

ORIGINAL ARTICLE

## Mantoux Test in Under-five Children Visiting the Out-patient Child Clinic of Dr. Pirngadi Hospital, Medan

by

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### Abstract

To assess the difference of Mantoux test result of under-five children who had had BCG vaccination and those who had not, a cross sectional study was conducted in the out patient child clinic of Dr. Pirngadi Hospital, Medan.

This study was conducted from February 6, 1990 until March 3, 1990 comprising 328 under-five children (164 who had received BCG vaccination and 164 who had not).

We found positive Mantoux tests in 86.0% of under-five children who had BCG vaccination and 9.2% of under-five children who not had ( $p < 0.001$ ). The diameter of induration of Mantoux tests in the under-five children who had received BCG at the age of 1 year or less was significantly different from those who had received it at the age of older than 1 year ( $p < 0.001$ ).

Positive Mantoux test with a diameter of  $\geq 5$  mm, done after 1 year or more was found in 21.7% of children who had BCG vaccination in the neonatal period.

## Introduction

In Indonesia tuberculosis is the fifth major disease after upper respiratory tract infection, diarrhea, malnutrition and vitamin A deficiency [1]. In developing countries, it has not guaranteed that improvement of socio-economic factor solely lowers morbidity and mortality rate caused by tuberculosis. It has believed that BCG vaccination is an important effort to prevent tuberculosis in developing countries especially in Indonesia [1.2]. BCG vaccinations in Indonesia have been done nationally since 1969, as an implementary action of the 1<sup>st</sup> Ciloto Workshop, aimed at children of 0-14 years old and done without a pre Mantoux test [3]. In our current immunization program the target age for BCG immunization are infants 0 - 11 months of age. [4]. BCG vaccination with a good vaccine is considered a success whenever there is a conversion of 95 - 100% of the Mantoux test [2.5]. Mantoux test is the most suitable, efficient, safe and reliable test to support the diagnosis of tuberculosis, and could also be used to evaluate individual or

group immunity in that have received BCG vaccination [6.7.8]. Mantoux test can give a false negative reactions or also called anergy and false positive reactions. Anergy could be found in several conditions such as tuberculosis incubation period (2-10 weeks), malnutrition, severe tuberculosis, morbilli, pertussis, typhus abdominalis, diphtheria, long standing corticosteroid therapy, dehydration and high fever. False positive reaction could be found in atypical Mycobacterium infection and after BCG vaccination [7.9.10].

The purpose of this study is to assess the difference of Mantoux test results in under-five children who had received and who had not received BCG vaccination; to assess the diameter of the induration of Mantoux test after BCG vaccination performed before vs after the age of one year, and to assess the number of the under-fives with positive Mantoux test (induration  $\geq 5$  mm) who had had BCG vaccination in neonatal period.

## Materials and Methods

A cross sectional study was carried out on the under-five children visiting the out patients Child Clinic Department of Child Health, School of Medicine University of North Sumatera Dr. Pirngadi Hospital, Medan. They were divided into two groups; one who had had BCG vaccination and the other who had not had BCG vaccination. Sample size was 164 each group determined by the formula :

$$n_1 = n_2 = \frac{[Z\alpha^2 \times \{p_1(1-p_1) + p_2(1-p_2)\}]}{B}$$

$n$  (each groups) =

Confidence level = 95% ;  $\alpha = 0.05$  ;  $z \alpha = 1.96$  ;  $p_1$  (proportion of Mantoux test positive in the immunization group) = 0.25

;  $p_2$  (estimated immunized) = 0.60 ; B (bound on error) = 0.1 ; drop out = 10% .

Under-five children that presumably anergy was excluded from this study.

The child identity, date of immunization, date of Mantoux test were recorded by the authors. To know whether the child had been vaccinated or not, we looked for BCG scar, medical record, KMS or by asking the parent. Mantoux test was performed by injecting of 0.1 ml PPD-S 5 TU (Biofarma, Bandung) with a tuberculin syringe (needle size 2461 x 1") intracutaneously on the volar surface. The result was assessed 48-72 hours after the injection. To get the correlation between qualitative variables a Chi square

test was used while with mean differentiation test (variable quantitative) a student t test was used. Mantoux test was regard-

ed as positive if the diameter of induration was  $\geq 5$  mm, and negative if  $< 5$  mm [8.11].

## Results

Age and sex distribution of 164 under-five children who had had BCG vaccination and who had not is presented on Table I, (the youngest was 3 months old and the oldest 4 years 11 months old).

