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EPIDEMIOLOGICAL SITUATION OF TUBERCULOSIS IN THE WORLD BASED ON A REPORT OF THE WORLD HEALTH ORGANIZATION 2013

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ABSTRACT

The epidemiological situation of tuberculosis is regionally diverse and dynamically changing. It is related not only to the health status of people but also to the organization of health care, financial possibilities, and cultural problems affecting the dissemination of the infection. The actions taken by the WHO since the 90s have been effective and from 2005 a decrease in the prevalence has been noted and even earlier a decrease in mortality was observed. The best situation is in North America and in Western Europe. The highest number of TB cases are observed in South-East Asia; however the highest incidence index is in Sub-Saharan Africa. Demographic differences related to sex and age are still observed. Men suffer more often than women. In countries with a good epidemiological situation elderly people are ill more frequently, while in epidemic regions more children and young people are ill.

Key words: *tuberculosis, epidemiology, prevalence, mortality, demographic factors*

INTRODUCTION

The epidemiology of tuberculosis has long been causing a lot of emotions and conflicting assessments. You can meet with the opinion that it is a dangerous disease, being one of the most important public health problems and also with the statement that it is now no longer a serious threat. This duality is not accidental and is supported by facts that can be presented depending on the thesis that the author wants to prove. A reliable assessment of the epidemiology of tuberculosis requires clarification of the place, time, form of the disease and the population concerned. It depends on whether the problem is presented as a serious or marginal one. In the case of infectious diseases it is important to know the local and global epidemiological situation. Universal migration causes the spread of infections from countries with a bad epidemiological situation to rich countries, which have limited the epidemic of tuberculosis.

DISSEMINATION OF TUBERCULOSIS

In a recent report the World Health Organization (WHO) demonstrated that 8.6 million new cases of TB were diagnosed in 2012 (1). Nearly 40% of all new cases, with more than 200 countries reporting epidemiological data to WHO were recorded in two countries - India (26%), and China (12%) (1). Epidemiological data include WHO regions: Africa (AFR), Americas (AMR), Eastern Mediterranean (EMR), Europe (EUR), South-East Asia (SEAR) and Western Pacific (WPR), which differ from the geographical divisions. The largest number of cases of TB have been diagnosed in SEAR (39%), AFR (27%) and WPR (18%), much less in EUR (4%), AMR (4%) and EMR (8%). The greatest number of new cases are in over-populated Asian countries, however the largest incidence rates are in African countries. In India and China the number of new cases each year reaches one million. Of the top fifteen countries with the highest number of cases more than half are Asian countries such as Indonesia (331 000), Pakistan (273 000), Philippines (236 000), Bangladesh (174 000), Myanmar (148 000) and Vietnam (104 000). In only three of the African countries the number of new cases exceeds 100 thousand (331 000 in South Africa, 147 000 in Ethiopia and 113 000 in Congo). Russia takes 7th place in the ranking (150 000 new cases per year). As many as 81% of all new cases of tuberculosis are recorded in 22 countries with a particularly bad situation.

WHO estimates that the average incidence rate in the world is 122/100 000, but the AFR is twice as high

and reaches 2 (Fig. 1). 255/100 000. Among the 15 countries with the highest incidence of TB as many as 13 are in Africa. More than 500 new cases per 100 000 were found in Swaziland (1350), South Africa (1003), Sierra Leone (674), Namibia (655), Lesotho (630), Djibouti (620), Zimbabwe (562) and Mozambique (552) (1). Especially low rates were recorded in small isolated island communities, such as. Netherlands Antilles (4.9/100 000), Granada (4.1/100 000), Iceland (3.5/100 000), Puerto Rico (2.2/100 000) and Barbados (1.6/100 000) (1). In some large countries with the very tight control system, for example the US and Canada, incidence rates are also below 5/100 000. A good epidemiological situation is also found in small countries, eg. San Marino (1.5/100 000) and Monaco (2.1/100 000). The epidemiological situation varies not only between macro-regions, but also locally. In EUR the average incidence rate of tuberculosis is 40/100 000, but the average data flattens the problem, because in 5 countries of the former Soviet Union the incidence was found to be more than 100 cases per 100 thousand, and from another 11 countries, where the index is 50-99/100 000, only Romania is not the former Soviet republic. Simultaneously, in 21 European countries the incidence rate is below the 10/100 000, and in 4 below 5/100 000 - like in other regions. Incidence rates in some AFR countries is lower than the average in the region (255/100 000), eg. in Mali (60/100 000), Burkina Faso (54/100 000), Ghana (70/100 000), Mauritius (21/100 000) and the Seychelles (30/100 000). In turn, in AMR, which has the lowest average incidence rate of tuberculosis (29/100 000), there are countries with a high rate, for example Haiti - 213/100 000, 127/100 000 Bolivia and Guyana 109/100 000. In AMR, therefore, there are countries with a poorer epidemiological situation than in some countries in AFR. With such a diverse epidemiological situation general statements that it is bad or good should be avoided, without specifying the place.

