

## Multidrug resistant tuberculosis in Qena governorate and it's socioeconomic burden

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### Abstract:

**Background:**Resistance to tuberculosis (TB) drugs is a formidable obstacle to effective TB care and prevention globally.

**Patients and Method:**This study included 100 patients of both sexes were chosen from outpatient clinic and inpatient ward in Qena University hospital. Patients were subjected to: Full history and examination, chest X-Ray, ESR, CBC, sputum microscopic examination, Genexpert for sputum samples, sputum cultures.

**Results:** :Patients with treatment failure were 64 with mean age $48.9\pm 16.1$  and 34.4% of patients were male and 65.6% females.The mean ESR in was 1<sup>ST</sup> hr 101 and after 2nd hr 120. About 43.8% stopped working and 38.5% borrowed money. Chest x-ray showed 50.1% cavitary lesion, 21.8% consolidation, and 28.1% miliary shadow.Patients with treatment response were 36 with mean age $57.3\pm 19.3$ , about 55.6% of them males and 44.4% females. The mean ESR 1<sup>ST</sup> hr  $54\pm 24$ , 2ndhr  $96.1\pm 32$ .Chest x-ray showed 22.2% cavitary lesion, 44.4%consolidation and 33.4% miliary shadow. About 38.9% stopped working and 55.6% borrowed money.

**Conclusion:** This study showed increase social and economic burden in TB resistant patients. We noticed that TB resistant patients were reported income loss and work affection.

**Keywords:** MDR TB,CHEST X RAY, CBC.

### Introduction

Multidrug resistant tuberculosis (MDR-TB), defined as resistance to, at least, rifampicin and isoniazid ,represents another important threat in the fight against the disease. The emergence and spread of drug resistances mostly derive from mismanagement of TB cases such as the use of inappropriate dosages, inappropriate regimens, limited availability of quality-assured pharmaceutical products, and little efforts to support patient's adherence.

( Prasad et al., 2018). The socioeconomic impact of multidrug resistant tuberculosis on patients: Although drugs for TB treatment are free in most high TB-burden countries, TB patients face costs due to charges for related health services, costs for transport, accommodation,

nutrition and suffer lost income. A recent systematic review showed that the financial burden of both diagnosis and treatment was high and varied widely across settings, the total costs amounting to 58 % (range 5–306 %) of annual patient income. ( Tanimura et al., 2014).

These costs are expected to be higher for patients with multidrug resistant (MDR) TB than for other TB patients given the three to four times' longer treatment period. Although there is a paucity of data, the data at hand indicate that, during treatment, patients with MDR-TB face 5–20 times higher and longer pre-diagnosis and treatment periods involving more visits and procedures and inability to work.

( Hof et al.,2016).

#### Exclusion criteria

Patients who were recovered from TB.

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1. Patients were not compliant to treatment with antituberculous therapy.

### Methodology

1. The patient was evaluated regarding the incidence rate for new and relapse cases.
2. Estimation of time from appearance.

Mycobacterium tuberculosis continues to cause significant morbidity and mortality in low- and middle-income countries. The World Health Organization (WHO) estimates that one-third of the world's population is infected with tuberculosis, with approximately 9 million new tuberculosis cases and 1.4 million deaths worldwide each year. (Mohajan, 2015).

We aimed in this study to evaluate socioeconomic burden in TB resistant patients.

### Materials & Methods

**Study design:** This cross-sectional study conducted at Qena chest hospital, and Qena university hospital for One year from July 2019 to July 2020 on patients with T.B and all patients were reviewed.

**Sample size:** 100 of TB resistant patients of both sexes were chosen from outpatient clinic and inpatient in Qena University hospital and Qena chest hospital.

#### ▪ Target population

##### Inclusion criteria:

1. Patients were diagnosed with TB.
2. History of receiving previous treatment with TB.
3. Age more than 20 years old.
4. Patients with history of failure of antituberculous therapy.

of appearance of symptoms to diagnosis.

3-Estimation of the cost of investigations needed for diagnosis.

4-Estimation of social burden on (work if stopped or not, income loss, Husband and effect on sexual desire).

##### Ethical Considerations

1-Risk – benefit assessment:

All benefits and hazards of this research project will be assessed obviously to avoid any harmful issues to participants during Evaluation.

2-Confidentiality: All data, investigations and results will be collected, analyzed and discussed with full confidentiality with complete respect to patients' privacy.

3- Statement describing the research procedure to be given to the participants: All steps, benefits and hazards of this project will be obviously explained to the participants.

4-Informed consent:

Through getting a written consent from the responsible person on the selected patient before conducting the research.

