

RESEARCH ARTICLE

SUDDEN UNEXPECTED DEATHS DUE TO TUBERCULOSIS: AN AUTOPSY BASED STUDY

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ABSTRACT

Purpose: *Mycobacterium tuberculosis* is estimated to infect 1.6 billion people worldwide and killing around 2-3 million people annually. This autopsy based retrospective research was conducted to understand the pattern of sudden deaths from tuberculosis in Mangalore, South India. **Methods:** The study was conducted at the Department of Forensic Medicine, Kasturba Medical College, Mangalore and autopsy case files during May 2004 to April 2008 were studied. Histopathologically confirmed cases of sudden death due to tuberculosis were included in the study. **Results:** During the study period a total of seventy three cases of sudden deaths due to respiratory system involvement were reported. Of all sudden respiratory deaths, forty five cases (61.64%) were specifically assigned to tuberculosis. Males were predominantly affected (86.67%). Majority of deaths were reported in the 5th decade of life (33.33%). Most of the victims (84.44%) were underweight and emaciated. Findings were restricted to lungs in 82.22% cases while miliary spread was observed in 17.78% cases. **Conclusion:** Active TB has implications for the health of autopsy room staff, autopsy room design and ventilation, choice of protective equipment and for the public health service. Steady increase in fatal cases of tuberculosis even with better treatment and diagnostic facilities is a cause of concern.

Keywords: Tuberculosis; Miliary tuberculosis; Sudden death; Autopsy; South India.

INTRODUCTION

Forensic pathologists deal not only with unnatural deaths, but also with a wide range of natural deaths, especially, if they have occurred suddenly in apparently healthy individuals¹. Suspicion usually arises when an

individual is found dead in a public place, without anyone having witnessed it². WHO has defined sudden death as death occurring within 24 hrs from the onset of symptoms³. Under the British system all cases of sudden death which are not seen by a doctor within 14 days preceding death should be autopsied⁴. In India, a similar system is followed and the very purpose of medico legal autopsy in such deaths is to determine whether poisoning or violence has been in any way responsible for the death. Disease of any body system can result in sudden death. Majority of the sudden deaths reportedly involve the cardiovascular system (45%), respiratory system (25%), or the nervous system (20%), other causes contribute to remaining 10% of sudden deaths⁵.

Tuberculosis (TB) remains a major respiratory cause of morbidity and mortality worldwide and has been identified as a 'global emergency' by the WHO⁶. One third of the world's current population has been infected with *M. tuberculosis*, and new infections occur at a rate of one per second⁶. Latent infection is however, most common and about 10% of it eventually progresses to active disease, which, if left untreated, kills more than half of its victims. In 2004, mortality and morbidity statistics included 14.6 million chronic active cases, 8.9 million new cases, and 1.6 million deaths, mostly in developing countries⁶. The national average of tuberculosis per 100,000 populations in India was 168 in the year 2006. Worldwide problem status is presented in table 1⁷. India has the largest number of infections, with over 1.8 million reported cases⁸. Reasons for increasing incidence of this treatable disease are HIV infection, drug resistance, lack of access to health care, ineffective preventive and control programmes etc.

Even after complete cure of disease tuberculosis leaves behind sequelae and complications like tuberculoma, cavitations, bronchiectasis, chronic empyema, pneumothorax, opportunistic infections etc. Acute deaths due to tuberculosis are uncommon; however since it is a common disease in India its causal relationship with sudden death should be kept in mind. Present study was done to understand the problem status of sudden deaths from tuberculosis in Mangalore, South India.

METHODS

This autopsy based retrospective research was conducted at Kasturba Medical College, Mangalore from the cases autopsied at District Government Hospital,

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Mangalore from May 2004 to April 2008. Confirmed cases of sudden death due to tuberculosis based on gross and histopathological examination were included in the study. Significant pathology in other systems was ruled out by the autopsy surgeons based on gross and microscopic features, before assigning tuberculosis as the cause of death. Haematoxylin and eosin staining was used during the histological examination. Data was analysed using SPSS (Statistical package for social sciences) programme, version 11.0 and a detailed epidemiologic profile was made.

