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MAIN TRENDS IN THE INCIDENCE OF TUBERCULOSIS IN THE SAKHA REPUBLIC (YAKUTIA) OVER THE PERIOD FROM 2013 TO 2018

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The main trends in the tuberculosis (TB) incidence in the Sakha Republic (Yakutia), over the period from 2013 to 2018 were revealed.

The following rates were analyzed (based on reports from facilities subordinate to Ministry of Health of the Sakha Republic (Yakutia), and reports from all agencies irrespective of subordination): TB incidence rates among general population; TB incidence among adults; TB incidence among children and adolescents; TB incidence among urban and rural population; incidence of pulmonary TB; incidence of TB cases positive for M.tuberculosis (MTB); incidence of multidrug-resistant tuberculosis (MDR) in Sakha Republic (Yakutia) in the dynamics. Favorable epidemiologic situation for TB was observed. The obtained findings call for more improvements in conducting anti-TB activities among rural population, and comprehensive measures to decrease the incidence of MDR TB.

Keywords: tuberculosis, epidemiologic situation, incidence, incidence decrease rate.

Incidence rate of tuberculosis (TB) in general population is an important indicator used in analysis of epidemiologic situation of TB. Data on TB incidence serve an unbiased method for evaluating population health and changes in it, and also, one of measures used to assess the work of TB services and healthcare facilities [4]. In view of this, monitoring of main trends in incidence rates over time is one of priority tasks, in terms of predicting the epidemiologic situation for TB and estimating quality of anti-TB care for population.

Aim: detect main trends in the TB incidence in the Sakha Republic (Yakutia), over the period from 2013 to 2018.

Methods: Based on reports from facilities subordinate to Ministry of Health of the Sakha Republic (Yakutia), and reports from all agencies irrespective of subordination, the following rates were analyzed: TB incidence rates among general population; TB incidence among adults; TB incidence among children and adolescents; TB incidence among urban and rural population; incidence of pulmonary TB; incidence of TB cases positive for M.tuberculosis (MTB); incidence of multidrug-resistant tuberculosis (MDR) in Sakha Republic (Yakutia) over the period from 2013 to 2018.

Data were extracted from national statistical reports and registries of persons with TB, collected and maintained within the scope of TB epidemiologic surveillance system of the Phthisiatry Research-Practice Center.

Statistical data processing was performed using Excel 2010, and software packages Statistica-8 and Biostat. Time series analysis was performed, to calculate mean annual rates of increase/decrease. For trend construction, and detection of tendencies in TB incidence, we calculated 5-year rates of increase and mean increase rates, performed time series fitting using quadratic approximation function, and calculated R-squared (R2) coefficient.

Results: Incidence of TB in the Sakha Republic (Yakutia) (statistical form no. 8, including reports from all agencies irrespective of subordination) was 29% lower in 2018, compared to 2013 (54.2 per 100000 pop.). It was also 18.1% higher than the average rate in Russia (44.4), and 26.8% lower than the rate in Far-East Federal District (74.1). Over the 5-year study period, the largest decrease rate was observed in 2016 (-15.2%), the lowest – in 2015 (-1.1%); mean decrease rate was -7.1%. As is seen in Fig.1, there is a negative linear trend with R2 value of 0.94, which suggests the existence of marked stable tendency to decrease in

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TB incidence in general population.

Based on reports from facilities subordinate to the Ministry of Health of the Sakha Republic (Yakutia) (form no. 33), TB incidence has declined by 29.4% over the study period (from 69.6 to 49.1 per 100000 pop.); it was 21.6% higher than the rate in Russia (38.5), but 24% lower than in the Far-East Federal District (64.6). Incidence decrease rate had been varying from -2.2% (2017) to -9.6% (2016); mean decrease rate was -6.4%. Overall, during the study period, there was a negative linear trend with high R2 value (0.98), i.e. a noticeable stable trend to decrease was observed.

TB incidence among adult population of Yakutia had decreased from 84.9 to 60.9 (per 100000), i.e. by 28.3%. Mean incidence decrease rate was -6.4%; the lowest and highest decrease rates were observed in 2017 (-2.4%) and 2016 (-9.5%), respectively. Over the study period, there was an observable negative linear trend with R2=0.96, signifying an apparent stable tendency to decreasing incidence of TB in adults.

