TUBERCULOSIS ASSOCIATED DEATHS - A COMPARATIVE AUTOPSY STUDY IN ACCRA, GHANA

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SUMMARY

This study was conducted to find out if there were any changes in the findings at autopsy of deaths associated with tuberculosis (TB) from the period when HIV was first detected in Ghana and to see whether any such changes are correlated with the progression of the HIV-AIDS epidemic. A retrospective review of autopsy files of tuberculosis-associated deaths at the Korle Bu Teaching Hospital Mortuary was done and a comparison was made between the calendar years 1987/1988 at the beginning of the HIV-AIDS epidemic in Ghana and 1997/98, a decade later.

The proportion of deaths associated with TB increased significantly ($X^2 = 9.17$, $P < 0.01$, 1d.f.) from 3.2% of 4321 autopsies in 1987/88 to 5.1% of 7004 autopsies in 1997/98. The increase was largely due to deaths among patients aged 20-49 years and was more pronounced among females. The proportion of deaths associated with TB among females aged 20-49 years increased from 10.0% in 1987/88 to 23.9% in 1997/98. The male: female ratio decreased from 3.4:1 to 1.9:1 over the period. Systemic miliary TB, more than doubled from 12.9% in 1987/98 to 33.4% in 1997/98. It became the commonest form of TB detected at autopsy in the 20-29 years age group in 1997/98.

A significant increase in deaths associated with TB occurred between 1987/88 and 1997/98 and the changes in the characteristics of TB associated deaths were as expected with the progression of the HIV-AIDS epidemic.

Keywords: Tuberculosis, autopsy study, HIV-AIDS.

INTRODUCTION

The world-wide incidence of tuberculosis has increased over recent decades after a period of apparent control, which started in the 1950s due to improved living conditions and the advent of effective multi-drug therapy[1]. It is now estimated that tuberculosis causes 2.5-3 million deaths annually world wide[1, 2]. In Africa there has not been a successful control of tuberculosis due to underdevelopment, poverty and more recently the HIV-AIDS epidemic[3]. This is supported by the increased prevalence of human immunodeficiency virus (HIV) seropositivity among tuberculosis patients of 20-67% reported from countries in the West African sub-region[1, 3,4,5] and from the rest of Africa[6, 7].

The first reported case of HIV-seropositivity in Ghana was in 1986[8]. The cumulative reported cases of AIDS deaths from HIV-AIDS surveillance centers in Ghana has steadily increased from 42 cases in 1986, to 5244 cases at the end of 1990, 14986 at the end of 1994 and 29546 at the end of 1998[9]. This is despite the fact that the level of reporting was estimated at 40% and considered low [9].

It is expected that with the progression of the HIV-AIDS epidemic the incidence and deaths associated with tuberculosis will correspond to the modal age groups for HIV-seropositivity, HIV-AIDS related deaths, and the disseminated form of TB will become more common[10]. This is because HIV infection causes progressive and ultimately profound reduction in cell mediated immunity and subsequent severe impairment of immunologic mechanisms that allow the host to contain the organisms[6, 10,11,12].

A recent survey by Frimpong et al[13] found prevalence of HIV-seropositivity of 23.2% among tuberculosis patients in Kumasi. Ayisi, et al[14] found TB to be the commonest opportunistic infection among 20 AIDS cases at autopsy. However no study has been conducted to find the impact of the HIV-AIDS epidemic on deaths associated with TB in Ghana.

This is a preliminary study conducted at the Korle Bu Teaching Hospital mortuary to compare deaths associated with TB for two calendar years in the late 1980's at the beginning of the HIV-AIDS epi-

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demic and a decade thereafter. The aim is to find our what changes in the characteristics of deaths associated with TB has taken place, and whether such changes are as expected from the progression of the HIV-AIDS epidemic. It is expected that data from this study will provide a basis for further study into HIV-AIDS related deaths among TB patients.

MATERIALS AND METHODS

Autopsy files on deaths associated with TB were retrieved from the records of the Korle Bu Teaching Hospital mortuary for the periods January 1987 to December 1988 and January 1997 to December 1998. These two periods were chosen to represent the beginning of the HIV-AIDS epidemic (1987/1988) and a decade into the epidemic (1997/1998). The total number of autopsies performed in 1987/88 and 1997/98 were recorded. The number, age, sex, whether authorization for the autopsy was by the hospital or by the coroner, and autopsy finding of TB as cause of death or a significant contributory factor were recorded. Diagnosis of TB was based on macroscopic finding of tubercles, and supported by histologic and cytologic stain for acid fast bacilli. Analysis was by EP1-Info Version 6 data analysis software. For ease of comparison, cases were defined into eight groups see Appendix 1.

