

**An outbreak of Multi-Drug-Resistant Tuberculosis cases amongst the same family living in a rural area in Morocco; Juillet-2017. A Teaching Case-Study**

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## **Abstract**

Multidrug-resistant tuberculosis (MDR-TB) is a public health priority in Morocco, especially after the medical delegation of the province was acknowledged about confirmed MDR-TB cases. An investigation was conducted in Morocco to identify the characteristics of the reported cases and evaluate the undertaken response measures. Information about confirmed MDR-TB cases was collected by the Epidemiology Department of Health via the consultation registry and medical records. Additionally, a home survey with interviews of cases and contacts defined according to the National Tuberculosis Control Program. A total of eight MDR-TB cases were diagnosed (bacteriologically confirmed) from the same family living in a rural area. All cases had a tuberculosis contagion notion and were seronegative for the acquired immunodeficiency virus. The objective of this case study is to build the capacity of trainees on investigating outbreaks. The case study is designed for novice field epidemiology trainees. The case study can be completed in 3-4 hours.

**Keywords:** Multidrug-resistant tuberculosis; response measures

## **How to Use the Case Study?**

**General instructions:** This case study should be used as an adjunct training material for novice epidemiology trainees to reinforce the concepts taught in prior lectures. The case study is ideally taught by a facilitator in groups of about 20 participants. Participants are to take turns reading the case study, usually a paragraph per student. The facilitator guides the discussion on possible responses to questions. The facilitator may make use of flip charts to illustrate certain points. Additional instructor's notes for facilitation are coupled with each question in the instructor guide to aid facilitation.

**Audience:** This case study was developed for novice field epidemiology students. Participants, who actively engaged in the case study have a health care background and work experience in the county health departments. This includes medical doctors, nurses, environmental health officers, laboratory scientists and other public health-related specialists.

**Prerequisites:** Before using this case study, participants should have received lectures on disease surveillance, detection, and control of outbreak.

**Materials needed:** Flash drive, flip charts, markers, computers

**Level of training and associated public health activity:** Novice – Outbreak investigation

**Time required:** 2-3 hours

**Language:** French - English

## **Goal of Case Study**

The goal of this case study is to build the capacity of trainees to investigate outbreaks.

## **Learning Objectives:**

At the end of this case-study, participants will be able to:

1. Redefine the steps of investigation and the specificity of certain situations such as grouped cases
2. Develop data collection tools
3. Conduct descriptive analysis
4. Make and propose preventive measures, as well as innovative actions to decrease the burden on the healthcare system

## **Introduction:**

According to World Health Organisation (WHO), tuberculosis is a disease that can be prevented and cured by administering a standard treatment for 6 months. However, adherence to treatment can be difficult, thus increasing the risk of disease transmission across the country. Studies showed that multidrug-resistant tuberculosis (MDR-TB) is a serious form of tuberculosis because it does not respond to isoniazid and rifampicine.

The MDR-TB is considered to be a global public health problem. Therefore, it is crucially important to rapidly detect MDR-TB and accordingly implement the appropriate response to stop the transmission of disease. Yet, each case needs to be investigated around its indexes and has been an obstacle to effective TB control since the 1980. The fight against tuberculosis in Morocco is considered by the public authorities as a priority. It has been organized for several decades as part of the National Tuberculosis Control Program (PNLT), which has adopted the Stop TB Strategy to improve and consolidate the achievements of the DOTS Strategy and develop new strategic interventions such as collaborative Tuberculosis / Human Immunodeficiency Virus (TB/HIV) activities, programmatic management of drug-resistant tuberculosis (PCPTPR), or the practical approach to respiratory health (APSR). Several efforts have been made under this program to consolidate control and surveillance in Morocco.

The prevalence of MDR-TB remains low, according to a 2014 survey: only 1% in new cases and 8.7% in previously treated case. In fact, TB remains a concern for public health due to the implications related to survey management and screening that are somewhat different from conventional surveys. The time between infection and disease (incubation period) varies greatly from 2 months to 2 years, or up to 50 years, so the identification and management of contacts requires a specialized level of expertise for the diagnosis of MDR-TB cases and the organization of a well-defined and regionally coordinated care channel. In addition, the lack of validated chemoprophylaxis protocol for MDR-TB and usable TB drugs to date, caused the occurrence of some adverse events, particularly in children.

A study was conducted in one of the four tuberculosis and Respiratory Disease (CDTMR) diagnostic centers in the Rabat-Salé-Zemmour-Zaer region, (Khémisset is a province in this region) that covers a population of about 2,678,000 people and has a population density of 277 inhabitants

per km<sup>2</sup>. The population remains young with an age of less than 30 years (58.6%), 85% of this population is urban and men make up 49.3% of the population.

### **Part 1 Story (Narrative)**

Grouped cases of MDR-TB from the same community was reported to the medical delegation of the province of Khemisset. Following this notification, an investigation was carried out on the 27<sup>th</sup> and 28<sup>th</sup> July 2017 by the Directorate of Epidemiology; two participants from the public health epidemiology sector of the National School of Public Health FETP-Morocco in coordination with the Khmisset medical delegation and pulmonologist at the Tuberculosis and Respiratory Diseases Diagnostics Centre were involved in this outbreak investigation

The aim of this investigation was to:

- Validate the reports and confirm the grouped cases.
- Ensure that the health care professionals followed the National Tuberculosis Control Program intervention measures.
- Propose, if necessary, further control measures to improve the current local situation

Question 1: This event constitutes a public health alert? WHY?

