

Impact of loss of Resources on Sputum Smear among TB Patients in Borama, Somaliland, Somalia

Mohamed Gedi Qayad* and Gianfranco Tarsitani

Department of Public Health and Infectious Diseases, Sapienza University of Rome, Italy

*Corresponding Author: Mohamed Gedi Qayad, Department of Public Health and Infectious Diseases, Sapienza University of Rome, Piazzale Aldo Moro 5, 00185 Roma, Italy.

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Abstract

Background: Borama TB control program in Somaliland, Somalia, had relatively better resources than other TB programs in Somalia for its direct and indirect operations. In late 2003, the program lost the resources. This study evaluates the impact of the loss on the sputum smear of TB patients in Borama.

Objectives: Evaluate the impact of loss of resources on sputum smear of TB patients in Borama TB program, Somaliland, Somalia.

Results: We studied 2,535 pulmonary TB cases in 2002-2003 and 2007 in Hargeisa and Borama TB programs. Of these, 1,231 cases and 1,304 TB were from Borama and Hargeisa respectively. In Borama, the percent of sputum smear positives decreased 22% prior to initiation of treatment, from 72% in 2002-2003 to 56% in 2007. At the end of intensive phase of treatment, the cases converted to negative increased 11%, from 72% in 2002-2003 to 80% in 2007. The percent of patients remained negative at the end of the 5th month decreased 14%, from 69% in 2002-2003 to 59% in 2007, and those remained negative at the end of treatment declined 19%, from 68% in 2002-2003 to 55% in 2007. The changes observed in 2007 in Borama, compared to 2002-2003, were statistically significant. In the comparison program, the percent of sputum negatives in the 5th month increased 53%, from 58% in 2002-2003 to 89% in 2007, and at the end of treatment the sputum negatives increased 68%, from 53% in 2002-2003 to 89% in 2007. The increases in the sputum negatives in the comparison group were statistically significant, and were opposite to that of Borama.

Conclusion: The loss of resources impacted adversely the sputum positives prior to initiation of treatment and negatives in the course of treatment. The impact was remarkable on the sputum negatives in the 5th month and at the end of treatment.

Keywords: Impact; Sputum smear; Tuberculosis; Somaliland; Somalia

Introduction

Tuberculosis (TB) affects 9 million persons and kills 2 million around the globe, annually [1]. The World Health Organization (WHO) declared TB as a global public health threat in 1991 and the World Health Assembly (WHA) affirmed sustainable financing for TB control programs in 2005 [2]. According to a recent WHO report, several WHO regions achieved the 2015 TB millennium development goals (MDG) [3]. However, many countries in the southern hemisphere are still far from achieving these goals. To accelerate the MDG achievements, the Stop TB Strategy was launched in 2006 [4]. The private and public sectors, and non-governmental organizations (NGO's) are in collaboration to combat the global TB threat. Almost all countries use the short course chemotherapy for treating new TB patients for six months. For patients previously treated, eight months chemotherapy is often used [5]. The treatment is patient-centred and many TB patients may require specific treatment regimen depending on their conditions and co-morbidities [6]. The TB coalition for technical

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assistance in The Hague set International Standards for Tuberculosis care (ISTC) [7]. The ISTC proposed monitoring patient's improvement in the course of treatment. Also, the International Union against TB and Lung Disease (IUALTD) and WHO recommended monitoring patients in the course of treatment through bacteriologic examination of sputum smear [8,9]. Different monitoring schedules were developed for patients treated in the first-line and those treated on the second-line regimen. The weight of every patient under treatment should be monitored monthly. Pulmonary TB patients, new and re-treated, going under first-line treatment are monitored often through sputum smear examination. The sputum smears of new and re-treated TB cases are examined at the end of intensive-phase of the treatment, end of the second or third month of treatment respectively. Sputum smear positive cases at the end of the second month, for new TB pulmonary cases, should also be tested at the end of the third month. Smear positive cases at the end of the third month should go through sputum culture and drug susceptibility test to determine resistance. Patients who were negative at the start of the treatment or at the end of the intensive-phase should not be sputum tested at the end of the fifth or sixth month of the treatment. However, patients with smear positive at the end of the intensive-phase of the treatment should be sputum tested at the end of fifth and sixth month of treatment. Patients remaining sputum positive at the end of the fifth or sixth month of treatment are considered as treatment failures and should be referred to culture and drug susceptibility test.

