

A DISTRIBUTION MAP OF CHILDHOOD TUBERCULOSIS IN AGE GROUP OF 0-14 YEARS BY THE COVERAGE OF EXCLUSIVE BREAST MILK AND BCG IMMUNIZATION

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ABSTRACT

Tuberculosis (TB) can infect all age groups, even children. Three provinces in Indonesia namely West Java (14%), Papua (13%), and Bangka Belitung provinces (11%) have the highest proportion of children with TB disease. Some previous research reveals that there is a relationship between exclusive breastfeeding and BCG immunization status of children with TB disease. This current study identified the increasing trend of children (aged 0-14 years) with TB disease in Bangka Belitung province based on the coverage of exclusive breastfeeding and BCG immunization. It was observational research with a cross-sectional design. Data were retrieved from seven districts/cities in Bangka Belitung province in 2015-2017. The unit of analysis was the number of overall TB cases, the percentage of BCG immunization coverage, and exclusive breastfeeding. The data were analyzed using the Health Mapper application version 4.3.0.0 with product version 4.03. The number of children (aged 0-14 years) with TB disease increased from 2015-2017, and BCG immunization coverage and exclusive breastfeeding decreased in 2015-2016 only, but swelled in 2016-2017. The number of TB cases was still high despite the high coverage of exclusive breastfeeding and BCG immunization. Several factors such as the quality of vaccines and exclusive breastfeeding might influence the prevalence of TB in children. Future studies should employ more variables to garner more references.

Keywords: Bangka Belitung province, pediatric tuberculosis, exclusive breastfeeding, Bacillus Calmette-Guérin immunization

ABSTRAK

Penyakit TB (Tuberkulosis) dapat menyerang segala kelompok umur, termasuk anak-anak. Tiga provinsi di Indonesia dengan proporsi pasien TB anak tertinggi adalah Jawa Barat (14%), Papua (13%), dan Kepulauan Bangka Belitung (11%). Penelitian sebelumnya mengungkapkan adanya hubungan antara pemberian ASI eksklusif maupun status imunisasi BCG terhadap TB anak. Penelitian ini mengidentifikasi adanya kecenderungan peningkatan TB anak (usia 0-14 tahun) yang terjadi di Provinsi Kepulauan Bangka Belitung berdasarkan cakupan pemberian ASI eksklusif dan imunisasi BCG. Jenis penelitian ini adalah penelitian observasional dengan desain studi potong lintang. Data didapatkan dari tujuh kabupaten/kota di Provinsi Kepulauan Bangka Belitung tahun 2015-2017. Unit analisis penelitian ini meliputi jumlah populasi kasus TB, persentase cakupan imunisasi BCG, dan ASI eksklusif. Pengolahan data menggunakan aplikasi Health Mapper versi 4.3.0.0 dengan seri produk 4.03. Terjadi kenaikan kasus TB anak (usia 0-14 tahun) dari 2015-2017. Penurunan cakupan imunisasi BCG dan pemberian ASI eksklusif hanya terjadi pada tahun 2015 ke 2016, tetapi meningkat dari tahun 2016 ke 2017. Angka kasus TB yang masih tinggi meskipun telah disertai cakupan pemberian ASI eksklusif dan BCG yang tinggi. Hal ini mungkin dipengaruhi oleh beberapa faktor seperti kualitas vaksin dan ASI eksklusif. Penelitian selanjutnya dapat menggunakan variabel lain sebagai referensi rujukan.

Kata kunci: Kepulauan Bangka Belitung, tuberkulosis anak, ASI eksklusif, imunisasi Bacillus Calmette-Guérin.

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INTRODUCTION

Tuberculosis (TB) is a contagious disease in humans and often occurs globally, including Indonesia, a tropical country with high population. *Mycobacterium tuberculosis* is the direct cause of TB disease. TB transmission

occurs through the air when people with TB disease expel bacteria into the air either through cough or sneeze (WHO, 2019).

Mycobacterium germs have several species including *Mycobacterium africanum*,

Mycobacterium tuberculosis, *Mycobacterium bovis*, *Mycobacterium leprae*, and others classified as acid resistant bacteria (Indonesian Ministry of Health, 2018). The characteristics of the bacteria can survive for several months, especially in dark or humid conditions. Infections caused by these bacteria include lung infections and blood vessels throughout the body parts such as the bones, joints, lymph, and brain. A TB disease that occurs other than in the lungs is called extrapulmonary.

