

DIAGNOSIS METHODS IN THE FORMS OF ACTIVE PULMONARY TUBERCULOSIS

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Keywords: pulmonary tuberculosis, investigations, radiological examination, bacteriological investigation

Abstract: The study herein aims at investigating the active forms of pulmonary tuberculosis, an idea sprung from the high incidence of the infection with *Mycobacterium tuberculosis* in various parts of the world. From this standpoint, to rapidly and correctly determine the diagnosis of active pulmonary tuberculosis is very important. In this context, there were investigated symptomatic patients who came for consultation at the specialized physicians of the TB Clinic of Braşov, during the first quarter of the year 2011. After studying the medical history, they were imaginatively investigated, by effectuating the standard chest X-ray. In circumstances where the radiological aspect pleads for one of the forms of active pulmonary tuberculosis, the bacteriological examination of the sputum followed next, directly and in culture. Once confirmed the diagnosis of active pulmonary tuberculosis, by corroborating the results of these investigations, the symptomatic patient who was diagnosed to have been contaminated with *Mycobacterium tuberculosis*, will be hospitalized. He/she will be applied the appropriate treatment regimen, to healing purposes, for social reintegration as soon as possible.

Cuvinte cheie: tuberculoză pulmonară, investigații, examen radiologic, examen bacteriologic

Rezumat: Studiul de față își propune investigarea formelor active de tuberculoză pulmonară, idee dată de incidența crescută a infecției cu *Mycobacterium tuberculosis* în diferite zone ale lumii. Din acest punct de vedere, de mare importanță este stabilirea rapidă și corectă, a diagnosticului formei de tuberculoză pulmonară activă. În context, s-au investigat pacienți simptomatici care s-au prezentat pentru consult, la medicii de specialitate din Dispensarul TBC Braşov, în primul trimestru al anului 2011. După anamneză, aceștia au fost investigați imaginistic, prin efectuarea radiografiei pulmonare standard. În condițiile în care aspectul radiologic pledează pentru una dintre formele de tuberculoză pulmonară activă, urmează efectuarea examenului bacteriologic al sputei, direct și în cultură. Odată confirmat diagnosticul de tuberculoză pulmonară activă, prin coroborarea rezultatelor acestor investigații, pacientul simptomatic căruia i s-a stabilit diagnosticul contaminării cu *Mycobacterium tuberculosis*, va fi internat în spitalul de specialitate. Acestuia i se va aplica schema terapeutică adecvată, în scopul vindecării, pentru reintegrarea socială cât mai rapidă.

INTRODUCTION

Pulmonary tuberculosis stands for a globally extensive pathology. From this standpoint, many factors are estimated to contribute to the disease onset.

Among the factors incriminated in the infection with *Mycobacterium tuberculosis*, mention should be made of the socioeconomic factors, income, housing, nutrition and personal hygiene.(2,3,7) Likewise, the informative programmes and educational measures instituted among the population contribute to raising awareness on the risk of pulmonary tuberculosis, determining every individual to apply methods of protection, respectively of prevention, which reduce the risk of illness.(1,5)

In this context, if an individual familiar with the symptoms that advocate for the infection with *Mycobacterium tuberculosis* shows up, from the first symptoms of the disease, to the specialized physician, this one may timely detect the illness onset.(4,8)

From this standpoint, the clinical examination with complete medical history, followed by laboratory investigations, which should confirm the diagnosis of active pulmonary tuberculosis, are primarily useful for diagnostic purposes.

At the same time, the confirmation of the diagnosis through the mentioned investigations is also useful for establishing the adequate treatment regimen, necessary for the patient's healing, who will be isolated by hospitalization, during the period of the active form of pulmonary tuberculosis.(6,9,10)

PURPOSE

The study aimed at identifying the forms of active pulmonary tuberculosis, in the symptomatic patients who had arrived at the TB Clinic of Braşov. The investigated patients, who were confirmed with the diagnosis of active pulmonary tuberculosis, by corroborating the results of the standard pulmonary radiological investigation with those of the bacteriological examination, were hospitalized for medicinal treatment, for healing purposes.