The TB control programs in Somalia, as in other TB programs in the developing countries, perform sputum examination before the initiation of the treatment and during the course of the treatment. The success of the treatment is monitored regularly through bacilloscopy of the sputum. At least 3 sputum tests are performed for each patient in the course of the treatment: end of the intensive phase, end of the fifth month and end of the treatment course (sixth/eighth month), which is similar to testing occasions recommended by IUALTD.

The TB control in Borama, Somaliland, had relatively better support and resources, from a volunteer, donor countries and organizations, than other TB programs in Somalia, which included: livelihood support to patients and their immediate families, counselling, thorough supervision of direct observed therapy strategy (DOTs), regular bacilloscopy monitoring of sputum tests to assess treatment failure/success. In 2003, the program lost that support and resources. Several drawbacks in the operation of the program became imminent including monitoring sputum testing and treatment outcomes. This study evaluates the impact of the loss of resources, funds and strong management, on monitoring the sputum smear in Borama TB patients.

Materials and Methods

The study was conducted in 2012 in Somaliland, Somalia. We used TB patients registered in Borama TB control program in 2002-2003 and 2007, and a sample of four months from TB patients registered in Hargeisa, as a comparison, in the same period. We analyzed pulmonary TB cases for this study. Information abstracted from the TB registry included: demographics, place of residence; treatment related information; smear test prior to treatment, during and end of treatment; treatment regimen; treatment attributes and outcomes, such as no prior treatment, relapsed or defaulted; disease classification and end status after treatment.

We used pre-event and post-event design to evaluate the impact of loss of resources and on sputum smear of TB patients in Borama TB program. The pre-event and post-event periods were 2002-2003 and 2007 respectively. The pre-event period represents before the loss of resources and post-event period represents after loss of resources.

In the pre-event period, Borama TB program had access to resources for direct and indirect TB program operations. The program provided livelihood support to TB patients and their immediate families, strictly monitored and supervised DOTs and sputum testing, and involved community elders in the initiation of therapy and assurance of completion of therapy.

We used SAS version 9.1 to analyze the data. We calculated the following measures: percent of patients with positive sputum test prior to initiation of treatment, percent converted to negative at the end of intensive phase of treatment, percent remained sputum negative at the end of fifth month of treatment and end of the treatment (sixth/eighth month). We compared the pre-event and post-event measures, within each program and between programs. The statistical significance of the differences was tested using t-test.

The study was approved by the University of Rome-SAPIENZA, department of public health and infectious diseases, and the Somaliland Ministry of Health and the TB control program directors for both programs. The Somaliland Ministry of Health gave the consent for the study to proceed. The study did not involve patients/human subjects and used data collected for surveillance and administrative purposes.

Results

We studied 2,535 pulmonary TB cases abstracted from the TB registers in 2002-2003 and 2007 in Borama and Hargeisa TB control programs. Of these 1,231 (48.6%) cases were from Borama and 1,304 (51.5%) from Hargeisa (Table 1). Sputum smear examination before starting TB treatment in Borama showed that 69% of the cases were smear positive, 10% negative and the results of 21% were missing, whereas 56%, 41% and 3% were positive, negative and missing in Hargeisa, respectively. The percent with positive smear in Borama were significantly different than Hargeisa ($P < 0.001$).

At the end of the intensive phase of the treatment, 74% of the cases in Borama converted to negative on sputum examination, whereas 76% converted to negative in Hargeisa (Table 1). In Borama, 9% of the cases remained positive and 3% of the cases in Hargeisa. The results of sputum examination of 17% and 21% of the cases were missing in Borama and Hargeisa respectively. The percent of cases in the above categories were not significantly different between Borama and Hargeisa TB programs.