Name:

Age:

Address:

Male/female:

Date:

Tel:

I am .....who signed this paper, I agree completely on participation in this research project

by Dr. Kirolos Shenouda William who has explained to me obviously all the benefits and hazards of my participation in this research project.

### Investigations

#### A- Lab investigations for TB diagnosis:

1-Complete blood count:(was done by Coulter counter), the collected data were:

• Total leucocytic count.

• Hemoglobin count.

2- Erythrocyte sedimentation rate:

(ESR) by Westergren methods, 1<sup>st</sup> and 2<sup>nd</sup> hours were collected.

3-Sputum examination:

Morning sputum or bronchoalveolar lavage samples submitted for diagnosis of tuberculosis, samples were collected from each patient in 50 ml sterile plastic containers. Decontamination of sputum samples was carried out using the N-acetyl-L-cysteine (NALC/NaOH) method.

Microscopy: smears were stained with the ZN technique.

#### 4-Culture for sputum samples

Culture examination should be performed on all patients with suspected active tuberculosis, regardless of the AFB smear results. The sensitivity is greater than that of smears.. Cultures are inoculated into a liquid broth and solid medium, and monitored for growth for 6-8 weeks.

#### 5-Chest X-ray

Radiological features were recorded according to interpretation of the initial chest radiography taken when the patient visited the hospital before a definite diagnosis had been made. That included the location and lesion appearance. The radiological appearance of pulmonary TB lesion was classified as typical fibrous nodular infiltrates and/or a cavitory lesion, consolidation, large opacity mimicking a mass or as others.

Location of TB lesion was categorized as upper lobe involvement (upper lobe alone or upper with middle or lower lobe) or isolated middle and/or lower lobe involvement.

### **B-Lab investigation for MDR-TB diagnosis**

1-Genexpert for all sputum samples and other samples: These tests detect nucleic acids and do not determine if the organism is viable unless ribonucleic acid (RNA) is detected. There are several tests available including BD ProbeTec Strand Displacement Amplification DTB, HAIN GenoTypeMTBDRplus, GeneXpert and in-house polymerase chain reaction (PCR). As the test can be rapidly performed, the detection of MTC DNA can provide the empiric basis for initiation of treatment. However, nucleic acids may still be detected up to several years following treatment. The result may be falsely negative when there is a mixed culture, inhibitors in the sample or genetic mutation in the gene target of the isolate. Conversely, cross-contamination

from the environment and inanimate objects may lead to a false positive result. Therefore, these molecular tests should be used as an adjunct to other investigations such as culture or histology.

### **Statistical analyses:**

Statistical analysis was performed using the SPSS software package(version 20). Statistical differences between the clinical features of the two groups were determined with chi-square test. All values are reported as mean  $\pm$  standard deviation (SD). A p value (2-tailed)  $\leq 0.05$  was considered statistically significant. The student's t test was used when indicated for independent means.

### **Results**

#### Demographic data

36patients with treatment response including (20males and 16 females) with mean age  $57.3 \pm 19.3$ years, 64 patients with treatment resistance including (22males and 42 females) with mean age  $48.9 \pm 16.1$ years (Table 1).

Laboratory data: As regard laboratory investigations:

patients with treatment response we found that mean ESR after 1<sup>st</sup> hour was  $54 \pm 24$  and after 2 hour  $96.1 \pm 32$ . Patients with treatment failure mean ESR in 1<sup>st</sup>hr was 101 and after 2<sup>nd</sup>hr 120 with P value (.000)(Table 2). Patients with treatment response mean HB level was  $11.8 \pm 1.7$  mg\dl and patients with treatment failure mean HB was  $11.7 \pm 2.05$  mg\dl with P value( .133). Patients with treatment response mean WBC was  $13.4 \pm 5.2$  and patients with treatment failure mean WBC was  $11.2 \pm 3.9$  with P value (.023 ) (Table 2).

Patients with treatmentresponse CXR mainly presented with 22.2% cavitory lesion, 44.4%consolidation and 33.4% miliary shadow. patients with treatment failure 50.1% with cavitory lesion, 21.8%with consolidation, and 28.1% with miliary shadow with P value (.065). patients with treatment response 77.8% of the patients

were sputum positive and 22.2% were negative and patients with treatment failure 62.5% were sputum positive and 37.5% were negative with P value (.116) . patients with treatment response 94.4% were sputum culture positive and 5.6% were negative. patients with treatment failure 84.6% of them were sputum culture positive and 15.4% was negative with P value( .137) .(Table 3).

Patients with treatment response 42.5% stopped working and 57.5% didn't stop working. patients with treatment failure 43.8% stopped working and 56.2% didn't stop working with P value (.286) (Table 4).

