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# Tuberculosis: The Effect of Limited Screening Program on the Epidemiology of TB

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**Objective: To study the epidemiology of tuberculosis (TB) in Bahrain and identify the risk factors for transmission and potential target interventions.**

**Design: Retrospective analysis of registered cases of tuberculosis in Bahrain.**

**Setting: Salmaniya Medical Complex, Bahrain.**

**Method: Review of registered patients with TB from 2004 to 2008, details and epidemiological data of the patients were retrieved from the records.**

**Result: One thousand three hundred ninety-five patients were registered with TB diagnosis. The average incidence was 32.3/100,000 population. Disease incidence decreased during the study period and that was more prominent with extrapulmonary TB (EPTB). The most common site of extrapulmonary involvement was lymph nodes.**

**The overall male-to-female ratio of TB cases was 1.7; it is higher (2.1) for pulmonary TB (PTB) but lower (1.3) for EPTB patients.**

**Non-Bahrainis were the majority of TB patients, 1056 (75.7%). TB among Non-Bahrainis is high in the age group of 20-29 and almost zero at the two extreme ages. Non-Bahrainis peak incidence of both PTB and EPTB is in the age group of 20-29 years, while among Bahrainis PTB peaked in the 40-49 years age group, but EPTB showed an increase in the incidence in the age group 20-49 years.**

**Conclusion: The majority of TB patients in the Kingdom of Bahrain are expatriates, which is possibly related to the limitation of screening program to chest radiography for male laborers. The control of TB among expatriates can be improved by implementation of PPD to all expatriate workers upon entry to the Kingdom.**

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Human tuberculosis continues to be a fatal contagious disease; its overall global incidence is decreasing but slowly. In 2006, the World Health Organization (WHO) estimated that the prevalence of active disease was 14.4 million, a prevalence rate of 219/100,000 persons. The number of new cases was 9.2 million, an incidence rate of 139/100,000. In 2009, the estimated global TB was 9.4 million, an incidence of 137/100,000. The death rate was 1.3 million death per year, which is equivalent to 20/100,000 population[1]. Most of the reported cases of TB were from Asia (55%) and Africa (30%)[1].

The epidemiology of TB is changing in different parts of the world. In the USA, the overall incidence is decreasing, and TB has become a disease primarily of older or immunocompromised people[2]. In other areas of the world with high TB endemicity, such as Africa, TB primarily affects adolescents and young adults[2].

In most parts of the world, incidence of extrapulmonary TB (EPTB) is on the rise, despite the decrease in the overall global incidence. The increase in EPTB may be related to the HIV epidemic in certain areas[3-5].

The Kingdom of Bahrain is one of the low-intermediate endemicity areas for TB; yet, Bahrain is experiencing a dramatic expansion of population (from 707,160 in 2004 to 1,106,509 in 2008)[1]. There is a parallel increase in the number of foreign workers from high TB burden countries. We hypothesized that this demographic change might lead to concomitant changes in the epidemiological patterns of TB in the Kingdom. Studying such changes should help identify risk factors for transmission of TB in the Kingdom and design potential interventions to prevent TB transmission.

To the best of our knowledge, this is the first study to report the epidemiological pattern of TB in the Kingdom.

The aim of this study is to evaluate the epidemiology of tuberculosis (TB) in Bahrain and identify the risk factors for transmission and potential target interventions.

## METHOD

The Kingdom has a strict TB screening program with chest radiograph and purified protein derivative test (PPD), mandatory for all female foreign housemaids.

All registered cases of TB in Bahrain during 5-year period from January 2004 to December 2008 were reviewed. Those registered cases were diagnosed by their treating physicians based on clinical and/or microbiological finding. Details and epidemiological data were retrieved from the record of cases registered with the Disease Control section of the Public Health Directorate. The patients were divided into 2 groups (EPTB and PTB); according to the European consensus on surveillance of TB, the 2 groups were compared by age, sex and nationality[6].

SPSS No 14 was used for data analysis.

## RESULT

Between January 2004 to December 2008, 1395 patients were registered with a diagnosis of TB in the Kingdom of Bahrain. The average number of new cases diagnosed annually was 279, an

incidence of 32.3 per 100,000 during the study period, 19.7 cases of PTB and 12.6 cases of EPTB per 100,000.

Figure 1 and 2 show that the incidence of TB in the Kingdom decreased during the study period. This decrease was prominently observed for EPTB, the incidence of which decreased from 16.5 cases per 100,000 in 2004 to 9.1 cases in 2008.

