

ORIGINAL ARTICLE

Difference in Severity of Tuberculosis in Children with or without a BCG Scar

GUNADI SANTOSA, MAKMURI MUHAMAD SYAMSURI, I GUSTI GDE DJELANTIK, ELISABETH PROJOGO and I GUSTI NYOMAN

GDE RANUH

(From the Department of Child Health, Medical School University of Airlangga / Dr. Soetomo Hospital Surabaya)

Abstract

Tuberculosis can also be found in BCG vaccinated children. An attempt is made to know the difference in severity of tuberculosis in children vaccinated or not vaccinated with BCG.

Our impression is that tuberculosis occurs less frequent and less severe among BCG vaccinated children compared with unvaccinated children.

Received 25 Desember 1984.

Introduction

The protective effect of BCG vaccination remained a matter of controversy (Stott et al, 1982). The information obtained in the adolescents and adults were contradictory, but results in the newborn and young children appeared very favourable (Stott et al., 1982; ten Dem and Hitze, 1979). The trial in South India was not designed to establish the effect of BCG in infants and young children (Stott et al., 1982).

BCG vaccination is meant to prevent the children against the primary tuberculosis

Materials and methods

The medical records of all children admitted to the Department of Child Health or treated in the Pediatric Pulmonary Out Patient Department of Dr. Soetomo Hospital Medical School Airlangga University, Surabaya, Indonesia, with the diagnosis of tuberculosis and its complications between January 1979 and December 1982 were reviewed. The records were reviewed with respect to age, sex, BCG vaccination status, clinical diagnosis, severity of the disease and the mortality.

Results

There were 823 tuberculosis patients. 562 (68.3%) were unvaccinated children and 261 (31.7%) were vaccinated children. 638 (55.7%) were male and 508 (44.3%) were

with its serious complications such as meningitis and miliary tuberculosis which are the usual causes of death in childhood tuberculosis. If the BCG vaccination is effective one should at least find a reduction in the incidence and the severity of the disease.

The purpose of our study is to look whether there are differences in the incidence and the severity of tuberculosis in the vaccinated and the unvaccinated children.

The exact incidence of tuberculosis in our community is not known, because tuberculosis is not a notifiable disease. In order to have an image of the difference in incidence of tuberculosis in BCG vaccinated and unvaccinated children we conducted a scar survey on all patients visiting our Pediatric Outpatient Department from July 25, 1983 to July 31, 1983. These children can be regarded as a sample of the child population who is using the facility of our hospital and we used it as the control group.

female. 1146 children served as the control group. 535 (46.7%) were unvaccinated and 611 (53.3%) were vaccinated children.

TABLE 1 : Tuberculosis in BCG vaccinated and unvaccinated children compared to the BCG vaccination status of the Control group.

	BCG -	BCG +	Total
TBC	562	261	823
Control	535	611	1146
Total	1097	872	1969

χ^2 : 90.51 DF : 1 p < 0.001

Table 1 shows that tuberculosis occurred much more in the unvaccinated than in the vaccinated children. The difference is statistically significant.

TABLE 2 : Severity of tuberculosis in vaccinated and unvaccinated children.

	BCG -	BCG +	Total	χ^2 p value
Need for admission				
Admission	127	29	156	p < 0.01
Total	562	261	823	
Severity of disease				
Mild - Moderate	390	215	605	p < 0.001
Severe	172	46	218	
Severe cases				
Meningitis	62	10	72	p < 0.01
Miliary	49	10	59	
Bone	37	23	60	
Miliary + Meningitis	19	3	22	
Meningitis + Bone	3	0	3	
Miliary + Bone	2	0	2	
Mortality				
Alive	531	256	787	p < 0.02
Died	31	5	36	

Table 2 shows clearly that tuberculosis was much more severe in the unvaccinated than in the vaccinated children. This was true regarding the need for admission, the severity of the disease as well as the mortality. The difference is statistically significant.