METHODS

The study was made on the symptomatic patients, who went to the TB Clinic of the Lung Phthiology Hospital Braşov, in the first three months of the year 2011. The anamnesis was made by specialized physicians, being followed by the standard

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radiological examination, resorting to the SWISSRAY-ddR apparatus. In case the radiological image pleads for the imagistic aspect of one of the forms of active pulmonary tuberculosis, the radiological investigation is followed by the bacteriological examination made directly and in culture, whose result is useful for confirming a form of active pulmonary tuberculosis.

In this study, the direct examination of sputum was performed on Ziehl-Neelsen coloured smears, analyzed in the optical microscope, resorting to cedar oil and immersion objective for counting the bacilli. In this context, the direct examination of sputum, resorting to Ziehl-Neelsen staining, allows determining the contamination degree. From this standpoint, to identify a large number of acid-resistant bacilli on the smear, indicates the number of expectorated bacilli, reflecting the lower or higher degree of contamination with *Mycobacterium tuberculosis*. The examination of sputum in culture was performed by resorting to Lowenstein-Jensen medium. According to the methodological norms, the confirmation of the positive bacteriological diagnosis by cultivating the mycobacteria in the sputum is estimated to be more than 50 bacilli/ml.

RESULTS AND DISCUSSIONS

Following the study conducted on the patients having turned up as symptomatic at the TB Clinic of the Lung Phthisiology Hospital of Braşov, in the first quarter of the year 2011, there were detected, following the medical history and the radiological examination, various forms of active pulmonary tuberculosis. To confirm and support the diagnosis, the bacteriological examination of sputum was used, directly and in culture. The results of the study made it possible to count the cases declared with active pulmonary tuberculosis, as well as the negative cases (tables no. 1-6). The bacteriological investigation also allowed determining the positivity rate, expressed as a percentage for each of the three months of the year 2011, when the study was performed (figures no. 1-6)

The data of table no. 1 reflect the results of the direct bacteriological investigation of the total 735 examinations carried out in January 2011, by sampling and analyzing the sputum. From this point of view, observing the protocol for this type of investigation, after the sampling of the sputum, we proceeded to the execution of smears in the clinical laboratory of the hospital.

Results interpretation was possible through Ziehl-Neelsen staining, taking into account the count of the bacilli which also confirms the presence and the contagiousness intensity of the *Mycobacterium tuberculosis* contamination.

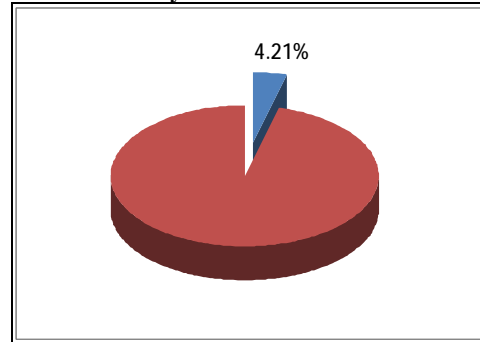
Thus, in January 2011 of the total tests carried out using the direct bacteriological examination, the number of negative tests was considerably higher than the number of positive tests, which confirms the minor presence of *Mycobacterium tuberculosis* infection of the investigated symptomatic patients.

As such, the percentage expression of the results of table 1 was possible using figure no. 1 that also reflects the minor percentage of symptomatic patients confirmed positive at the direct bacteriological examination of the sputum.