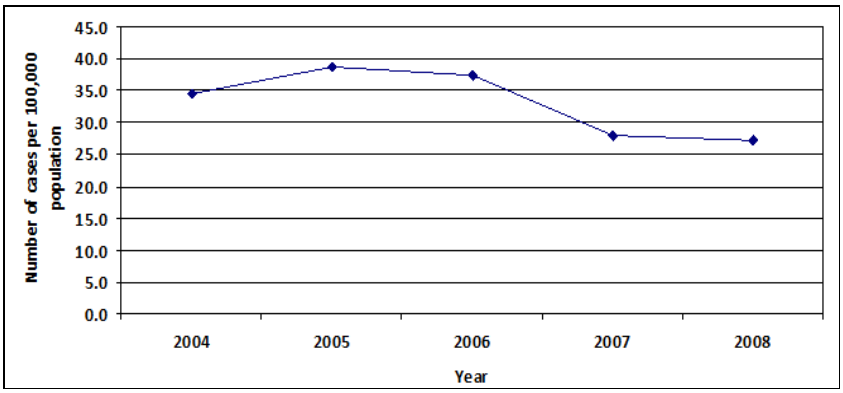


**Figure 1: Incidence of Tuberculosis per 100,000 Population during the Study Period (2004-2008)**

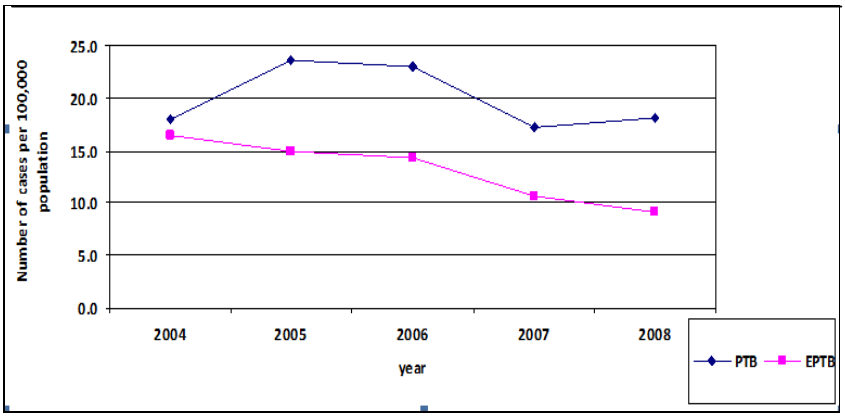


**Figure 2: Incidence of PTB and EPTB per 100,000 (2004-2008)**

Five hundred forty-five (39%) were diagnosed with EPTB and 850 (61%) with PTB. The most common site of EPTB was the lymph nodes 272 (50%), followed by pleural involvement 120 (22%), abdominal 45 (8.3%), meningeal 35 (6.4%) and spinal 18 (3.3%) sites.

The remaining 55 (10.1%) EPTB patients had TB at other sites, including the eyes 11 (2%), genitourinary 11 (2%) and osteoarticular 6 (1.1%) sites. Less than 1% of EPTB cases involved the skin, muscle, breast and liver. In 20 cases, the sites of TB were not specified (the exact type was missing from the record).

Figure 3 shows the proportion of different types of EPTB and stratification by gender among the 545 patients. In females, the most common subtype of EPTB was lymphadenitis 301 (59%), followed by pleural involvement 40 (7.8%). In males, the most common type of EPTB was also

lymphadenitis 354 (40%), followed by pleural involvement 250 (28.3%), which is significantly higher than that in females.

