

The distribution of tuberculin reaction among children at school entry in Madaba, Jordan

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توزع تفاعل التوبركولين بين الأطفال لدى دخولهم المدارس في منطقة مادبا
سيف الدين صلاح حسين وعالم عبد الحميد يعقوب

خلاصة تعرض هذه الدراسة نتائج استقصاء حول اختبار التوبركولين في عينة ممثلة من الأطفال الذين لم يسبق تمنيعهم بلقاح بي سي جي وهم في سن الالتحاق بالمدرسة في منطقة مادبا بالأردن في السنة الدراسية ١٩٩١ - ١٩٩٢ . كما تم كذلك فحص أطفال السن قبل المدرسية من مخالطي التلاميذ الإيجابيين في منازلهم ، وعينة عشوائية قدرها ٥% من التلاميذ السلبيين الاختبار . ولقد تبين أن ثلاثة من بين ٧٤٦ تلميذاً تم فحصهم في الاستقصاء المدرسي المبدئي كانوا إيجابيين ، أي بمعدل انتشار قدره ٠,٤% . ووجد أن معدل الانتشار الإجمالي للعدوى بين مخالطي التلاميذ في السن قبل المدرسية كان ١,١% (٢٨,٦% بين مخالطي التلاميذ الإيجابيين ، مقارنة بنسبة ٨,١% بين مخالطي التلاميذ السلبيين) .

ABSTRACT The present study reports the results of a tuberculin test survey of a representative sample of BCG unvaccinated children at school entry age in the Madaba district in Jordan in 1991-92. Preschool household contacts of positive schoolchildren and a 5% random sample of negative schoolchildren were also screened by the same test. Three out of the 746 children screened by the initial school survey were found to be positive giving a prevalence rate of 0.4%. The overall prevalence rate of infection among preschool contacts was found to be 10.1% (28.6% among the contacts of the positive schoolchildren compared to 8.1% among contacts of the negative children).

Distribution des réactions tuberculiques chez les enfants à l'âge de la scolarité dans le district de Madaba en Jordanie, 1991-1992

RESUME Cette étude présente les résultats de l'enquête tuberculique effectuée sur un échantillon représentatif d'enfants non vaccinés par le BCG à l'âge de la scolarité dans le district de Madaba en Jordanie en 1991-1992. Des sujets contacts d'âge préscolaire au foyer d'écoliers positifs et d'un échantillon aléatoire à 5% d'écoliers négatifs ont également été soumis au même test tuberculique. Trois enfants sur les 746 ayant fait l'objet de l'enquête initiale en milieu scolaire se sont révélés positifs, ce qui donne une prévalence d'infection de 0,4%. On a trouvé que la prévalence globale de l'infection chez les sujets contacts d'âge préscolaire était de 10,1% (28,6% chez les contacts des écoliers positifs contre 8,1% chez les contacts des écoliers négatifs).

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Introduction

Since its inception in 1952, the national tuberculosis control programme in Jordan has adopted policies based on active and passive case-finding, and BCG vaccination for contacts, newborn infants and school students, aiming to decrease both morbidity and mortality rates due to tuberculosis [1]. In 1980 BCG vaccination policy was changed by shifting vaccination from neonates to children at the age of school entry, because prevalence had decreased among children below six years of age.

Currently, tuberculosis in Jordan is considered to be well controlled. In spite of deficiencies and inaccuracies in recording of cases, the annual reports of tuberculosis in Jordan from 1951 [1-3] indicate that the national programme seems to operate satisfactorily. However, the size of the problem is still not well defined in many areas of Jordan, and epidemiological surveys using epidemiological indicators such as those recommended by WHO [4] are highly needed. Tuberculin test surveys on samples of unvaccinated children can be used for that purpose and are preferable to sputum or chest X-ray examinations since they are cheaper and easier to conduct [4]. Tuberculin surveys may be conducted in Jordan on children at school entry since such children have not been vaccinated previously with BCG, according to the current national vaccination policy.

This paper reports the results of a survey carried out among children at school entry age (six years old) in the Madaba district, which is one of the larger districts in Jordan. Tuberculosis is known to be endemic here, yet it has not previously been studied in detail. The purpose of the present study was to fill a gap in our knowledge about the epidemiology of tuberculosis in Jordan, not only

with respect to the prevalence of infection among children at school entry but also to provide an in-depth understanding of the problem based on a household survey of families of a sample of schoolchildren screened.

Specifically, the household survey was carried out to study the distribution of tuberculin reaction among preschool contacts of tuberculin positive children in comparison with contacts of tuberculin negatives. Also studied was the distribution of selected socioeconomic variables of families of such children.

