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## **Epidemiological Profile of Tuberculosis in the Provinces of Laayoune and Tarfaya, Morocco (2006-2012)**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author NAO collected data from the CDTRD and designed the study. Author AA carried out the statistical analysis and translated the manuscript into English. Authors MEB and AS managed the literature searches. Author AK wrote the first draft of the manuscript. Authors AQ and AS wrote the protocol. All authors read and approved the final manuscript.*

**Original Research Article**

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### **ABSTRACT**

**Aims:** Tuberculosis is considered as one of the major causes of mortality worldwide after AIDS in the recent years. The present work aims to bring out the epidemiological profile of tuberculosis in the provinces of Laayoune and Tarfaya so as to contribute to the improvement of the application WHO Anti- Tuberculosis Program and to the increase of success rates of treatment in these regions.

**Methodology:** This is a retrospective study based on 1331 cases of tuberculosis, all forms combined, reported to the Centre for Diagnosis and Treatment of Respiratory Diseases of Laayoune during the period between 2006 and 2012.

**Results:** The results show that the average age of patients is  $34.97 \pm 15.47$  years old while median age is 32 years. The highest incidence is observed in patients who are between 20 and 50 years old. The sex-ratio men to women, which is 1.73, is highly significant ( $\chi^2=95.2$ ,  $P<.001$ ). Moreover, the number of cases is significantly higher during the winter and spring, compared to autumn and summer ( $\chi^2 =16.07$ ,  $P<.001$ ).

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The repartition of patients according to the type of tuberculosis shows that respiratory tuberculosis represents three-quarters of cases. As for the patients' evolution, we noticed a disappearance of the symptoms as well as a general improvement for 37% of the cases that have finished their treatment. 25% of the patients healed with a negative bacillus copy. 34 deaths were registered during the study's period. It should be mentioned that the evolution remains unknown for 14% of the cases because of their disappearance during the treatment.

Finally, we noticed a constant and remarkable increase of the annual success rate, which rose from 48% in 2006 to reach 69% in 2012.

**Conclusion:** In conclusion, it should be pointed out that health authorities should make more efforts for a better implementation of the national anti-tuberculosis strategy in these regions.

*Keywords: Tuberculosis; Epidemiological Profile; laayoune; tarfaya; Morocco.*

## 1. INTRODUCTION

Tuberculosis (TB) remains a major global health problem. In 2011, an estimated 8.7 million people developed TB and 1.5 million died from the disease (including 320 000 deaths among HIV-positive people) [1]. The number of TB deaths is unacceptably large given that most are preventable.

In Morocco, 25000 to 26000 new cases of tuberculosis, all forms combined, are faced with this disease since 2000. The incidence of the disease was the highest among the neighboring countries but it decreased from 135 cases per 100 000 inhabitant in 1990 to 110 cases in 2005. In spite of the efforts deployed by the country in TB fight, the situation remains alarming because of the bad socio-economic conditions.

The present work aims to bring out the epidemiological profile of tuberculosis in the provinces of Laayoun and Tarfaya during the period between 2006 and 2012 in order to contribute to the improvement of the application of the WHO Anti-Tuberculosis Program [2] and to the increase of success rates of anti-tuberculosis treatment in this region.

## 2. METHODS

The present work covers two provinces of Laayoun-Boujdour-Sakia El Hamra region. The two provinces, Laayoun and Tarfaya, are situated in the Atlantic seaboard and their population came close to 260 000 inhabitants in 2012.

With regard to the geographical coordinates, latitude/longitude of Laayoune is 27° 09'44 "North/13° 12'11" West, and those of Tarfaya are 27° 56 '22 "North/12° 55' 34" West.

This work consists in a retrospective study based on 1331 cases of tuberculosis, all forms combined, reported to the Centre for Diagnosis and Treatment of Respiratory Diseases (CDTRD) of Laayoune for a period of 7 years from January 2006 to December 2012. These cases come from the military hospital and various health centers, public and private pulmonologists and general practitioners in both provinces.

All criteria of reported cases (age, gender, organ affected, radiological and biological examination and treatment, changes in case ...) are stored in individual records of patient treatment and in a register in the CDTRD. The source of our study was mainly individual records of patients which are updated.

