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Group infection of tuberculosis on a school campus and prompt control actions taken by the local health center

Seitetsu Hokama*, **, Hisao Hirata*, ***, Masako Kinjoh*, ***, Mutsuo Kuba*, †, Shigeo Adaniya*, †† and Yoshihiko Nakamura*

*Tuberculosis Control Committee, Nanbu Health Center, Okinawa

**Department of Laboratory Medicine, Faculty of Medicine, University of the Ryukyus

***Nanbu Health Center

†National Okinawa Hospital

††Okinawa Prefectural Nanbu Hospital

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ABSTRACT

Recent trend in the incidence of tuberculosis in Japan shows a decline, but reports of occasional outbreaks of the disease in a form of group infection has become a matter of concern. We report on a prompt action taken by a local health center to prevent the spread of tuberculosis in a high school. Following the detection of the first case of a seventeen-year old male high school student, the tuberculosis control team in a local health center carried out purified protein derivative (PPD) tests in the school and on family members of the patient leading to the identification of four more infected students. PPD tests were performed on 664 students in the school. A definite difference in the mode of PPD reaction was recognized between individuals with closer contact with the patients (high risk group) and the non-high risk group with less opportunity to associate with them. It is recommended that individuals who gave strong reactions for PPD tests must be put on prophylactic chemotherapy to avert full-blown infection and spread of the disease. *Ryukyu Med. J., 15(2)19~22, 1995*

Key words: Tuberculosis, Group infection, Control action

INTRODUCTION

This is a report of an outbreak of tuberculosis in a school campus and the measures instantly taken by the local health center in order to control and prevent the spread of the disease among students.

CASE DETECTION AND ACTION FOR CONTROL

(1) Detection of case A

A 17 year old male student (case A) in his sophomore at TM High School, located in the southern part of Okinawa, was first found to have pulmonary tuberculosis at the end of January, 1992. His PPD test was strongly positive demonstrating $10 \times 15/34 \times 55\text{mm}$. Chest x-ray showed an infiltrative shadow in the right upper lung field (rIII1) as shown in Fig.1. Sputum was not examined. He was registered at the health center on Jan. 30 for treatment and observation.

A few months earlier, he was admitted in a hospital for two weeks with pneumonia. PPD test at that time was

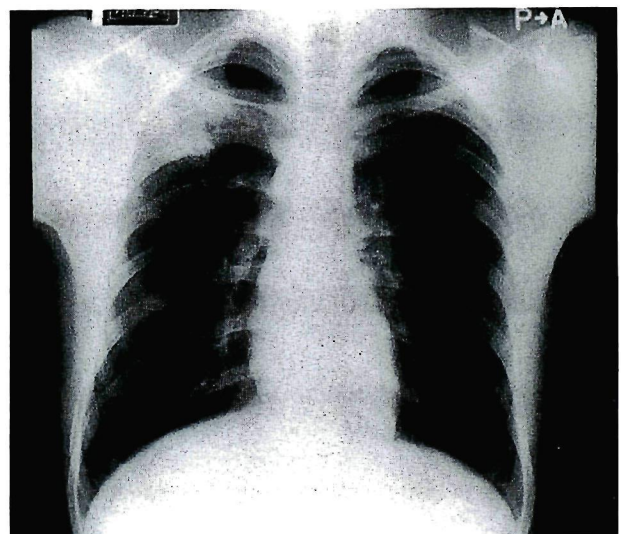


Fig.1 Chest x-ray of Case A (rIII1).

said to be negative.

(2) Actions for control in relation to case A

A special team of staff members including doctors and public health nurses of Nanbu Health Center, was organized to investigate a possible outbreak and spread of tuberculosis within the school to which case A belonged.

i) An instant survey was conducted on A's family members on Mar. 9, in the same year with PPD and chest x-ps and all five of them were found not to have been infected with tuberculosis.

ii) A subsequent survey was done on 43 students belonging to the same class as case A on Mar. 13 with PPD and chest x-ps and a female student B was found to have active tuberculosis.