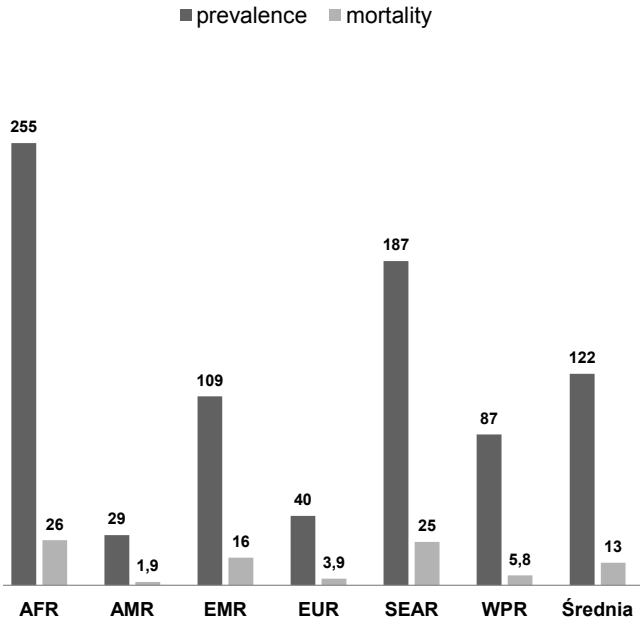

Fig. 1. Mean incidence and mortality index of tuberculosis per 100 000 of population in different WHO regions. Based on the WHO report 2013 (1)

In Poland, the TB incidence rate is 19.5/100 000 (2). In European Union countries worse indicators were found in 6 countries: Romania (94/100 000), Lithuania (66/100 000), Latvia (53/100 000), Bulgaria (32/100 000) Portugal (26/100 000) and Estonia (23/100 000) (1). Between the provinces with the highest rates (30 in Lubelskie Voivodeship, 29 in Swietokrzyskie Voivodeship, 27 in Lodz Voivodeship, and in Silesian Voivodeship 27/100 000), and the lowest (10.6 in Lubusz Voivodeship, 10.9 in Greater Poland Voivodeship, 12.3 in West Pomeranian Voivodeship, 13.3 in Podlaskie Voivodeship and in Warmia-Mazury 13.5/100 000) are significant differences (2). Even greater diversity is in the absolute numbers of new cases of tuberculosis observed in the different provinces. The difference between the region of Silesia (1185 cases and 144 deaths) and the adjacent Opole is almost ten times (150 cases and 14 deaths) (2).

MORTALITY

Annually 1.3 million people die in the world due to TB (1). Most patients die in AFR and SEAR (75% of all deaths). The mortality rate is high among untreated patients. According to the WHO as many as 3 million TB patients are not treated. An important element on the death structure is the co-infection with the HIV virus. In AFR 480 thousand TB patients die each year, however patients co-infected with HIV account for 52%. For comparison, in SEAR 510 thousand people die from tuberculosis, but among these patients 10% are HIV(+) (1). The smallest number of deaths due to tuberculosis were found in AMR (25 thousand), of which a quarter are people infected with HIV (1).

An important risk factor of death is multidrug-resistance (MDR) (1). As many as 37% of patients with MDR TB die compared to 13% with preserved drug sensitivity (1). The average mortality rate in the world is 13/100,000, however it ranges from 1.9 in AMR to 26 in AFR (Fig. 1). The highest mortality rates were observed in South Africa 59/100 000, in the Congo 54/100 000 and in Mozambique 53/100 000. On the other hand, in many developed countries this indicator is below 1/100 000, for example 0.19 in Australia, 0.17 in Canada, 0.14 in the US and in New Zealand 0.1/100 000 (1).

