Epidemiological, Progressive and Therapeutic Aspects of Pulmonary Tuberculosis in Diabetic Patients in the Reference Nationale University Hospital Center in N'Djamena, Chad

ABSTRACT

Introduction: Tuberculosis is associated with diabetes in 16-46% of cases according to the International Union Against Tuberculosis and Lung Disease. The objective of this work is to study the epidemiological, progressive and therapeutic aspects of pulmonary tuberculosis in diabetic patients at the Renaissance University Hospital Center in N'Djamena, Chad.

Methodology: This is a descriptive retrospective study evaluating the association between pulmonary tuberculosis and diabetes in the pneumophtisiology department of the Renaissance University Hospital Center over a period of 3 years.

Results: During our study period, we collected 51 cases of pulmonary tuberculosis and diabetes out of 910 hospitalized patients with a prevalence of 5.6%. The sex ratio was 2.18. The average age was 52.3 ±13.8 years with extremes ranging from 20 to 80 years old The notion of tuberculosis infection was found in 21.6% of cases. Other comorbidities were present, such as hypertension (41.2%) and HIV (15.7%). Xpert was positive in 62.7% of cases with 9 cases of rifampicin resistance. The type of diabetes found was mainly Type 2 diabetes (88.2%) and the most common complication was diabetic foot. The treatment consisted of a quadruple therapy, ADO and insulin, or a combination of both.

Conclusion: Tuberculosis and diabetes mellitus are a lethal combination. Prevention of TB and correct management of diabetes could reduce the prevalence of this pandemic.

Keywords: tuberculosis, diabetes, prevalence, N'Djamena, Chad

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INTRODUCTION

Tuberculosis remains to be a major public health problem in developing countries particularly in Africa and notably in Chad. According to the World Health Organization (WHO), in 2020, the total number of tuberculosis cases was estimated to be 10 million (9 to 11.1 million), a number which has remained relatively stable over the last decades. [1] Approximately, 10% of subjects infected

with Koch's Bacillus develop tuberculosis disease while the vast majority, 90% present with primary tuberculosis (PTB) infection which can progress to tuberculosis disease during immune deficiencies such as HIV infection, immunosuppressive therapy, long-term corticosteroid therapy and diabetes which will favor the outbreak of the disease [1]. Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin or when the body is not able to effectively use the insulin it produces. In 2017, the number of people with diabetes worldwide was estimated to be 425 million and is expected to reach 629 million by 2045. Every year, 10 million new cases are recorded and up to 5 million people die from complications. Africa has the lowest prevalence, which is 3.2% compared to the rest of the world which is above 8%, but has the highest rate of undiagnosed cases (above 50%) [2]. Diabetes is known to weaken the immune system, leaving individuals vulnerable to infections including tuberculosis. In Africa, little is known in the literature for the frequency of TB in diabetic patients; hence the interest of this work.

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PATIENTS AND METHOD

Setting, period and type of study: The pneumophthisiology department of the Reference Nationale University Hospital Center served as our study setting. This is a descriptive retrospective study from January 1, 2019 to December 31, 2021, i.e. in a duration of 3 years.

Inclusion criteria : all patients with the combination of diabetes (whatever the type) and tuberculosis (whatever the location) have been hospitalized during this study period with complete medical records and with an age ≥15 years old and all patients with the combination of diabetes and tuberculosis who also have other comorbidities as well.

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Non-inclusion criteria : were not included in our study all patients aged <15 years old, patients whose medical records were incomplete and patients infected with tuberculosis but not diabetic.

Data entry and analysis: Data was entered into Microsoft Word and Microsoft Excel 2019 software and analyzed using SPSS Version 25. For the analysis, the differences observed between the results will be assessed by using the Student's T-Test and the Fisher Exact Test. The level of statistical significance of the p-value is 0.05.

Ethical considerations: For our study, we received research authorization from the Faculty of Human Health Sciences of N'Djamena and the management of the Renaissance University Hospital Center.

