

Childhood tuberculosis in a developed country

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ABSTRACT: From 1975 to 1985, 25 Danish children (aged less than 15 yrs) and 40 children of immigrants were notified for tuberculosis in Copenhagen for the first time. A follow-up was undertaken in 1987. The annual rate of tuberculosis per 100,000 among the Danish children was 5 and among immigrant children 68-200 depending on the nationality. At the time of diagnosis, no significant differences were present between Danes and immigrants as regards age, sex, occurrence of symptoms or previous BCG immunization, whereas there were significantly more bacteriologically proven cases among the immigrants. All Danish children had respiratory tuberculosis only, whereas 13 immigrant children had extrapulmonary manifestations including one case of miliary and two cases of meningeal tuberculosis. At follow-up, all patients were cured for tuberculosis and had experienced a normal physical development.
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In the last decade the incidence of tuberculosis has remained virtually constant in Denmark. In 1987 the incidence was 1 per 100,000 among children below the age of 15 yrs in Denmark, whereas the incidence was 5 times higher in the capital, Copenhagen. This is partially due to a higher number of immigrants living in Copenhagen. In an attempt to identify the variables associated with childhood tuberculosis we contacted in 1987 all children with tuberculosis in the years 1975 to 1985 in Copenhagen. This report describes the characteristics at the time of notification and the consequences and prognosis for the children with special emphasis on differences between the endogenous and immigrant populations.

Methods

All cases of first time tuberculosis from 1975 to 1985 in the municipalities of Copenhagen/Frederiksberg among children under the age of 15 yrs were investigated using information from the chest clinics and other relevant departments. Cases with atypical mycobacteria were excluded. In 1987, the patients were traced through the same institutions and through the population registers. Those living in Denmark were invited to answer a questionnaire.

We defined Danish children as children of Danish extraction with Danish citizenship, and immigrant children as first and second generations of non-Danish extraction living in Denmark, irrespective of citizenship. For statistical comparisons the Fisher exact probability test was used. We used 0.05 as the level of significance.

Results

Sixty six children were notified for tuberculosis in the period, but one child was excluded because culture from the affected lymph nodes revealed atypical mycobacteria. Twenty five were Danes, 40 were immigrants. No significant difference was found in age or sex distribution between the two groups.

The localization of the disease was significantly different between the Danish and immigrant children ($p < 0.01$). All Danish children had respiratory tuberculosis only, whereas 68% (27/40) of immigrants had respiratory tuberculosis only. Five immigrants had both respiratory and non-respiratory tuberculosis, the latter localization being meningeal, bone and joint and cutaneous, bone and joint, respectively, and in two children, lymph nodes. In the 8 immigrant children with non-respiratory lesions only, the lymph nodes were affected in 5, while one had meningeal tuberculosis, one had bone and joint lesions and one miliary tuberculosis. In 6 of 7 children, *Mycobacterium tuberculosis* was cultured from the cervical lymph nodes. In one child with mediastinal lymph node disease no culture was performed.

Incidence

The number of cases is listed in table 1 according to country of origin. In addition to the 57 mentioned in table 1, 8 immigrants came from 8 different countries. Based on these figures and on population figures by ethnic groups in Copenhagen we have estimated a mean incidence for the different nationalities. The estimates are

Table 1. — Morbidity from tuberculosis according to nationality

Country of birth	No. of cases	No. at risk	Incidence per 100,000	Incidence* in country of birth per 100,000
Denmark	25	48,020	5	5
Pakistan	16	1,564	93	255
Yugoslavia	6	805	68	184 [†]
Turkey	5	449	101	68 [†]
Morocco	3	251	109	116
Philippines	2	90	202	295

*: The incidence is estimated as a mean value for 1975–1985 for the total population (all ages); †: pulmonary tuberculosis only.

given together with the incidences of active tuberculosis in the respective home countries (WHO statistics).

Basis of diagnosis

The cases were diagnosed because of symptoms (45%), after contact screening (39%) and by routine screening (16%). The diagnosis was made on the basis of bacteriological findings (with or without other evidence) in 12 (48%) Danish and 32 (80%) immigrant children. The difference was significant ($p < 0.02$). Only 16 (25%) had a positive smear.

In the 21 (32%) children without a positive culture for *Mycobacterium tuberculosis*, the diagnosis was based on a combination of most of the following criteria: radiographic evidence (20 children), positive tuberculin tests (20 children), a contact history (15 children) and clinical evidence of tuberculosis (12 children).

Ten immigrant children and 10 Danish children had no symptoms at the time of diagnosis. Twenty six children had various pulmonary symptoms and 17 had fever. Few children experienced malaise or weightloss. Only one Danish child had night sweats.

The source of infection was suspected in 46 children. Nearly all (91%, 42/46) of the index cases were adults; 87 per cent (40/46) were household contacts. In 11 immigrant children, it was not possible to trace any contact, but 5 children had been visiting the country of birth within a few months prior to the diagnosis.

History of BCG-vaccination

Of the Danish (immigrant) children, 3 (5) were known to have had BCG-vaccination, and in 4 (14) it was not known whether they had been vaccinated (no information about BCG scar could be obtained either), while 18 (21) had not been vaccinated (differences not significant).