Large variations in national mortality rates are observed. In Moldova this rate is 18/100 000, in Russia 13/100 000, and in Belarus 11/100 000, while in Norway

it is 0.14/100 000, in Holland 0.17/100 000, in Cyprus 0.2/100 000 and in Switzerland 0.22/100 000 (1). Equally significant differences are noted in the EMR. In Somalia, the mortality rate is 64/100 000, in Djibouti 76/100 000, in Afghanistan 37/100 000, in Pakistan 34/100 000 and at the same time in the same region in Qatar 0.17/100 000, in Bahrain 0.3/100 000, in Egypt 0.46/100 000, and Jordan 0.53/100 000 (1). Smaller differences are in SEAR. In East Timor mortality rate is 74/100 000, in Bangladesh 45/100 000, and in the Maldives 2/100 000 and in Sri Lanka even 1/100 000 (1).

In Poland the number of deaths in the course of tuberculosis has been systematically decreasing and in 2012 it amounted to 640, which was, however, 8.5% of all cases (2). However, the statistics count deaths from all causes in the course of tuberculosis. Infection with Mycobacterium tuberculosis in Poland was the direct cause of death in only 2.7% of patients with tuberculosis. Regional differences in the percentages of deaths in relation to all TB patients can be observed. In Swietokrzyskie Voivodeship 4.5% of patients with tuberculosis die, in Lodz Voivodeship 5.4%, in Mazowieckie Voivodeship 5.8%, however in Silesian Voivodeship 17% and in the Lubusz Voivodeship 17.5%. The mortality rate in Poland is 1.7/100,000 which is not a very good achievement compared to other countries, not just in Europe. TB is the cause of 0.2% of all deaths in Poland and 20% of deaths caused by infection (2).

DYNAMICS OF EPIDEMIOLOGICAL CHANGES

The global incidence of tuberculosis increased until the end of the twentieth century, reaching a peak in 2005 (9.4 million), and only in subsequent years showed a gradual decline in the diagnosis of new cases (Fig. 2). In AMR and WPR there has been a continuous reduction in the number of new cases since 1990, while in EMR the situation has systematically deteriorated - from 460 thousand cases in 1990 to 670 thousand in 2012 (Fig. 2). In AFR and SEAR the constantly deteriorating an epidemiological situation reached a plateau in 2005. In EUR after 20 years the situation returned to the starting point. In 1990 there were 360 thousand cases, in 2000 it went up to 640 thousand and 360 thousand in 2012 (Fig. 2). The average incidence rate drops by 2% per annum, but in EUR it decreases by 6.5%, and in SEAR by less than 1% (1). Among the 22 countries with the worst epidemiological situation half of them have failed to reduce the incidence rates in the last 20 years (1). Increasing incidence rates were observed until 2000 only in EUR and AFR, while in other regions at the end of the twentieth century there was no longer a growth visible and but rather a systematic decline (1). Despite this, in regions with a high birth rate the number of cases increased (Fig. 2). In Poland at that time we observed a steady improvement of the epidemiological situation, but temporary inhibitions in the decline in the number of new cases are visible (2). The incidence of tuberculosis decreased in our country in parallel to the global index.

Significantly improved results were achieved in reducing deaths due to tuberculosis. The global mortality rate in the world decreased by 45% from 1990 to 2012 (Fig. 3). Apart from EUR, in which thanks to the former Soviet Union countries, until the end of the twentieth century an increase in mortality was observed, in other regions a systematic reduction was recorded. In AMR, EMR and WPR the planned by the WHO reduction in mortality of 50% in 2015 has already been achieved (1). Only in some countries with the worst epidemiological situation, with a large percentage of the coexistence of tuberculosis infection and HIV (for example Zimbabwe, South Africa and Kenya), the mortality rate is not reduced or has even increased (1). In Russia, after a long period of regular growth, the mortality from tuberculosis has been reducing since recently. Also in Poland a reduction in the mortality rate by 50% from 3.5/100 000 in 1990 to 1.7 in 2011 was achieved (2).

