

The Prevalence of Pulmonary Tuberculosis in the Diabetic Population

Fadoua ELFARSSANI¹, Khadija AIT ZIRI¹, Lamiae ARSALANE², Said ZOUHAIR², Saliha CHELLAK¹, Abderrahmane BOUKHIRA¹

¹ Biochemistry laboratory at the Avicenne military hospital in Marrakech.

² Microbiological laboratory at the Avicenne military hospital in Marrakech.

doi: 10.51505/IJMSHR.2021.5105

URL: <http://dx.doi.org/10.51505/IJMSHR.2021.5105>

Abstract

We report a series of 26 cases of association with pulmonary tuberculosis and diabetes collected over 4 years between January 2014 and December 2017 at the pneumology and internal medicine department of the Avicenne Military Hospital in Marrakech. We retrieved the biological assessments from the Biochemistry-Toxicology department and the Microbiology-Virology department of the Avicenne Military Hospital.

The average age of our patients was 54 years, with an extreme age ranging from 21 years to 88 years, with a clear predominance of men.

Diabetes was known for 4 to 26 years in 61.5%, 11.5% had type 1 diabetes and 88.5% had type 2 diabetes. 50% had an average blood sugar between 2.6- and 3 g / l, with an average HbA1c of 11%.

The duration of the symptoms of tuberculosis varies between 15 days and 3 months, with a significant deterioration in the general condition in 81.6%. The radiological lesions were bilateral in 31%. the smears were positive in 46.2%

Introduction:

Tuberculosis is an infectious pathology caused by a bacillus: *Mycobacterium tuberculosis*, with a pulmonary predilection thus realizing common pulmonary tuberculosis. As for diabetes, it is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body is not able to use the insulin it produces effectively. A distinction is made between diabetes type 1 and type 2 diabetes.

Diabetes is known to weaken the system immune, leaving individuals vulnerable to infections including tuberculosis. [1]

Through a retrospective study on a sample of 858 diabetics, it is proposed to evaluate the prevalence of tuberculosis in a diabetic population.

Patients & methods:

Type and location of the study:

This is a retrospective study of the files of patients hospitalized in the pneumology and internal medicine department of the Avicenne military hospital in Marrakech. All these patients benefited

from biological tests in the Microbiology-Virology and Biochemistry-Toxicology laboratories of the Avicenne Military Hospital.

Study period: We report a sample of 858 people with diabetes, collected over a period of 4 years between January 2014 and December 2017 at the pneumology and internal medicine department of the Avicenne military hospital in Marrakech.

Study population:

Inclusion criteria:

- Age > 20 years old;
- HIV serology - negative;
- Pulmonary tuberculosis confirmed on one or more of the following criteria:
 - Positive research for B.A.A.R in repeated sputum examinations: TPM +
 - X-ray image suggestive of pulmonary tuberculosis.
 - TPM cases - but positive TPM - C + culture.
 - Recent diagnostic methods: Gene Xpert MTB/RIF.
- The existence of type 1 or 2 diabetes.

Exclusion criteria:

Any patient who does not meet the above conditions.

Results:

In our study, the prevalence of pulmonary tuberculosis in diabetic patients was in the order of 3.03% (26/258), the mean age was 54 years with extremes ranging from 21 to 88 years, 85% were male and 15% female with a sex ratio of M / F = 5.5.

The diabetes was mostly type 2 with a percentage of 88% versus 12% of type 1, the HbA1c level was between 10 and 12 in 50% of cases, the average blood sugar over 3 months was less than 2 g / l in 61.5%, the complications of diabetes were objectified in 14% of cases.

Pulmonary tuberculosis was mainly manifested by the deterioration of the general condition (92%), followed by cough with a rate of 65%, chest pain (53%) and fever (34%). the AFB test was positive in 46%, the culture came back positive in 53.8%, the smear was positive in 46.2% and the gene-expert® test was performed in 9 cases (25%) and was positive in 2 cases (5.5%).

Radiologically, the nodular image was the most frequent (38%) followed by infiltrates (32%) and the cave image (23%), the most frequent location was basal right and bilateral involvement in 31%. Analysis of the results shows the following findings:

- Pulmonary tuberculosis most often complicates a badly balanced old diabetes and makes its balance more difficult.
- Diabetes promotes the occurrence of tuberculosis which is characterized by extensive lesions, rich in tuberculosis bacilli.