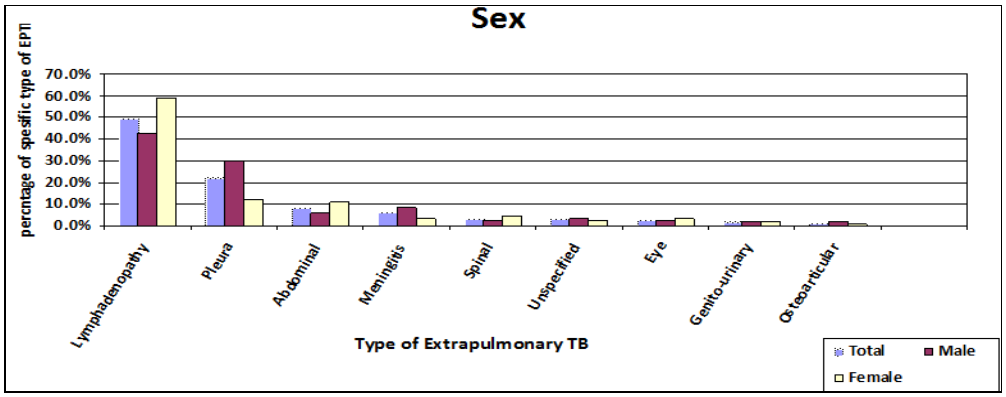


**Figure 3: Distribution of Types of Extrapulmonary TB by Sex**

The overall male-to-female ratio of TB cases was 1.7 (884/511). The male-to-female ratio was higher for PTB patients (2.1; 573/277) but lower (1.3; 311/234) for EPTB patients. Of the 884 male patients with TB, 573 (64.8%) had PTB disease, whereas 277/511 (54.2%) female patients had PTB. This difference was statistically significant ($P < 0.05$), see table 1.

**Table 1: Sex Distribution of TB**

| Site of Infection | Male (%) | Female (%) |
|---|---|---|
| PTB | 573 (64.8%) | 277 (54.2%) |
| EPTB | 311 (35.2%) | 234 (45.8%) |
| **Total** | **884** | **511** |

Three hundred thirty-nine (24.3%) patients were Bahrainis; one thousand fifty-six (75.7%) patients were Non-Bahrainis. The proportion of PTB cases was significantly higher among Non-Bahrainis patients. Whereas 699/1056 (66.2%) non-Bahrainis had PTB, 151/339 (44.5%) Bahrainis had PTB ($P < 0.05$), see table 2.

**Table 2: Nationality**

| Site of Infection | Bahraini | Non-Bahraini |
|---|---|---|
| PTB | 151 (44.5%) | 699 (66.2%) |
| EPTB | 188 (55.5%) | 357 (33.8%) |
| **Total** | **339** | **1056** |

The peak incidence is in 20-29 year age group and a significant decline with age. Figures 4 and 5 show the incidence of TB in different age groups by nationality. These data indicate that Non-Bahraini patients were more likely to have PTB and EPTB at younger age (20-29 years). While among Bahrainis, the incidence of PTB peaked in the 40-49 years age group and EPTB showed an increase in the incidence over the 20-49 years age group.

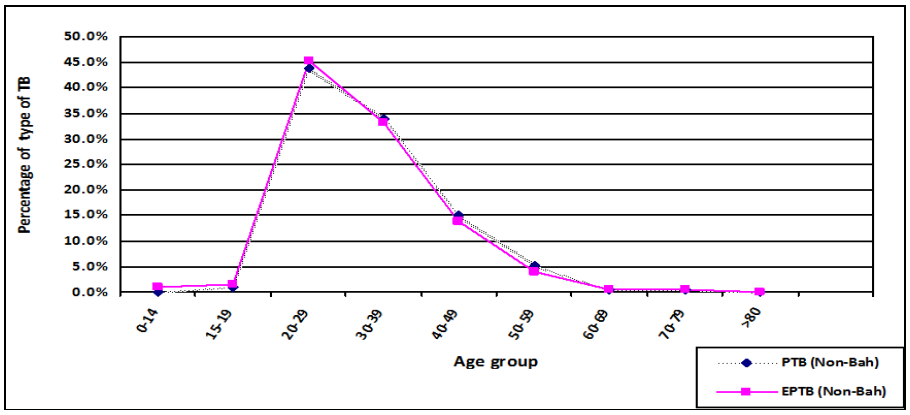


**Figure 4: Distribution of Pulmonary and Extrapulmonary TB among Non-Bahrainis by Age Group**

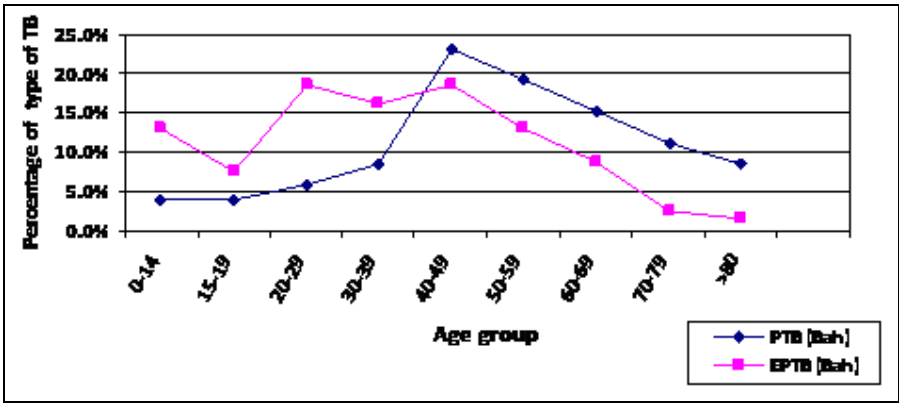


**Figure 5: Distribution of Pulmonary and Extrapulmonary TB among Bahraini by Age Group**

As shown in figure 6, the contribution of Non-Bahraini to the total TB patients was variable among different age groups; it is highest in 20-29 years age group and almost zero at the two extreme of ages.