(3) Detection of case B

In the previous survey relating to case A, a 17 year old female student (case B) was found to have active tuberculosis. Her PPD test was positive demonstrating $9 \times 10/10 \times 10$ mm. Chest x-ray showed a cavitary lesion in the left

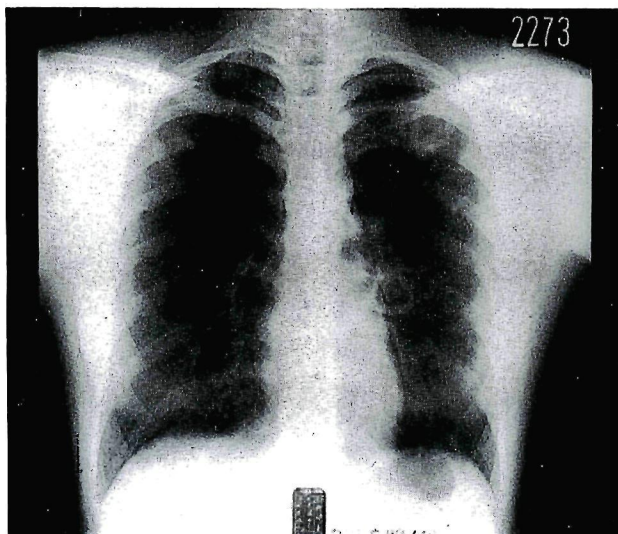


Fig.2 Chest x-ray of Case B (bII2).

upper lung field with infiltrative shadows in both lungs (b II 2) as shown in Fig.2. The Sputum examination was positive for acid fast bacilli, as many as Gaffky No. 6. She was admitted to a TB hospital.

(4) Actions for control in relation to case B

i) An instant survey was made on B's family members with PPD and chest x-ps.

The survey revealed the evidence of her elder sister showing strong PPD reaction and younger sister having active tuberculosis.

ii) Additional survey was extended to students in the neighbouring class to her own and members of the athlete

club to which she belonged. None of them revealed active tuberculosis but one showed strong PPD reaction, on whom a course of prophylactic chemotherapy was instituted.

(5) Detection of case C

A 14 year female student (case C) of N Junior High School, B's younger sister was found to have active tuberculosis in the survey described above. The PPD test on her was positive and the chest x-ray film showed tuberculous lesions in both lungs (bIII 1) as shown in Fig. 3. The sputum examination was positive for acid fast bacilli showing Gaffky No. 4. She was admitted to a TB hospital.

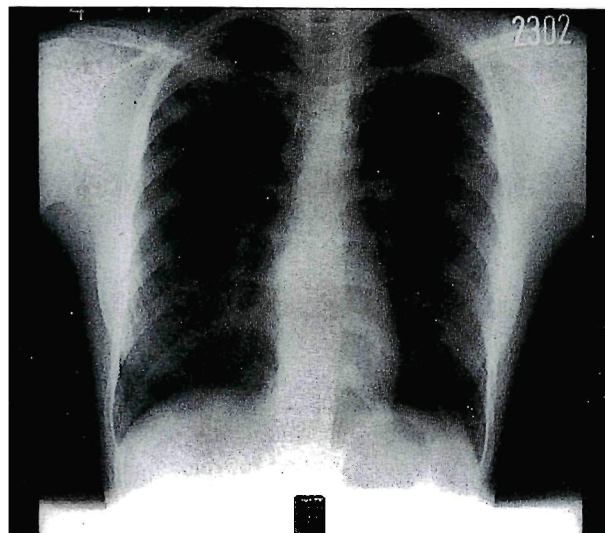


Fig.3 Chest x-ray of Case C (bIII1).

(6) Actions for control in relation to case C

i) Because of involvement of the other schools, an instant survey was conducted on 79 students of N Junior High School and 30 students of the preparatory school who might have had close contact with case C.

Stronger reactions of PPD in comparison with the previous results of the test performed one year ago were observed in 8 students on whom a course of prophylactic chemotherapy was instituted.

ii) A course of prophylactic chemotherapy was also given to B's and at the same time C's elder sister on account of strong reaction of PPD.

(7) Detection of case D

After several months had elapsed after the survey, a new case was detected. A 17 year old male student (case D), a classmate of cases A and B developed chest pain early in July in the same year, and was diagnosed as tuberculous pleurisy. He was admitted to a TB hospital. The PPD reaction tested on him was negative at the time of the previous survey.

(8) Actions for control in relation to case D

Right after the detection of case D, a re-examination of PPD was performed on 71 students who had close contacts with the described cases but were excluded from taking prophylactic chemotherapy because of their reactions under our criterion which was ≥ 30 mm.