Incidence of TB in children is one of key indicators of epidemiologic situation for TB [1]. In 2018, child incidence of TB in Yakutia was 33.6% lower, compared to 2013 (15.0 per 100000 pediatric population); it was 14.8% lower than in Far-East Federal District (17.6), but 44.7% higher than the same in Russia (8.3). Upsurges were observed in 2014 and 2016 (increase rates of 4.4 and 1.0%, respectively). Nevertheless, an observed negative polynomial trend with R2=0.96 along with the mean decrease rate of -7.5% speak for the presence of pronounced stable tendency to decrease in child TB incidence (Fig. 2).

Incidence of TB in adolescents declined by 20.7% (from 51.1 to 40.5, per 100000 adolescent population); mean decrease rate was -0.6%. This rate showed no tendency to decrease (R2=0.03), and the increase/decrease rate varied substantially, from 51.1% (2017) to 29.1% (2018).

Over the period from 2013 to 2018, incidence of TB in urban residents exceeded the incidence among rural population of Yakutia, although decrease rate was higher in urban population (Fig. 3). Urban incidence of TB was 41.2% lower in 2018 compared 2013 (52.2 per 100000 urban pop.). Rates of decrease were varying from -2.4% (2017) to -19.3% (2014); increase rate of 8.1% was observed in 2015 (from 71.6 to 77.4, per 100000 urban pop.); mean decrease rate was -9.5%. Over the 5-year period, negative polynomial trend with R2=0.86 was observed, suggesting markedly stable tendency to decrease in urban TB incidence.

Incidence of TB in rural residents had decreased from 2013 to 2018 by 16.5% (from 60.6 to 50.6, per 100000 rural pop.), with the upsurges in 2014 (increase rate 13.0%) and in 2017 (minor increase rate 0.2%). Mean decrease rate was -2.7%, which, along with overall trends observed for the study period, such as polynomial trend with R2=0.63, speaks for moderate unstable tendency to decrease in rural TB incidence.

Pulmonary TB, invariably prevailing in the incidence structure, has a defining impact on the epidemiology of TB infection [3]. In Yakutia, over the last 5 years, 94.3 to 98.3% of all TB incidence was due to pulmonary TB.

Incidence of pulmonary TB in Yakutia, for the years 2013-2018, showed a negative linear trend with R2 of 0.98, suggesting strong stable tendency to decrease. Over the last 5 years, it decreased by 27.3%; mean decrease rate was -6.1%. The lowest decrease rate was observed in 2017 (-2.8%), the highest – in 2018 (-8.9%).

Incidence of MTB-positive pulmonary TB in Yakutia, over the study period, decreased by 12.3% (from 34.1 to 29.9), with an increase by 0.9% in 2014. Rates of decrease ranged

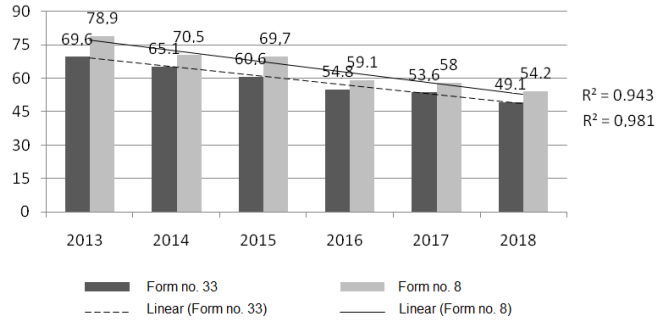

Fig. 1. Trends in incidence of tuberculosis among general population, Sakha Republic (Yakutia), 2013-2018 (statistical form no. 8 including all agencies, and form no. 33, per 100000 population).

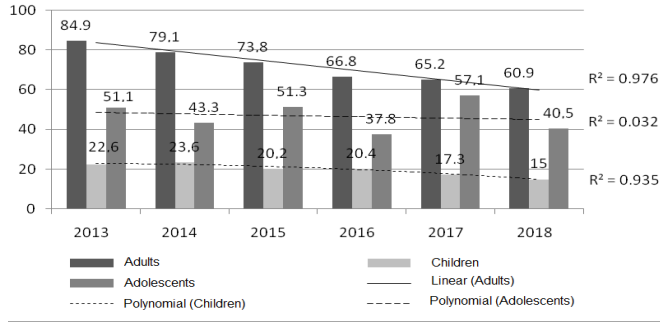

Fig. 2. Trends in tuberculosis incidence in adult, child and adolescent population, Sakha Republic (Yakutia), 2012-2017 (form no. 33, per 100000 pop.).

