

Predicting TB outbreaks based on the first 2 cases

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Outbreaks of tuberculosis (TB) may be able to be identified by looking at certain characteristics of the first two patients, according to new research. If the first two patients are diagnosed within three months of each other, live in urban areas, and if one or both are of sub-Saharan African origin, there is a 56 percent chance that the two cases will lead to a large outbreak of TB, whereas if the patients exhibit none of those characteristics, the odds are just one percent.

The research, which appears in the first issue for July of the *American Journal of Respiratory and Critical Care Medicine*, published by the American Thoracic Society, is the first to determine that patient characteristics might be used to predict outbreaks and thus more efficiently allocate limited public health resources.

“Early identification of clusters that could potentially become large could help focus TB control efforts, especially in low-incidence countries that approach the elimination phase of TB,” wrote lead author of the study, Sandra V. Kik, M.Sc., an epidemiologist at the KNCV Tuberculosis Foundation in The Hague, The Netherlands. “The aim of our study was therefore to determine which characteristics of the first two cases can predict the development of a large cluster.”

To do so, Kik and her colleagues analyzed data from the Netherlands Tuberculosis Register and the National Institute of Public Health and the Environment from 18,200 patients with reported TB between 1993 and 2004. They discounted non-culture-confirmed cases, cases that could not

be exactly matched between the two databases and duplicate cases, and then determined which cases were a part of a cluster episode of 2 years—and whether those cluster episodes were small (four or fewer cases) or large (five or more.) In the final analysis, they had 622 cluster episodes, comprising 1,756 individual cases, 54 of which were large clusters.

“In 36 of the 54 (67 percent) large clusters, the first two cases were diagnosed within a period of three months, compared to 150 of the 568 (26 percent) in small clusters,” wrote Ms. Kik. “The short time period between two successive patients was the strongest predictor. If two patients are diagnosed within 3 months of each other, and they belong to the same M.tuberculosis cluster this is a strong indication for an upcoming outbreak,” said Ms. Kik.

In addition to having the initial two cases identified within three months of one another, if the initial two patients were under the age of 35, were of sub-Saharan African origin, or lived in an urban setting, they were also more likely to be a part of a large versus small cluster.

“The main advantage of using patient characteristics as predictors is that these are known shortly after diagnosis and easy to determine as this information is often part of the current registration system,” said Ms. Kik.

While noting that the specific predictive characteristics of the first-two-patient model may vary from country to country, the authors point out that their research methodology could be used to determine those characteristics with the most predictive power whatever the country, and thus have the potential to concentrate limited public health resources in the areas that may have the greatest public health impact.

“This study confirms previous understanding that tuberculosis is a social

– as well as infectious disease – that depends for its spread on the nature of human interactions and the social context,” say John Heffner, Md., past president of the ATS. “What is fascinating is that the authors identified quite early in a cluster outbreak specific social factors that predicted the rapidity and extent of disease transmission, which allows more focused interventions.”

Creative ways to identify the most powerful interventions are essential to fight the global spread of TB. “If we could also rapidly identify new clusters of TB cases at the population level, we could intervene in time to prevent them from enlarging,” wrote Kathryn DeReimer, Ph.D., of the University of California at Davis and Bouke C. de Jong, M.D., of New York University in an editorial in the same issue of the journal. “We need to be clever and quick to limit further transmission and new cases of *M. tuberculosis* worldwide.”

Source: American Thoracic Society

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