

# Tuberculin Reactivity and Subsequent Development of Tuberculosis in a Cohort of Student Nurses

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## Summary

This retrospective study documents a strong correlation between tuberculin reactivity and the subsequent development of active tuberculosis in student nurses. 12% of the 25 student nurses with tuberculin reactions above 20mm developed tuberculosis over a period of 2 years, compared to only 0.3% of the 341 student nurses with reactions of 20mm or less. The implications of these findings for preventive therapy are discussed.

**Key Words:** Tuberculin reactivity, Preventive therapy

## Introduction

Preventive therapy with isoniazid for 6 to 12 months is being implemented in several countries as one of the modalities of tuberculosis control. Preventive therapy, or "chemoprophylaxis" as it is sometimes termed, has been shown to reduce the risk of developing tuberculosis in individuals infected by the tuberculosis bacillus, by up to 90% if the course of chemotherapy is adhered to strictly<sup>1</sup>. The United States Centers for Disease Control has published guidelines recommending preventive therapy for several categories of patients with tuberculin reactions of 10mm or more but with no clinical or radiological evidence of tuberculous disease<sup>2</sup>.

Preventive therapy is not routinely offered by the National Tuberculosis Control Programme in Malaysia. Though studies in the West have shown promising results, Malaysian clinicians are as yet uncertain what level of tuberculin reactivity should be the threshold for initiating preventive therapy in a population where tuberculosis is endemic, and which in addition, receives Bacille Calmette Guerin vaccination (BCG) both at birth and at 12 years. K.K.Tan's paper<sup>3</sup> regarding

tuberculin reactivity in the Singapore population is interesting, but does not specifically address the issue of preventive therapy.

The purpose of this retrospective study was to assess the clinical significance of tuberculin reactivity in a cohort of student nurses who had had tuberculin tests done upon joining the course to help ascertain the level of tuberculin reactivity at which preventive therapy could be offered.

## Materials and Methods

All student nurse candidates joining the Nursing School in Ipoh are sent to the Chest Clinic to have their tuberculin skin test performed, as part of the pre-enrolment medical examination. The nursing staff at the Chest Clinic in Ipoh Hospital carry out this test, which comprises the intradermal instillation of 0.1ml of Purified Protein Derivative (from the Commonwealth Senior Laboratories, Melbourne, Australia) containing 10 tuberculin units on the volar aspect of the forearm. The transverse diameter of the induration measured at 3 days gives the reactivity.

## TUBERCULIN REACTIVITY AND SUBSEQUENT DEVELOPMENT OF TUBERCULOSIS

Altogether 366 student nurses underwent this test from January 1994 to December 1996, and their reactions were recorded in the Mantoux Test record book which the clinic maintains. All student nurses also had chest radiographs done as part of their medical examination and those with tuberculin reactions of 15mm or more were referred to the doctor in the Chest Clinic to exclude active tuberculous disease.

The tuberculin readings of these 366 student nurses as well as the case records of 4 of them who later developed tuberculosis were traced and analysed.

### Results

322 of the 366 student nurses were fresh school-leavers, while a batch of 44 were assistant nurses enrolling for a

course to upgrade them to staff nurses. 282 of them had 2 BCG scars while 79 had only one scar, 2 had 3 scars and 3 had no scar at all. This information is summarised in Table I.

As depicted in Table I, the modal group had a tuberculin reactivity of 11 - 15mm for both the fresh school-leavers and the assistant nurses. The distribution of tuberculin reactions was not influenced by the number of BCG scars nor by prior employment in the Health Delivery System. 64.5% of the student nurses had tuberculin reactions of more than 10mm at the time they reported for the course, with 28.4% having tuberculin reactions more than 15mm and 6.8% having reactions more than 20mm.