Meningitis, miliary tuberculosis and tuberculosis of the bone were grouped as the severe cases because they caused the greatest mortality (88.9% of all deaths). Although the mortality of tuberculosis of the bone is not high, it can cause many deformities (Table 3).

TABLE 3 : Mortality from tuberculosis.

Diagnosis	BCG -		BCG +		Total	
	Death / Total	%	Death / Total	%	Death / Total	%
Meningitis	13/62	21.0	1/10	10.0	14/72	19.4
Miliary	7/49	14.3	1/10	10.0	8/59	13.6
Bone	0/37	0	1/23	4.4	1/60	1.7
Miliary + Meningitis	7/19	36.8	1/3	33.3	8/22	36.4
Meningitis + Bone	0/3		0/0		0/3	0
Miliary + Bone	1/2		0/0		1/2	50.0
Peritonitis	1/10		0/3		1/13	7.7
Massive Pneumonia	1/27		0/0		1/37	2.7
Pneumonia + Cavity	0/2		1/1		1/3	33.3
Pleural Effusion	1/36		0/25		1/61	1.6
Total	31/562 = 5.5%		5/261 = 1.9%		36/823 = 4.4%	

$$\text{Mortality rate of } \frac{\text{Meningitis} - \text{Miliary} - \text{Bone}}{\text{Total deaths}} = \frac{32}{36} = 88.9\%$$

The age of the patients ranged from 4 months to 12 years. Figure 1 shows that tuberculosis can be found at all ages. In the unvaccinated group tuberculosis was found much more (82.7%) in children under the age of 6.

Among the vaccinated group we could not find a peak age incidence. The incidence of tuberculosis in the unvaccinated group under the age of 6 was significantly higher than in the vaccinated group. But in children older than 6 years there is no difference in the incidence, severity and mortality between the two groups. (See Table 4).

TABLE 4 : Difference in incidence, severity and mortality of tuberculosis in children older than 6 years.

	BCG -	BCG +	Total	X ² p value
Incidence				
≤ 6 years	465	154	619	p < 0.001
> 6 years	97	107	204	
Severity				
Mild/Moderate	78	89	167	p > 0.5
Severe	19	18	37	
Mortality				
Alive	95	107	202	p < 0.5
Died	2	0	0	

Discussion

The findings of our study clearly show that tuberculosis occurs less frequent among the BCG vaccinated children and that the severity and the mortality are also significantly lower than in the unvaccinated children. This supports the opinion that BCG is still effective in the prevention of childhood tuberculosis and its complications. Whether BCG vaccination can prevent the reinfection form of tuberculosis (smear positive tuberculosis) (Kendig and Chernick, 1977; Youmans, 1979) or not (Miller, 1982; Stott et al., 1982) still needs to be investigated thoroughly.

We observed in our patients that tuberculosis in vaccinated subjects does not differ in anyway from that seen in the unvaccinated individuals, except in frequency and severity. This is in accordance with the findings of other workers (Greybowski, 1980).

The beneficial effect of BCG vaccination was not observed in children older than 6 years of age. The most probable reasons for this are vaccination in the preallergic

state or vaccination of a tuberculous child since BCG vaccination is given directly without prior examination. Another possibility is that BCG vaccination is only effective when given in the newborn or in children younger than 6 years and that the immunity lasts only for 6 years or less so that revaccination is needed. Only a few of our patients got the BCG revaccination. More intensive investigation is needed to clarify this "failure" of BCG vaccination.

If the BCG vaccination is only effective for the prevention of primary tuberculosis with its serious complications, then its influence on the chain of transmission will be very limited, because it will not prevent the smear positive cases (Styblo, 1980). Other measures of tuberculosis control i.e. case finding and case treatment should be better carried out.