Patients with treatment response 48.5% of them borrowed money and 51.5% didn't borrow money. patients with treatment failure 55.6% of them borrowed and 44.4% didn't borrow money with P value (.424) (Table 5).

Patients with treatment response 18.8% of their husbands showed decrease sexual activity. Patients with treatment failure 44.5% of their husbands showed decrease sexual activity with P value (.014). (Table 6).

**Table (1) socio-demographic characteristics of patients .**

		Treatment response	Treatment failure	P value
Gender	Male	20(55.6%)	22(34.4%)	.039*
	Female	16(44.4%)	42(65.6%)	
Age		57.3±19.3	48.9±16.1	.021*

**Table (2) complete blood picture&ESR**

	Treatment response	Treatment failure	P value
TLC	13.4±5.2	11.2±3.9	.023*
HBG	11.8±1.7	11.7±2.05	.133
PLT	323.4±112.7	335.9±116.3	.604

1 <sup>ST</sup> ESR	54±24	101	000*
2 <sup>ND</sup> ESR	96.1±32	120	000*

**Table (3) relation between ,chest X ray,,sputum AFB & culture.**

		MDR-TB		P value
		Treatment response	Treatment failure	
Chest X ray	Cavitary lesion	8(22.2%)	32(50.1%)	.065
	Consolidation	16(44.4%)	14(21.8%)	
	Miliary shadow	12(33.4%)	18(28.1%)	
Sputum AFB	Positive	28(77.8%)	40(62.5%)	.116
	Negative	8(22.2%)	24(37.5%)	
Sputum culture	Positive	34(94.4%)	54(84.4%)	.137
	Negative	2(5.6%)	10(15.6%)	

**Table (4) Estimation of stoppage of work in MDR TB .**

		MDR-TB		P value
		Treatment response	Treatment failure	
work	Not stopped	20(57.5%)	36(56.2%)	.286
	Stopped	16(42.5%)	28(43.8%)	

**Table (5) Estimation of social burden on patient.**

		MDR-TB		P value
		Treatme	Treatme	

		nt failure	nt response	e
Patient	No need to burrow money	16(44.4%)	30(51.5%)	.424
	Need to burrow money	20(55.6%)	34(48.5%)	

Table (6) Estimation of sexual activity on husband after exclusion of single patients.

		MDR-TB		P value
		Treatment failure	Treatment response	
husband	Decrease sexual activity	16(44.5%)	12(18.8%)	.014*
	normal sexual activity	26(55.5%)	46(81.2%)	

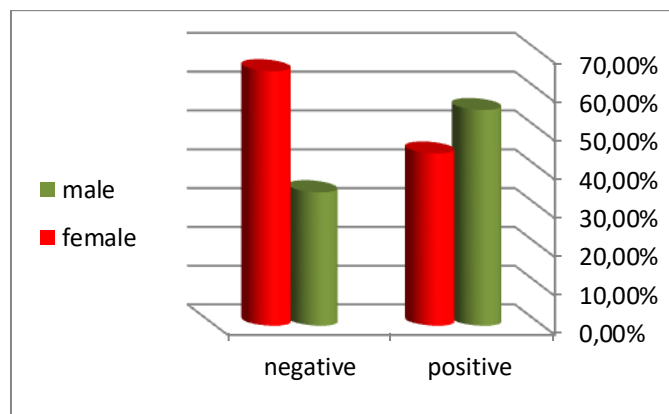
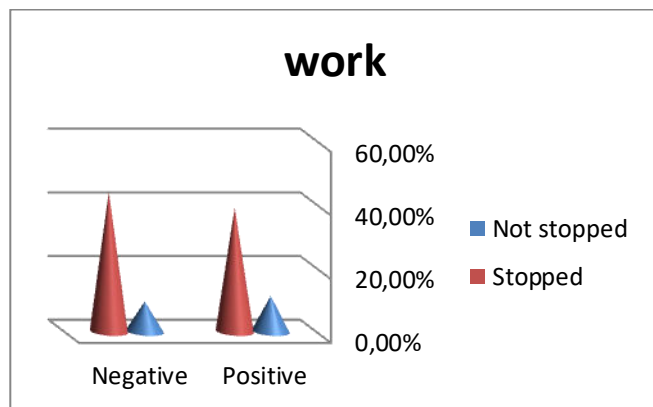
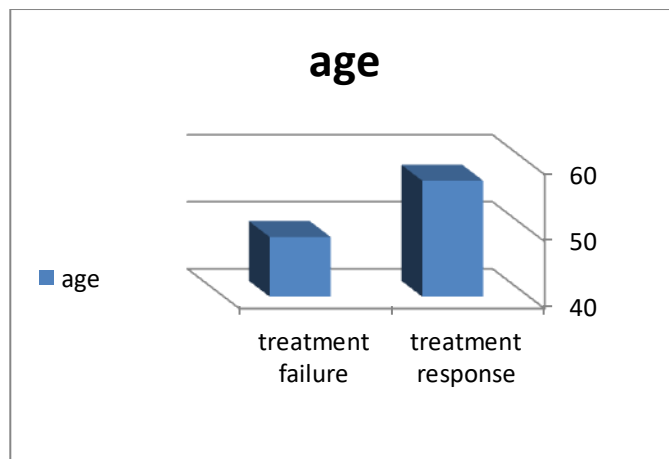


Figure (1) gender in relation to failure of treatment.