Appendix 1 Definitions of terms and comments

1. Pulmonary TB-cavitating fibrocaseous pulmonary tuberculosis or primary pulmonary tuberculosis with no systemic spread.
2. Tuberculous bronchopneumonia-confluent bronchopneumonia or lobar pneumonia with numerous AFBs demonstrable on staining with few tubercles seen.
3. Pulmonary miliary TB-diffuse small "millet seed" sized tubercles limited to the lungs.
4. Systemic miliary TB-diffuse miliary tubercles in systemic organs (pulmonary, meningeal and peritoneal lesions may be present).
5. Isolated tuberculous meningitis-tuberculous meningeoncephalitis or tuberculoma in the absence of systemic tuberculosis.
6. Abdominal TB-tuberculosis of the intestine, peritoneum and mesenteric lymph nodes in the absence of pulmonary or systemic organ spread.
7. Spinal TB-tuberculous osteomyelitis of the vertebral column with extensive vertebral destruction and compression fractures and spinal cord damage.
8. Tuberculous pericarditis-chronic pericarditis with death due to constructive pericarditis in absence of systemic or significant pulmonary disease.

No distinction between mycobacterium tuberculosis and mycobacterium avium-intracellulare was made in pulmonary and widespread disease.

RESULTS

A total of 4321 and 7004 autopsies were performed in 1987/88 and in 1997/98 respectively. Coroner's cases formed 73% and 77% of all autopsies for the respective periods. The rest were hospital requests.

A diagnosis of tuberculosis was made in 140 out of 4,321 autopsies (3.2%) in 1987/88 and in 356 out of 7004 autopsies (5.1%) in 1997/98. This represents a significant increase in the proportion of deaths associated with TB over the decade ($X = 9.17$, $P < 0.01$, 1d.f).

Hospital deaths formed 43% (60/140) of autopsied cases of TB in 1987/88 and 30% (107/356) of TB cases in 1997/98. Coroner's autopsies formed 57% of cases in 1987/88 and 70% of cases in 1997/98.

Table 1 shows the age distribution of deaths associated with TB for 1987/88 and 1997/98. The modal age group for deaths associated with TB, was 30-39 years in 1987/88 and in 1997/98. The highest increase in number of deaths occurred among 20-29 year group which formed 10% (14/140) in 1987/88 and 19.7% (70/356) of TB associated deaths in 1997/98, a significant increase ($X^2 = 6.0$, $P<0.05$, 1d.f.).

There was a decrease in the proportion of deaths for the extremes of age (<10 years and >60 years) from 32.1% in 1987/88 to 21.3% in 1997/98.

The overall deaths from TB over the two periods were higher among males than females (male : female ratio of 2.2:1). The male : female ratio however decreased from 3.4:1 in 1987/88 to 1.9:1 in 1997/98. This indicates an increase in deaths among females that is particularly evident among females aged 20-49 years. The proportion of deaths among this group rose from 10.1% in 1987/88 to 23.9% in 1997/98, a significant increase ($X^2=33.01$, $P<0.001$ 1.d.f). For males in the same age group, the proportion decreased slightly from 37.1% to 36.6% over the period. The proportions remained the same or dropped slightly for both sexes outside the 20-49 year group.

The commonest form of TB seen at autopsy in 1987/88 was localized pulmonary TB either primary or fibrocaseous type (60.7% of cases). This was followed by systemic miliary TB 12.9%,

