Socioeconomic and clinical analysis of 50 Multi-drug resistant Tuberculosis cases in Rajkot district of Gujarat, India

Rajesh Pimpaldara[1,*], K.G. Vithlani[2], Manisha Vasava[3], Rakesh Pimpaldara[4]

[1]Assistant Professor, Dr. MK Shah Medical College & Research Center, Ahmedabad, Gujarat, [2]HOD, Dept. of Pulmonary Medicine, [3]Resident, Dept. of Radiodiagnosis, PDU Medical College & Hospital, Rajkot, Gujarat, [4]Senior Resident, Dept. of Pathology, CMC, Vellvore

***Corresponding Author:**
Email: rs83804@gmail.com

Abstract

Background: This study was conducted to analyse the socioeconomic and clinical profile of MDR TB patients in Rajkot to deal with this growing threat.

Methodology: Total of 50 cases 0f MDR TB were analysed retrospectively in a period of 2 years during August 2013 to august 2015 to study various variables like age, sex, socioeconomic status, residence, occupation and clinical profile.

Results: Most of the patients with MDR TB were in weight band of 26-45 kg and 46-70 kg and in age group of 21-40 and 41-60. 64% were male and 36% were female showing M:F ratio 1.7:1. The average BMI of patients in this study is 17.42. Most of patients were from lower (60%) and middle (36%) socioeconomic status. Almost all patients had fever, anorexia and weight loss. 26% Patients were category-I failure, 30% category-II failure, 16% defaulter and 28% were from relapse group. 36% had only Rifampicin R resistance while 64% had both R and Isoniazid (H) resistance. At the end of 6 months of treatment; 78% had culture conversion, 22% had culture non-conversion, 16% patients were defaulter, 8% were died and 76% were on treatment.

Conclusions: Study revealed that lack of education, poor life style, poor nutrition, adverse effects of drugs, and absence of follow up visits led to non-compliance. So there is a great need of patient counselling and follow-up visits to improve their quality of life and safety of other people around.

Keywords: DST; MDR TB; Non-compliance; Socioeconomic factor; XDR-TB

Introduction

Tuberculosis (TB) has coevolved with humans for many thousands of years, and perhaps for several million years [1]. The oldest known human remains showing signs of tuberculosis infection are 9,000 years old [2]. Since ancient times, TB is widely distributed all over world more particularly in a country like India. TB is an infectious disease caused by Mycobacterium tuberculosis. It is an airborne disease, spread from person to person through the coughing, sneezing, speaking or singing of a person with active pulmonary TB disease. Others who inhale the airborne droplet nuclei may become infected with TB, which can lead to TB disease. The disease primarily affects lungs and causes pulmonary TB (PTB). It can also affect intestine, meninges, bones and joints, lymph glands, skin and other tissues of the body. The disease is usually chronic with cardinal features like persistent cough with or without expectoration, intermittent fever, loss of appetite, weight loss, chest pain and haemoptysis [3].

An estimated 489000 cases of multi drug resistant tuberculosis occurred worldwide in 2006 and the global proportion of MDR-TB among all cases was 4.8% [4]. China and India carry approximately 50% of the global burden and the Russia carry approximately 7%. As per the global tuberculosis report from WHO in 2009, India ranked first in terms of total numbers of MDR-TB cases (131,000 in 2007) [5]. The prevalence of MDR-TB in India is found to be around three percent in new cases and 12-17 percent in re-treatment cases [6]. Due to the prolonged nature of MDR-TB, one might expect higher rates of chronic disability among cured patients with MDR- TB compared with those with drug susceptible TB.

Worldwide there are an estimated 14 million cases of tuberculosis (TB), with MDR-TB making up a growing percentage of those. MDR TB is defined as a strain of *Mycobacterium tuberculosis* resistant to at least Isoniazid and Rifampicin, two of the most effective first-line anti-TB drugs [7,8]. Treatment of MDR TB cases is longer and more complex than treatment for drug-susceptible TB. MDR TB treatment regimens require second-line anti-TB medications, and these drugs are more expensive, can have severe side effects, and must be taken regularly for 24 months [9,10]. It can be difficult to ensure that patients are adherent during this lengthy treatment period, particularly for patients who experience adverse events related to their medication. Curing MDR TB is possible, but, due to these challenges, negative outcomes among patients with MDR TB are far more common than for those with drug-susceptible TB [11,12].