During the study period (2006-2012), we registered 1331 cases of tuberculosis from 1 to 90 years old. The population data used for the calculation of incidence rates originated from the estimations of the High Commissioner for Planning on a regional level.

The rate of incidence was obtained by multiplying the number of cases by 100 000 and dividing by the population of the two provinces.

In order to compare numbers between different groups, we used chi-2 test with an error risk consented to 5%.

### 3. RESULTS

The annual incidence of tuberculosis decreased slightly after 2008, from 91 to 87 cases per 100 000 inhabitants. Similarly, the study of annual changes in incidence by gender showed an overall decrease in both genders, males being much higher throughout the study period. In fact, it decreased from 116 cases per 100,000 in 2008 to 89 in 2012 among males and 75 cases per 100,000 in 2007 to 55 in 2011 among females (Fig. 1). It should be noted that there was a remarkable increase in the incidence rate among females in 2012.

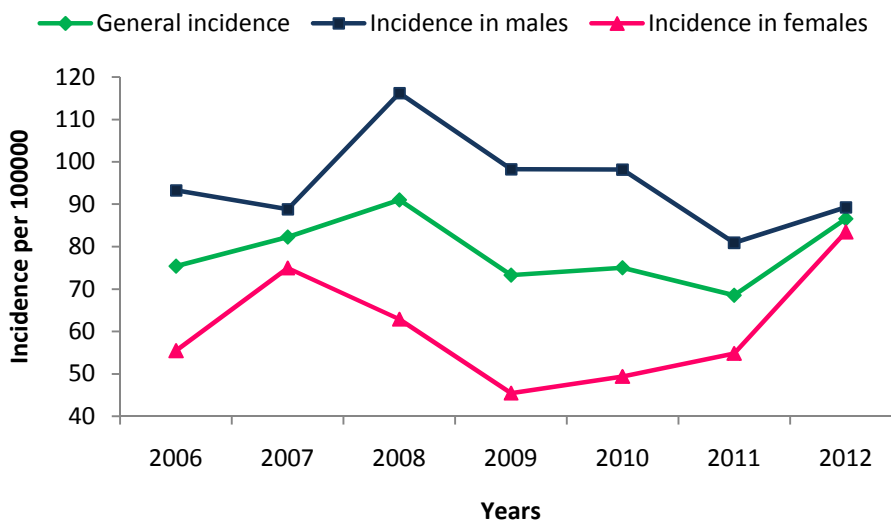
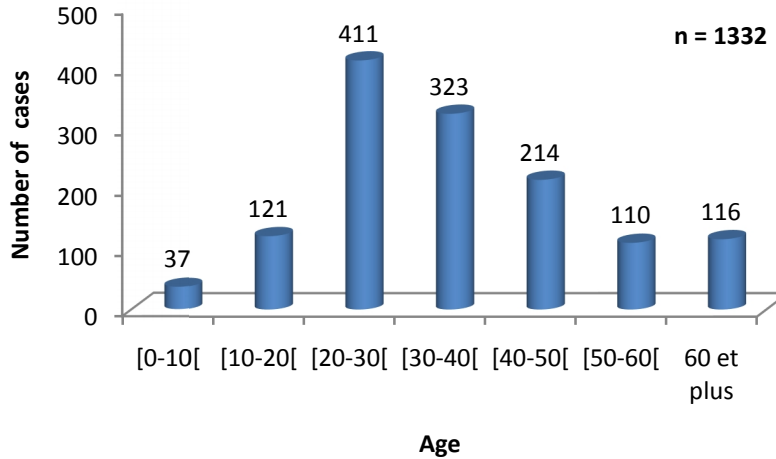


Fig. 1. Evolution of the annual incidence of TB from 2006 until 2012

On the other hand, the results showed a preponderance of males with 844 cases (63.4%) against 488 female cases. The sex-ratio of 1.73 is highly significant ( $\chi^2=95.2$ ,  $P<.001$ ).