Table no. 1. Direct bacteriological examination in January 2011

Test results	No. of test
Positive	31
Negative	704
Total no. of tests	735

Figure no. 1. Positivity rate through direct bacteriological examination in January 2011

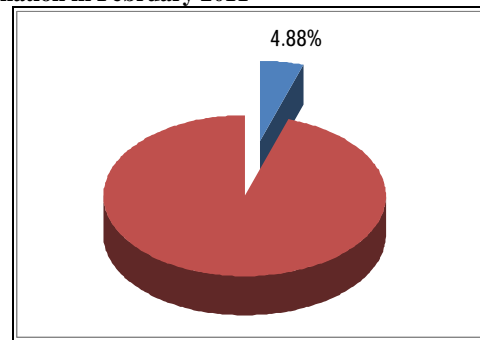


The results of the direct bacteriological investigation by the test of the sputum carried out in February 2011 show in table no. 2 a considerably higher number of symptomatic patients investigated and declared negative, compared to the number of symptomatic patients tested by means of the direct bacteriological test and confirmed positive as infected with *Mycobacterium tuberculosis*. The percentage expression of the data presented in table no. 2 was possible using figure no. 2. This graphic shows the contamination with *Mycobacterium tuberculosis* of a small number of symptomatic patients, rather similar to the number of symptomatic patients contaminated with *Mycobacterium tuberculosis* of the total cases investigated in January 2011 and presented as results in the previous figure no. 1.

Table no. 2. Direct bacteriological examination in February 2011

Test results	No. of tests
Positive	37
Negative	720
Total no. of tests	757

Figure no. 2. Positivity rate through direct bacteriological examination in February 2011



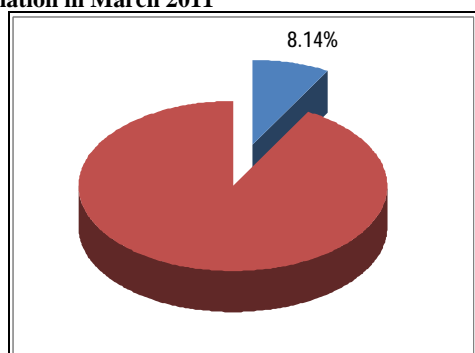
The direct bacteriological test carried out at the symptomatic patients in March 2011 was numerically higher than the previous months of the first quarter of 2011. As such, we can also see from table no. 3 the minor percentage of the positive cases after the direct bacteriological examination, compared to the large number of the negative cases. At the same time, figure no. 3 represents the reduced percentage of the symptomatic patients contaminated with *Mycobacterium tuberculosis*.

Table no. 3. Direct bacteriological examination in March 2011

Test results	No. of tests
Positive	69
Negative	778
Total no. of tests	847

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Figure no. 3. Positivity rate through direct bacteriological examination in March 2011



As the investigation by direct bacteriological test is not always eloquent on the contamination with *Mycobacterium tuberculosis*, it is necessary to continue the bacteriological test by the test of the sputum culture. This type of investigation is also carried out in the clinical laboratory of the hospital, the specialized personnel observing the test's and results' interpretation protocol, using Lowenstein-Jensen culture media.

The presentation of the bacteriologic test in culture also used tables and figures for the cases analyzed every month of the first quarter of 2011 in the investigated symptomatic patients.

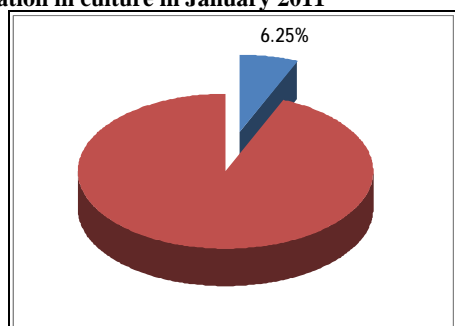
Table no. 4 presents the large number of negative cases related to the *Mycobacterium tuberculosis* infection, compared to the small number of positive cases, namely the small number of patients contaminated with *Mycobacterium tuberculosis*.

Figure no. 4 also presents the percentage expression of the data presented in table no. 4.

Table no. 4. Bacteriological examination in culture in January 2011

Test results	No. of tests
Positive	46
Negative	689
Total no. of tests	735

Figure no. 4. Positivity rate through bacteriological examination in culture in January 2011



Compared to January, in February 2011 the number of bacteriologic examinations slightly increased according to the number of symptomatic patients who requested specialized consultation.