TB and DR-TB burden in India [Source: WHO-Global TB Report, 2015]
India Population (2014) - 1295 million

Estimates of TB burden (2014)

Statistics	Number (In thousands)	Rate (Per 100000 population)
Mortality (excludes HIV+TB)	220 (150–350)	17 (12–27)
Mortality (HIV+TB only)	31 (25–38)	2.4 (2–2.9)
Prevalence (includes HIV+TB)	2500 (1700–3500)	195 (131–271)
Incidence (includes HIV+TB)	2200 (2000–2300)	167 (156–179)
Incidence (HIV+TB only)	110 (96–120)	8.3 (7.4–9.3)
Case detection, all forms (%)	74 (70–80)	-

Estimates of MDR-TB burden (2014)

Statistics	No. of cases	Percentage (%)
MDR-TB among notified New pulmonary TB cases (1097300)	24000 (21000–29000)	2.2 (1.9–2.6)
MDR-TB among notified retreatment pulmonary TB cases (311113)	47000 (35000–59000)	15 (11–19)

Treatment outcome in MDR-TB patients (2014)

Number of MDR-TB patients estimated among pulmonary TB patients (new + retreatment) in 2014	71000 (57000-85000)
Number of MDR-TB/RR-TB cases notified in 2014	25748/71000 (36%)
Number of patients put on second line treatment for MDR-TB in 2014 (leaving many patients on waiting lists for treatment)	24073/25748 (93%)
Number of MDR-TB cases reported with treatment outcome data 2012 cohort	9874
% of Successfully treated MDR-TB patients in 2012	4740/9874 (48%)
% of MDR-TB patients who were defaulter or in whom treatment outcome not documented in 2012	2370/9874 (24%)
% of MDR-TB patients who were not cured despite receiving treatment in 2012	1184/9874 (12%)
% of MDR-TB patients died in 2012	1580/9874 (16%)

Material and Methods

The present study was prospective, longitudinal, hospital based socio-economical and clino-microbiological observational study conducted in the Department of Tuberculosis and Chest Diseases at P.D.U. Medical College and Hospital, Rajkot from August 2013 to August 2015. A total number of 50 patients having multi-drug resistant tuberculosis were subjected to detailed examination.

Data collection: Indoor patient from TB and chest ward and outdoor patient from TB & chest OPD as well as patients attending visit to District tuberculosis centre, Rajkot were included in this study. Patients were selected in a randomized manner. They were asked detail clinical history of symptoms, personal habits (smoking, alcohol) past history of tuberculosis, family history of tuberculosis, drug history etc. They were examined clinically (general & systemic) and investigated for routine haemogram (Hb, TLC, DLC, PC), RFT, LFT, RBS, ESR, X-ray chest (PA view), USG chest or local part, two sputum AFB smear examination with Z-N stain, serological test for HIV infection, urine routine and microscopy, thyroid function test, sputum culture and sensitivity, DST (CBNAAT/LPA/Liquid Culture) was done in all patients. All patients were treated with category-IV ATT according to the RNTCP and the programmatic management of drug resistant tuberculosis (PMDT) guidelines in India.

Data on various parameters of the patients, demographic, socio-economic, clinical presentation, radiology, previous treatment history and results of drug sensitivity testing were recorded from the PMDT treatment register, PMDT treatment card and clinical information booklet. The data were entered in a pre-designed proforma.

Results

Demographic profile of 50 patients with MDR-TB in present study

Age group	<21 (04%) 21-40 (60%) 41-60 (34%) >60 (02%)
Gender (M : F)	32:18 (1.7:1)
Weight band	26-45 (48%) 46-70 (52%)
BMI	<18.5 - 74% >18.5 - 26%
Socio economic status	Lower - 60% Middle - 36% Upper - 04%
Residence	Urban - 72% Rural - 28%
Addiction	Smoking - 54% Alcohol - 42% Tobacco chewing - 60% Non addicted - 26%

Clinical and Radiological profile of 50 patients with MDR-TB in present study

Site of involvement	Pulmonary - 94% Extrapulmonary - 06%
Symptomatology	Cough - 94% Fever -100% Dyspnoea - 62% Anorexia - 100% Haemoptysis -70% Weight loss - 100%
Initial sputum Grading	Negative - 08% Scanty- 04% +1 - 26% +2 - 24% +3 – 32%
History of ATT	Cat 1 Failure - 26% Cat 2 Failure - 30% Defaulter - 16% Relapse - 28%
Compliance	Regular - 68% Irregular - 32%
X–ray findings	Unilateral - 48% Bilateral - 46% Cavitatory - 30% Non-cavitatory – 64%
Co-morbidity	COPD -22% DM - 10% HTN - 06% Asthma - 02%
Resistance type	Primary - 26% Secondary - 74%
Resistance pattern	Only R - 36% Both H & R - 64%
Culture conversion at 6 months	Culture conversion - 78% Culture non-conversion - 22%
Outcome at 6 months	Death – 08% Defaulter - 16% On treatment - 76%

