

## GENERATION-TO-GENERATION TB TRANSMISSION IN AICHI, CENTRAL JAPAN

— An Epidemiological Study of 701 TB Patients in 290 Clusters —

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**Abstract** [Objectives] To elucidate characteristics in generation-to-generation TB transmission from smear positive pulmonary TB patients.

[Subjects and Methods] The subjects of this retrospective study were 10,088 TB patients registered in Aichi prefecture between 1989 and 2003. Smear-positive pulmonary TB was found in 3,332.

All registration files were reviewed to identify epidemiological links of patients. When linked patients with an interval of the dates of registration of less than 10 years were found, the first case was considered as the index case, and the other patients were regarded as secondary patients. All patients were subdivided by every 10 years of age as a generation. All patients were also grouped as young generations aged 0 to 29, middle-aged generations aged 30 to 59, and elder generations aged 60 to 99.

A young generations rate (YGR) for a generation of index cases was defined as following;

$YGR = NY/NA$ , where  $NA$ : Number of whole TB secondary patients transmitted from all index cases belonging to generation A, and  $NY$ : Number of secondary patients aged 0–29 in  $NA$ .

A same generation rate (SGR) for a generation of index cases was defined as following;

$SGR = NS/NA$ , where  $NA$ : Number of whole TB secondary patients transmitted from all index cases belonging to generation A, and  $NS$ : Number of secondary patients belonging to the same generation A in  $NA$ .

[Results] A total of 290 clusters were found with 290 index cases and 411 secondary cases. Of the 290 index cases, the biggest number of patients was 58 for the forties, followed by 43 patients for the twenties and the fifties. Of the 411 secondary patients, the biggest number of patients was 91 for the twenties, followed by 58 patients for the thirties, and 158 patients or 38.4% belonged to the young generations.

High YGRs were found in the young and middle-aged

generations ranging from 37.5% to 75.0%, while YGRs were low in the elder generations ranging from 15.9% to 26.7%. The difference was significant between the fifties and the sixties ( $p < 0.01$ ). The YGRs were calculated 57.1% for the young generations, 43.5% for the middle-aged generations, and 18.9% for the elder generation. The differences were significant between the young and the middle-aged ( $p < 0.05$ ), as well as between the middle-aged and the elder ( $p < 0.001$ ). The biggest SGR was calculated 42.2% for the twenties. Low SGRs were 18.2% for the forties and 17.5% for the fifties. The differences were significant between the twenties and the forties ( $p < 0.01$ ), as well as between the twenties and the fifties ( $p < 0.01$ ).

The secondary patients aged 0 to 29 were counted 158 : 123 were transmitted through intra-familial infection and 35 were through extra-familial infection. The major index case generation was the middle-aged generations with 82 or 66.7% secondary patients in the case of intra-familial infection, while it was the young generations with 20 or 57.1% patients in the case of extra-familial infection.

[Conclusion] These findings suggest that the major sources of TB transmission to young people are smear-positive pulmonary TB patients aged 0 to 59.

**Key words:** Generation-to-generation TB transmission, Cluster, Smear-positive pulmonary TB, Intra-familial TB transmission, Extra-familial TB transmission, Aging

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————— Case Report —————

A CASE OF PULMONARY TUBERCULOSIS WITH MILIARY GRANULES,  
MEDIASTINAL LYMPH NODE ENLARGEMENT  
AND ELEVATION OF SOLUBLE INTERLEUKIN-2 RECEPTER

Hisako TABATA, Yoshiro MOCHIZUKI, Yasuharu NAKAHARA, Tetsuji KAWAMURA,  
Shin SASAKI, and Hiroaki TSUKAMOTO

**Abstract** An 80-year-old woman suffered from fever and loss of appetite. Her chest X-ray showed mediastinal tumors and diffuse granular shadows in the bilateral lung fields. Elevations of sIL-2r and M-protein were present. HRCT showed numerous small granules in both lungs and mediastinal lymph node enlargement. Tuberculosis DNA was detected by PCR in her sputum. Later, *Mycobacterium tuberculosis* was cultured from her sputum. After she started anti-tuberculosis therapy, her general fatigue and elevation of sIL-2r improved gradually. Her chest X-ray revealed a decrease in the size of mediastinal lymph nodes and small granules.

