in 1993 and formally launched by government in 1998¹¹. Further effort should be made to reduce the TB mortality as in United States of America where, the TB mortality dropped from 199 to 0.5 per 100 000 populations during the period 1900 to 1980⁹.

While TB-mortality rate among females was much less compared to males, there was a parallel decline of 3% annually amongst both the genders. The annual decline of 6.7% was observed in urban areas; where as the mortality rate increased by 1.3 percent in rural areas. This may be due to better access to health care facilities in urban areas. SMR due to TB mortality declined nearly by 16.1 percent during the decade 1991-2001. If the present trend of TB-mortality continues, by the year 2015, it would be possible to reduce overall TB mortality rates by 50 percent, however special targeted strategies have to be devised in rural areas and for female TB patients in order to reduce it.

Conclusion

The present analysis revealed that in the State of Goa, TB-mortality rate showed upward trend up to 1994 and declined thereafter. It was higher among males and urban residents. The standardized mortality ratio showed a 16.1 percent decline in the TB-mortality by the year 2001 compared to the year 1991. The TB-mortality rates and standardized mortality ratio provide useful and intelligent information for the TB control programme managers to monitor the progress and efficiency of the programme¹². The analysis also identified the special areas and population groups for emphasis for more effective implementation of the programme. The mortality rates and Standardized Mortality Ratios could thus be used as important measurement tools for evaluation of the tuberculosis control programme.

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TABLES

Table 1 : Tuberculosis mortality rate in Goa, 1991 - 2015

| Year | No. of deaths | Population | Mortality rate |
|-----------------------|---------------|------------|----------------|
| 1991 | 298 | 1170000 | 25.47 |
| 1992 | 337 | 1187316 | 28.38 |
| 1993 | 343 | 1204882 | 28.46 |
| 1994 | 361 | 1222721 | 29.50 |
| 1995 | 323 | 1240817 | 26.03 |
| 1996 | 300 | 1259181 | 23.83 |
| 1997 | 244 | 1277817 | 19.09 |
| 1998 | 290 | 1296729 | 22.36 |
| 1999 | 275 | 1315921 | 20.90 |
| 2000 | 293 | 1335396 | 20.67 |
| 2001 | 303 | 1335396 | 22.48 |
| 2015 | - | - | 13.41 |
| Annual rate of change | | - | -3.17% |

Table 2: Tuberculosis mortality rate / 100 ,000 population according to gender in Goa, 1991-2015

| Year | Male | | | Female | | |
|-----------------------|--------|------------|----------------|--------|------------|----------------|
| | Deaths | Population | Mortality rate | Deaths | Population | Mortality rate |
| 1991 | 234 | 594814 | 39.34 | 64 | 575186 | 11.13 |
| 1992 | 260 | 603618 | 43.67 | 77 | 586698 | 13.19 |
| 1993 | 275 | 612548 | 44.89 | 68 | 592334 | 11.48 |
| 1994 | 298 | 622567 | 47.86 | 63 | 600154 | 11.5 |
| 1995 | 260 | 631781 | 41.15 | 63 | 609036 | 10.34 |
| 1996 | 244 | 641131 | 38.06 | 56 | 618050 | 9 |
| 1997 | 189 | 650610 | 29.04 | 55 | 627197 | 8.77 |
| 1998 | 229 | 661596 | 34.61 | 61 | 635133 | 8.77 |
| 1999 | 226 | 671388 | 33.66 | 49 | 644533 | 7.6 |
| 2000 | 231 | 681324 | 33.9 | 62 | 654072 | 9.47 |
| 2001 | 229 | 685617 | 33.4 | 74 | 658381 | 11.23 |
| 2015 | | | 19.72 | | | 5.76 |
| Annual rate of change | | | -3.42% | -2.95% | | |

Table 3: Tuberculosis mortality rate / 100,000 population according to residence in Goa, 1991-2015

| Year | Urban | | | Rural | | |
|------------------------------|--------|------------|----------------|---------------|------------|----------------|
| | Deaths | Population | Mortality rate | Deaths | Population | Mortality rate |
| 1991 | 184 | 479700 | 38.35 | 114 | 690300 | 16.51 |
| 1992 | 216 | 498536 | 41.73 | 121 | 688781 | 17.56 |
| 1993 | 221 | 517616 | 42.69 | 122 | 687266 | 17.75 |
| 1994 | 212 | 536966 | 39.48 | 149 | 685754 | 21.72 |
| 1995 | 184 | 556572 | 33.05 | 139 | 684245 | 20.31 |
| 1996 | 143 | 576441 | 24.79 | 157 | 682740 | 23.05 |
| 1997 | 131 | 596379 | 21.95 | 113 | 681238 | 16.58 |
| 1998 | 148 | 576528 | 25.67 | 142 | 679739 | 20.89 |
| 1999 | 156 | 616990 | 25.68 | 119 | 678244 | 17.55 |
| 2000 | 137 | 658645 | 20.48 | 135 | 676751 | 19.94 |
| 2001 | 161 | 668869 | 24.15 | 142 | 690491 | 21.08 |
| 2015 | | | 8.5 | | | 24.57 |
| Annual rate of change | | | -6.65% | +1.28% | | |

Table 4: Standardized Mortality Ratio for Tuberculosis

| Age group (years) | Observed death in 2001 | Population in 2001 | Mortality rate/lakh population 2001 | Mortality rate per lakh population in 1991 | Expected deaths in 2001 as per mortality rate of 1991 |
|-------------------|------------------------|--------------------|-------------------------------------|--|---|
| <5 | 3 | 103823 | 2.89 | 5.24 | 5.38 |
| 5-15 | 1 | 227403 | 0.44 | 1.67 | 3.76 |
| 15-25 | 9 | 267047 | 3.37 | 1.93 | 9.85 |
| 25-35 | 45 | 256158 | 17.57 | 13.55 | 34.38 |
| 35-45 | 66 | 187104 | 35.27 | 31.75 | 58.93 |
| 45-55 | 73 | 139943 | 52.16 | 64.05 | 88.95 |
| 55-65 | 61 | 89299 | 68.31 | 89.66 | 79.02 |
| 65+ | 45 | 76891 | 58.52 | 107.85 | 82.09 |
| Total | 303 | 1347668 | 22.48 | 25.47 | 361.13 |

$$\text{SMR} = \frac{\text{Number of Observed deaths in 2001} \times 100}{\text{Number of Expected deaths in 2001}} = 83.9.1\%$$