Developing countries like Indonesia suffer much from TB. The World Health Organization (WHO) ranked TB disease as the top 10 causes of death in the world and top three deadly infectious diseases in lower-middle income countries (WHO, 2018). In 2016, the number of TB cases globally reached more than 10 million, and people with HIV constituted 10% of the total cases. It mostly happened in Indonesia, India, the Philippines, China, Africa, and Pakistan. The number of TB cases in Indonesia increased from 425,089 cases in 2017 to 360,565 cases in 2016. Central, West, and East Java provinces were in the top three provinces with the highest number of TB cases at 43% of the total TB cases (Indonesian Ministry of Health, 2017). The prevalence of TB in Indonesia in 2018 was 0.4 where Banten province had the highest TB prevalence (Indonesian Ministry of Health, 2018).

TB disease can affect all age groups from children to adults where 75% of the productive age group (15-49 years) suffer from this disease. Symptoms of TB, in general, include chronic cough and phlegm, weight loss (without being accompanied by cough in children), night sweats, low-grade fever, weakness, and lethargy. TB can attack organs other than the lungs and have various symptoms. TB diagnosis in children usually can be seen from a children's TB scoring system, while in adults from a minimum of sputum/sputum tests, chest X-rays, and blood tests (Sembiring, 2019).

According to the epidemiological triangle, the risk factors for TB disease can be seen from three aspects, namely the host, agent, and environment. When viewed from the host factor, the body's resistance affects a person's susceptibility to *Mycobacterium tuberculosis* infection. People who are infected or have poor nutritional status will be more susceptible to TB disease (Indonesian Ministry of Health, 2018). *Mycobacterium tuberculosis*

becomes a direct cause of TB disease, while the environmental component holds a fairly broad scope such as the physical environment, social environment, and economy.

Research in Garut, West Java stated that children's nutritional status, parental knowledge, TB contact history, exclusive breastfeeding, and BCG immunization had a relationship with the occurrence of TB in children (Yani et al, 2018). Children without exclusive breastfeeding had a 9.198 times greater risk of developing pulmonary TB disease than children who are exclusively breastfed (Aziz, 2018). Exclusive breastfeeding contributes to improving the immune development of infants from exposure to disease and an unhealthy environment. The components in breast milk are also anti-inflammatory to control inflammation in babies (Alasil and Kutty, 2015). The Indonesian Ministry of Health on February 7, 2015 reported three provinces with the highest proportion of pediatric TB patients were West Java (14%), Papua (13%), and the Bangka Belitung Islands (11%).

Immunization could prevent TB disease. A complete basic immunization program reached more than 85% in the last five years although this percentage had not yet met the national target at 92% according to the strategic plan. Immunization can reduce the probability of death (mortality) due to certain diseases. In 2017, Bangka Belitung Islands had the basic immunization coverage of 24,772 people (92.8%) and BCG immunization of 24,882 people (91.2%) (Indonesian Ministry of Health, 2017). The provision of BCG immunization is associated with TB cases in children as it is assumed to prevent TB infection, especially pulmonary TB (Febriyeni, 2017). Research in Banyuasin stated that 85%-effective BCG immunization could reduce childhood TB by 33.5%. This shows that immunization status affects numbers of childhood TB cases in Banyuasin (Wulanda, 2018).

Exclusive breastfeeding is a source of nutritional intake for babies which have received it since 0 to 6 months old (Indonesian Ministry of Health, 2018). The coverage of exclusive breastfeeding in the Bangka Belitung Islands for 2015-2017 was fluctuating. The coverage of exclusive breastfeeding in this province was 58.33% in 2015, while at 55.12% in 2016 and 57.96% in 2017. Although it kept

rising, It did not achieve the target yet (Bangka Belitung Islands Provincial Health Office, 2017).

Support for growth and development of infants and treatment of health problems and infections in children are also the benefits of exclusive breastfeeding (Bangka Belitung Islands Provincial Health Office, 2017). This study aimed to describe the number of TB cases in children, especially aged 0 to 14 years based on the coverage of exclusive breastfeeding and BCG immunization in the Bangka Belitung Islands.

