

Rates of BCG Vaccination and Tuberculosis Infection Prevalence Among Primary School Students in Şanlıurfa

ŞANLIURFA'DAKİ İLKÖĞRETİM OKULU ÖĞRENCİLERİNDE BCG AŞILAMA ORANLARI VE TÜBERKÜLOZ ENFEKSİYON PREVALANSI

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Summary

In this study, Bacillus-Calmette-Guerin (BCG) vaccination rates and tuberculin response to 5 tuberculin units of purified protein derivative (PPD) were evaluated in 2685 healthy children (6-12 years old) during March-May 1998 in Şanlıurfa, a southeast Anatolia region city of Turkey. 1200 (44.7%) of children had no BCG vaccine (unvaccinated), while 1401 (52.2%) had one vaccine (vaccinated) and 84 (3.1%) had two vaccines (revaccinated). Tuberculin positivity rates representing infection with Mycobacterium tuberculosis in the unvaccinated, vaccinated and revaccinated children were 7.3%, 4.9% and 3.6%, respectively. Difference between unvaccinated and vaccinated children were statistically significant ($p<0.01$). The prevalence of tuberculosis infection (PTI) was 3.2%. Our results show that routine BCG vaccination could decrease the prevalence of infection with Mycobacterium tuberculosis and should be recommended on a community base in regions where tuberculosis infection prevalence is high.

Key Words: BCG, PPD, Tuberculosis, Prevalence

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Tuberculosis is still a major health problem throughout the world, especially in developing countries. Mycobacterium tuberculosis is estimated to be leading to approximately 13 million new cases of active tuberculosis and 450 000 deaths among children each year (1,2). Protective effect of

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Özet

Şanlıurfa'daki ilköğretim okullarında 6-12 yaş arasındaki 2685 sağlıklı öğrencide 5 tuberkülin ünitesi PPD'ye tuberkülin cevabı ve BCG aşılama oranları araştırıldı. Öğrencilerden 1200'ü (%44.7) aşısız, 1401'i (%52.2) tek aşı ve 84'ü (%3.1) iki aşı idi. Tuberküloz basili ile enfeksiyonu gösteren tuberkülin pozitiflik oranları aşısızlarda %7.3, tek aşıllarda %4.9 ve iki aşıllarda %3.6 olarak saptandı. Aşılı ve aşısız öğrenciler arasındaki fark istatistiksel açıdan anlamlı bulundu ($p<0.01$). Tuberküloz enfeksiyon prevalansı ise %3.2 idi. Sonuçlarımız bölgede BCG aşılama oranlarının düşük ve tuberküloz enfeksiyon prevalansının yüksek olduğunu ve rutin BCG aşılaması ile bu prevalansın azaltılabileceğini göstermektedir. Tuberküloz enfeksiyon prevalansının yüksek olduğu bölgelerde rutin BCG aşılama takviminin toplum bazında düzenli şekilde uygulanması gerektiği vurgulandı.

Anahtar Kelimeler: BCG, PPD, Tuberküloz, Prevalans

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Bacillus Calmette-Guerin (BCG) vaccine in prevention of tuberculous infection is not always sufficient, but it plays an important role in prevention of severe forms of tuberculosis, e.g. miliary and meningitis, especially in children (3-6). Therefore, World Health Organization (WHO) recommend BCG vaccination as a public health measure in developing countries with a higher prevalence of tuberculosis infection (1%, and upper) (6,7). The tuberculin skin test, which is based on the detection of delayed hypersensitivity to the antigens of Mycobacterium tuberculosis, is used as a parameter

for the determination of infected children. However, the value of tuberculin skin test is decreased in children with BCG vaccine. Purified protein derivative (PPD) is the preferred skin test antigen and used for the intradermal Mantoux test (1,8).

In this study, we aimed to determine the rates of BCG vaccination and the prevalence of tuberculosis infection in schoolchildren using Mantoux test in Çanlıurfa, a southeast Anatolia region city of Turkey.

Subjects and Methods

The study was carried out on 2685 healthy children (6-12 years old) who were selected by group sampling method from ten different primary schools in Çanlıurfa during March-May 1998 period. Children who had abnormal conditions which may affect PPD response such as coincident clinical viral infections, immunization with an attenuated virus vaccine, treatment with immunosuppressive agents, severe malnutrition, neoplastic diseases and other chronic systemic diseases were not included in the study. Two pediatricians performed all procedures. Children without BCG vaccine were ascertained from history and absence of BCG scar on physical examination. Tuberculin skin test with 5 tuberculin units of PPD antigen (RT Tween 80) was administered to children by intradermal Mantoux method and the site of antigen injection was examined for occurrence of induration at 48-72 hours. If induration was 10 mm and more in children without BCG vaccination and 15 mm and more in children with BCG vaccination, the test results were defined as positive (9-11). Children with tuberculin positive were accepted as infected with *M. tuberculosis* and were referred to the local tuberculosis control center where in further examination and investigations were done (10).