Question 2: What are the needed prior steps for the implementation of the investigation?

Chronologically, the first case of MDR-TB corresponded to a 56-year-old diabetic woman who after two months of treatment for Pulmonary Tuberculosis was diagnosed with MDR-TB. The diagnosis was confirmed in in June 2014 and she died in the same year. In 2015, the screening revealed the existence of a 5-year-old son and a 52-year-old woman with MDR-TB, patients were diabetic. In 2016, two more cases also developed the MDR-TB. In 2017, three cases of MDR-TB were also reported. This was the triggering point to initiate the outbreak investigation

## **Part 2: Methods**

Before the Survey:

- Background reports of MDR-TB investigations and supervision in the province
- Study the geographical and epidemiological situation of the area

Epidemiological Survey:

Study Design: This is a descriptive investigation of a series of cases.

Case definition: Prior to 2011, reported cases of drug-resistant TB registry mainly concerned suspected cases of drug resistance without confirmation of TBs resistance and classified as chronic TB until 2010. As of 2011, the case definition was based on the results of phenotypic and genotypic TBs as follows:

- MDR-TB is defined as TB case resistant to both Isoniazide and Rifampicine
- MDR-TB confirmed based on rapid diagnostic test Xpert MTB-RIF and conventional DST results

Data Collection: The investigation took place during the 27th and 28th July 2017 and data were obtained from the medical records and via the consultation registry.

Study tool: Structured questionnaire

Variables studied: Sociodemographic/ clinical variables

Environmental investigation: A home survey with interviews of cases and contacts. This survey focused on three areas, number of people living under one roof, ventilation system, sunshine accessibility, lifestyle factors, and adherence to treatment.

Question 3: What type of information is needed to conduct an investigation and how to build the questionnaire?

## **Part 3: Results**

A total of eight MDR-TB cases were bacteriologically confirmed from the same family living in a rural area. The Male/female ratio was 1; median age was 31 years old. All cases had a tuberculosis contagion notion and were seronegative for the acquired immunodeficiency virus. The first case was for a 56-year-old woman, who was diagnosed in June 2014; two months after

she started treatment for pulmonary tuberculosis. She died after a few months. In 2015, two cases were also discovered by screening: a 5-year old child and a 52-year old woman. Two and three other cases were reported respectively in 2016 and 2017.

- 7/8 of patients received free treatment.
- 2/8 patients were diabetic
- 2/8 were smokers and 4/8 had a bad observance to anti-tuberculosis treatment.

The home survey allowed us to know about the epidemic determinants of MDR-TB, such as unhealthy habitat, lack of aeration, and insufficient sunshine.

Question 4: What does this investigation bring to the surveillance program?

#### **Part 4: Discussion**

Multi-drug resistant tuberculosis (MDR-TB) is a global threat to TB control efforts, especially in resource-limited countries where sensitivity testing is not routine. The onset of MDR-TB is mainly due to human error, although genetic factors are also believed to contribute to some extent. It is generally suggestive of mismanagement through incomplete treatment that occurs when patients stop taking the prescribed medications regularly or for the required duration to eliminate the disease. This is either because they begin to feel better or are not informed about the risks associated with incomplete treatment by doctors and health service staff, who should provide sufficient information, education, and awareness to the patient and those around him in therapeutic success. Another factor is the risk of poor prescription of drugs

The analysis of the epidemic curve showed a common source, the cases are therefore young, which is consistent with the literature. Additionally, it was demonstrated that males are more affected than women with a sex ratio M/F of 1. Our survey revealed the presence of a child among these clustered cases; in fact, the literature also shows that childhood tuberculosis is estimated at 10-15% of the total burden, but the burden of MDR-TB in children in developing countries is not proven to be higher. According to the WHO, children should be suspected of having MDR-TB if they are in contact with a case of MDR-TB or do not respond to the standard TB regimen.



From the literature and our descriptive analysis some of the sociodemographic and epidemiological characteristics are seen as risk determinants and are in favor of TMR of the cases investigated; these determinants can be divided into two categories:

- lifestyle habits: eating from a common dish, close contact, way of salvation, poor adherence to treatment, irregularity in the use of medication, history of diabetes and smoking.
- Other factors related to the suscepability of the host including quality of life, host vulnerability, ignorance, and poor hygiene.

Question 5: What hypothesis we can develop from the descriptive analysis concerning the risk factors for multidrug-resistant tuberculosis.

Question 6. What are the public health implications of this investigation?

#### **Part 5: Case study conclusion**

This study indicates the importance of early alert because a single case of MDR-TB can be a source of an outbreak. Additionally, this case study highlights the importance of conducting awareness and educational sessions about TB to prevent its transmission.

#### **Acknowledgements**

Authors would like to acknowledge The Eastern Mediterranean Public Health Network (EMPHNET) for their technical support.