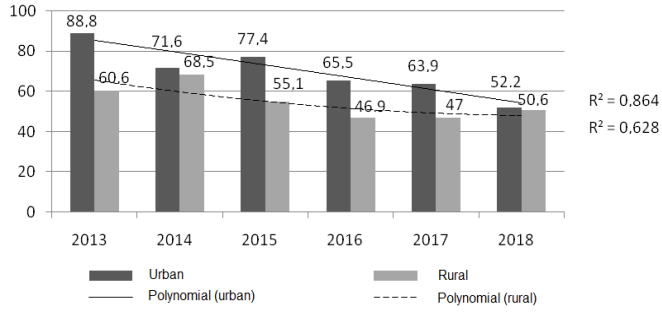

Fig. 3. Trends in incidence of tuberculosis among urban and rural population, Sakha Republic (Yakutia), 2013-2018 (form no. 33, per 100000 pop.).

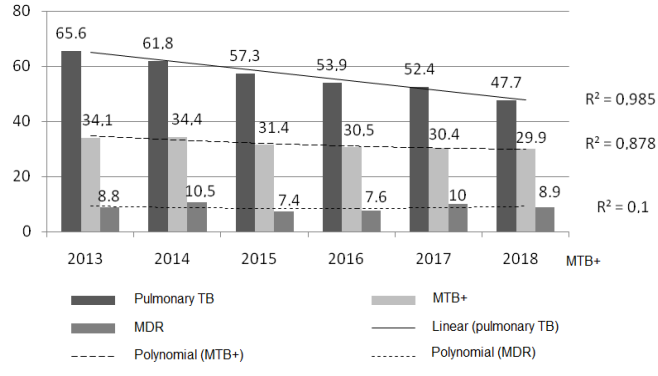

Fig. 4. Trends in incidence of pulmonary tuberculosis, MTB-positive tuberculosis, and multidrug-resistant tuberculosis, Sakha Republic (Yakutia), 2013-2018 (Form no. 33, per 100000 pop.).

from -0.3% (2017) to -8.7% (2015); mean decrease rate was -2.5%. A 5-year negative polynomial trend with R2=0.88 suggests moderate stable tendency to decrease.

Incidence of primary MDR in new patients is an important measure of quality of TB diagnosis and treatment [2, 5]. Unlike the two above indicators, incidence of MDR TB in Yakutia, over the 5-year period, had no trend to decrease (Fig. 4). Compared to 2013, there was an increase by 1.1% (from 8.8 to 8.9, per 100000 pop.), while decreases were observed only in 2015 and in 2018 (by 29.5% and 11.0%, respectively). Mean increase rate in the incidence of MDR TB over the study period was 2.6%. This could be explained by better diagnosis, larger coverage of new patients with pulmonary TB with rapid tests for drug sensitivity, and timely notification of cases of MDR TB. As an example, in 2013, drug-sensitivity tests before therapy were performed in 89.6% of patients, while in 2017, the coverage was already 98.6%, and 97.2% in 2018.

Conclusions:

1. In Sakha Republic (Yakutia), over the period from 2013 to 2018, we estimated the epidemiologic situation for TB as favorable; this is supported by the apparent stable decrease trends in incidence rates in general population, incidence rates in child population (mean decrease rates -7.1 to 7.5%), and stable decrease trends in incidence of pulmonary TB, incidence of MTB-positive pulmonary TB (mean decrease rates -6.1 and -2.5%, respectively).

2. Over the period from 2013 to 2018, mean decrease rates of urban TB incidence (-9.5%) had been outpacing those in rural population (-2.7%). Urban incidence of TB had a pronounced stable tendency to decrease, whereas the trend to decrease in rural TB incidence was moderate and unstable. This calls for more improvements in conducting anti-TB activities among rural population, paying due respect to social and local context, socio-medical differences, disparities in materials and resources, differences in staffing with healthcare workers between administrative districts in Yakutia.

3. Incidence of MDR TB had no tendency to decrease. In 2018 vs. 2013, it increased by 1.1%; mean increase rate was 2.6%. This could be linked to more extensive coverage of new patients with rapid drug sensitivity tests, and to growing number of timely notified cases of MDR TB, over the study period. Nonetheless, this finding requires in-depth analysis, and comprehensive managerial actions to decrease the incidence of MDR TB.

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