RESULTS

A total of 2515 cases were autopsied during the study period. Sudden natural death comprised of 274 cases (10.89%). Cause of death remained unascertained in 23 cases. Seventy three cases of sudden deaths (26.64%) were related to respiratory system, of which forty five cases (61.64%) were specifically assigned to tuberculosis (16.42% of total sudden deaths). A steady rise in number of sudden deaths due to tuberculosis was observed during the study period. Males were predominantly affected (86.67%) and one-third of deaths were reported in 5th decade of life (Table 2). Majority of the victims (84.44%) had emaciated appearance at autopsy and were diagnosed to be

Table 1: Problem status in different countries (based on 2006 data)

Country	Cases per 100,000 population
US	4.3
Switzerland	6.7
UK	15
Spain	30
Portugal	32
Brazil	50
China	99
India	168
Swaziland	1155

Table 2: Age and sex distribution of the study sample

Age (Years)	Males	Females	Total
< 20	-	-	-
21-30	4	2	6
31-40	6	3	9
41-50	14	1	15
51-60	5	-	5
61-70	8	-	8
71-80	1	-	1
Unknown	1	-	1
Total	39	6	45

underweight based on body mass index (BMI) (Figure 1). Autopsy findings were restricted to lungs in 82.22% of

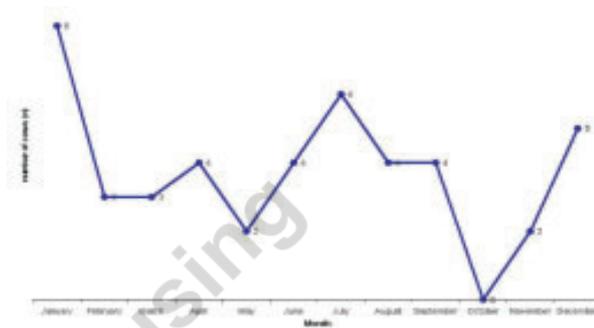


Figure 1: Monthly distribution of cases

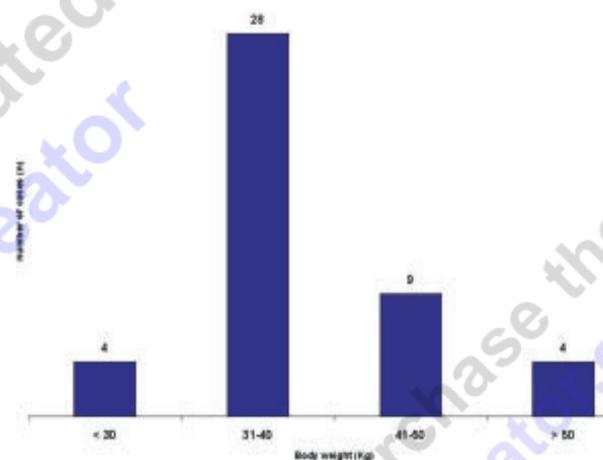


Fig 2: Distribution of the study sample based on the weight of individuals

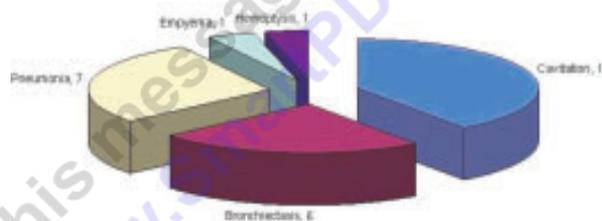


Fig 3: Complications of Tuberculosis

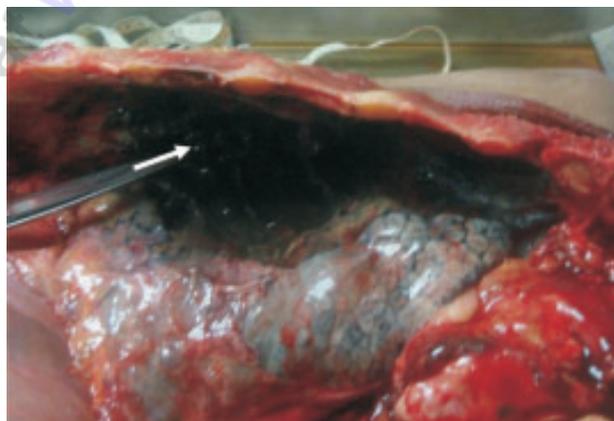


Fig 4: Extensive pleural adhesions on the right side

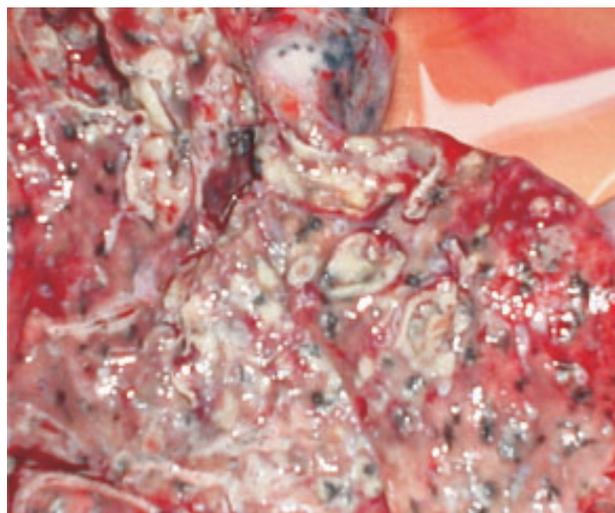


Fig 5: Cut section of lung showing tubercular changes

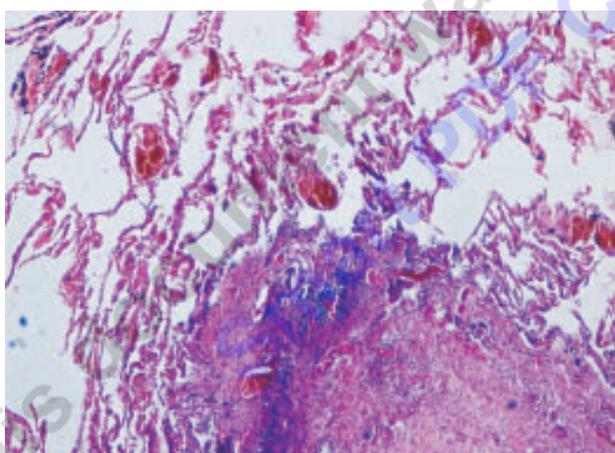


Fig 6: Caseous necrosis in lungs, 10 x, H& E Stain

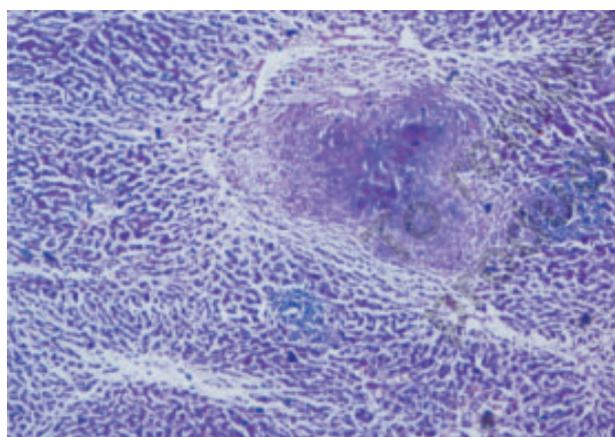


Fig 7: Caseous necrosis in liver, 10 x, H& E Stain

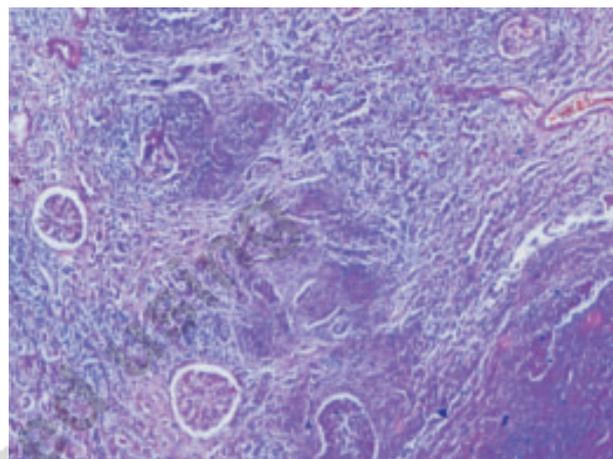


Fig 8: Caseous necrosis in kidney, 10 x, H& E Stain