The present study was carried out on 50 patients who were put on Category-IV ATT under the PMDT. The commonest age group affected was of 21-40 years (60%). Majority of the patient are in the weight band of 26-45(48%) and 46-70(52%). Fewer patients were seen in other weight bands. Males were affected more than females with male: female ratio was 1.7: 1. Most of the patients are malnourished with 74% patients having BMI <18.5. Malnourished Patients with BMI < 18.5 were more prone to death (10.8%), than patient with normal BMI. 72% patients are from rural area with 60% patients are from lower socioeconomic status and 36% patients are from middle socioeconomic status. In pulmonary MDR-TB, cough was present in all patients (100%). Constitutional symptoms like Fever, anorexia and weight loss found in all patients (100%). Haemoptysis was seen in 70% of patients. 26% patients had received earlier unsupervised ATT from private during their course of illness. 26% patients were category-I failure, 30% patients were category-II failures, 16% patients were defaulter and 28% were from relapse group. 68% patients were regular in consuming ATT while, rest 32% patients were taking treatment irregularly. Only 26% patients are non-addicted. 54% patients were smoker, 42% patients had alcohol addiction and 60% patients had addiction of tobacco chewing. 40% patients had Co-morbid illness. Out of this; 22% had COPD, 2% had asthma, 10% had diabetes and 6% had hypertension. COPD was the commonest co-morbidity. Only one patient had HIV status positive. Rest were HIV non-Reactive. On general examination; 44% patients had pallor, 24% patients had icterus and 04% patients had lymphadenopathy. 28% patients had normal general examination. 94% patients had pulmonary MDR-TB and 6% had extra-pulmonary MDR-TB. On chest X-ray (PA view), 48% patients had unilateral involvement and 46% patients had bilateral involvement. 30% patients had cavitatory lesion and 64% patients had non-cavitatory lesion. Three patients with extra pulmonary MDR-TB had no abnormality detected on chest X-ray. Patients with cavitatory lesion had higher death rate (13.3%) compared to patients with Non-cavitatory lesion (6.2%). Majority of patients (56%) were found to had high initial sputum smear grading (+2/+3); 26% patients had sputum smear +1 positive; 04% patient had scanty positive and 08% patients had sputum smear negative. In three patients with extra pulmonary MDR-TB, sputum AFB was note done. 26% patients had primary (initial) resistance and 74% had secondary (acquired) resistance. 36% patients had only R resistance, while 64% patients had both H and R resistance. At the end of 6 months of treatment; 78% patients had culture conversion, 22% had culture non-conversion. At the end of 6 months of treatment; 16% patients were defaulter and 08% patients had died. Patients with only R resistance had higher culture conversion rate (83%) than patients with both H and R

resistance (75%) at the end of 6 months of treatment. 80% patients had adverse drug reaction, while 20% patients had no adverse drug reaction at all. Default rate is more in male (21.8%) than in female (5.5%). Default rate is very high (50%) in patients who were taking treatment irregularly. Death rate is more in male (9.3%) than in female (5.5%). Death rate is high (18.7%) in patients who were taking treatment irregularly than patients who are taking treatment regularly (2.9%).

Discussion

The emergence of MDR-TB is a global problem which is threatening to destabilize the best efforts of TB control [13-16]. It has been attributed to factors such as non-adherence to treatment, inappropriate treatment regimens, drug malabsorption, poor drug quality, lack of health education and a poor health infrastructure for effective delivery of treatment [13,14]. However, even if good drugs are available without a properly functioning DOTS plus programme, it may not show good results. To manage MDR-TB in poor economic settings, the WHO and its partners launched the DOTS-Plus initiative to develop a global policy to provide technical assistance to DOTS programme and also to enable access to second-line drugs under rational use [14-17]. A systematic review of MDR-TB treatment outcome in different studies World-wide observed cure rates ranging from 38% to 100% [16].