METHOD

This descriptive-analytic research used research population of districts or cities in the Bangka Belitung Islands. Data for the period of in 2015-2017 were retrieved from seven districts or cities in the Bangka Belitung Islands. This study analyzed the number of TB cases, the coverage percentage of BCG immunization and exclusive breastfeeding.

Variables included the incidence of TB cases (children aged 0-14 years) for three years (2015, 2016, and 2017), exclusive breastfeeding, and BCG immunization coverage. The data from the period were collected from the Bangka Belitung Islands Provincial Health Office. Health Mapper version 4.3.0.0 was used for the data analysis on health status mapping and surveillance. The analysis results were used by the WHO for infectious disease surveillance at the national and world levels.

RESULT

Distribution of Childhood Tuberculosis (0-14 Years) by Coverage of Exclusive Breastfeeding

In 2015, the number of TB cases (aged 0-14 years) in the Bangka Belitung Islands was 171 cases, while the coverage of exclusive breastfeeding was 58.33% which was below the Strategic Plan of the Health Office at 75% in 2015. Several districts or cities including Bangka, Belitung, and Pangkal Pinang had the same percentage. Meanwhile, in Central Bangka and West Bangka, the high number of TB cases in children was followed by low practice of exclusive breastfeeding. Two

other districts i.e., South Bangka with low exclusive breastfeeding coverage and East Belitung with high exclusive breastfeeding coverage had fewer childhood TB cases compared to other districts or cities (Bangka Belitung Islands Provincial Health Office, 2015).

The number of TB cases in children (aged 0-14 years) in the province increased from 171 in 2015 to 221 cases in 2016. The coverage of exclusive breastfeeding for infants aged 0 to 6 months decreased from 58.33% in 2015 and 55.12% in 2016. The coverage of exclusive breastfeeding has not yet reached the target at 80% in the 2016 Strategic Plan. The number of childhood TB cases in South Bangka increased along with the coverage of exclusive breastfeeding. Districts or cities with an increasing number of TB cases in children but a decrease in the coverage of exclusive breastfeeding were Bangka and Belitung. The increased number of childhood TB cases along with the increased coverage of exclusive breastfeeding existed in West Bangka, Pangkal Pinang, and East Belitung. While that with the decreased coverage of both variables occurred in Central Bangka (Bangka Belitung Islands Provincial Health Office, 2016).

The number of childhood TB cases (aged 0-14 years) increased in 2017 (415 cases), so did exclusive breastfeeding by 57.96%. The distribution map of the cases and coverage of the two variables is presented in Figure 1 (Bangka Belitung Islands Provincial Health Office, 2017).

There were 171 childhood TB cases in 2015 in the Bangka Belitung Islands Province, followed by BCG immunization coverage of 96.88%. This immunization coverage reached the target at 91% in the 2015 Strategic Plan of the Indonesian Ministry of Health. Central Bangka, Bangka, Belitung, West Bangka, and Pangkal Pinang Districts/cities had a high number of childhood TB cases followed by the high coverage of BCG immunization. On the other hand, East Belitung had the low number of childhood TB cases, followed by unmet BCG immunization. Few TB cases with the very high BCG immunization coverage only occurred in South Bangka where seven cases was followed by 101.48% BCG immunization coverage (Bangka Belitung Islands Provincial Health Office, 2015).

In 2016, the provided had more cases as many as 221 cases but less BCG immunization at 93.92%. The immunization coverage did not meet the 2016 Strategic Plan of the Indonesian Ministry of Health at 91.5%. Bangka, Belitung, and South Bangka had an increasing number of childhood TB cases but low immunization coverage. Fewer cases and lower immunization

coverage were present in West Bangka, Pangkal Pinang, Central Bangka, and East Belitung (Bangka Belitung Islands Provincial Health Office, 2016). In 2017, the number of TB cases went higher as the coverage did. The distribution map of the cases and coverage is demonstrated in Figure 2 (Bangka Belitung Islands Provincial Health Office, 2017).