Table 1 Age/gender distribution of deaths associated with tuberculosis

	1987/89	N = 140		1997/98	N = 356	
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
0-9	7 (5)	2 (1.4)	9 (6.4)	13 (3.6)	3 (0.8)	16 (4.5)
10-19	4 (2.9)	6 (4.3)	10 (7.1)	5 (1.4)	11 (7.9)	16 (4.5)
20-29	9 (6.4)	5 (3.6)	14(10)	34 (9.6)	36 (10.1)	70 (19.7)
30-39	27 (19.3)	4 (2.9)	31 (22)	49 (13.8)	32 (9)	81 (22.8)
40-49	16 (11.4)	5 (3.6)	21 (15)	47 (13.2)	17 (4.8)	64 (13.8)
50-59	16 (11.4)	3 (2.1)	19 (13.6)	42 (11.7)	7 (2)	49 (12.6)
60-69	17 (12.1)	4 (2.9)	21 (15)	34 (9.6)	11 (3.1)	45 (12.6)
70-79	10 (7.1)	2 (1.4)	12 (8.6)	8 (2.2)	4 (1.1)	12 (3.4)
80+	2 (1.4)	1 (0.7)	3 (2.1)	1 (0.3)	2 (0.6)	3 (0.8)
Total	**108 (77)**	**32 (23)**	**140 (100)**	**233 (65.4)**	**123 (34.6)**	**356 (100)**

abdominal TB 9.3%, and isolated TB meningitis 8.6% of cases. In 1997/98, the commonest form of TB was pulmonary TB (46.6%) followed by systemic military TB forming 33.4% and TB bronchopneumonia (11%) and pulmonary miliary TB (3.7%). The proportion of males with pulmonary TB decreased from 53.6% (75/140) in 1987/88 to 32.6% (116/356) in 1997/98 whilst for females there was an increase from 7.1% (10/140) to 14% (50/356), (Table 2).

Also in 1987/88 there was a fairly even spread of miliary TB over all age groups but in 1997/98, it was largely found in 20-49 year groups. It was the commonest from of TB in the 20-29 year age group (Figure 1).

Among coroner's cases, systemic miliary TB significantly (X^2 = 16.4, P<0.001, 1.d.f) increased in proportion from 12% (8/67) in 1987/88 to 40% (77/193) in 1997/98. Among hospital deaths, the increase in systemic miliary TB from 25% (9/36) in 1987/88 to 44.2% (34/77) in 1997/98, was not statistically significant (X^2 = 3.04, P>0.05, 1d.f.).

Table 2 Gender distribution of different types of tuberculosis

Type	1987/89			1997/98		
	Male	Female	Total (%)	Male	Female	Total (%)
Pulmonary	75	10	85 (60.7)	116	50	116 (46.6)
TB bronchopneumonia	5	5	10 (7.1)	23	16	39 (11)
Pulmonary miliary TB	-	-	-	9	4	13 (3.7)
Systemic miliary TB	10	8	18 (12.9)	77	42	119 (33.4)
Isolated TB meningitis	9	3	12 (8.6)	3	5	8 (2.2)
Abdominal TB	8	5	13 (9.3)	1	3	4 91.1)
Spinal TB	1	1	2 (4.1)	1	1	2 (0.6)
TB-pericarditis	-	-	-	3	2	5(1.4)
Total	**108**	**32**	**140 (100)**	**233**	**123**	**356 (100)**

The overall increase in the proportion of systemic miliary TB over the period from 12.9% to 33.4% was significant (X^2 = 19.7, P < 0.001, 1.d.f). It was mostly seen among the 20-49 year groups with a six-fold increase from 4.3% in 1987/88 to 24% in 1997/98. There was an increase among both males and females.

The proportion of males with systemic miliary TB increased from 7.1% in 1987/88 to 21.6% in 1997/98 whilst among females there was an increase from 5.7% to 11.8%. The gender distribution for systemic miliary TB for 1987/88 was 56% 10/18) males and 44% (8/18) females. For 1997/98 it became 65% (77/356) males and 35% (42/119) females. This indicates that a higher proportion of males than females showed systemic miliary TB in 1997/98 as compared to 1987/88.

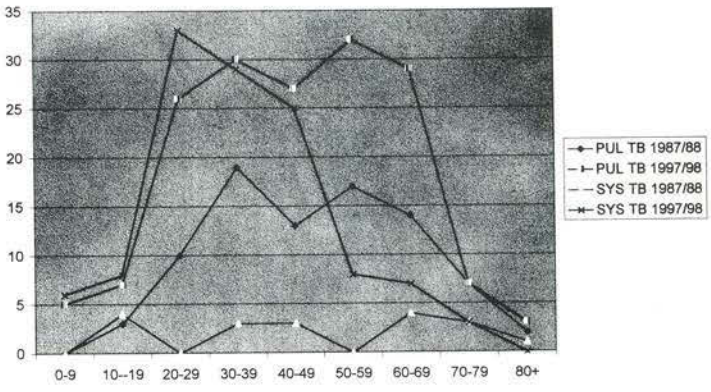

Figure 1 Age distribution of pulmonary TB and systemic miliary TB

DISCUSSION

The Korle-Bu Hospital mortuary serves the Accra metropolis with an estimated HIV seropositivity prevalence among the 15-49 year group of 2.4%[16,17]. It also serves the Greater Accra region with 15.5% of the cumulative reported cases of HIV-AIDS[9] and with areas that have a prevalence of HIV seropositivity of 18%[9,16,17]. Since most of the cases autopsied in this mortuary are coroners cases (70-80%), coming from the community, the autopsy findings may reflect the effect of the HIV-AIDS epidemic on TB associated deaths in Accra.

