The epidemiology and outcome of childhood tuberculous meningitis

The Pelonomi Hospital experience

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Summary

A prospective study was undertaken to determine the epidemiology and outcome of tuberculous meningitis in children admitted to hospital in Bloemfontein, OFS. Over a 5-year period 75 patients were studied, and 78% of them were < 5 years of age. The largest group of patients came from rural areas. The annual incidence in the 0 - 14-year-old group for the City of Bloemfontein was estimated at 3.6/100 000. Most patients were in an advanced stage of illness at the start of therapy and the mortality rate was 18%. Of those patients who survived, 26% had severe neurological sequelae. The incidence of tuberculous meningitis can be decreased by improving primary health care facilities in certain areas of the OFS.

Despite the fact that we are nearing the 21st century, tuberculosis remains the most important infectious disease in South Africa.2 Tuberculous meningitis (TBM) is the most serious complication of the primary tuberculous infection in the young child and carries considerable risk of death or severe physical and mental retardation. Not only is the incidence of TBM in a community a measure of the number of children who escape the primary and secondary preventive measures for primary tuberculosis,2 but it also is a marker of tuberculous disease in the general population.

Ascertaining the extent of TBM in a community is thus of both academic and practical importance. Because no such data have been published for Bloemfontein and surrounding areas, a prospective study to determine the epidemiology and outcome of TBM in children was undertaken.

Patients and methods

All children < 14 years of age admitted to Pelonomi Hospital, Bloemfontein, with a diagnosis of TBM over a 5-year period (1984 - 1988) were studied. They were hospitalised for a minimum period of 12 months and a maximum period of 18 months and thereafter clinically evaluated to determine the outcome of their disease.

The criteria for diagnosis of TBM included either of the following: (i) any three of: (a) cerebrospinal fluid (CSF) pleocytosis and protein level > 0.4 g/l; (b) evidence of tuberculous meningitis, such as chest radiographic appearances or gastric washings positive for Mycobacterium tuberculosis; (c) CSF culture positive, bromide partition ratio < 1.6 or CSF adenosine deaminase activity (ADA) > 5 U/l; (d) computed tomography of the brain showing ventricular enlargement or basal enhancement; (e) clinical course consistent with TBM; or (ii) autopsy evidence of TBM.

The clinical condition of the patients on admission to hospital was classified into three stages according to the British Medical Research Council classification.3 These are as follows: stage 1 - fully conscious and rational with signs of meningeal irritation but with no focal neurological signs or signs of hydrocephalus; stage 2 - mentally confused and/or neurological signs such as squints or hemiparesis; and stage 3 - mentally inaccessible owing to the depth of stupor or delirium or a complete hemiplegia or paraplegia.

On admission to hospital it was established whether patients had received BCG vaccine. Either proof of vaccination on a clinic chart or the presence of a vaccination scar was regarded as evidence of BCG vaccination. If neither was positive, vaccination was recorded as uncertain.

After completion of chemotherapy, patients were also classified according to the eventual outcome using the basic categories employed by Kennedy and Fallon:4 (i) apparently good health or a minor physical abnormality that does not interfere with the child's lifestyle; (ii) minor sequelae, such as mild mental retardation, epilepsy, deafness or behavioural problems; (iii) major sequelae — either severe mental retardation or mild mental retardation with physical abnormalities, such as hemiparesis or athetoid movements; and (iv) death during the period of inpatient treatment.

Results

Seventy-five patients were included in the study over the 5-year period, of which 67 were black and 8 coloured. There were 41 girls (54%). Ages ranged from 2 months to 12 years (median 22 months). Of the patients, 52% were aged < 2 years and 78% < 5 years.

Place of origin

The largest group of patients (41%) came from small towns, villages and farms scattered throughout the central and southern parts of the OFS; 20% came from the townships of Bloemfontein, small holdings round Bloemfontein and farms in the magisterial district of Bloemfontein; 11% came from Botshabelo, a large black settlement area near Bloemfontein; 16% came from towns and farms situated in the north and north-eastern parts of the Cape Province; only 3 patients came from the town of Welkom in the OFS; and the rest came from the western Transvaal, Lesotho, Qua-Qua and Transkei (Fig. 1).