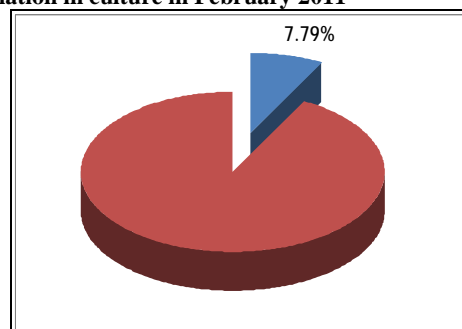
The data of table no. 5 show the small number of symptomatic patients declared positive by the contamination with *Mycobacterium tuberculosis* at the bacteriological test in culture.

The expression of the *Mycobacterium tuberculosis* contamination in percentages was possible using figure no. 5.

Table no. 5. Bacteriological examination in culture in February 2011

Test results	No. of tests
Positive	59
Negative	698
Total no. of tests	757

Figure no. 5. Positivity rate through bacteriological examination in culture in February 2011



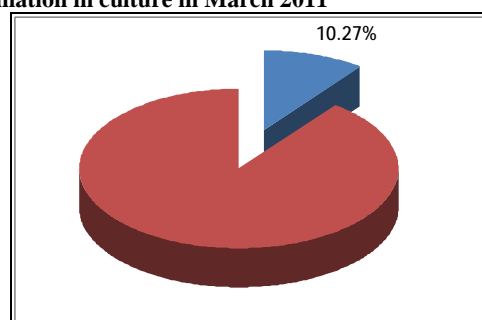
Taking into consideration that this study refers to the investigation of *Mycobacterium tuberculosis* contamination in symptomatic patients, the bacteriological investigation in culture of the total patients turned out to be larger in March 2011 compared to January and February 2011, as presented in table no. 6.

The numeric expression of the positive cases was accompanied by the expression in percentages of the symptomatic patients confirmed positive as contaminated with *Mycobacterium tuberculosis* in March 2011, presented in figure no. 6.

Table no. 6. Bacteriological examination in culture in March 2011

Test results	No. of tests
Positive	87
Negative	760
Total no. of tests	847

Figure no. 6. Positivity rate through bacteriological examination in culture in March 2011



To set the diagnosis of an active form of pulmonary tuberculosis, one of the screening methods is the standard imaging investigation. This type of routine investigation is used by the specialized doctors and it is practiced for the investigation of each symptomatic patient suspected of *Mycobacterium tuberculosis* contamination. Standard imaging investigation may be completed if applicable by complementary imaging investigations, such as computer tomography which follows standard lung X ray.

Standard lung scans performed in postero-anterior incidence (PA) presented in the paper and which plead for active pulmonary tuberculosis forms, are included as method of first

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choice among the investigations that were resorted to for identifying active pulmonary tuberculosis forms and that led to performing the bacteriological examination in order to confirm the contamination degree with *Mycobacterium tuberculosis* (figure no.7).

Figure no. 7. Cavitory pulmonary TB



With a view to support the stages inscribing among the diagnostic methods of the active pulmonary tuberculosis forms, all data submitted in the paper represent the outcome of the study.

CONCLUSIONS

The infection with *Mycobacterium tuberculosis* is a public health problem worldwide.

From this standpoint, pulmonary tuberculosis, first of all requires setting up screening measures, especially in the countries where the population is at risk of falling ill.

In this context, it is imperative to establish measures for informing the population on the risk of pulmonary tuberculosis and on the repercussions of the disease on the quality of the patient's life and likewise of those with who it comes in contact with and for whom the epidemiological investigation is mandatory.

The correct diagnosis, adequate therapy and the patient's compliance to the treatment represent opportunities for healing purposes.

Likewise, patients should be aware of the risk of a possible disease reactivation, because of the factors that contribute to the recurrence of active pulmonary tuberculosis, through a new contamination with *Mycobacterium tuberculosis*.

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