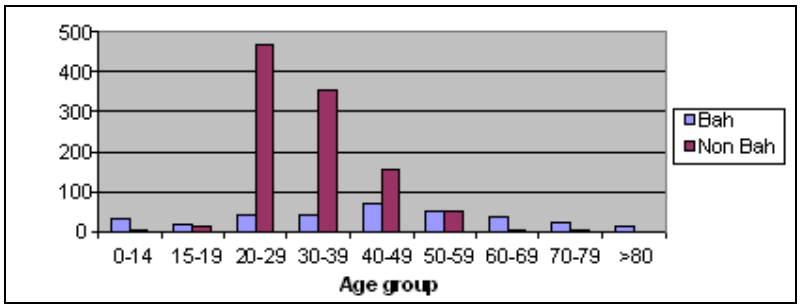


**Figure 6: Number of TB Cases among Different Age Groups**

One thousand fifty-six TB patients were non-Bahraini; 28 different nationalities were involved. Four hundred ninety-two (46.6%) were from India, 127 (12%) from Bangladesh, 113 (10.7%) from the Philippines, 78 (7.4%) from Ethiopia, 71 (6.7%) from Pakistan, 60 (5.7%) from Indonesia, 40 (3.8%) from Nepal, 21 (2%) from Sri Lanka and 11 (1%) from Thailand. The

remaining 43 patients (4.1%) were from Yemen, Qatar, Syria, Saudi Arabia, Egypt, Morocco, South Africa, Turkey, Vietnam, Brazil, Iran, the Ivory Coast, Jordan, Russia, Somalia, South Korea, UAE, USA and one from European country (not specified).

## DISCUSSION

The overall incidence of TB in the Kingdom of Bahrain, as in most parts of the world, is decreasing[1]. However, in our study, there was a parallel decrease in the incidence of EPTB, which is not similar to other studies, where EPTB incidence is on the rise despite the decrease in the overall incidence of TB worldwide[7]. This may be explained by the low incidence of HIV in the Kingdom (<0.5 per 100,000 population) or by the small number of female patients in our study, which usually contribute to the majority of EPTB cases.

The overall male-to-female ratio of TB cases was 1.7. The ratio for PTB was 2.1. This ratio is almost similar to those of previous studies in different parts of the world, which showed that the incidence of PTB is higher among males[8-10]. EPTB showed male-to-female ratio of 1.3, which is dissimilar to previous studies, where EPTB used to be higher among females than males[8-10]. Higher EPTB might be due to strict TB screening program, which targets female foreign workers. Non-Bahrainis constituted 75.5% of the study group.

In this study, lymph nodes were the most common site of EPTB. Our result is comparable to previous studies from Saudi Arabia, Nepal and Turkey, which showed that TB lymphadenitis was almost 50% of EPTB[8,11,12]. The second most common site of involvement was the pleura. We observed that lymph node involvement occurred in a significantly greater number of women, while pleural disease was significantly higher in men. This gender predilection was also observed earlier in a similar study from Hong Kong[13].

The contribution of expatriate to the total TB in Bahrain was mainly in the age groups of 20-39 years.

This finding was observed in previous studies reported from Saudi Arabia and Kuwait, which share similar demographic data of expatriate workforce with Bahrain[8,14,15].

The key to control TB in Bahrain is to add PPD testing during expatriate entry to the Kingdom, which is the standard means of assessing the presence of latent TB infection[16,17]. This would increase the rate of detecting latent tuberculosis upon arrival and decrease the incidence of reactivation.

## CONCLUSION

**The majority of TB patients in the Kingdom of Bahrain are expatriates, which is possibly related to the limitation of screening program to chest radiography for male laborers. The control of TB among expatriates can be improved by implementation of PPD to all expatriate workers upon entry to the Kingdom.**

**Effective TB screening program for all groups of foreign workers is mandatory for the success of the TB control program. Diagnosis and treatment of latent tuberculosis infection is considered an essential component of TB control strategy and should be a major component of the overall public health plan for controlling TB in the Kingdom.**

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