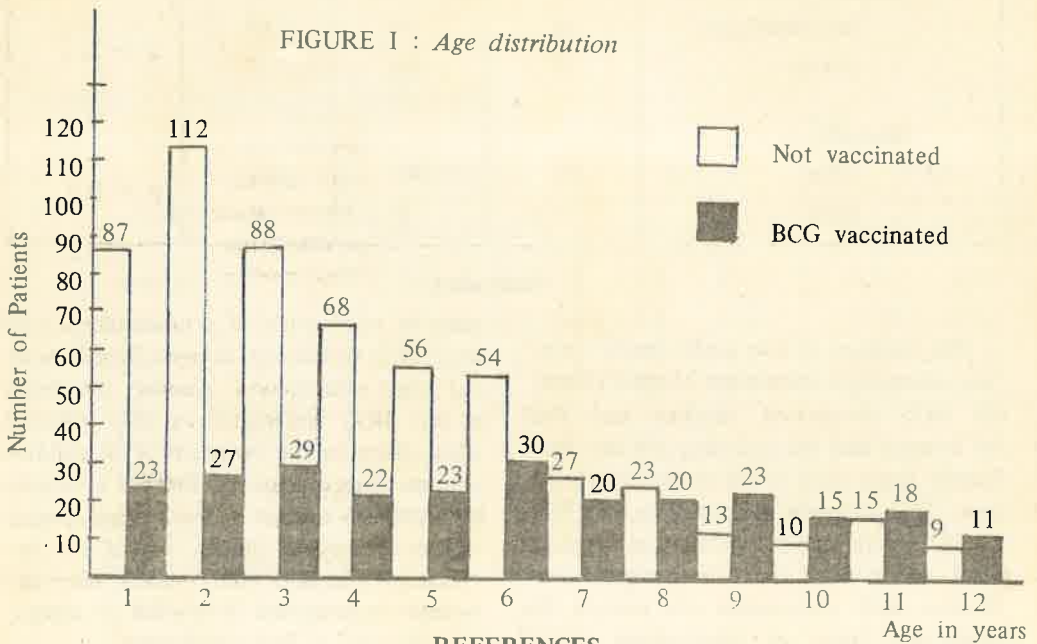
In Sweden, general BCG vaccination of the newborn was stopped on April 1975. Romanus (1983) found that the annual incidence of pulmonary, miliary and meningeal tuberculosis increased 4 times in the

unvaccinated child population born after 1975 compared with the BCG vaccinated population born in Sweden before 1975.

We conclude that BCG vaccination, should not be stopped in countries with a high prevalence of tuberculosis infection even though its role in the prevention of

adult tuberculosis is still a matter of dispute. BCG vaccination certainly has its role in the prevention of childhood tuberculosis and its serious complications especially in children under the age of 6 years. BCG vaccination should be given as early as possible, preferably in the newborn period.

FIGURE I : Age distribution



REFERENCES

- KENDIG, E.L.; CHERNICK, V. : Disorders of the respiratory tract in children, 3rd Ed., p. 838 (Saunders, Philadelphia/London/Toronto 1977).
- MILLER, F.J.W. : Tuberculosis in children. p. 55, 65 - 67, 71 (Churchil Livingstone, Edinburgh/London/Melbourne/New York 1982).
- ROMANUS, V. : Childhood tuberculosis in Sweden. Tubercle 64 : 101 - 110 (1983).
- STOTT, H.; PIO, A.; LEOWSKI, ten DEM, H.G. : Tuberculosis control - current situation. Summary of the views of workers involved in tuberculosis control programmes throughout the world, W.H.O./TB/133 : 12 - 13 (1982).
- STYBLO, K. : Recent advances in epidemiological research in tuberculosis. Adv. Tuberc. Res. 20 : 1 - 63 (1980).
- ten DEM, H.G.; HITZE, K.L. : BCG vaccination of the newborn and young infants. World Health Organization, Scientific group on vaccination against tuberculosis. p. 12 TRI/Sc G (1979).
- YOUNG, G.P. : Tuberculosis, p. 376 (Saunders, Philadelphia/London/Toronto 1979).