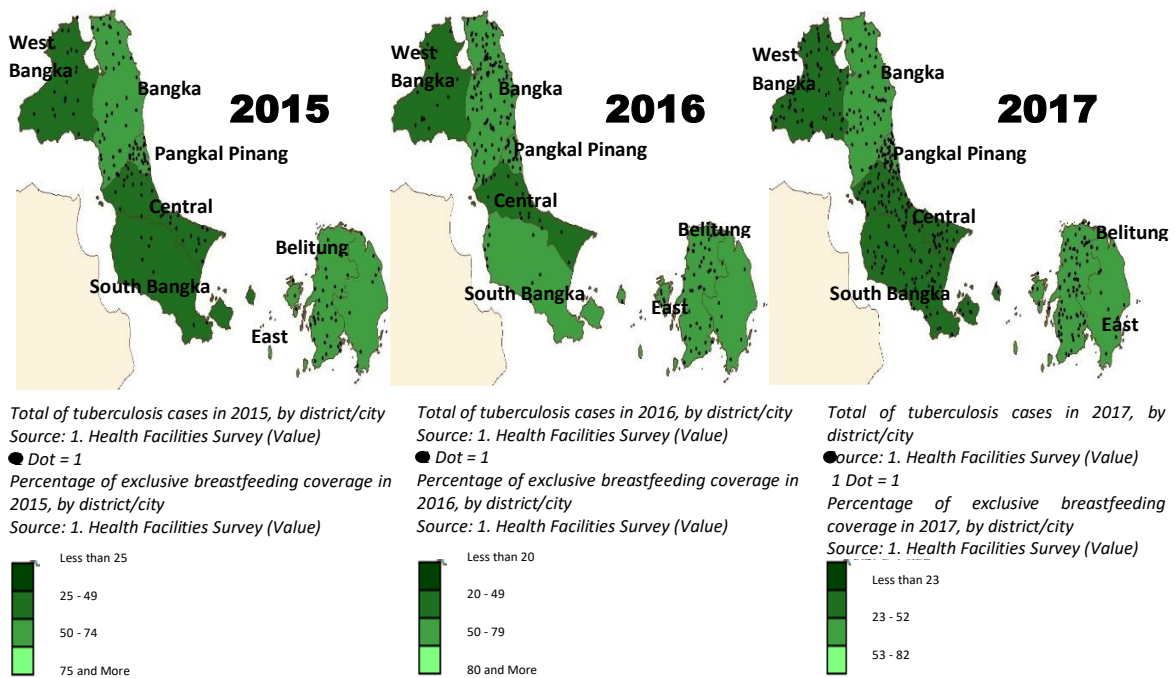


Figure 1. Distribution map of childhood TB cases (0-4 years) by coverage of exclusive breastfeeding.

Distribution of childhood TB (0-14 years) by BCG Immunization Coverage

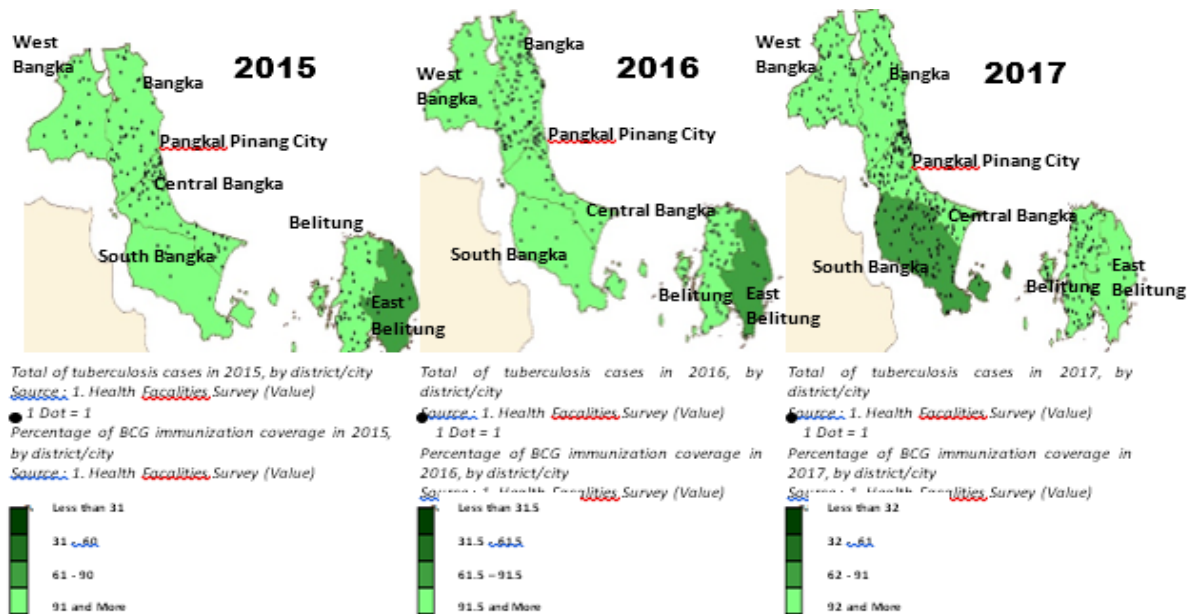
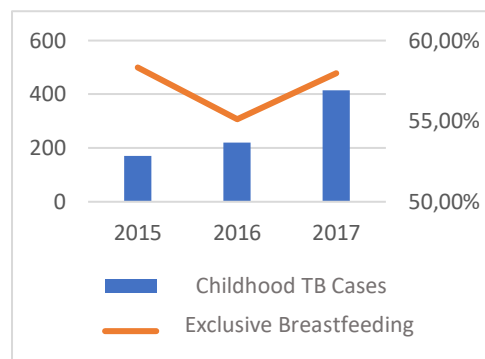
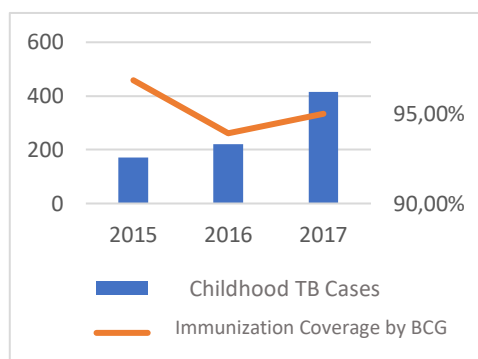