5 more students were selected to join the prophylactic chemotherapy, because of their enhanced PPD reactions in the second test.

(9) An over all survey and follow-up cares

Eventually, an over all survey was conducted on 664 students of TM High School, 104 students of N Junior High School, 30 students of the local preparatory school, besides the members of the families of cases A, B&C and D, based on a TB control programme and actions.

Follow-up cares such as chemotherapy for treatment of those 4 active cases described above and for prophylaxis for as many as 69 students with strong PPD reactions were performed with the purpose of a desirable control of the disease.

(10) The mode of PPD reactions

664 students of TM High School were divided into the following two groups; (a) the high-risk group consisting of 113 students who have had close contact with the described cases, and (b) the low-risk group consisting of 551 students with less opportunity for contact.

A definite difference was recognized in the mode of PPD reactions between the two groups. Strong reactions over 30 mm in diameter of erythema were observed in 41 students out of 113 of the high-risk group (36.3%), while in 148 students out of the low-risk group (26.9%) as shown in Fig. 4 and 5.

These stronger reactions in the high-risk group was also recognized by comparing with the reactions of post-BCG vaccination observed in the junior high school students performed on a different occasion. 82 students out of 629 showed strong reactions larger than 30mm (13.0%) as shown in Fig. 6.

(11) The Criteria for application of prophylactic chemotherapy

The following criteria were set for application of prophylactic chemotherapy. A course of prophylactic chemotherapy with INH be given to;

- i) those of the high-risk group with PPD reactions ≥ 30 mm.
- ii) those of the low-risk group with PPD reactions ≥ 60 mm.
- iii) those whose PPD reactions were below the defined criteria in the first test and were obviously enhanced in the second test showing ≥ 30 mm, simultaneously 20mm larger than the preceding test.

Eventually, 69 persons consisting of 41 students, one OB member of the athlete club and one member of B's family in the first criteria and 13 students in the second and 13

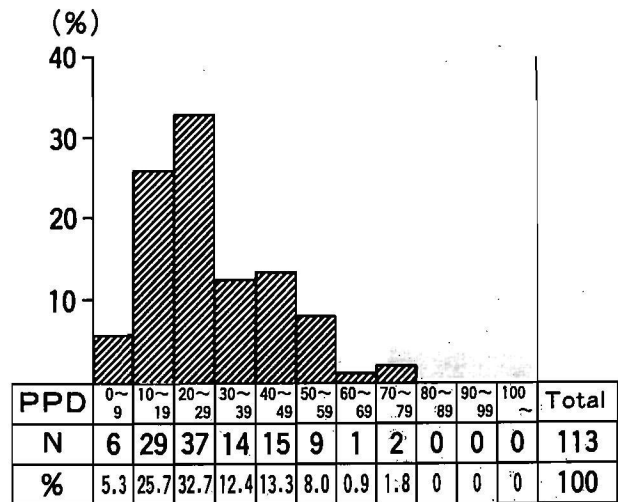


Fig. 4 PPD reactions in the high-risk group.

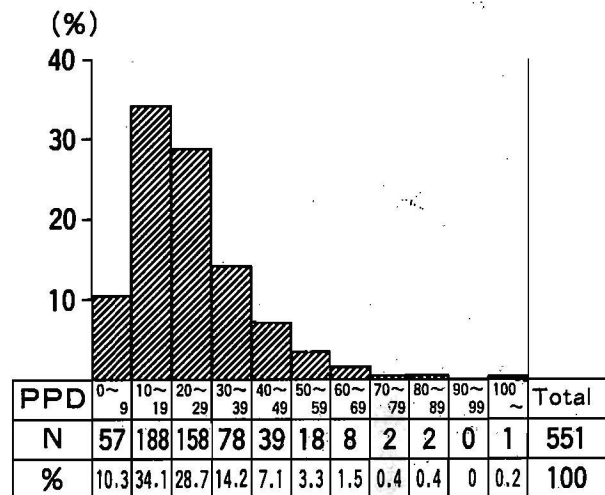


Fig. 5 PPD reactions in the less high-risk group.