cases and miliary spread was observed in 17.78% of cases. Most common target organs involved were liver, spleen and kidneys. 55.55 % of the cases showed specific pulmonary findings like cavitation, bronchiectasis and pneumonia while findings in remaining cases were non specific (Figure 2). In our study, although no specific seasonal trend was observed, majority of cases were reported in winter season (Figure 3). Gross and histopathological findings from the cases included in the study are shown in figures 4-8.

DISCUSSION

Hassan and Hanna have reported approximately 2% of all sudden deaths due to tuberculosis in Baghdad. In their study tuberculous cavitation was the principle finding in 75% of the cases followed by miliary tuberculosis in 10.1% cases. The principal acute complications of tuberculosis were hemoptysis and pneumothorax⁹. In another study most common cause of tuberculosis related sudden deaths was tuberculous bronchopneumonia in 64% cases and hemoptysis in 30 % patients¹⁰. Bobrowitz conducted a study on 21 deaths due to tuberculosis (undiagnosed till autopsy) of which 11 were due to pulmonary tuberculosis and 10 due to miliary tuberculosis¹¹. Breathnach et al have reported an outbreak of multi drug resistant tuberculosis in a teaching hospital¹². The risk of encountering tuberculosis has reduced with the decreased incidence of the disease; however, it can still be found at autopsy. Isolated cases of sudden deaths due to tuberculosis have been reported in literature¹³⁻¹⁷. Flavin et al reported 15 cases (0.3%) of active tuberculosis from 4930 autopsies over a period of 14 years out of which 67% remained undiagnosed till autopsy¹⁸. In two separate studies it was demonstrated that the incidence of tuberculosis infection among staff that had contact during autopsy room alone was higher than those who had contact during hospital admissions¹⁹⁻²⁰. Thus, suggesting that a patient who did not transmit tuberculosis before death released a prodigious number of bacilli during autopsy.