Table 1: Patient characteristics

Variable	Value
Prevalence	3,03%
Middle age	54 years
Gender Male	85%
Feminine	15%
Type of diabetes: type 1	12%
Type 2	88%
Middle of HbA1c	11%
Average blood glycemias (3 months) :	56,5%
<2	16,5%
2-2,5	22%
2,6-3	5%
3,1-3,5	
Functional signs:	
Fever	34%
AEG	92%
Cough	65%
Hemoptysis	15%
Chest pain	53%
Sputum	19%
Biology:	
BAAR + research	46%
Culture +	53,8%
Bacilloscopy +	46,2%
Expertgene®: rate	25%
GE +	5,5%

Discussion:

In 2017, a total of 30,897 cases of tuberculosis, all forms combined, corresponding to a reported incidence of 88 / 100,000 inhabitants. The estimated number of TB-related deaths: 3,300 deaths, corresponding to specific mortality of 9.3 / 100,000 / year. [2]

In 2013, the International Diabetes Federation (IDF) estimated the population of diabetic patients to be in the order of 382 million people, and predicts by 2030 an increase in all countries to 592 million people. [3]

Diabetes weakens the immune system and triples the risk of developing tuberculosis, the disease responsible for the death of 1.5 million people in 2014. According to the International Union Against Tuberculosis, 16 to 46% of people infected with tuberculosis suffer from diabetes, and many of them are unaware of it. While around nine million people contract tuberculosis each year, the convergence of the two diseases threatens to create a major public health crisis. [3]

In our study, the mean age was 54 years with extremes ranging from 21 to 88, which is consistent with the results of similar studies in which the majority of cases were young adults [4-10]

Our study agrees with several others, which showed a clear male predominance [4-10].

In almost all of the series [9,10,11,12], type 2 diabetes was more frequently associated with pulmonary tuberculosis. This could be due to the fact that tuberculinization in our diabetic patients most often occurs beyond 45 years, the age when it is more frequent to observe type 2 diabetes than type 1 diabetes. For our series, 88% of patients have type 2 diabetes, while 12% of patients have type 1 diabetes. These data agree with those in the literature [4-10].

Diabetes monitoring is primarily based on the analysis of HbA1c, which is a major component in monitoring glycemic control in diabetic patients. Its determination can be carried out using different methods, including high performance liquid chromatography (HPLC). (Reference Technique).

In our series, the HbA1c value was determined by the new method available on the Variant II® Turbo analyzer (Bio-Rad) equipped with the new 270-2101 NU kit Chromatographic separation is improved, allowing better identification of peaks.

As the control of analytical quality is a major element for the validation of the HbA1c result and its clinical use, the characteristics of this new method make it a tool well suited to daily laboratory practice.

In the different studies during the diagnosis of tuberculosis, there was a very marked glycemic imbalance with such high levels of HbA1c [6,9,11,13].

The clinical signs most recorded in the different series were: general signs, cough, sputum, dyspnea and hemoptysis. The frequency of these clinical signs was variable in the different series [5, 6, 7, 10, 11, 14].

Biologically, only the discovery of Koch's bacillus in sputum confirms pulmonary tuberculosis.

The AFB search is done according to the Ziehl-Nielsen method. [15,16]

After the Ziehl-Nielsen stain, microscopic examination reveals acid-fast bacilli, which appear as red rods on a blue background.

The bacilloscopy was performed on all our patients, it came back positive in 46.2%. In the literature this rate was variable [4, 5, 7, 16, 17, 18]

The culture of mycobacteria is of paramount importance in the confirmation of pulmonary tuberculosis, especially for microscopic negative (TPM-) forms [19]. In our series, culture was carried out in all patients, it came back positive in 12 cases and negative in 14 cases. In Bassirou's series of 80 patients (including 43 TPM- cases), only 2 of their patients benefited from

the culture of mycobacteria [17]. In the MAALEJ series 4 out of 60 patients had positive cultures [8].

The GeneXpert MTB / RIF is a real-time polymerase chain reaction (PCR) based system that detects MTBC DNA and mutations that confer resistance to RIF in less than 120 minutes from clinical samples [20].

The system consists of a device, a personal computer, a barcode reader and preinstalled software to perform tests on collected samples and display the results.

The system requires the use of disposable and single-use GeneXpert MTB/RIF cartridges, cartridges that contain the PCR reagents to perform a PCR procedure. The GeneXpert MTB / RIF test was performed in 9 patients. 2 cases of GeneXpert MTB/RIF positive were noted in our series.

The GeneXpert MTB / RIF test compared to the conventional reference method showed sensitivity and specificity of 76.19% and 68.75% for the detection of *M. tuberculosis*; and 71.4% and 100% for the detection of rifampicin resistance. [21]

Conclusion:

When pulmonary tuberculosis is combined with diabetes, each disease exacerbates the other. Due to the increasing increase in diabetes, this association tends to create a real health crisis.

In contrast, tuberculosis diabetics tend to develop complications, with a particular radiological presentation, in particular a predominance of bilateral lesions, the involvement of the bases and nodules as a radiological lesion.

The biological workup is of extreme importance, it often makes it possible to evoke the diagnosis and to predict the prognosis.

Bibliography:

1 Martens GW, Arikian MC, Lee J, et al.

Tuberculosis susceptibility of diabetes mice.

American Journal Respiratory Cell and Molecular Biology.2007; 37:518-24.