Schedule of Sputum smear examination	Borama N=1,231		Hargeisa N=1,304		P-value
	No.	%	No.	%	
First and second sputum test (prior treatment)					
Positive	853	69.3	729	55.9	< 0.0001
Negative	126	10.2	535	41	
Not done/unknown	252	20.5	40	3.1	
Total	1,231		1,304		
End of Intensive phase sputum test					
Positive	110	9	40	3.1	NS
Negative	904	73.6	988	75.8	
Not done/unknown	214	17.4	276	21.2	
Total	1,228		1,304		
End of 5th month sputum test					
Positive	33	2.7	16	1.2	NS
Negative	825	67.3	874	67.2	
Not done/unknown	368	30	411	31.6	
Total	1,226		1,301		
End of 6th/8th month sputum test					
Positive	10	0.8	17	1.3	NS
Negative	813	66.1	833	64	
Not done/unknown	407	33.1	451	34.7	
Total	1,230		1,301		

Table 1: Sputum smear of Pulmonary TB cases, in Borama and Hargeisa, Somaliland, Somalia, 2002-2003 and 2007.

The sputum smear at the end of the fifth month of treatment showed an increase of the cases with missing results, 30% and 32% in Borama and Hargeisa, respectively, whereas the percent of cases with negative sputum tests declined to 67% in both programs and 2.7% of the cases in Borama and 1.2% in Hargeisa remained positive. These percentages were not significantly different between the two programs (Table 1). The results of the sputum examination at the end of the treatment, sixth/eighth month, had similar pattern to that observed at the end fifth month in both programs (Table 1).

In Borama, the sputum smear examination of pulmonary TB cases prior to the initiation of treatment showed that the percent of patient with smear positive declined 22% , from 72% in 2007 to 56% in 2002-2003 ($P<0.001$), (Table 2). In Hargeisa, the percent of patients with positive results prior to initiation of therapy also declined 20%, from 60% in 2002-2003 to 48% in 2007 ($P<0.001$), (Table 3).

	Borama				P-value
	2002-2003 N=1,029		2007 N=202		
Schedule of Sputum smear examination	No.	%	No.	%	
First and second sputum test (prior treatment)					
Positive	739	71.8	114	56.4	< 0.0001
Negative	57	5.5	69	34.2	
Not done/unknown	233	22.6	19	9.4	
Total	1,029	100	202	100	
End of Intensive phase sputum test					
Positive	103	10	7	3.5	
Negative	743	72.4	161	79.7	<0.03
Not done/unknown	180	17.5	34	16.8	
Total	1,026	100	202	100	
End of 5th month sputum test					
Positive	30	2.9	3	1.5	<0.03
Negative	706	69	119	58.9	
Not done/unknown	288	28.1	80	39.6	
Total	1,024	100	202	100	
End of 6th/8th month sputum test					
Positive	10	1	0	0	<0.004
Negative	702	68.3	111	54.9	
Not done/unknown	316	30.7	91	45.1	
Total	1,028	100	202	100	

Table 2: Sputum smear of Pulmonary TB cases in Borama, Somaliland, Somalia, 2002-2003 and 2007.

The percent of patients converted to negative after the intensive phase of TB treatment in Borama increased 11% , from 72% in 2002-2003 to 80% in 2007 (P<0.01), (Table 2). Similarly, the percent converted to negative in Hargeisa increased 38%, from 68% in 2002-2003 to 94% in 2007 (P<0.001), (Table 3). At the end of the fifth month of treatment, the percent of patients remained sputum negatives declined 14%, from 69% in 2002-2003 to 59% in Borama (P <0.05), whereas the percentages in Hargeisa increased 53%, from 58% in 2002-2003 to 89% in 2007, (P<0.001), which is opposite of the change in Borama. Similarly, the percent of patients with negative sputum smear at the end of 6th/8th month of treatment in Borama, completion of the treatment, decreased 19%, from 68% in 2002-2003 to 55% in 2007 (P<0.004), Table 2). Conversely, the percent of cases with negative sputum smear in Hargeisa increased 68%, from 53% in 2002-2003 to 89% in 2007 (P<0.001), (Table 3).