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RESULTS

The prevalence of tuberculosis in diabetics was 5.6% (n=51/910) of patients hospitalized during the study period. The average age of the patients was 52.3 ±13.8 years old, with extremes ranging from 20 to 80 years old. The most represented age group is 60 years and above with 35.3%. We noted a male predominance of 68.6% (n=35) with a sex ratio of 2.18. Married couples constituted 62.7% (n=32), followed by single people with 13.7% (n=7). High blood pressure is the most represented comorbidity with 41.2% (n=21), followed by HIV infection with 15.7% (n=8). There were 33.3% (n=17) of patients who had a history of previous TB and who. completed treatment. The most common general signs were anorexia followed by physical asthenia and weight loss, which was 88.2% (n=45), 74.5% (n=38) and 62.7% (n=32) respectively. Cough, fever and chest pain were the most common functional signs, which were 100% (n=51), 84.3% (n=43) and 80.4% (n=41) respectively. The search for Koch's Bacillus by GeneXpert PCR technique was positive in 62.7% (n=32) including 71.8% sensitive to Rifampicin and 28.10% (n=9) resistant. Radiological abnormalities consisted of alveolar and alveolar-interstitial syndrome in 31.4% each (n=16). The most common location was in the left lung, which was 45.1% (n=23). The duration of diabetes was on average 6.13 ±4.5 years with extremes ranging from 0.1 to 20 years. Patients who had diabetes for 10 years represented with 33.3% (n=17). Type 2 diabetes represented 88.2% (n=45) compared to Type 1 diabetes which represented 11.8% (n=6). There were 16 patients that had diabetes-related complications, which were diabetic foot in 13.7% (n=7), followed by 3.9% in neuropathy and retinopathy each. The discovery of diabetes was incidental in 41.2% (n=21). Biologically, the average blood glucose level was 2.4 ±1.04 g/dl with extremes ranging from 0.5 to 5.34 g/dl. The treatment was with insulin in 49% of cases. Insulin therapy associated with oral antidiabetics was in 5.9% of cases. All of the patients had received multiple antituberculosis drug therapy according to the National Tuberculosis Control and Protocol Guidelines. The evolution was favorable in 52.9% (n=27) of cases. Those who didn't come for follow-up sessions represented 27.5% (n=14). Those deceased were 19.6% (n=10).

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DISCUSSION

Our study included 910 patients hospitalized in the pneumo-phthisiology department and 51 patients of whom had tuberculosis due to diabetes (5.6%). This prevalence is similar to that of different african authors including Diarra et al in Mali [3], Djenebou et al in Mali [4] and Morad et al in Morocco [5] who reported 5.7%, 5.2 % and 5.2% respectively.
In this study, we noted a male predominance (68.6%) with a sex ratio of 2.18. This result agrees with those of several other authors who had shown a male predominance such as, Toure et al., [6] and Kouismi et al., [7] in Senegal, who reported 68% and 60%, respectively. This male predominance is explained by the fact that tuberculosis and diabetes are more present among men in Africa. The average age of the patients in our study was 52.3 ±13.8 years as reported in most of the data in the literature, notably, Tour□et al [6], Djenebou et al [4], and Diarra et al [3] reported the average age of 53.4 years, 51.5 years and 52.4 years, respectively. The age group most affected in our study population is that of the 60 years and above (35.30%).
In our study, hypertension was present in 21 patients (41.2%). This data is consistent with the data of Aynaou H. et al in Oujda [8] who found a frequency of association between hypertension and diabetes in 55% of cases. In this series, 8 patients (15.7%) were co-infected with HIV. This prevalence of co-infection is similar to that of the World Health Organization [9], which stated that 13% of people who developed tuberculosis worldwide were immunosuppressed by HIV.
The history of previous tuberculosis is found in 33.3% of cases. Adrianinianna et al., in Madagascar [10] and Rhanim et al., in Morocco [11] had found 26.42% and 16.3% respectively. A precarious immunity most often exposes diabetic patients to a new episode of tuberculosis, whether by reinfection or by endogenous reactivation of latent tuberculosis.
Concerning the signs, in our study, 88.2% were anorexic, 74.5% had physical asthenia and 62.7% had weight loss. These data corroborate with those of other authors, notably in Tekpa et al., in Bangui [12] who reported that the main signs were long-term fever in 96.82% of cases and deterioration of general condition in 75.91% of cases. This noted difference would be due to variations in the epidemiological or clinical profile of the patients. Cough is present in all patients followed by chest pain in 80% of the cases. The same is done by Tekpa et al., in the Central African Republic [12] which reports 71.81% cases of chronic cough. The GeneXpert carried out in all patients was positive in 62.7%, these results are identical to those of Diop et al., in Senegal [13]

who obtained a positive result in 62% of the cases in accordance with the African literature [14]. On the other hand, the study by Moustarhfir Elidriss et al., in Morocco [15] shows a positivity rate of 43.7%. This result, slightly lower than ours, could be explained by the difference in the population studied and the size of the sample used. GeneXpert remains the most appropriate test for the diagnosis of tuberculosis [16]. In our study, the sensitivity to rifampicin is 71.8% compared to 28.1% in resistance. This result is similar to that of Creswell et al., in Nepal [17] with 21.1% of resistance to rifampicin. On the other hand, in Mali and the DRC [18,19], resistance to rifampicin is slightly lower than that of ours with 15.9% and 18.02%, respectively. This difference can be justified by the fact that in our study we have cases of recurrence of tuberculosis among the patients investigated and this reduces the rate of sensitivity to rifampicin and increases the rate of resistance.