**Key words:** Pulmonary tuberculosis, Miliary nodules, Lymph tuberculosis, sIL-2r, M proteinemia

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## Field Activities

EVALUATION OF TUBERCULOSIS CONTACT INVESTIGATION & EXAMINATION  
IN CONGREGATE SETTINGS IN OSAKA CITY<sup>1</sup>Akira SHIMOUCI, <sup>2</sup>Shinichi KODA, <sup>3</sup>Makoto HIROTA, and <sup>4</sup>Kenji MATSUMOTO

**Abstract** [Objective] To evaluate tuberculosis index case, group contact investigation and usefulness of tuberculin skin test (TST) results.

[Methods] We analyzed data for 833 groups examined by contact investigation registered in 2003–2005 in 24 wards of Osaka City characteristics of their index cases, TST results, and follow-up outcome of radiograph screening up to 2 years.

[Results] 71.3% (7406/10378) of contacts completed 2 years follow-up radiograph screening. There were 54 secondary cases. Characteristics of 38 index cases of contact groups were compared by the rate of causing secondary cases. Results showed that the following characteristics were statistically significant in causing secondary cases: sex (male: 5.6%, female: 1.8%,  $\chi^2$  test;  $p < 0.05$ ), age (49 or less: 6.8%, 50–64: 5.7%, 65 or over: 0,  $p < 0.01$ ), chest radiography (cavitary: 6.0%, non-cavitary: 2.0%,  $p < 0.05$ ), initial AFB smear grade (G5 or over: 6.5%, G4 or less: 2.2%,  $p < 0.01$ ), cough duration (2 months or more: 7.0%, less than 2 months: 2.8%,  $p < 0.01$ ), transmission risk index (10 or over: 8.4%, 0.1–9.9: 3.4%, 0: 0,  $p < 0.001$ ). As initial part of contact investigation, decision was made for each group whether TB secondary transmission was “likely” or “unlikely”. If it was considered as “likely”, TST was conducted for contacts. Incidence rate of secondary case was 0.44% in groups TST was conducted, and 0.09% in groups TST was not conducted. The difference was statistically significant ( $p < 0.05$ ). According to tuberculin results, 760 persons in 215 groups were

given LTBI treatment. Comparing the number of secondary cases in the age group of 10–39 eligible for LTBI treatment, 19 secondary cases were detected immediately or 2 months after the initial contact examination, and it was reduced to 7 cases after 6 months to 2 years. However in the age group of 40 and over not eligible of LTBI treatment, the number of secondary cases increased from 10 immediately or 2 months after the initial contact examination to 18 after 6 months to 2 years, and the difference was statistically significant ( $p < 0.01$ ).

[Conclusion] Results of contact investigation and successful LTBI treatment showed that the prevention of secondary cases was effective, despite of some over-diagnosis of LTBI by TST.

**Key words:** Group contact investigation, Index case, Secondary case, Tuberculin skin test, Latent tuberculosis infection

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**Report and Information**

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**TUBERCULOSIS PRIMARY INFECTION**

Tadao SHIMAO

**Abstract** Since the introduction of mass BCG vaccination program, it has become difficult to know how TB primary infection takes place. Based on data before the introduction of mass BCG vaccination, the author tried to overview TB primary infection.

Most TB primary infection takes place via lung as shown in Table 1. Soon after TB primary infection, primary focus in the lung and regional glandular changes were formed, and they were named primary complex, which is the morphological sign of TB primary infection. Comparing the location of primary focus in right and left lung, it was 56.6% vs. 43.4%, which just correspond to the right and left lung volume as shown in Table 2. Observing by the location of primary focus in different lung lobes, it was found more frequently in upper lobe than in middle and lower lobe after adjustment for volume of different lung lobes as shown in Fig. 1 and Table 2, however, chronic pulmonary TB is found much more frequently in apex or upper part of the lung.

The number of primary foci was 1 in the majority of cases, however, 2 or more foci were found in some cases. Several weeks after TB primary infection, TB immunity started to work, and primary focus be never formed thereafter. The fact indicates that multiple primary foci were seen only repeated TB infection taking place in short period soon after primary

infection. The distribution of number of primary foci should follow Poisson's distribution if repeated infection takes place by chance, and it should follow Poly-Eggenberger's distribution if chance of repeated infection takes place cumulatively, and observed figure matched with the latter as shown in Fig. 2.

Location of primary complex is useful sign to determine invasion place of tubercle bacilli in epidemiological survey of TB infection in medical accident cases. If major pulmonary lesions are found in middle or lower part of lung, we have to suspect onset of TB soon after primary infection among immunity attenuated cases such as HIV/AIDS, diabetics and cases using steroid, and if cavities are found more likely diabetes is suspected, and no cavity with or without adenopathy more likely HIV/AIDS.

**Key words:** TB primary complex, TB primary infection focus, with its location and number in the same individuals, Regional adenopathy

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