Materials and methods

The study was carried out in the Madaba district, situated south-west of Amman. The district includes the city of Madaba, the town of Thiban and a number of villages (Figure 1). The total population of the district was estimated to be 103 000 in 1991, of whom 60% live in urban areas and the rest in rural areas [5]. The number of children at school entry age was estimated to be 3000, and the required sample size to be studied was calculated by the test described by William [6] at a 5% level of significance and at 80% power of the test, using 1.8% as the estimated prevalence rate of tuberculosis in Jordan [3]. The sample size required was calculated to be 660 (or around 20% of the target population). The district was divided into three strata: Madaba, Thiban and a third rural stratum. A list of primary schools was obtained, and a sample of 20% of them in Madaba (three out of 15 schools) and in the rural stratum (14 out of 70 schools) were selected by a systematic random sampling method. There were only two schools in Thiban and both were included. All children six years old (i.e. at school entry) in the se-

lected schools were covered by the tuberculin test.

During the survey, which was carried out in 1991–92, schools were visited and tuberculin tests were performed on all children, except those who had already had BCG and those who had had recent polio vaccinations. Feverish children were temporarily excluded but retested in a subsequent visit. The Mantoux test was employed using PPD RT23 stabilized with Tween 80. The dose used was 0.1 millilitres (two tuberculin

units). The site of injection was on the dorsal surface of the left forearm, and a special disposable tuberculin syringe was used. The intradermal injection was carried out by a qualified senior nurse. Reading of the test was carried out after 72 hours. The induration (not the redness) was measured as the average of maximum and minimum diameters of the induration at right angles.

Household visits were made to all schoolchildren with positive reactions, and a 5% random sample of definitely negative school children (reading of 10 millimetres and more were considered definitely positive and those below 5 millimetres were considered definitely negative). During the household survey all preschool contacts (children below six years of age) were tuberculin tested with the same batch used in the school survey. In addition, information on the level of crowding, occupation and educational status of the father and house ownership were obtained.

Children with readings of 10 millimetres and more (whether identified by the school or household survey) were referred to the chest diseases clinic for full investigation and treatment.

Statistical analyses of the data included a χ^2 test and exact Fisher test wherever appropriate.

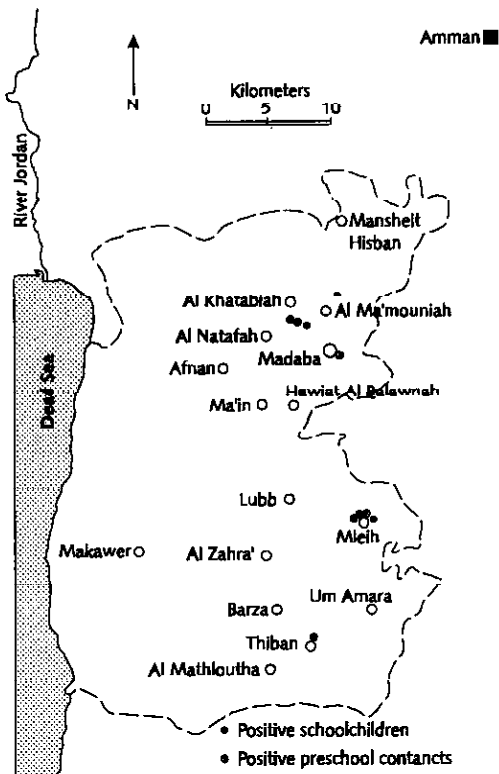


Figure 1 Map of the Madaba district showing the relative locations of Madaba, Thiban and villages included in the study and the locations of positive schoolchildren and positive preschool contacts

Table 1 The distribution of tuberculin reaction among the sampled students

Reaction	Number	%
No reaction (0 mm)	721	96.6
Minimal reaction (1–4 mm)	17	2.3
Weak reaction (5–9 mm)	5	0.7
Moderate reaction (10–14 mm)	1	0.1
Strong reaction (15+ mm)	2	0.3
Total	746	100.0

Table 2 The distribution of tuberculin reaction among preschool contacts by place of residence

Place of residence	Number of contacts	Positive	%
Urban	31	2	6.5
Rural	38	5	13.2
Total	69	7	10.1

Results

The 19 selected schools included 824 children who were to be covered by the survey. Seventy-eight of them were excluded (38 because of previous BCG vaccination and 40 who were absent during the survey). Thus 746 children were covered by the tuberculin survey (424 from urban areas and 322 from rural areas). There was no significant statistical difference in the distribution by sex between rural and urban areas. Table 1 shows the distribution of tuberculin reaction among the sampled children. It can be seen that 743 (99.6%) had either no reaction (721), minimal reaction (17) or a weak one (5). These were considered negative reactions. Three children (two males, one female) had readings 10 millimetres and above, giving a prevalence rate of positive reactions of 0.4%. All positives were from rural areas. Males with 5–9 millimetres reaction constituted 0.8% of total male children while females with the same reaction size constituted 0.5% of total females.