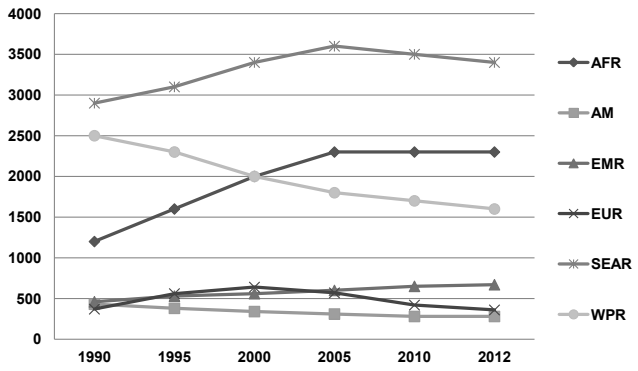

Fig. 2. Number of new cases of tuberculosis in thousands in different WHO regions. Based on the WHO report 2013 (1)

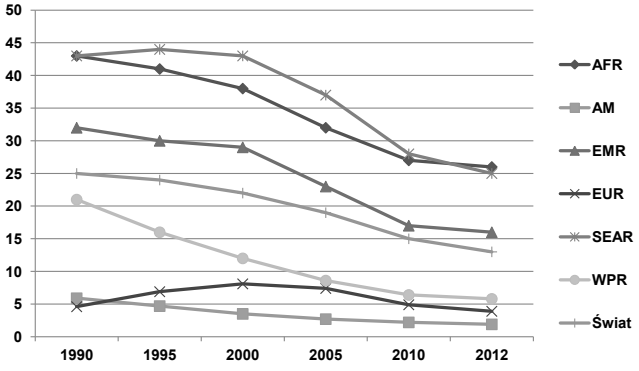

Fig.3. Dynamic of epidemiological changes in TB mortality index on 100 000 deaths in different WHO regions 1990-2012. Based on the WHO report 2013 (1)

DEMOGRAPHIC CONSIDERATIONS

In the epidemiological situation, large variations in demographics, gender and age are observed. Women suffer from tuberculosis less frequently than men. In 2012 2.9 million women and 5.7 million men suffering from tuberculosis were registered. Women represent 34% of all TB patients (1). The average ratio of men to women in the world is 1.9, but in countries with the worst epidemiological situation it varies from 0.5 in Afghanistan to 2 in Vietnam (1). This value is partly dependent on HIV infection. In AFR the ratio of male/female patients with tuberculosis and HIV(-) is 1.5, and with HIV(+) is 1, however in SEAR it is 3.5 and 1.8 respectively (1).

Out of 1.3 million total deaths caused by tuberculosis 410 thousand were women (31.5%) (1). Among them up to 160 thousand are HIV-infected women and 140 thousand of them are in AFR alone. In the case of HIV-infected individuals gender differences are not observed and the same number of men (160 thousand) and women infected with HIV die from tuberculosis (1). Regionally large differences in the structure of deaths depending on the status of HIV were observed (Fig. 4). In AFR 63% of women who died of tuberculosis are also infected with HIV, while only 4% of women in WPR, and 7% of in EMR who died of tuberculosis were also HIV(+).

In Poland also are observed significant differences between the incidence of tuberculosis among women (12.2/100 000) and men (27.4/100 000) (2). Women in Poland constitute 32% of all TB patients, and the ratio of men to women suffering from tuberculosis is 2.2 (2). Even greater differences are observed when comparing the number of deaths in the course of tuberculosis: 136 women and 504 men (2). Among the patients who died due to tuberculosis, women accounted for only 21%. The mortality rate among women in Poland is 0.7/100 000, in men, 2.7/100 000 (2).

Nevertheless, an important risk factor for tuberculosis is age. In poor Asian and African countries dominate young and middle-aged patients. In countries with the worst tuberculosis situation at the age of 15-44 years it is 2 times as likely (1 172 486) than in 45-64 years (604 196) and 6 times more than in the group over 65 years (205 703) (1). In developed countries the incidents of tuberculosis shift to an older population. However, it is not clearly visible, when taking into account the average of individual regions. Numerous cases in the elderly in Western Europe balance out the number of those diseased at a young age in Eastern Europe. A similar situation is in North and South America (Fig. 5). In developed countries a higher percentage of latent tuberculosis is observed in the elderly compared to the young (3). Often in states of immune-suppression the active form of the disease develops among people previously infected with Mycobacterium tuberculosis.