Figure 2. Distribution map of childhood TB cases (0-4 years) by BCG immunization coverage

Graph. 1 shows that increased numbers of childhood TB cases (0-14 years) followed by increased BCG immunization coverage from 2015 to 2016. Meanwhile, increased numbers of childhood TB cases from 2016 to 2017 were accompanied by

decreased coverage of BCG immunization. Graph 2 shows that similar trends every year but in 2015 to 2016 where the number of exclusive breastfeeding decreased. From 2016 to 2017, the coverage of exclusive breastfeeding for toddlers rocketed.

Distribution of Childhood TB (0-14 years) by BCG Immunization Coverage and Exclusive Breastfeeding



Note: x = years; y = number of TB cases, exclusive breastfeeding coverage

Graph 1. Distribution of childhood TB cases (0-14 years) by BCG immunization coverage within three years

Graph 2. Distribution of childhood TB cases (0-14 years) by exclusive breastfeeding coverage within three years

DISCUSSION

Distribution of Childhood TB (0-14 years) By Exclusive Breastfeeding Coverage

The number of childhood TB cases (0-14 years) from 2015-2017 in the Bangka Belitung Islands generally increased, but exclusive breastfeeding in infants aged 0 to 6 months fluctuated. Some districts experienced a high number of childhood TB cases accompanied by low coverage of exclusive breastfeeding, but others went reversely. Several studies discussed the relationship between exclusive breastfeeding, the incidence of TB cases, and BCG immunization. Some proved that exclusive breastfeeding had a relationship with the occurrence of infectious diseases in children, for example, childhood TB (Yani et al, 2018).

Research in Aceh found that exclusive breastfeeding can reduce TB disease. Children under five years old (toddlers) with non-exclusive breastfeeding had a 1.4 times risk of suffering from infectious diseases compared to exclusively breastfed infants. Antibodies of infants are produced from the fetus in the womb to the placenta and then breast milk (Nur and

Marissa, 2014). Breastfeeding given until the age of two years can minimize the number of infant mortality due to diarrhea and acute respiratory infections. Breast milk protects babies from exposure to microorganisms in the gastrointestinal tract as their immune system has formed (IDAI, 2013).

Colostrum has rich proteins in antibodies as the body's immune system to kill germs (Indonesian Ministry of Health, 2017). Exclusive breastfeeding primarily could meet the nutritional needs and child's immune system against diseases because breast milk has lysozyme and immunoglobulin A which function to break the cell walls of enterocyte bacteria and *Mycobacterium tuberculosis* (Aziz, 2018).