The household survey identified seven positive preschool contacts of two positive schoolchildren (the household of the third positive child could not be located) and also identified 62 negative preschool contacts of the 37 negative reactors (which constituted 5% of the negative schoolchildren).

Table 2 shows the distribution of tuberculin reaction among preschool contacts by place of residence. Figure 1 shows the distribution of cases identified by the school and household surveys in various areas of the Madaba district. The overall prevalence rate of infection (those with readings of 10 millimetres or more) among those contacts was 10.1% (9.3% among males and 11.5% among females [$\chi^2 = 0.09$, not significant]), which is significantly higher than that ascertained by school surveys ($p < 0.001$, Fisher exact test).

The prevalence rate among contacts of the positive index cases was 28.6% compared to 8.1% among contacts of the selected negative reactors. The difference, however, was not statistically significant ($P = 0.199$, exact Fisher test).

Discussion

The sample in the study was representative to an extent which is usually considered acceptable in population surveys. This was achieved by:

- observing proper random sampling methods based on stratified and systematic random techniques;
- ensuring that the sample size was sufficient for statistical requirements. In fact the sample size chosen was more than that calculated for that purpose (746 vs 660); and
- the low non-response rate, which was only around 10% (78 out of 824).

In epidemiological surveys it is important to make sure that the screening test used measures what it is supposed to measure. In this study, the Mantoux test was used because it is generally agreed that it is the most valid and precise of all tuberculin tests and should be used whenever the degree of hy-

persensitivity needs to be measured as accurately as possible [7].

The prevalence rate of positive reactors among schoolchildren at school entry reported in this study (0.4%) was the lowest compared to other studies among children of the same age done in Jordan. In a study carried out in Balka [8] a prevalence rate of infection was found to be 0.7%. A prevalence rate of 1.78% was recorded among children between five and eight years of age in national Jordanian studies [9]. Another study carried out in Amman among children at school entry revealed a prevalence rate of 0.7% [10]. The results of the present study and these studies support the impression that satisfactory progress has been achieved in the control of tuberculosis in Jordan.

Tuberculin surveys carried out in neighbouring countries covered a wider spectrum of age and thus were not strictly comparable, for example, studies in Iraq [11] and Saudi Arabia [12]. In a survey carried out in Bahrain [13] among children at school entry, a prevalence rate of 1.55% was found, higher than that reported in our study. The prevalence rate reported in Madaba is comparable to that reported from a developed country such as the Netherlands [14], which

was 0.43% among the same group of children according to surveys carried out between 1969 and 1979.

The household approach employed in this study, based on screening members of households of schoolchildren found positive and a sample of negative children resulted in a higher case yield compared to the conventional approach based on screening schoolchildren only. Such an approach was employed in a study from South Africa [15], where the prevalence rate of infection among contacts of smear-positive cases was higher than that among a non contact population. Such an approach allowed the identification of foci of infection which could not have been identified otherwise.

In conclusion, the prevalence rate of infection among children at school entry in Madaba was found to be low and was comparable to figures from developed countries. The household approach, however, revealed a higher prevalence rate of infection among preschool contacts. Thus it is recommended that the approach used in this study be contemplated in national tuberculosis control programmes, not only in Jordan but also in other countries where tuberculosis is endemic.

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Adverse reactions reported with measles immunization: safe injection practices

In the past year, there has been a striking increase in reports of adverse events associated with the use of measles vaccine in immunization programmes. However, in every case, it has been found after careful investigation that these events were linked to improper handling of the measles vaccine. Measles vaccine has been reconstituted by mistake, using powerful drugs, unsterile water or other materials that happened to be in the refrigerator, as substitutes for the diluent supplied by the manufacturer. Occasionally the vaccine has been correctly reconstituted but stored and reused over a number of immunization sessions, during which time it has become contaminated. These incidents, which have resulted in needless deaths and life-threatening illnesses

and in damage to immunization programmes, are completely preventable if proper reconstitution and handling procedures are followed. *Measles vaccine must be reconstituted only with the diluent supplied by the manufacturer, and reconstituted vaccine must be discarded at the end of each immunization session.* Guidelines can be found in the WHO publication *Surveillance of adverse events following immunization: field guide for managers of immunization programmes* (EPI/TRM/93.2, available in English and French). The complete document and other information on investigation and prevention of such adverse events can be found in the UNICEF–WHO kit *Injections: pledge for safety*.

Source: *Voice of WHO Sudan*
Issue No.11. September 1995