2 A. Maaroufi.

Lutte Antituberculeuse au Maroc: Progrès, Défis et Perspectives Campagne Nationale pour le
Dépistage de la tuberculose 26 Mars-06 Avril .2018

3 Atlas du diabète de la FID Sixième édition.

<http://www.santediabet.org/fr/le-diabete-en-chiffres>

4 A. M. Trailescu, E. Micu, M. Badier, S. Delpierre.

Particularités de l'association entre diabète sucré (DS) et tuberculose pulmonaire (TP),

Revue des maladies respiratoires. 2006 Janv; 23 :27

5 Sidibé A.T., Dembélé M., Diarra A.S., Cissé I., Bocoum A., Traoré A.K., Traoré H.A.

Pulmonary tuberculosis among diabetic patients in internal medicine at Point G Hospital
Bamako – Mali. Service de médecine interne de l'hôpital du Point G ; These, Med
2002; N°206

- 6 W. Hadji, A. Amar, H. Zadouk, H. Ouleghzal, N. Elyaagoubi, F. Boufares, G. Belmejdoub.
Les particularités de la tuberculose pulmonaire chez les diabétiques. *Diabetes & Metabolism*.2012; 38:A64
- 7 H. Kwas, E. Guerhazi, I. Zendah, A. Khattab, I. Khouaja, H. Ghedira.
Effets du diabète sur la tuberculose pulmonaire .
Revue des Maladies Respiratoires. 2016; 33:A140.
- 9 B. Hamdi, Z. Moatemri, C. Aichaouia , G. Laaribi, S. Daboussi, M. Hdiji, M. Khadraoui, R. Cheikh.
Tuberculose pulmonaire et diabète.
Revue des Maladies Respiratoires.2012; 29:A212-A213
- 10 S. Morad, H. Benjelloun, H. Moubachir, N. Zaghba, A. Bakhatar, N. Yassine, A. Bahlaoui.
Profil clinique, radiologique et évolutif de la tuberculose pulmonaire chez les diabétiques
Revue des Maladies Respiratoires. 2015;32:A225
- 11 A. Rhanim, N. Zemed, K. Marc, M. Soualhi, R. Zahraoui, J. Benamor, J.E. Bourkadi.
Diabète et tuberculose pulmonaire : aspects clinique, radiologique et biologique.
Revue des maladies respiratoires. 2015;32:A224
- 12 Sonia Maâlej1, Nachraouane Belhaoui1, Mehrezia Bourguiba1, Ridha Mahouachi1, Amel Chtourou1, Sofia Taktak1, Hamouda Fennira1, Leila Slim2, Ali Ben Kheder1, Ikram Drira1.
La tuberculose pulmonaire provoque un déséquilibre du diabète.
La Presse Médicale.2009;38:20-24
- 13 S. Mazghani, H.Laadhar, A. lhayouni, M. Benzarti, M. Jerray.
l'association tuberculose pulmonaire et diabète sucré.
Revue des Maladies Respiratoires .2015 ;20 :153-166.
- 14 H-G. Chen, M. Liu, S-W. Jiang, F-H. Gu, S-P. Huang, T-J. Gao, Z-G. Zhang.
Impact of diabetes on diagnostic delay for pulmonary tuberculosis in Beijing.
Int. J. Tuberc. Lung Dis. 2014 Mar; 18(3):267-71.
- 15 Mohammed Akhtar; Gisela Bretzel; Fadila Boulahbal; David Dawson; Lanfranco Fattorini
Diagnostic de la tuberculose par examen microscopique direct des expectorations dans les pays à faibles revenus.
Paris, Ed. Fadila Boulahbal, Arnaud Trébucq.2000; 4: 64
- 16 Truffot-Pernot C., Veziris N.
Les tests bactériologiques de la tuberculose maladie : standards et perspectives.
Rev .Mal.Respir. 2011; 28:1034-1047.
- 17 B. Diarra; A .Diallo; M. Maiga
Tuberculose et diabète à Bamako, Mali: prévalence et caractéristiques épidémiocliniques de l'association.

Revue Malienne d'Infectiologie et de Microbiologie. 2014; 2:24-26

18 S. El Farhati, S. Bousnina, K. Marniche, E. Gaiesse, S. Yaalaoui, A. Chabbou

Particularités de l'association tuberculose et diabète.

Rev .Mal. Respir. 2006;23:27.

19 N.O. Touré¹, Y. Dia Kane¹, A. Diatta¹, S. Ba Diop², A. Niang¹, E.M. Ndiaye¹, K. Thiam¹,
F.B.R. MBaye¹, M. Badiane², A.A. Hane¹.

Tuberculose et diabète.

Rev. Mal .Respir. 2007; 24:869-875.

20 N.O. Touré¹, Y. Dia Kane¹, A. Diatta¹, S. Ba Diop², A. Niang¹, E.M. Ndiaye¹, K. Thiam¹,
F.B.R. MBaye¹, M. Badiane², A. A. Hane¹.

Tuberculose et diabète.

Revue Des Maladies Respiratoires.2007;24:869-875.

21 R. Set, S. Bankar, D. Sharma, D. Shah, and J. Shastri,

Performance of Xpert MTB/RIF for detection of Mycobacterium tuberculosis and rifampicin
resistance in pus aspirates.

Indian. J. Tuberc., Apr. 2018