The coverage of exclusive breastfeeding in the province was still lacking. It is evident from the coverage of exclusive breastfeeding from 2015 to 2017 that did not meet the standards. Low exclusive breastfeeding may be subject to several influencing factors such as socio-culture, awareness of the importance of breastfeeding, and lack of mothers'

knowledge about exclusive breastfeeding (Bangka Belitung Islands Provincial Health Office, 2017). Research in the Jetis Primary Healthcare Center in Yogyakarta discovered that exclusive breastfeeding had a relationship with the incidence of childhood TB cases (in the age group of 3-11 years). As many as 65.5% of the children who were exclusively breastfed did not suffer from pulmonary TB (Saman, 2013).

The low practice of exclusive breastfeeding may cause the high incidence of childhood TB cases (in the age group of 0-14 years) in several districts or cities in the Province of the Bangka Belitung Islands. Besides, it also could be due to immunization status and non-crowded housing. The Children's Polyclinic of Indonesian Community Center of Lung Health / *Balai Besar Kesehatan Paru Masyarakat* (BBKPM) Surakarta in 2015 showed children who were exclusively breastfed had a 2.25 times greater risk of suffering from TB disease than those who were not despite the insignificant result (Rahmawati, 2015).

Distribution of Childhood TB Cases (0-14 years) by BCG Immunization Coverage

The BCG vaccine which contains attenuated *Mycobacterium bovis* has been used for a long time in Indonesia. It can prevent either primary TB infection or reactivation of latent TB infection (IDAI, 2016). The increase in TB cases from 2015 to 2017 was not accompanied by a decline in BCG immunization coverage. The BCG immunization coverage was more volatile to increase or decrease. High coverage of BCG immunization resulting in high TB incidence in children could be influenced by the quality of the vaccine, the dose of vaccine given, and the health condition of the recipient once vaccinated. A study in Semarang mentioned that BCG immunization had no significant relationship with the incidence of pulmonary TB in children (Puspitasari et al, 2015). A hospital in North Aceh showed that BCG immunization history in children did not have a significant relationship with the incidence of childhood TB cases. BCG immunization has varied effectiveness as it cannot fully protect against diseases (Surura et al, 2015). Research in Semarang

mentioned BCG immunization had no relationship with the occurrence of pulmonary TB diseases (Kholifah and Indreswari, 2015). In Pandian Primary Healthcare Center, Sumenep Regency, East Java, BCG immunization and childhood TB cases were interrelated. It might be assumed that BCG immunization is a protective factor against TB in children (Rachim, 2014). Research at RSUD Dr.H. Abdul Moeloek, Lampung Province found that unvaccinated children had a 2.6 times greater risk of developing pulmonary TB than vaccinated children (Sjahriani, 2018). BCG immunization status is one of the risk factors for pulmonary TB in children besides other risk factors such as social status, normal nutritional status, and economy (Siregar et al, 2018).

The low coverage of BCG immunization may occur because of far distance from residence to adequate health facilities or lack of BCG immunization (Susanto et al, 2016). Mother's attitude and motivation for BCG immunization are also important factors. Research in Tanjung Jabung Barat Regency, Jambi Province presented that mothers who lacked immunization information were 95 times at risk of not completing immunization for their babies. Those who were less motivated for immunization were 37 times at risk of having incomplete basic immunization for their children (Yundri et al, 2017). From other perspective, it says people who had scars due to BCG immunization did not suffer from TB (Rosandali, 2016). In addition to maternal factors, social factors such as continuous health promotion through Integrated Health Post (*Posyandu*) services can also prevent childhood TB (Sugandi, 2018).

CONCLUSIONS AND SUGGESTIONS

Conclusion

Overall, TB cases in children aged 0 to 14 years in the Bangka Belitung Islands in 2015-2017 increased, but the coverage of exclusive breastfeeding and BCG immunization went fluctuating. Exclusive breastfeeding decreased from 2015 to 2016 but increased from 2016 to 2017. The coverage of BCG immunization also decreased from 2015 to 2016, but swelled from 2016 to 2017. The success of BCG

immunization for TB cases (0-14 years) might be influenced by the quality of the vaccine and exclusive breastfeeding.

Suggestion

Further research on the distribution map of TB cases can involve more independent variables, such as nutritional status or environment.

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