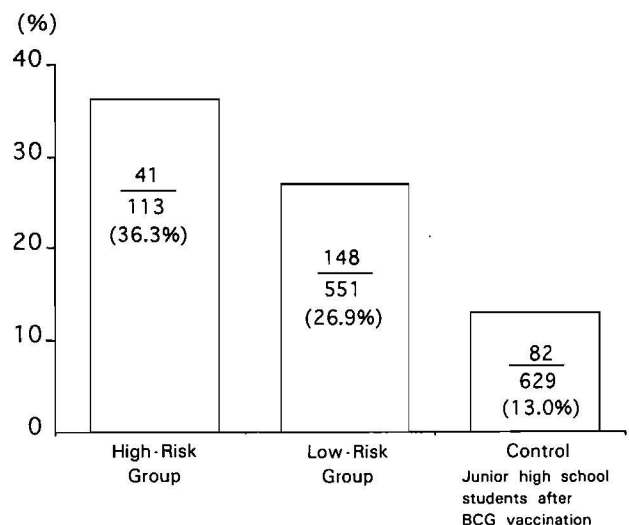


Fig. 6 Comparison of PPD reactions among the high-risk low-risk and control groups showing more than 30mm.

students in the third were selected as subjects to be on prophylactic chemotherapy.

A TB control programme based on the above mentioned criteria has been implemented to check the spread of the disease.

DISCUSSION

Recent trend in the incidence of tuberculosis is on the decline in Japan¹⁾, but occasional outbreaks of the disease has become a cause of concern. Observing the world-wide status quo, unexpected group infection of tuberculosis tends to occur in developed countries such as U.S.A., most of European countries and Japan where prevalence of the disease has been generally well controlled²⁾.

This report concerns the outbreak of the disease on a school campus. Regarding group infection among teenagers, Aoki³⁾ stated that when the following points are satisfied, immediate remedial actions should be taken: ①any case with active tuberculosis, ②more than two cases and ③strong PPD reactions in large number of group members.

The incidence in this report met all of the described points. Four cases with active tuberculosis were found at the same time and a definite difference in the mode of tuberculosis between the high-risk and the low-risk group was observed.

Investigations of groups having contacts with these active cases are very important, in drawing up an adequate plan for control of the disease. A PPD test is without doubt very useful. On evaluating the test whether it is due to an unexpected outbreak of group infection, we must take into consideration the effects of BCG vaccination previously received. The general mode of the PPD reactions in BCG vaccinated groups is well documented^{4,5)}. Nevertheless, as occurred in the present study, there is a high frequency group which gives larger reactions in case of outbreaks of the disease. To select possibly infected subjects for prophylactic chemotherapy, we set up the criteria on the size of PPD reactions referring to the ones recommended by the Infectious Diseases Control Division, Health Service Bureau, The Ministry of Health and Welfare⁶⁾. For the high-risk group, cases showing $\geq 30\text{mm}$ were selected as recommended. But for the low-risk group, the recommended limits was changed to a higher level, in this cases $\geq 60\text{mm}$ because of the large number of cases.

Treatment of the active cases requires a rigid and immediate chemotherapy. One important consideration is on how subjects who need prophylactic chemotherapy are selected. It should be judged from the result of PPD reactions. As subjects for prophylactic chemotherapy, we chose ①43 students from the high-risk group whose PPD reactions were $\geq 30\text{mm}$, ②13 students from the low-risk

group whose PPD reactions were $\geq 60\text{mm}$, ③additional 13 students whose PPD reactions were definitely enhanced in the reexaminations.

CONCLUSION

This is a report of an incidence of group infection of tuberculosis occurred in the school campus and prompt actions to control and prevent further spread of the disease by the local health center.

1) Four cases with active tuberculosis were detected through the surveys and were admitted to the TB hospital for treatment.

2) A definite difference in the mode of PPD reactions was observed between the high-risk and the low-risk group, manifesting significantly higher incidence in strong reactions in the former than in the latter.

3) A course of prophylactic chemotherapy was given to the following persons according to our criteria for application;

i) 43 students in the high-risk group whose PPD reactions were $\geq 30\text{mm}$.

ii) 13 students in the low-risk group whose PPD reactions were $\geq 60\text{mm}$.

iii) additional 13 students whose PPD reactions were definitely enhanced in the reexamination.

This report was presented at the 12th Asia Pacific Congress on Diseases of the Chest, held in October, 1992 in Seoul, Korea.

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