Tuberculosis can be a difficult disease to diagnose,

mainly due to the difficulty in culturing this slow-growing organism in the laboratory. A complete medical evaluation for tuberculosis must include a medical history, chest radiographs, physical examination, microbiological smears and cultures. Currently, latent infection is diagnosed in a non-immunized person by a tuberculin skin test, which yields a delayed hypersensitivity type response similar to those immunized for tuberculosis or with past-cleared infection, so the test must be used with caution. New tuberculosis tests like PCR and antibody assays are not affected by immunization, so generate fewer false positive results. Majority of the cases are latent infections but when the disease becomes active, 75% of the cases are pulmonary tuberculosis, in 25% of cases (more commonly in immunocompromised persons) the infection moves from the lungs, involving other organs⁶. Even after successful chemotherapy there is a <5% risk of relapse²¹. In the absence of treatment, smear positive tuberculosis patient remains infectious for an average 2 years; and 25% of untreated cases die within 1 year²². A person with active but untreated tuberculosis can infect 10–15 other people per year⁶. People at risk include residents and employees of high-risk congregate settings, IV drug abusers, medically underserved and low-income populations, immunocompromised patients and health care workers serving these high-risk clients. Since humans are the only host of *Mycobacterium tuberculosis*, eradication would be possible: a goal that would be helped greatly by an effective vaccine. The rise in HIV infections, neglect of tuberculosis control programs, and emergence of drug resistant strains have enabled a resurgence of tuberculosis. From 2000 to 2004, 20% of tuberculosis cases have been recorded to be resistant to standard treatments and 2% resistant to second line drugs²³. The rate at which new tuberculosis cases occur varies widely, even in neighboring countries, apparently because of differences in health care systems.

The WHO declared tuberculosis a global health emergency in 1993, and developed a global plan to stop tuberculosis that aims to save 14 million lives between 2006 and 2015. WHO is working to dramatically reduce the burden of tuberculosis, and halve tuberculosis deaths and prevalence by 2015, through its 'Stop Tuberculosis Strategy' and supporting the Global Plan to Stop tuberculosis²⁴.

Our study reveals that tuberculosis was the single most important cause of sudden unexpected death involving the respiratory system. Thus increase in frequency of sudden death due to undiagnosed tuberculosis in spite of better health care facilities is a cause of concern. Even though the gradual control of tuberculosis is progressing today in most countries, disability and death still exists. Sudden deaths due to tuberculosis are mainly attributed to hemorrhage or to the virulence of the bacilli. Most of the cases pose a danger to the community, both during life as well as after death. Tuberculosis is a treatable disease; its fatality is attributed to its association with HIV infection,

immunocompromised state of patients with immunosuppressive therapy and evolution of multi drug resistant tuberculosis (MDR-TB) and extensively drug-resistant tuberculosis (XDR-TB). Antemortem diagnosis of tuberculosis is not always possible. There are a number of reasons why tuberculosis cases are "missed" and are identified and reported at death. Individuals may have had a concurrent condition masking tuberculosis disease; they may have been treated for tuberculosis disease or infection in the past and suffered an unidentified reactivation; or they may have encountered economic or socio cultural barriers to accessing health care.

Active tuberculosis has implications for the health of autopsy room staff, autopsy room design and ventilation, choice of protective equipment and for the public health service. Protective strategies should include assessment of the risk of a case being infected, early recognition of gross lesions, use of methods for reducing the production of infected aerosols and protection against any aerosols created including anti-air droplet infection at autopsy.

KEY POINTS

1. Tuberculosis is the single most important cause of sudden death involving the respiratory system.
2. Steady increase in fatal cases of tuberculosis even with better treatment and diagnostic facilities is a cause of concern.
3. Missed antemortem diagnosis of TB is a cause of concern for autopsy staff.
4. Protective strategies like risk assesment, early recognition of lesions, use of methods to reduce infection transmission, protection against transmitted infection and effective treatment are advocated.
5. Fatality due to tuberculosis is attributed to its association with HIV infection, immunocompromised state of patients, multi drug resistant TB (MDR-TB) and extensively drug-resistant TB (XDR-TB).

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