In the group that had had BCG vaccination the proportion of positive Mantoux test was 86.0%, there was a significant difference ( $p < 0.001$ ) compared to the group that had not had BCG vaccination (9.2%) (Table II).

Mean diameter of induration of Mantoux test in those who had had BCG vaccination at age of 1 year or less, significantly differed ( $p < 0.001$ ) with the diameter of induration of those who had had BCG vaccination at the age of more than 1 year (Table III).

In children who had had BCG vaccination in neonatal period Mantoux, resulting in an induration of  $\geq 5$  mm, was found in 21.7% of children (Table IV).

Table I. Age and sex distribution

Age (years )	BCG (+)		Total	BCG (-)		Total	Total
	Male	Female		Male	Female		
0 - 1	34	27	61	26	28	54	115
2	33	12	45	17	20	37	82
3	10	17	27	8	10	28	55
4	9	12	21	4	20	24	45
>	9	1	10	10	11	21	31
Total	95	69	164	75	89	164	328

Table II. BCG vaccination and result of Mantoux test

BCG Vaccination	Mantoux test				Total	%
	(+)	%	(-)	%		
+	141	86.0	23	14.0	164	47.6
-	15	9.2	149	90.8	164	92.4
Total	156	47.6	172	52.4	328	100
$\chi^2 = 194.072$		df = 1		p < 0.001		

Table III. Age at BCG vaccination and mean diameter of induration of Mantoux test

Age at BCG vaccination	Total	%	Mean diameter of induration (Mean ± SE)
≤1 year	79	48.2	9.8608 + 4.3699
> 1 year	85	51.8	7.5411 + 3.0997
Total	164	100	

t = 3,9421      df = 162      p<0.001

Table IV Under-fives with Mantoux test positive who had had BCG vaccination during the neonatal period

Age (years)	Number of children vaccinated in the neonatal period	positive Mantoux test (induration ≥ 5 mm)	%
0 - 1	22	6	13.0
2	15	3	6.5
3	3	0	0
4	2	0	0
5	4	1	2.2
Total	46	10	21.7

### Discussion

In the under-five children who had had BCG vaccination, we found positive Mantoux test in 86.0%, compared with the group had not had BCG vaccination i.e. 9.2% (p<0.001) (Table II). Negative Mantoux test was found in 14.0% of under-five children who had had BCG vaccination. This may be caused by improper vaccine storage (cold chain), technical difficulties or undiagnosed anergy [5]. Positive Mantoux test which was found in the group who had not had BCG vaccination, may be caused by natural infection or atypical Mycobacterium [10]. In

the under-five children who had had BCG vaccination, the diameter of induration of Mantoux test varied between 2 - 18 mm, whereas the diameter of induration of < 5 mm was found in 14% (Table II); diameter of induration of 5 - 9 mm in 52.4%, 10 - 14 mm in 21.3% and ≥ 15 mm in 12.2% (not presented on table). Interpretation of Mantoux test in the under-five children who had had BCG vaccination was still a difficult problem to solve [7]. Kendig (1985) stated that the diameter of induration of Mantoux test after BCG vaccination was 5 - 9 mm, ex-

ceeded rarely 12 - 14 mm and if ≥ 15 mm the likelihood was super infection [9]. In their survey in Ma-lang, Hasan and Han Sik Liang (1965) found the diameter of induration of Mantoux test 10 - 15 mm after BCG vaccination in 65% and > 15 mm in 35% of the their sample.[12] Bleiker (1966) found that the diameter of induration of Mantoux test varied between 0 - 12 mm after BCG vaccination (Cited from 7). The mean diameter of induration of Mantoux test after BCG vaccination ≤ 1 year was 9.9 mm and > 1

year was 7.5 mm, P < 0.001 (Table III). In 46 out of 164 under-five children who had had BCG vaccination during neonatal period the diameter of induration ≥ 5 mm of Mantoux test done 1 year or more was found in 21.7% (Table IV). Lifshitz reported that children who had had received BCG vaccination during neonatal period, the diameter of induration of Mantoux test ≥ 5 mm after 1 year later only in 10% of cases; and if it was ≥ 10 mm, the likelihood was super infection (cited from 5).

### Conclusion

1. There was a significant difference of the diameter of induration of Mantoux tests in under-five children between those who had had BCG vaccination and who had not.
2. There was a significant difference of the diameter of induration of Mantoux test in under-five children between those who had had BCG vaccination
3. In children who had had BCG vaccination during the neonatal period, after 1 year or more period, the Mantoux test with diameter of induration of ≥ 5 mm was found in 21.7% of cases.

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