Treatment

The treatment consisted of a standard regimen of isoniazid, ethambutol, rifampicin and in some cases pyrazinamide. The duration of chemotherapy treatment was shortened to 9 months during the period of the study. A sensitivity test showed 42 of the cultures to be fully sensitive, one was resistant to isoniazid and pyrazinamide, and one to isoniazid alone, both patients being immigrants. On average, the immigrants were hospitalized for a longer time than the Danish children. None of the children died and all were considered cured from tuberculosis.

Prognosis

Questionnaires were sent out in 1987. Twenty five immigrants and 23 Danes returned the questionnaires. Forty seven had no sequelae after tuberculosis. One child with previous meningeal tuberculosis had severe dysphasia. However, his intelligence was found normal, as judged by psychological testing. It was not possible to get in contact with 17 of the children or their parents. Four had emigrated while the rest were known to live in Denmark.

We compared the age-adjusted height of the Danish children at the time of diagnosis and at follow-up to the reference values for Danish children [1]. On average the children followed the 45 percentile and 61 percentile, respectively. Seventeen had moved to a higher height curve at follow-up.

Discussion

The main finding of this study is that while the incidence of tuberculosis in Denmark is among the lowest in the world, the incidence among immigrants is still high. The incidence among immigrant children was markedly higher (10–40 times higher) than for the genuine Danish children but somewhat lower than in the countries in which they or their parents were born. Similar findings have been reported from other advanced countries [2–9]. The explanation for this is a higher risk of infection within their often rather closed community, and during visits to and from their home country. It has been estimated that one-fifth of Asian immigrants who develop tuberculosis in West Ham, UK, did so as a result of a recent visit to Asia and that one-third had acquired the infection before leaving Asia [9].

Childhood tuberculosis remains important from a clinical and a preventive health perspective. Infection among children must be relatively recent and therefore an indicator for the transmission rate of *Mycobacterium tuberculosis* in the population. The severe forms of the disease, such as miliary and meningeal tuberculosis, are more likely to occur in persons recently infected [2] and therefore occur with a higher proportion in children. In this study, these severe forms of tuberculosis occurred in 5% of the children compared with 4.3% of children in the USA [2] and with only 3% of adults in Copenhagen

[10]. Extrapulmonary tuberculosis occurred in immigrant children only. It was most often localized to the lymph nodes, which is consistent with reports from England and Wales in 1978/79 and 1983 [3, 4].

The frequency of bacillary cases in this study is higher than in most other reports [2-5]. The high frequency of bacillary cases is the consequence of a change in diagnostic policy [10]. In a society with a low incidence of tuberculosis, patients with negative culture have been considered less likely to have tuberculosis in spite of radiographic findings compatible with tuberculosis. However, especially in young children, one is more likely to accept the diagnosis of tuberculosis without a positive culture if the child is a tuberculin converter, has radiographic evidence and a contact history to an adult index person.

Today, children are usually infected from sputum positive adults. In 46 of the cases, a history of contact was known, 91% of these being with an adult. In less than a third, a possible contact could not be traced. In England and Wales, 75% of children notified for tuberculosis in 1983 had been in contact with an adult index case [4].

BCG-vaccination was known to have been carried out in 12% of cases and not carried out in 60%, corresponding to the figures from English children in 1983 [4] of 21% and 73%, respectively. In 1983 it was decided to stop the routine BCG-vaccination of school children in Copenhagen because of the low risk of infection and only immunize on special indications e.g. close contact history.

At the time of notification the children were generally smaller than the healthy children, consistent with findings in children with chronic disease [11]. However, neither the disease nor the chemotherapy have had a restrictive influence on the physical development, and in 1987 the children were slightly taller than the average.

Although the problem of childhood tuberculosis has declined over the years in developed countries, the maintained high frequency and the different presentation of tuberculosis in immigrants stresses the need for thorough examination, case finding, and treatment of immigrants especially. It should always be born in mind that all immigrants, whatever the age, are candidates for tuberculosis, and that the lesions may be very curious ones [12].

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Tuberculose de l'enfant dans un pays développé. J. Mortensen, P. Lange, H.K. Storm, K. Viskum.

RÉSUMÉ: Entre 1975 et 1985, 25 enfants danois âgés de moins de 15 ans, et 40 enfants d'immigrants, ont fait l'objet d'une déclaration pour tuberculose de première intention à Copnehague. Un follow-up a été entrepris en 1987. Le taux annuel de tuberculose chez les enfants danois est de 5 pour 100.000, et chez les enfants immigrants entre 68 et 200 pour 100.000 selon leur nationalité. Au moment du diagnostic, l'on n'a pas noté de différence significative entre les danois et les immigrants en ce qui concerne l'âge, le sexe, la présence de symptômes, ou une immunisation préalable au BCG, alors que l'on a trouvé chez les immigrants un nombre significativement plus important de cas de contagiosité démontrée. Tous les enfants danois avaient des formes uniquement respiratoires de tuberculose, alors que 13 enfants immigrants avaient des manifestations extra-pulmonaires, y compris 1 miliaire et 2 méningites tuberculeuses. Au follow-up, tous les patients étaient guéris de leur tuberculose et avaient connu un développement physique normal.

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