Schedule of Sputum smear examination	Hargeisa (2002-2003) N=901		Hargeisa (2007) N=403		P-value
	No.	%	No.	%	
First and second sputum test (prior treatment)					
Positive	536	59.5	193	47.9	<0.01
Negative	325	36.1	210	52.1	
Not done/unknown	40	4.4	0	0	
Total	901	100	403	100	
End of Intensive phase sputum test					
Positive	34	3.8	6	1.5	
Negative	609	67.6	379	94	< 0.001
Not done/unknown	258	28.6	18	4.5	
Total	901	100	403	100	
End of 5th month sputum test					
Positive	12	1.3	4	1	
Negative	517	57.5	357	88.8	<0.001
Not done/unknown	370	41.2	41	10.2	
Total	899	100	402	100	
End of 6th/8th month sputum test					
Positive	14	1.6	3	0.8	
Negative	474	52.7	359	89.3	<0.001
Not done/unknown	411	45.7	40	10	
Total	899	100	402	100	

Table 3: Sputum smear of Pulmonary TB cases, in Hargeisa, Somaliland, Somalia, 2002-2003 and 2007.

Discussion

The study shows that the loss of resources in Borama TB program had a significant impact on the sputum smear positives and negatives of TB patients prior to initiation of treatment and during the course of treatment. The impact could be attributed entirely to the loss of resources on the decrease of sputum smear negatives at the end of fifth month and at the end of treatment course. Contrarily, the sputum negatives in the comparison group increased in the same periods. The demographic distributions of patients in the two programs were similar and could not account for the differences observed (reported in a manuscript in press for JIDC). The loss of strict supervision and monitoring of sputum smear of TB patients could explain the decrease of the negatives in the 5th month and at the end of treatment. The sputum smear positives did not increase and patients with missing sputum smear increased in both the 5th month and at the end of treatment. This could affect the quality of the TB program operation and its' integrity.

The other changes in the sputum smear positives prior to the initiation of treatment and the conversion of the positives to negatives at the end of intensive phase of treatment in Borama may also be partially attributed to the loss of resources, since similar changes were observed in the comparison TB program in Hargeisa, though at a lesser extent. The TB control program in Borama lost the livelihood support for patients and their immediate families. Many patients, with multi-bacillary TB or at advanced stage, may have abandoned seeking for treatment in Borama after the loss. This is supported by the decrease of sputum smear positives prior to initiation of treatment and the increase in the conversion of the positives to negatives, indicating possible dominance of pauci-bacillary cases in 2007. A study in India showed a slightly higher proportion of sputum positive cases converted to negative at the end of intensive phase of treatment, compared to our study [10]. A study in a Thailand refugee camp shows that multi-bacillary cases have lower conversion to negative than pauci-bacillary cases, which our study shows [11].

In the developing countries, sputum smear microscopy is the mainstay for testing TB suspects and monitoring treatment response of TB cases [12,13]. Sputum smear microscopy detects little above half of TB cases [14]. Drug susceptibility and sputum culture are rarely done because of absence or lack of laboratory infrastructure. Thus, the impact of the loss of resources could be higher than what we observed in our study.

The sputum microscopic results of substantial proportion of TB patients in both programs were missing, possibly not recorded. This could have an impact on the health of the community and patient's health, and on the program success. The study shows that the success of TB programs in the developing countries rely mostly on external support, dedicated volunteers, organizations or donor countries. Thus, without sustainable resources from the locals, such programs may hardly achieve international and national program goals.

The study has some limitations. A substantial proportion of sputum smear were not recorded, which could affect the findings observed in the study. The sputum smear detects just above half of TB patients which limits the extrapolation of the results to all TB patients in Somalia. The study compared only two TB control programs in Somalia. Comparison to other TB programs to Borama program may show results contrary to our findings. Despite these limitations, the study used an appropriate evaluation method that produces valid results. Further studies are needed to compare the Borama TB control program to other TB programs in other parts of Somalia to validate the results of the study.

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Conflict of Interest

The authors declare no conflict of interest.

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