Figure(2) Estimation of stoppage of work in MDR TB .



Figure(3) Age in relation to treatment failure and treatment response.



## Discussion

Tuberculosis (TB) is a chronic, granulomatous, bacterial infection that may display multisystemic involvement. It still constitutes a major global health problem and it is estimated that almost one-third of the population is infected worldwide. Main microbiological agent is *Mycobacterium tuberculosis* in the vast majority of cases. The disease may transform into the active phase in 10 % of cases and lungs are the most common site of involvement. Pulmonary tuberculosis (PTB) is a highly contagious infection that may disseminate in the initial period after infection. (Sunnetcioglu et al., 2015).

In the present study we found that the mean age of the included patients with treatment sensitive was 57.3 years and 55.6% of the studied patients were male and 44.4 % were female. The mean age of patients with treatment resistance 48.9 years and 34.4% of them were male and 65.6% were female.

In a study done on Genotyping and drug resistance patterns of *Mycobacterium tuberculosis* strains observed in a tuberculosis high-burden municipality in Northeast, Brazil (A total of one hundred fifteen *M. tuberculosis* clinical isolates from pulmonary sources were studied, with 63 (54.8%) males and 52 (45.2%) females. Of these, 51 (44.3%) isolates were R-TB and 64 (55.7%) were S-TB. The average age of the R-TB was 39.8 years (SD 11.2 years; range 20–62 years), while it was 40.3 years (SD 15.9 years; range 19–82 years) among the S-TB. Although resistance was not associated to gender, previously treated cases were more likely among resistant patients (84.3%), when compared to the control group (31.2%,  $p < 0.001$ ). Both R-TB and S-TB groups have had history of previous contact with a TB case, with no significant difference between the two groups ( $p = 0.181$ ). (Phillip et al., 2013).

In another study about Risk factors and drug-resistance patterns among pulmonary tuberculosis patients in northern Karnataka region, India A total of 150 sputum smear patients with pulmonary TB were included in the study. Out of these, 113 specimens (75%) were found to be positive for AFB by ZN method. The AFB cultures on LJ medium were positive in 66 patients (44%). About two-third patients had prior history of TB. Only 13 patients (19.7%) had contact history of TB. The resistance rate in the present study was observed in 46 patients (69.7%). Rest of the 20 patients (30.3%) showed sensitivity to all the drugs tested. (Gaude and Hattiholli, 2014).

In our study, 62.5% of our patients were smear AFB positive, and about 84.4% were sputum culture positive, about 31.3% of our patients with history of treatment from TB. 64% of patients were drug resistant and 36% was drug sensitive.

In another study about The socioeconomic impact of multidrug resistant tuberculosis on patients: results from Ethiopia, Indonesia and Kazakhstan, there was In total 406 MDR-TB patients: 169 MDR-TB patients in Ethiopia; 143 MDR-TB patients in Indonesia; and 94 MDR-TB patients in Kazakhstan.. Importantly, 38–92 % reported income loss and 26–76 % of TB patients lost their jobs due to (MDR) TB illness, further aggravating the financial burden. IN Ethiopia about 91.2% of cases were sputum positive, and 2.1% of cases were sputum negative. Also 55.2% of cases were male and 44.8% were female. IN Indonesia about 63.6% of cases were sputum positive, and 27.6% of cases were sputum negative. Also 52.9% of cases were male and 46% were female. IN Kazakhstan about 80.7% of cases were sputum positive, and 18% of cases were sputum negative. Also 66.7% of cases were male and 33.3% were female. ( Hof et al., 2016).

In our study ,about 55.6% of cases borrowed money in patients with treatment failure. About 43.8% of cases lost their work. Also about 62.5% of cases were sputum positive and others about 37.5% were sputum negative, Also about 34.4% of cases were males and 65.6% of cases were females.

### Conclusion

This study showed increase social and economic burden in TB resistant patients. We noticed that TB resistant patients were reported income loss and work affection.

### Recommendations

We need to give attention to MDR-TB patients with the need to special efforts and further reasearches will be needed.

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