Four students from this cohort of 366 were diagnosed to have tuberculosis disease as of October 1999. The

**Table I**  
**Tuberculin Reactivity of Student Nurse Candidates**

Tuberculin Range	Fresh School-leavers		Assistant Nurses		Total
	BCG Scars		BCG Scars		
	One	Two	One	Two	
0 mm	1	13	1	1	16
1 - 5 mm	10	22	2	4	38
6 - 10 mm	22	45	1	5	73
11 - 15 mm	22	96	2	12	132
16 - 20 mm	11	56	4	8	79
21 - 25 mm	2	15	0	3	20
26 - 30 mm	1	1	0	1	3
Total	69	248	10	34	361*

\* 3 of the school-leavers with no BCG scars had tuberculin reactions of 1 mm, 10 mm and 23 mm respectively, while 2 with three BCG scars had tuberculin reactions of 2 mm and 24 mm respectively

**Table II**  
**Clinical Particulars of Student Nurses Diagnosed to Have Tuberculosis**

Age	BCG scars	Tuberculin test Date	Tuberculin test Result	Date of diagnosis	Criteria for diagnosis
24	0	18/7/94	23mm	27/11/95	Sputum smear positive for AFB*
22	2	30/1/96	28mm	9/12/96	Caseating granuloma on lymph node biopsy
22	1	12/1/96	2mm	7/11/96	Caseating granuloma on lymph node biopsy
25	1	10/7/96	26mm	3/9/97	Sputum smear positive for AFB

\*AFB = Acid fast bacillus

relevant details of these four students are summarised in Table II. The diagnosis of active tuberculosis in all 4 students was quite definite with 2 of them having acid-fast bacilli in their sputum and the other 2 having caseating granulomata in biopsied lymph nodes. Three of these students had had very reactive tuberculin tests at initial testing suggesting that they had been infected prior to registering for their course.

## Discussion

This cohort of student nurses had much higher tuberculin reactions than comparable populations in Europe and North America. A large survey done in Canada in the late sixties for example, found that 4.2% of those aged 15 to 19 years, and 10.5% of those aged 20 to 29 years were tuberculin positive<sup>4</sup>. In comparison, almost two thirds of the cohort of students studied had tuberculin reactions above 10mm.

The high level of reactivity in this cohort of student nurses cannot be ascribed to exposure to tuberculosis patients within the health delivery system as tuberculin testing was done within a week of their reporting for their nursing course.

The degree of tuberculin reactivity was strongly correlated to the risk of developing tuberculosis in the subsequent 2 years. 12% of those with tuberculin reactions more than 20mm developed tuberculous disease compared to only 0.3% of those with reactions of 20mm or less. This suggests that a tuberculin reaction of above 20mm would be a reasonable threshold for initiating preventive therapy in Malaysian school-leavers. This threshold level would entail preventive treatment of less than 10% of the cohort and can be expected to capture the majority of cases who will otherwise develop tuberculosis over the subsequent 2 years.

The efficacy of preventive therapy with isoniazid has yet to be established in the Malaysian context, there is

certainly a need assess its role within the National Tuberculosis Control Programme. The decline in the annual incidence of tuberculosis plateaued out 15 years ago, and has been increasing at about 4 to 5% per annum for the past 5 years<sup>5</sup>. Our tuberculosis cases are, on the average, infecting sufficient people so as to cause at least one case of tuberculosis disease before becoming non-infectious. If a significant portion of those who would have otherwise developed the disease were prevented from doing so by preventive therapy, this would have a beneficial cumulative effect on the transmission of tuberculosis in our population. Thus, properly administered preventive therapy might be the interventional modality that we need to graft on to the National Tuberculosis Control Programme to further consolidate the gains that have already been made.

## Conclusions

Malaysian school-leavers are more strongly tuberculin positive than their Western counterparts, rendering Western guidelines pertaining to threshold levels for initiating preventive therapy inappropriate for the Malaysian setting. Nevertheless, higher levels of tuberculin reactions are strongly correlated to the risk of developing tuberculosis in the subsequent 2 years. A tuberculin reaction of more than 20mm appears to be the appropriate threshold for initiation of preventive therapy in our population of school-leavers. However, more empirical data is required to assess the efficacy of this modality of tuberculosis control in the Malaysian context.

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