An increase in deaths associated with TB is expected as the HIV-AIDS epidemic progresses. In this study the proportion of deaths associated with TB increased from 3.2% to 5.1% of all autopsies done in 1987/88 and 1997/98, respectively, at the Korle Bu Teaching Hospital mortuary. The increase is important in view of the recent finding of 23.2% prevalence of HIV-seropositivity among TB patients in Ghana[13] and that TB is the most common opportunistic infection in AIDS cases at autopsy[14]. It suggests that the HIV-AIDS epidemic is the most likely cause of the increase since a major manifestation of HIV infection in the West Africa sub-region is tuberculosis[3,4].

The low level of HIV serotesting among cases reviewed will not permit direct inferences on the association between HIV-seropositivity and deaths associated with TB and must await a follow up study of the HIV status of deaths from TB. Indirect indication that the altered characteristics of deaths from TB over the two periods may be due to HIV-AIDS epidemic has been demonstrated by this study.

The bulk of deaths from TB occurred in the 20-49 year groups, which form the same age groups with the bulk of HIV seropositive cases (77%)[16,17], and the reported cumulative cases of HIV-AIDS (88%)[9] among the general populace and among TB patients (86%)[13]. Deaths from TB in these age groups put together, rose from 47% in 1987/88 to 60.7% in 1997/98, in keeping with the rise in HIV-seroprevalence among the population.

The peak decade of deaths from TB in 1997/98 was 20-29 years for females and 30-39 years for males. These are the same peak decades for HIV seropositivity and reported HIV-AIDS deaths among the general population and also among TB patients[9,13,18,19]. Among HIV seronegative TB patients the modal age group of prevalence was 20-29 years for both males and females.

Although there was higher number of deaths associated with TB among males, there was a significant increase among females over the two periods, from 10.1% to 23.9%. A reason for this observation would be that more females infected with HIV in the preceding years were dying from or with tuberculosis.

Several studies from Africa[3,6,20,21,22] have shown increased cases of systemic miliary (disseminated) TB with the progression of the HIV-AIDS epidemic. In this study the proportion of systemic miliary TB increased significantly from 12.9% in 1987/88 to 33.4% in 1997/98. Also, it was the commonest form of TB seen at autopsy among the 20-29 year group in 1997/98. This was different from 1987/88 when pulmonary TB was the commonest and there was a general spread of systemic miliary TB over the different age groups. This change is as expected with the progression of the HIV-AIDS epidemic.

There was an increase in the proportion of systemic miliary TB for both males and females. It was expected that there would be an increase in the proportion of the disseminated form of TB when compared to the pulmonary form in both males and females. However this was only true for males. The proportion of systemic miliary TB decreased among women when compared to pulmonary TB. This finding would appear to indicate that if HIV was the underlying cause of the increase in deaths associated with TB, then more females with pulmonary tuberculosis were dying from other complications, including concomitant opportunistic infections before systemic spread of TB from the lungs had occurred. It may also be a pointer that perhaps HIV may not be the only cause of the increase among females.

The finding that a higher proportion of TB detected at autopsy was among coroner's cases, and that systemic miliary TB significantly increased from 12% to 40%, indicates a high number of undiagnosed and reactivation of quiescent TB among the general population. This may be related to increased risk of HIV infection in the community.

This study has demonstrated an increased proportion of deaths from TB among autopsies at the Korle Bu Teaching Hospital mortuary and in keeping with the increased prevalence of HIV-seropositivity among the population. The altered characteristics of the dead among TB cases are, to a large extent, as expected from the progression of the HIV-AIDS epidemic.

A prospective study is needed to investigate the HIV status of deaths from TB, the proportion of deaths due to the HIV per se, concomitant opportunistic infections, resistant strains of the tubercle bacillus and also the effectiveness of control programmes.

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