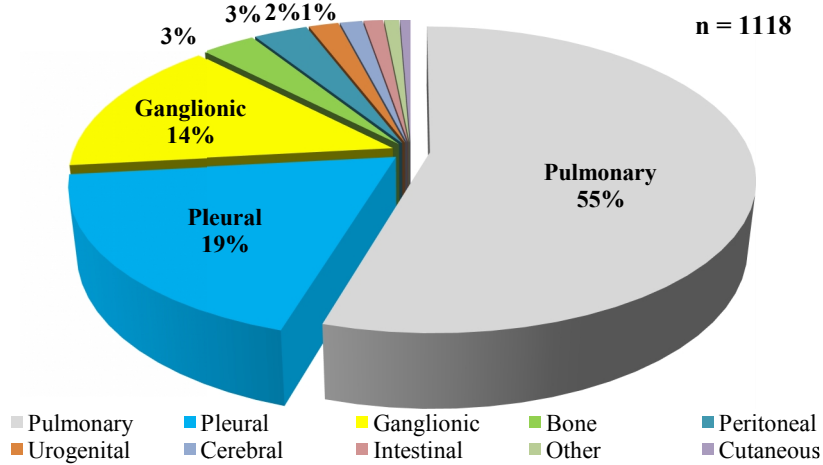
Moreover, the average age of TB patients was  $34.97\pm 15.47$  years, while the median age was 32 years. The repartition by age groups shows a predominance of cases who are between 20 and 29 years followed by those who are between 30 and 39 years and those

who are between 40 and 49 years respectively (Fig. 2). That means that the disease affects preferentially the most active population.



**Fig. 2. Repartition of tuberculosis cases by age group**

The repartition of patients according to the type of tuberculosis shows that respiratory tuberculosis represents three-quarters of cases: 55% are pulmonary and 19% are pleural. Ganglionic TB comes third with 14% (Fig. 3).

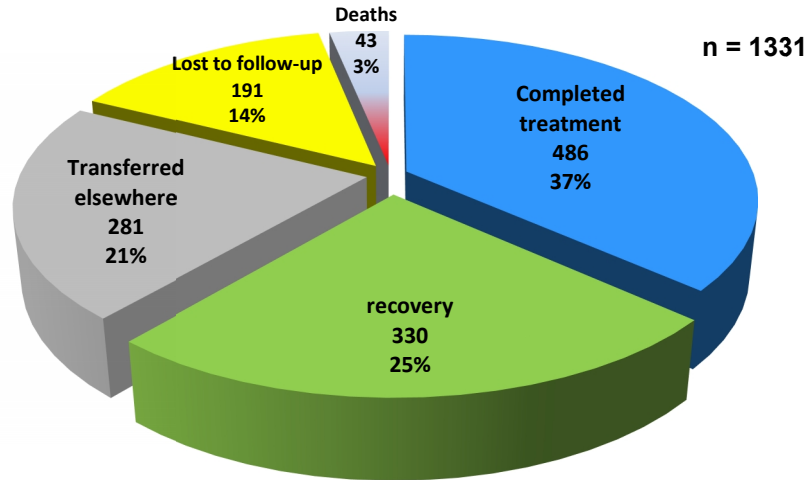


**Fig. 3. Repartition of tuberculosis cases according to the affected organ**

As far as the season is concerned, we found that the number of cases is higher during the winter and spring with 370 and 369 cases respectively, compared to autumn and summer with 300 and 293 cases respectively. The difference was statistically highly significant ( $\chi^2=16.07$ ,  $P<.001$ ).

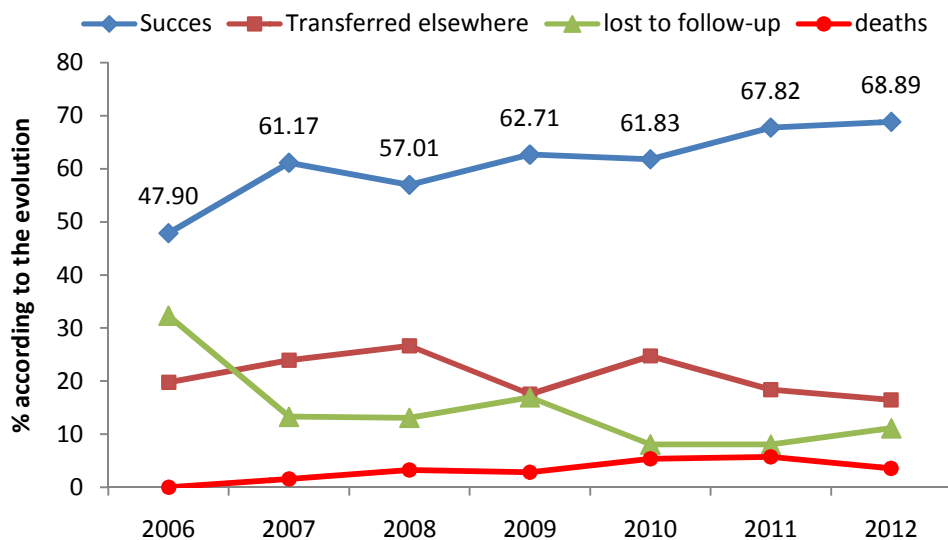
The evolution of patients was also investigated and we found that 37% of patients completed their treatment, with disappearance of all signs of the disease and improvement of the health