The prevalence of tuberculosis infection (PTI) was evaluated with following formula (12): the number of the children without BCG vaccine and with tuberculin positive (PPD>10 mm)/total number of screening population x 100. Statistical analyses were performed by chi-square test using SPSS for Windows package program.

Table 1. Tuberculin reaction rates according to the number of BCG vaccines

	n	%
Unvaccinated	1200	44.7
PPD: Negative	1113	92.7
10 mm	87	7.3
Vaccinated	1401	52.2
PPD: Negative	1119	79.9
10-14 mm	213	15.2
15 mm	69	4.9
Revaccinated	84	3.1
PPD: Negative	48	57.1
10-14 mm	33	39.3
15 mm	3	3.6

Results

While 84 (3.1%) children had two vaccines (revaccinated) and 1401 (52.2%) children had one BCG vaccine (vaccinated), 1200 (44.7%) children had no BCG vaccine (unvaccinated). Tuberculin positivity rates representing infection with *M. tuberculosis* in the unvaccinated (PPD>10 mm), vaccinated (PPD>15 mm) and revaccinated (PPD>15 mm) children were 7.3%, 4.9% and 3.6%, respectively (Table 1). Tuberculin positivity rates between unvaccinated and vaccinated children were significantly different ($\chi^2=6.5$, $p<0.01$). Also, the prevalence of tuberculosis infection was found as 3.2%.

Discussion

BCG is the only commercially available vaccine against tuberculosis and is commonly used in many developing countries to prevent tuberculosis for a long time (1,7,13,14). A recent meta-analysis of published BCG vaccination trials suggested that BCG is effective in 50% of children to prevent pulmonary tuberculosis. But the protective effect for disseminated and meningeal tuberculosis appears to be slightly higher, with 50-80% of cases (1,3-6). The official recommendation of the WHO is single dose administration during infancy, but recommended vaccine schedules vary widely among countries (6,7,13). Because of the high prevalence

of tuberculosis infection in our country, BCG vaccination has been accepted as a part of national immunization program applied routinely by Health Ministry (12). According to this, Turkish children should be carried out revaccination on five-seven years old after the first BCG vaccination applied to two months old. While the rate of children without BCG was 35% for Turkey, it was found as 44.7% in our study (12,15,16). These results show that routine BCG vaccination of infants has been somewhat neglected in nowadays. Also, this low rate of BCG vaccination of children was responsible for the increase in tuberculosis infection in Çanhurfa region.

Other data from Turkey have revealed high tuberculosis infection rates, 3.5 to 4.5%, in unvaccinated children (12,15,16). In our study, while tuberculin positivity rate representing infection with *M. tuberculosis* was 7.3% in children without BCG, it was found as 4.9% in children with BCG. Tuberculin positivity rates in unvaccinated and vaccinated children were higher than average rates of Turkey. Difference between the tuberculin positivity rates of children with and without BCG vaccine was statistically significant ($p < 0.01$). The increase in unvaccination rates is together with the increase of tuberculosis infection rates. These findings may point out that BCG vaccine has protective effect. Likewise, many studies from various countries have reported that BCG vaccine in children has a protective effect against all forms of tuberculosis ranging from 20 to 80% (3-6,17).

The prevalence of tuberculosis infection is important for the estimation of infected human pool of community. This criteria is especially more important for unvaccinated population (13,18). The prevalence of tuberculosis infection has decreased from 56% in 1959 to 25% in 1982 and 3.8% in 1990s in Turkey (12,15,16). Our finding for Çanhurfa region which is 3.2% is slightly lower than that of the mean value of Turkey, but it is higher than that of the values of developed countries, which is under 1% (7,19).

In conclusion, our study showed that the prevalence of tuberculosis infection and tuberculin positivity rates representing infection with *M. tu-*

berculosis in unvaccinated and vaccinated children were high in Şanlıurfa region and BCG vaccination has a protective effect. Therefore, we suggest that BCG vaccine should be administrated more effectively as a method of prevention of tuberculosis on a community basis in Turkey and similar countries.

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