Conclusions

Association between TB and poverty is known for centuries and it's also applies for MDR-TB as it is more commonly seen in lower socio-economic class. It is more common in young and middle age group. Steps are needed to be taken towards improving the socio-economic status of the community, in the form of social and financial rehabilitation. Poor nutrition is directly associated with adverse outcome in form of death and default in long term treatment of MDR-TB, which again can improve by improving the socio-economic status of both individual and community. A high degree of suspicion of MDR-TB should be maintained in patient with a history of prior treatment or in treatment failure cases as early recognition of MDR-TB status and initiation of second line drugs will minimise delay in diagnosis of MDR-TB and thus can prevent spreading of drug resistant strains and subsequently increase the effectiveness of category-IV regimen. This will require sensitization of both Dots provider and private practitioners, to refer patients for early sputum culture and drug susceptibility testing at intermediate reference laboratory. Addiction is also a risk factor associated with poor treatment outcome in form of death and default and it can be reduced by providing de-addiction treatment, health education and individual as well as family counselling. Adherence to therapy should be encouraged in favour of both curing the patient and preventing transmission of MDR-TB strain in community. Lastly, highest priority should be given to ensure effective running of DOTS programme as well as rational use of first line anti-TB drugs in newly diagnosed patients, which can prevent ultimate emergence of MDR-TB as a major public health problem.

Conflicts of interest: None declared

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References

1. Gutierrez MC, Brisse S, Brosch R, Fabre M, Omais B, Marmiesse M, et al. Ancient origin and gene mosaicism of the progenitor of Mycobacterium tuberculosis. PLoS Pathog. 2005;1(1):e5.
2. Hershkovitz I, Donoghue HD, Minnikin DE, Besra GS, Lee OY, Gernaey AM, et al. Detection and molecular characterization of 9000-year-old Mycobacterium tuberculosis from a neolithic settlement in the eastern Mediterranean. PLoS ONE. 2008;3(10):e3426.
3. Park K. Park's Textbook of Preventive and Social Medicine. 20th ed. Jabalpur (India): Banarsidas Bhanot; 2009. P. 159.
4. The WHO/IUATLD Global Project on Anti-tuberculosis Drug Resistance Surveillance 2002-2007: fourth global report. WHO/HTM/TB/2008.394. Geneva, Switzerland: WHO, 2008. Available from URL: http://www.who.int/tb/publications/2008/drs_report4_26feb08.pdf. Last accessed 2017 on April 4th.
5. World Health Organization. Global tuberculosis report 2009. Epidemiology, strategy, financing. WHO/HTM/TB/ 2009.411. Geneva, Switzerland: WHO, 2009. Available from URL: www.afro.who.int/index.php?option=com_docman&task=doc_download. Last accessed 2017 on April 4th.
6. Chauhan LS. Drug Resistant TB – RNTCP Response. Ind J Tuberc. 2008;55:5-8.
7. Ahmad S, Mokaddas E. Recent advances in the diagnosis and treatment of multidrug-resistant tuberculosis. Respir Med. 2009;103(12):1777-790.
8. Johnston JC, Shahidi NC, Sadatsafavi M, Fitzgerald JM. Treatment outcomes of multidrug-resistant tuberculosis: a systematic review and meta-analysis. PLoS One. 2009;4(9):e6914.
9. Bloss E, Kuksa L, Holtz TH, Riekstina V, Skripconoka V, Kammerer S, et al. Adverse events related to multidrug-resistant tuberculosis treatment, Latvia, 2000-2004. Int J Tuberc Lung Dis. 2010;14(3):275-81.
10. Media centre: Tuberculosis Fact sheet No 104. World Health Organization; 2010. Available from URL:-http://www.who.int/mediacentre/factsheets/fs104/en/index.html. Last accessed 2017 on April 4th.
11. Multidrug and extensively drug-resistant TB (M/XDR-TB): 2010 global report on surveillance and response. Geneva: World Health Organization, 2010. Available from URL:-http://apps.who.int/iris/bitstream/10665/44286/1/9789241599191_eng.pdf. Last accessed 2017 on April 4th.

12. Wright A, Zignol M. Anti-Tuberculosis Drug Resistance in the World: Report No.4. The WHO/IUATLD Global Project on Anti-Tuberculosis Drug Resistance Surveillance. Geneva: World Health Organization, 2008:120. Available from URL:-apps.who.int/iris/bitstream/10665/43103/1/9241562854.pdf. Last accessed 2017 on April 4th.
13. Sharma SK, Mohan A. Multidrug resistant tuberculosis; tuberculosis control. Chest. 2006;130:262-72.
14. Dhingra VK, Rajpal S, Mittal A, Hanif M. Outcome of multi drug resistance tuberculosis cases treated with individulazid regimen at a tertiary clinic. Indian J tuberc. 2008;55:15-21.
15. Behra D. Drug resistant TB in India- is it a matter of concern? Indian J tuberc. 2009;54:105-09.
16. Chaudhury RR, Thatte U. Beyond DOTS; avenues ahead in the management of TB. Nat med J India 2003;16:321-27.
17. Sharma SK, Kumar S, Saha PK, George N, Arora SK, Gupta D, et al. Prevalence of MDR-TB among category 2 pulmonary tb patient, Indian J Med res. 2011;133:312-15.