(but without bacillus copy), and 25% of patients are cured with negative bacillus copy. In addition, 43 deaths were reported during the period of study. It should be noted that 14% of patients are lost to follow-up and that their evolution is unknown (Fig. 4).



**Fig. 4. Repartition of tuberculosis cases according to the evolution**

We also studied the annual change according to the evolution of cases and we compiled the results in the Fig. 5. There is a remarkable and steady increase of the annual rate of success (completed treatment and recovery) from 48% in 2006 to 69% in 2012. Moreover, the rate of lost to follow-up patients decreased significantly from 32% in 2006 to 11% in 2012. With regard to the death cases, we recorded an increase of 4% in 2012. The transfer rate remained relatively constant.



**Fig. 5. Annual change of evolution rates during the period 2006-2012**

#### **4. DISCUSSION**

This work showed that the annual incidence of TB decreased slightly after 2008. This could be explained by the improvement of the management of the disease after installing a new care center during this period. This center has experienced medical staff and an archiving system following the DOTS strategy (Directly Observed Short Course strategy) which was set by World Health Organization (WHO).

Males are by far the most affected by this disease throughout the period of study with a sex-ratio of 1.73 (63.4%). This result is comparable to that found by studies in Madagascar [3] and Cameroon [1]. Other studies have reported a lower sex-ratio in favor of men, particularly in France with 1.5 [4], Tunisia with 1.4 [5] and Algeria with 1.1 [6]. However, there are studies where the sex-ratio was higher [7,8]. The fact that TB affects males preferentially would be likely due to smoking which predominates among males [9,10].

As far as the age of TB patients is concerned, the median value found in the present study is comparable to that found in Tunisia [5] and Cameroon [1] but is much lower than that found in France which is 42 years [11]. Also, the average age, which is 35 years, comes close to that found in Madagascar [3].

The age groups that are the most affected are those between 20 and 50 years with a percentage of 71% in total, which strongly matches the results of several previous studies [3,7,12]. This implies that TB reached preferentially the active population in these countries.

On the other hand, we found that lung damages predominate with 55%. This percentage is similar to that recorded in Tunisia in 2005 [4] but is considerably lower than that observed in France (73.6%) and Netherlands (62%) [13].

Regarding the evolution of tuberculosis cases, this work showed a significant improvement in the success rate and a decrease in the number of lost to follow-up patients, which would be due to the effort of the nursing staff, the establishment of a new treatment center and the introduction of combined forms of medication. This success rate is prominent compared to that found in other countries [3,14-16]. In addition, the increase in the death rate over the period of the study is mainly due to the improvement in the rate of lost to follow-up patients, which is in turn due to the improvement in the management of the disease and the monitoring of patients. It should be noted that despite its increase, the average death rate remains low compared to neighboring countries [6].

In conclusion, it should be noted that health authorities should make more effort to the successful implementation of the national anti-tuberculosis strategy in the provinces of Laayoune and Tarfaya.

#### **4. CONCLUSION**

In conclusion, even if the TB management success rate has known an important increase in the provinces of Laayoune and Tarfaya, the incidence of TB there remains high, then health authorities should make more effort to the successful implementation of the national anti-tuberculosis strategy in these two provinces of Morocco.

## **CONSENT**

Not applicable.

## **ETHICAL APPROVAL**

Not applicable.

## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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