

## Outcome of tuberculous meningitis in children: the first comprehensive retrospective cohort study in Indonesia

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### SUMMARY

**BACKGROUND:** Tuberculous meningitis (TBM) is the most severe form of extra-pulmonary tuberculosis.

**OBJECTIVE:** To assess hearing, visual, motor function, neurological and mental development outcomes in paediatric TBM.

**METHODS:** A retrospective cohort study was conducted among 139 children with TBM registered and treated at the Department of Child Health, Dr Hasan Sadikin Hospital, Bandung, Indonesia, from January 2007 to December 2010. Hearing and visual function, appearance of optic disc, motor function, and neurological and mental development were evaluated.

**RESULTS:** Of a final 128 patients (10 died during hospitalisation, 1 was excluded), 34 (26.5%) died after

hospital discharge, the addresses of 58 patients could not be found and 7 parents refused to participate. The remaining 29 patients (16 males, 13 females) were available for evaluation; the mean age was 44 months (range 7–162). Hearing loss and visual impairment were identified in respectively 11/28 and 10/25 patients. Most patients had motor disorders. Delayed neurological and mental development was observed in nearly three quarters of patients, 11 of whom had normal or borderline intelligence quotient.

**CONCLUSIONS:** TBM causes high mortality and sequelae involving hearing and visual impairment, and neurological and mental development.

**KEY WORDS:** outcome; TBM; children

ALTHOUGH CHILDHOOD TUBERCULOSIS (TB) contributes approximately 10–20% of all TB cases,<sup>1</sup> rising to 40% in some endemic countries,<sup>2</sup> data on childhood TB in endemic area are rare and inaccurately reported.<sup>3,4</sup> Children are at higher risk of developing severe extra-pulmonary TB, especially meningitis and miliary TB.<sup>5</sup> Of all forms of TB, tuberculosis meningitis (TBM) has been reported to have the highest rates of morbidity and mortality.<sup>6</sup> Limited-resource countries such as Indonesia still encounter many problems in the accurate diagnosis and early detection of childhood TB and TBM. In fact, poor outcome is directly associated with delayed diagnosis and poor treatment adherence.<sup>7</sup>

TBM prevalence among children in some countries is as follows: 214 cases in 8 years (1988–1996) in Turkey,<sup>8</sup> 23 cases in 20 years (1977–1997) in the United Kingdom,<sup>9</sup> 16 cases in 16 years (1982–1998) in Greece,<sup>5</sup> 20 cases in 10 years in California, USA,<sup>10</sup> 554 cases in 20 years in South Africa.<sup>11</sup> Half of the survivors had permanent neurological sequelae, varying from cranial nerve paralysis, ophthalmoplegia, seizure, psychiatric disorders and ataxia to

paresthesia, blindness, deafness and mental retardation.<sup>5,8,12</sup> No study covering all aspects of TBM sequelae, including hearing, vision, motor development, neurological and mental disorders, has been published in Indonesia to date.

### PATIENTS AND METHODS

#### *Study design and setting*

This was a retrospective cohort study among TBM patients admitted between January 2007 and December 2010 to Dr Hasan Sadikin Hospital, Bandung, Indonesia. Each patient's TBM record was reviewed and rechecked against the patient's hospital records for clinical features, results of investigations, treatment and outcome. We prospectively followed the 128 TBM patients post-hospitalisation (Figure).

#### *Patient recruitment*

Documented hospital-based TBM records of 139 TBM children were obtained. The parents and/or guardians of the patients were invited to bring the children for further examinations, i.e., physical,