Incidence

It was not possible to estimate the incidence of TBM in the OFS, since this study was confined to one hospital. We did,
however, attempt to establish the incidence of TBM for the City of Bloemfontein (12 children). The population denominator was derived from the 1985 census figures and was 67 154 children <15 years of age. The annual incidence was therefore 3,6/100 000. The incidence by population group was as follows: white 0/100 000; coloured 2,7/100 000 and black 6,3/100 000.

Stage of disease

Table I shows the stage of disease at the start of treatment of our study group. Only a minority (7%) was classified as stage 1, whereas most patients were in stages 2 or 3.

<table>
<thead>
<tr>
<th>Stage</th>
<th>No. of patients</th>
<th>%</th>
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<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>7</td>
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<tr>
<td>2</td>
<td>44</td>
<td>58</td>
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<td>3</td>
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BCG vaccination

Of the 75 patients, 36 (48%) did not receive BCG vaccine and 4 died. There was no difference in the survival rate between the group of 25 patients (35%) that received (8 deaths) and the group that did not receive BCG vaccine ($\chi^2 = 2,58; P = 0,1079$). In 13 patients it was uncertain whether they had received BCG vaccination (there were 2 deaths in this group).

Outcome

Of the 75 patients, 61 survived (82%). However, 47% of the survivors suffered from either a major or minor disability. The overall mortality rate was 18% (Table II). Fig. 2 shows the outcome by age group. Patients who were well or had minor complications according to the categories of Kennedy and Fallon were considered as having a good outcome. Fig. 3 displays the outcome according to the stage of the disease at the onset of treatment.

Discussion

TBM remains a problem among less-privileged children in our society, especially the very young. This is borne out by the fact that 78% of the children in this study were <5 years and 52% were <2 years of age. The dangers of TBM in young children are reflected in other published series. For this reason, preventive measures should be aimed at children <5 years.

Most of the patients came from rural areas, as was the case in the only other large series recently published in South Africa — from the western Cape. The largest group of patients originated from small villages and farms in the central and southern parts of the OFS. It appears that many of these areas lack adequate primary care facilities and this requires urgent attention.
The annual incidence of TBM for the City of Bloemfontein was 3.6/100,000 for all races. This figure can be compared with an incidence for the City of Cape Town of 1.75/100,000 in 1981. National figures for <15-year-olds give an incidence of 1.24/100,000 for 1988. This higher figure for urban children in Bloemfontein is distressing and should be cause for concern. However, the census figures may be inaccurate and the risk of infection overestimated.

The fact that most of the patients were in stage 2 or 3 on admission shows that they reached hospital at a late stage and were already seriously ill.

Many controversies exist regarding the efficacy of BCG vaccination. It has been said that BCG benefits the individual rather than the community and it is assumed that the vaccine will protect against the serious complications of primary tuberculous infection during childhood. In this study this does not seem to be true, since 35% of the patients with TBM had received BCG vaccine. Another point of concern is that almost half the children studied did not have any record of having received BCG vaccine. This could be a further indication of poor primary health care in certain regions of the OFS.

The results presented conform to the data presented in other series.5,6,8,9 The mortality rate of 18%, however, is lower than in most other studies. This may be attributed to the fact than increased intracranial pressure was treated medically and/or surgically in all patients studied. Early aggressive treatment of raised intracranial pressure is known to improve the outcome of TBM in children.9 Poor outcome in TBM correlates with young age and late-stage disease at presentation. Both facts were confirmed in both this study and the western Cape study.2

In conclusion, the incidence and outcome of TBM in children in Bloemfontein and the surrounding areas is a matter for concern. The mortality and morbidity related to TBM are largely preventable. A high index of suspicion and early administration of appropriate therapy are very important. Improvement of primary health care services in the OFS will decrease the incidence of this dreaded disease.

REFERENCES