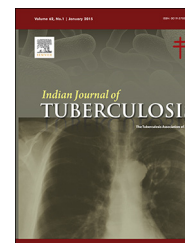


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Original Article

General and tuberculosis mortality in two states of India: A population-based survey

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ABSTRACT

Background: General and cause-specific mortality data for causes of death are not available for the states of Andhra Pradesh (AP) and Orissa in India.

Objectives: To estimate general mortality rate (GMR) and the tuberculosis mortality rate (TMR) among the general population in the two states.

Methods: All permanent residents in households of selected districts of AP and Orissa states were registered in the survey in 2005–2006. A sample size of 380,000 persons was selected from each state. Health workers carried out house-to-house enumeration. Demographic and occurrence of death data were collected. The cause of death was determined using the instrument of verbal autopsy.

Results: The GMR for AP and Orissa was 636 (95% CI: 610–662) and 616 (95% CI: 588–643) per 100,000 person years (p-ys) respectively. The TMR for AP and Orissa was 76 (95% CI: 67–85) and 41 (95% CI: 34–48) per 100,000 p-ys respectively. The difference in TMR between the states was statistically significant ($P < 0.0001$).

Conclusion: The GMRs are similar in AP and Orissa states. Tuberculosis accounted for 12% and 7% of deaths in AP and Orissa respectively. Focused strategies are needed to reduce mortality due to tuberculosis.

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1. Introduction

Globally, the number of incident tuberculosis (TB) cases is estimated to be falling slowly since 2006. Despite all the interventions, death due to TB is still significant. The 2014 WHO Global TB Report estimated that 9.0 million incident cases of TB and 1.5 million people died from the disease in 2013. India alone accounted for 24% of the total TB cases and about one-third of TB deaths in that year.¹ Multidrug-resistant TB continues to present significant challenges to TB control.

Reliable TB mortality data are not available especially from countries of the South East Asian Region. Medical certification of cause of death is generally of poor quality, because of lack of proper training for the doctors and poor enforcement. WHO estimates of TB mortality for these countries are derived indirectly from incidence (which itself is indirectly estimated) and reported case fatality rates. Such estimates are also not accurate. Mortality surveys using the verbal autopsy (VA) tool are an accepted method for estimating mortality rates for various health conditions and diseases.

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Usually mortality surveys are conducted using prospective follow-up design. Such surveys require at least one-year follow-up period to collect mortality (deaths due to all causes) data. They require more personnel, financial resources, and time. On the other hand, retrospective study designs such as the one used in this survey, require less time, personnel, and money. The present study was conducted to estimate the general mortality and cause specific mortality rates in two states from India. Cause-specific mortality rates are essential to prioritize the health needs of a community and to assess the impact of control measures. For example, reduction of TB mortality rate by 50% from 1990 to 2015 is a global health target proposed in the Millennium Development Goals.² In India, crude death rate for the nation as a whole and for the states are periodically measured through Sample registration systems (SRS) and general census.³ In fact, the proportion of deaths in 2001–2003 attributable to TB was 5.1% for South India in one report.⁴ The Register General of India survey is a prospective survey which is time consuming and very expensive. The National Institute for Research in Tuberculosis in Chennai conducted mortality surveys in Andhra Pradesh (AP) and Orissa states in India using a retrospective study design to collect data on death due to all causes, and TB in particular.

Objectives: 1. To estimate general mortality rate (GMR) for the states of AP and Orissa. 2. To estimate the TB mortality rate (TMR) among the general population in these two states.

1.1. Sampling and sample size

Our study was designed to detect enough TB deaths which could be stratified by age and sex. The required sample size was estimated to be 380,000 for an annual incidence of deaths due to TB of 36 per 100,000 population, a precision of 20% at 95% confidence level, and 25% of calculated sample size was accounted for absentees. Twenty-five percent of districts (6 from AP and 8 from Orissa states) were selected by systematic sampling method. In total, 380 units (urban/rural) were distributed proportionately to size of the population of urban (includes wards) and rural areas of the selected districts of each state. The size of each unit was fixed at 1000 persons to represent more units and the required sampling units were chosen randomly in urban and rural areas from each district.

2. Methodology

The survey was carried out during 2005–2006. Trained health workers visited each house in the selected areas and registered into the survey all permanent residents (who were residing in that unit permanently and belonging to the household) as they existed on the day of previous “Sankranti” for AP and “Holi” for Orissa in 2005 (both prominent festival days). During registration, the household number, names of the members in the household, age in completed years, and gender of the individuals were recorded. In addition, information on occurrence of death in each household (between “Sankranti” for AP and “Holi” for Orissa and the date of registration) was recorded. Similar information was also recorded for those who had migrated out of the selected areas. All household registration forms reporting deaths were handed over to the

supervisors (non-medical graduates specially trained in the VA instrument and proficient in the local language), for detailed VA to ascertain leading causes of death among the population.

VA was conducted by supervisors through an interview of the head of the family or any other adult household member of the deceased. Respondents were asked to describe the chain of events, circumstances, symptoms, and signs of the illness leading to death. The questionnaire used for VA consisted of the following three sections:

Section I: Dealt with general information of the deceased and the respondent.

Section II: Comprised of structured questions to probe the nature of symptoms and signs the deceased had immediately preceding the death and also past medical history.

Section III: Deals with the written narrative (a standardized symptom list was used as a filter to define additional probing questions related to a particular symptom).

The narrative was written in the local language as narrated by the respondent and included information gathered on the symptoms in the order of occurrence, the nature of medical help sought, findings of investigation reports and hospital diagnosis, and records whenever available. The average recall period was 342 days and 307 days for AP and Orissa states, respectively. 5% of randomly selected household registration forms and VA forms were cross-checked by coordinators/supervisors, through repeat visits to households and re-interview of the respondents of the diseased.

In both states, two medical officers specially trained in coding cause of deaths (ICD-10 version 2005) reviewed and coded all completed VA forms independently. The coded forms were reviewed by an adjudicator. The adjudicator's code was considered as the final code of the underlying cause of death, defined as the disease which initiated the train of events leading directly to death or the circumstances of the accident or violence which produced the fatal injury.

3. Results

In AP, 304 rural and 76 urban units were selected. Of the total population registered, 98.4% were alive, 0.6% had died, and 1% had migrated at the time of interview (Table 1). Krishna district was the biggest district with 82 units and Vizianagaram district was the smallest district with 44 units. Table 2 shows that from Orissa, 310 rural and 70 urban units were selected. Of the total registered population, 98.7% were alive, 0.5% had died, and 0.8% had migrated at the time of interview. Cuttack district was the biggest district with 94 units and Debagarh was the smallest district with 11 units.

The GMR for AP and Orissa was 636 (95% CI: 610–662) and 616 (95% CI: 588–643) per 100,000 person-years (p-ys) respectively. The difference was not statistically significant ($P = 0.29$). The TMR for AP and Orissa was 76 (95% CI: 67–85) and 41 (95% CI: 34–48) per 100,000 p-ys respectively, and the difference was statistically significant ($P < 0.0001$). Both the GMR and the TMR increased with increasing age (Table 3). Males had higher GMR ($P < 0.0001$) and TMR ($P < 0.0001$) than females in all age groups

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