Radiologically, in our series, tuberculous lesions are bilateral in 45.1%. This bilateralization of lesions is found in several studies and seems to be accentuated by diabetes. In the case of Mezghani et al., in Tunisia [20] and Morad et al., in Morocco [5] they had found 63% and 46% of bilateral lesions, respectively. Unilateral lesions on our radiographs were predominated by 39.1%, on the left. Which is similar to the result of Toure et al., in Senegal who found 27% of lesions on the left lung as well. Most studies report that radiological lesions are atypical in cases of pulmonary tuberculosis and diabetes. Therapeutically, almost all of our patients are treated according to the National Tuberculosis Control and Protocol Guidelines using the 2RHZE/4RH regimen. This is consistent with the data of Djenebou et al., [4] and Diarra et al., [3] in Mali who found that 87.5% and 84.2%, respectively, received the same treatment regimen. In our study, Type 2 diabetes is predominant with 88.2%. This result is consistent with most studies, notably those of Maalej et al., in Tunisia [21] and Sibomana et al., in Rwanda [22] which found 92% and 91.3%, respectively, of Type 2 diabetes. The high frequency of Type 2 diabetics in our series could be explained by the fact that our study population is mainly made up of people aged over 60 years old and that patients aged less than 15 years were excluded from the study. Additionally, Type 2 diabetes is the most common type of diabetes in sub-Saharan Africa. Biologically, HbA1c was high on admission and the average blood sugar level was 2.4g/dl ±1.04 in our series. Our data are superior to those of Rhanim et al., in Morocco [11] who reported a mean blood sugar level of 1.92 ±0.98g/dl and a 67% glycemic imbalance. In our study, the most frequent complications are diabetic foot with 13.7%

followed by neuropathy and nephropathy with 3.9% each. Our results corroborate with those of other authors [10].The study by Yan et al., in Denmark [23] 10.5% of the patients had diabetic foot. In our series, the evolution was favorable, which was marked by 52.9% of the patients that had gotten cured. However, 27.5% hadn't come for follow-up sessions and 19.6% deaths were recorded. This lethality is higher than that of the literature, in particular those of Toure et al., in Senegal and Maalej et al., in Tunisia which found 7.4% and 8%, respectively. While Viswanathan et al., in India [24] reported a very low rate of 2% deaths. This high rate of death could be explained by the older age of most of our patients and the delay in coming to see a health practitioner. Dooley et al., in the USA [25] shows that the risk of death is twice as high in diabetic tuberculosis patients then those in non-diabetic patients.

CONCLUSION

Tuberculosis and diabetes remains to be a deadly association in our country. Early detection as well as adequate management of diabetes would limit immunosuppression and therefore reduce the incidence and lethality of tuberculosis.

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Annexes

Table I: Distribution of patients according to other comorbidities

Comorbidities	Number	Percentage
Hypertension	21	41.2
HIV	8	15.7
Cardiopathy	3	5.9
Asthma	3	5.9
Hepatitis C	3	7.7

Table II: Distribution of patients according to symptoms of tuberculosis

Symptoms	Number	Percentage
Cough	51	100
Fever	43	84.3
Chest pain	41	80.4
Mucus secretion	29	56.9
Dyspnea	9	17.6
Hemoptysis	8	15.7
Night sweats	4	7.8

Table III: Distribution of patients according to type of chest injury

Lesions	Number	Percentage
Alveolar syndrome	16	31.4
Alveolar-interstitial syndrome	16	31.4
Mixed syndrome	13	25.5
Pleural effusion	6	11.8
Total	51	100

Table IV: Distribution of patients according to diabetic complications

Complications	Number	Percentage
No complications	35	68.6
Diabetic foot	7	13.7
Nephropathy	2	3.9
Retinopathy	2	3.9
Ketoacidosis	2	3.9
Cerebrovascular accident	1	1.9
Hypoglycemia	1	1.9
Neuropathy	1	1.9
Total	51	100