The incidence of tuberculosis in children is a reflection of the epidemiology of adults who are their primary source of infection. The risk of developing TB in children infected with Mycobacterium is greater than in adults (4). In 2012 TB affected 530 000 children, representing 6% of all cases. Within countries there are large variations in the percentage of children among new cases of tuberculosis. In many countries of Asia and Africa the percentage of TB in children is important. In Pakistan and Afghanistan this percentage is 25%, in Brazil 21%, and in Congo, Kenya, Ethiopia, Mozam-

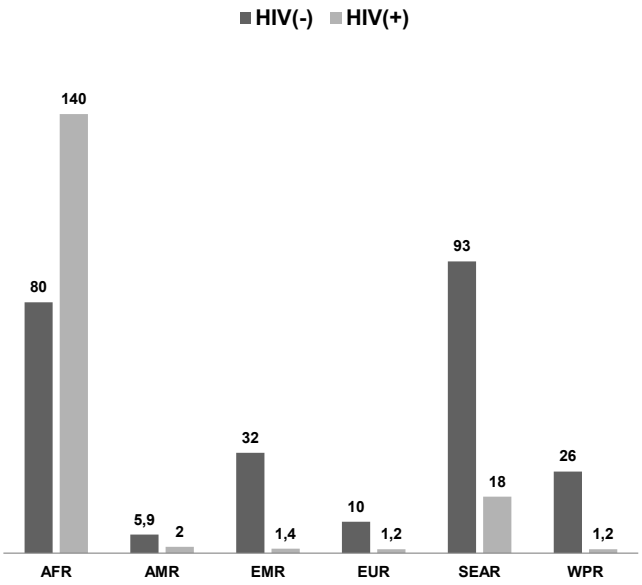

Fig. 4. Comparison of the number of deaths of HIV(+) and HIV(-) women in different WHO regions 1990-2012. Based on the WHO report 2013 (1)

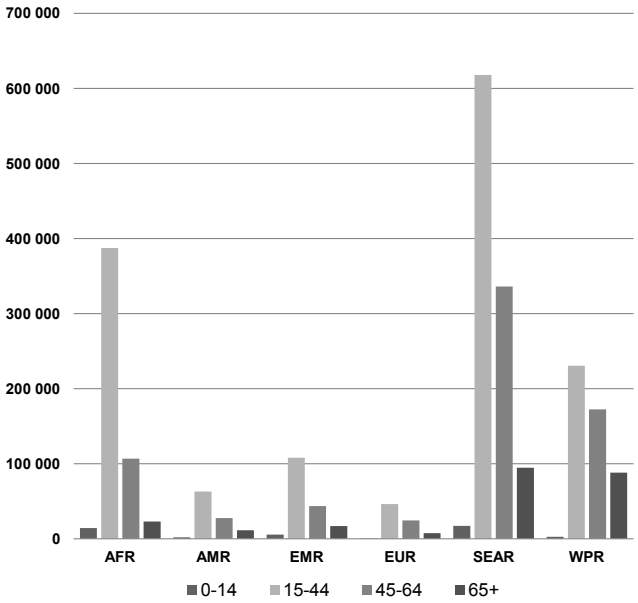

Fig. 5. New TB cases in different age group in different WHO regions in 2012. Based on the WHO report 2013 (1)

bique, South Africa., Uganda, Tanzania and Zimbabwe 16% (5). In highly industrialized European countries, tuberculosis of children constitutes 2-7% of cases, and in the US 5.8% (5). The highest incidence rates of TB in children have been found in South Africa 237/100 000, 229/100 000 in Botswana, 221/100 000 in Zimbabwe, 189/100,000 in Afghanistan and 167/100 000 in Kenya (6). Tuberculosis was the cause of death of 74 thousand HIV(-) children, representing 8% of the total of 940 thousand deaths in HIV(-) people (1). Over 90% of deaths in children occur in Asia and Africa (1). In Western Europe the mortality rate of TB in children is very small.

For many years now the incidence of TB in Poland increases with age (2). The lowest incidence rates of TB (1.6/100 000) are noted in children below 14 years of age, and the highest 35/100 000 in those above 65 years of age (2). The largest is the group of patients aged 45-64 years (2). They represent 45% of all cases of tuberculosis. The percentage of children suffering from tuberculosis in Poland (1.3%) is much lower than in other countries (2). In 2012, only 95 cases in children were observed, but the situation is very varied. In some regions 1-2 new cases were diagnosed, while in others there were a few dozen. In Poland, only 1-2 deaths of children per year caused by tuberculosis are noted (2). Tracking epidemiological trends and the development of models used in the diagnosis and treatment allows for a better control of the infection.

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